



Testing Equipment for the construction industry

General Catalogue 2015 8th Edition



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Catalogue CAT15R0/E/CB/9

In line with its continual program of product research and development, CONTROLS S.R.L. reserves the right to alter specifications to equipment to any time.

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CONTROLSGROUP

Anticipating the future

This is what CONTROLS has now been doing for almost 50 years. It might seem a long time, but those years have served to consolidate the company's core values: corporate ethics, accountability, a service-oriented attitude, continuous innovation and a mutual trust with all those customers and partners who have joined us on an exciting adventure of people, products and technologies.

Our heritage is founded on these solid bases.

Partnership and innovation have been the cornerstones of a continual process that has seen CONTROLS become a pioneer and leader in the industry since its inception.

But corporate positioning and strategy need to be constantly re-oriented to **anticipate market trends and meet the increasing needs of customers.**

This is why CONTROLS maintains a global presence based on a solid worldwide network carefully structured over the years and attentively serving its customers with a team of skilled and experienced staff regularly trained in the factory.

This is why CONTROLS is constantly investing in R&D, developing proprietary technologies and innovative products, such as the MCC, AUTOMAX and PILOT, still today unsurpassed benchmarks in the world of compression testing machines.

This is why CONTROLS, with its strong industrial vocation, vertically integrates the entire process, from product conception to design, and from production to distribution and service.

This is why in early 2015 CONTROLS moved to a new premises of over 8000 m² to make the entire processes more efficient and enhance the quality standards, to offer new spaces for products training and to further strengthen the R&D section.

This is why in 2014 CONTROLS acquired IPC Global Pty Ltd., Australia's global leader in dynamic pavement testing, recognized for its technological excellence. The initiative complements the Pavelab® Systems' range of advanced asphalt and bitumen testing equipment and confirms the status of CONTROLS Group as the ideal partner for the world of research and science.

This is why at last the new General Catalogue is here, now in its VIII Edition, rich and comprehensive, offering a range of products and systems unparalleled in detail and quality. A vast range of products and services, from basic equipment, always adhering without compromise to the latest standards and safety regulations, all the way up to the most sophisticated machines for the world of research and advanced testing.

My sincere thanks go to all those partners and associates who, with their expertise, commitment and loyalty, have helped over the years to increase and strengthen our position in the world. Building on the results so far and well aware that there is still a long way to go, we are committed to carry on with renewed energy and enthusiasm towards new and more exciting targets, well determined to continue... *anticipating the future.*

Pasquale Di Iorio
CONTROLS GROUP President

One group:
your partner

■ CONTROLS Group, with its branch offices and worldwide network of qualified distributors has been, for almost 50 years, the ideal partner in test equipment for the construction industry. Worldwide.

CONTROLS GROUP

CONTROLS Testing
Equipment Ltd,
since 1983
United Kingdom

CONTROLS Polska
Sp. z o.o.,
since 2004
Poland

TE CONTROLS Ltd,
since 2013
Iraq

Equipos de Ensayo
CONTROLS S.a.,
since 1989
Spain

CONTROLS S.à.r.l.,
since 1993
France

CONTROLS S.r.l.,
since 1966
Italy

Wykeham Farrance Ltd,
since 1941
United Kingdom

Equipos de Ensayo
CONTROLS, S.a. de c.v.,
since 1995
Mexico

IPC Global Pty Ltd,
since 1981
Australia



CONTROLS Group works
with four proprietary brands:



In the field

A global presence with a solid distribution network, carefully structured and attentively serving its customers with a team of highly skilled, experienced and regularly trained staff.

Anticipating the future:

the real test

- The challenges of the future demand solid answers and CONTROLS is taking action, today for tomorrow.



December 2014

- A new site covering over 8000 m² to make processes even more efficient and enhance quality, to offer new spaces for training and to further strengthen R&D.



April 2014



- The acquisition of IPC Global, Australia's global leader in Dynamic Pavement Testing, recognised for its technological excellence. The initiative complements the PAVELAB[®] SYSTEMS range of advanced Asphalt and Bitumen testing equipment and confirms the status of the CONTROLS Group as the ideal partner for the world of research and science.

March 2014



- The Academy Centre is launched, specializing in the training of laboratory technicians, either at CONTROLS headquarters or directly on site throughout the world.

Made in CONTROLS:

total quality

- Being a company with a long-standing industrial tradition, CONTROLS vertically integrates the entire process, from product conception to design and from manufacture to distribution and after-sales.





In the new site of over 8000 m², large-scale production and economies of scale go hand in hand with craftsmanlike care in the assembly and calibration of the products, from the simplest to the most complex and sophisticated.



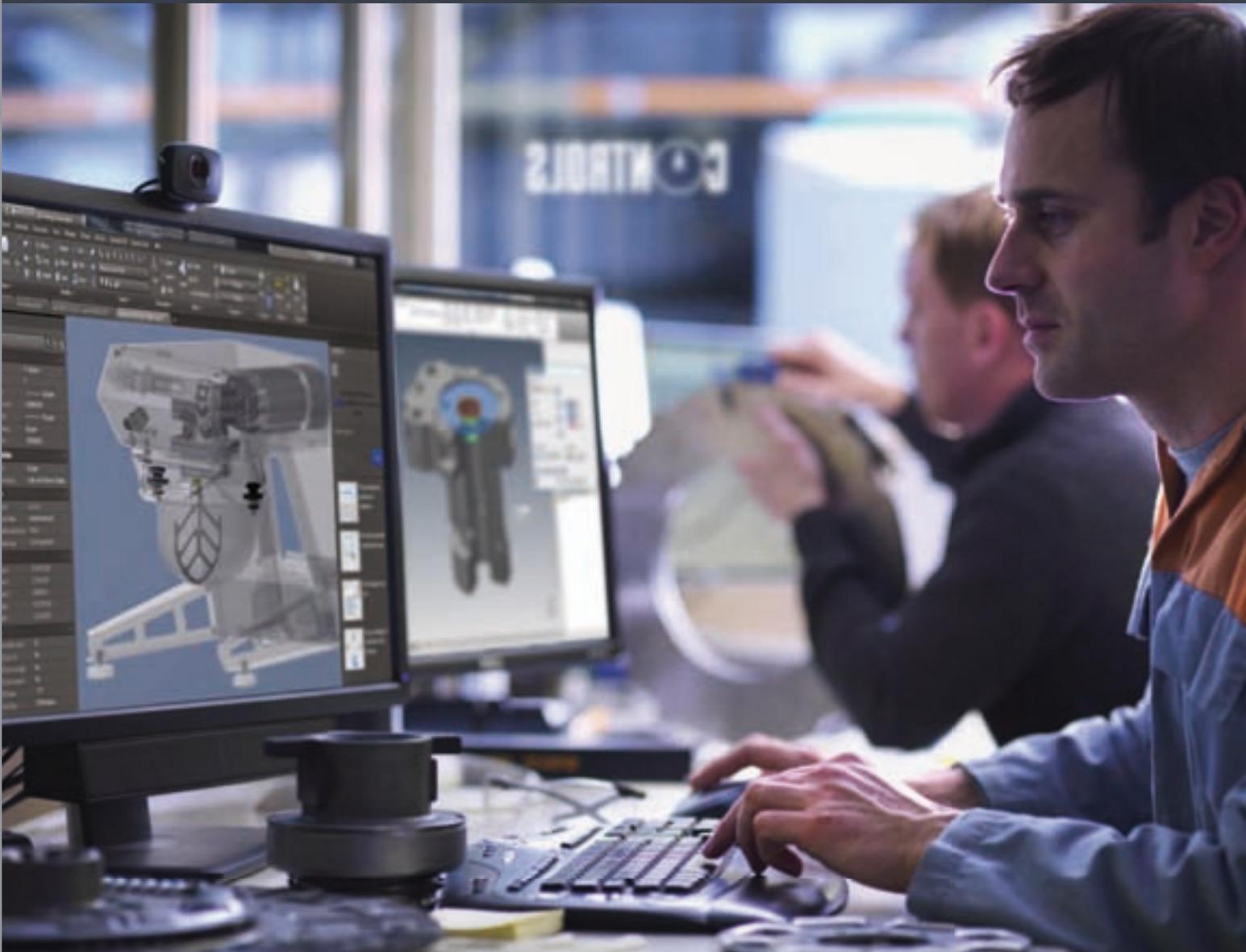
Uncompromising quality: all equipment strictly complies with product regulations and EC safety standards and undergoes precision checks and calibrations.

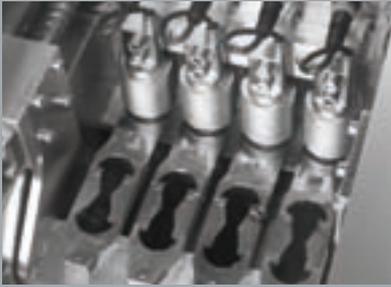


Made in **CONTROLS**:

creative technology

- The most comprehensive range of testing equipment for the construction industry on the market today is based entirely on advanced proprietary technologies.





For CONTROLS innovation has always been a state of mind, a mental attitude summed up in this concept:



CUSTOMER VALUE
DRIVES THE INNOVATION

The CVI-tech concept (efficient technology, smart software, industrial design, modular expandability) delivers the development of new, high-worth products and services to the customer in terms of:

- Rigorous regulatory compliance.
- Ergonomics and design.
- Value for money.
- Consistent performance even after intensive use.



Test us

for your testing

- We don't just sell products. The CONTROLS team of specialists supports clients in their testing and follow-on requirements and are always striving to find ways of improving.





Our specialists provide updated technical and scientific support for new regulations and on the latest and most advanced testing technologies at the advisory stage and during product use.



CONTROLS range of test machines, systems and accessories are able to provide a complete and satisfactory solution for all testing needs of construction materials for Q/A and for validation of R/D products.



Concrete: **CONTROLS** boasts unmatched leadership in the manufacture of compression machines and test equipment for concrete and cement.



Soil: **Wykeham Farrance** offers a complete range for static and dynamic testing for standard applications and research.



Asphalt: **Pavelab® Systems** and **IPC Global®** offer a range of road surface instrumentation unequalled in their completeness, quality and reliability.

First class after-sales service:

local to our customers

- CONTROLS offers a wide range of valuable services: calibration, technical support, assistance and training. Anywhere in the world.





Highly advanced communication systems allow the CONTROLS support team to be in constant contact with users, giving support also from headquarters. Product traceability, original components, complete and comprehensive support documents and a certified calibration service complete the offer of continuity that CONTROLS provides customers: a privilege that only a modern and efficient organisation can provide.



Training Centre CONTROLS



Calibration Centre LAT N°092
Signatory of EA, IAF and ILAC
Mutual Recognition Agreement

We believe in testing culture

The sales and service network is constantly updated with training activities at CONTROLS headquarters and in the field. An important commitment for superior service.

CONTROLS specialists offer training for laboratory technicians with tailored courses at the Academy Centre or at the customer's premises, wherever they might be in the world.

CONTROLS S.R.L. is accredited as a Calibration Centre N° 92 for the calibration and verification of force transfer on compression and tension machines in accordance to UNI CEI EN ISO/IEC 17025 and to the requisites from EA and ILAC.



This catalogue is also available in French, Spanish and Italian languages. If you wish to get one of those editions please visit our web site controls-group.com or ask to our offices.

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Drying, Weighing and Grading

10 | Drying samples

11 | Weighing samples

15 | Sample grading



Ovens and similar equipment, balances and test sieves with related accessories are common equipment that are indispensable for all laboratories for construction materials. We propose a wide range of models which satisfy the requirement of all main International Standards and particularly the EN 932-5 “Tests for general properties of aggregates – Part 5: Common equipment and calibration.”

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Laboratory ovens

Standards

EN 932-5 | EN 1097-5 |

ASTM C127 | ASTM D1559 | ASTM D698 |

ASTM D558 | ASTM D1557 | ASTM C136 |

ASTM D559 | ASTM D560 |

BS 1924:1

Laboratory ovens

10-D1396

Stainless steel, forced convection, digital laboratory oven, 250 litre capacity. 230 V, 50-60 Hz, 1 ph.

10-D1396/Z

As above but 110 V, 60 Hz, 1 ph.

10-D1397

Stainless steel, forced convection, digital laboratory oven, 450 litre capacity. 230 V, 50-60 Hz, 1 ph.

10-D1397/Z

As above but 220 V, 60 Hz, 3 ph.

10-D1398

Stainless steel, forced convection, digital laboratory oven, 780 litre capacity. 380 V, 50 Hz, 3 ph.

10-D1398/Z

As above but 220 V, 60 Hz, 3 ph.



Detail of external stainless lining: "linen patterned" resistant to scratches and shocks

main features

- > Digital PID temperature control system
- > High temperature uniformity and precision
- > Over-heating protection
- > Stainless steel internal and external 'linen patterned' lining
- > Forced convection airflow
- > 200°C maximum temperature
- > Supplied complete with three grid shelves

Models 10-	D1396 D1396/Z	D1397 D1397/Z	D1398
Nominal capacity	250 litres	450 litres	780 litres
Max. temperature	200°C	200°C	200°C
Air convection	Forced	Forced	Forced
Rated power	2100 W	3100 W	4200 W
Internal dimensions (w x d x h)	540 x 650 x 700 mm	600 x 750 x 1000 mm	810 x 800 x 1200 mm
External dimensions (w x d x h) (approx.)	900 x 1020 x 970 mm	1020 x 1120 x 1270 mm	1235 x 1180 x 1450 mm
Number of shelves	3	3	3
Weight (approx.)	130 kg	157 kg	200 kg

Accessories and spares

10-D1396/1

Spare grid shelves for 10-D1396

10-D1397/1

Spare grid shelves for 10-D1397

10-D1398/1

Spare grid shelves for 10-D1398

General purpose drying ovens



main features

- > Digital thermo-regulator / indicator
- > Forced convection (250 and 400 litre capacity models) and natural convection (100 litre capacity model)
- > Complete with safety thermostat to avoid over-heating
- > Supplied with two extractable grid shelves
- > Ideal for site laboratories

10-D1390/10

Natural convection oven, 100 litre capacity, digital thermo-regulator / indicator. 230 V, 50-60 Hz, 1 ph.

10-D1390/10Z

As above but 110V, 60 Hz, 1 ph.

10-D1390/25

Forced convection oven, 250 litre capacity, digital thermo-regulator / indicator. 230 V, 50-60 Hz, 1 ph.

10-D1390/25Z

As above but 110 V, 60 Hz, 1 ph.

10-D1390/40

Forced convection oven, 400 litre capacity, digital thermo-regulator / indicator. 230 V, 50-60 Hz, 1 ph.

10-D1390/40Z

As above but 110 V, 60 Hz, 1 ph.

Accessories and spares

10-D1390/T10

Spare grid shelf for 10-D1390/10

10-D1390/T25

Spare grid shelf for 10-D1390/25

10-D1390/T40

Spare grid shelf for 10-D1390/40

Models 10-	D1390/10 D1390/10Z	D1390/25 D1390/25Z	D1390/40 D1390/40Z
Nominal capacity	100 litres	250 litres	400 litres
Max. temperature	200 °C	200 °C	200 °C
Air convection	Natural	Forced	Forced
Rated power	1300 W	2000 W	3000 W
Internal dimensions (w x d x h)	440 x 460 x 498 mm	554 x 680 x 663 mm	604 x 790 x 849 mm
External dimensions (w x d x h) (approx.)	673 x 605 x 765 mm	787 x 908 x 930 mm	1115 x 1018 x 837 mm
Number of shelves	2	2	2
Weight (approx.)	47 kg	52 kg	104 kg

Hot plates

Digital hot plates

Designed to meet routine heating requirements of laboratories, this hot plate has a digital temperature controller and an aluminium heating surface.

10-D1401/E

Digital hot plate, 300 x 400 mm, aluminium alloy/stainless steel plate. 230 V, 50-60 Hz, 1 ph.

Technical specifications

- Temperature range: ambient to 350 °C
- Accuracy: ± 5 °C
- Heating area: 300x 400 mm
- Heating power: 2000 W
- Overall dimensions:
 - 400 x 300 x 150 mm
- Weight: 18 kg (approx.)

General utility hot plates

Used in laboratories for a wide variety of applications, there are two versions of this hot plate available: 10-D1402 with temperature control via a multi-position switch, and 10-D1402/A with a bi-metallic thermostat.

Technical specifications

- Plate diameter: 160 mm
- Heating power: 1000 W
- Overall dimensions:
 - 260 x 260 x 135 mm
- Weight: 3 kg (approx.)

10-D1402

Hot plate, 160 mm diameter, multi-position switch. 230 V, 50-60 Hz, 1 ph.

10-D1402/Z

As above but 110V, 60 Hz, 1 ph.

10-D1402/A

Hot plate, 160 mm diameter, bi-metallic thermostat. 230 V, 50-60 Hz, 1 ph.



10-D1401/E



10-D1402, 10-D1402/A

Muffle furnaces | Air drier | Microwave oven

Air drier

Used to dry small quantities of soil and aggregate particles.

Weight: 1.5 kg (approx.)

10-D1425

Warm-air drier. 1000 W, 230 V, 50 Hz, 1 ph.



Microwave oven

10-D1424

Microwave oven, 28 litre capacity, 900 W, 230 V, 50-60 Hz, 1 ph.

Muffle furnaces

This range of muffle furnaces covers practically all requirements of the construction material laboratory, from aggregates to concrete/cement and asphalt testing.

Model 10-D1418/AP is supplied complete with a programmer for setting the temperature ramp.

10-D1418

Muffle furnace, 1100 °C max temperature. 230 V, 50-60 Hz, 1 ph.

10-D1418/A

Muffle furnace, 1200 °C max temperature. 230 V, 50-60 Hz, 1 ph.

10-D1418/AZ

As above but 110 V, 60 Hz, 1 ph.

10-D1418/AP

Muffle furnace, 1200 °C max temperature, complete with temperature ramp programmer. 230 V, 50-60 Hz, 1 ph.

10-D1419

Muffle furnace, 1100 °C max temperature, high capacity, floor mounted model. 220-380 V, 50-60 Hz, 3 ph.



10-D1419

Models 10-	D1418	D1418/A D1418/AZ	D1418/AP	D1419
Max. temp., °C	1100	1200	1200	1100
Accuracy, °C	±4	±4	±4	±4
Rated power, W	3900	4200	4200	9000
Internal dimensions, mm	210 x 320 x 145	210 x 280 x 145	210 x 280 x 145	300 x 220 x 500
External dimensions, mm	510 x 750 x 660	510 x 650 x 650	510 x 650 x 650	750 x 1650 x 1100
Weight, kg (appr.)	89	70	70	400
Reference standards	EN 12697-1 EN 13108	EN 196-2 EN 196-1 EN 459-2	EN 196-2 EN 196-1 EN 459-2	EN 1367-5



10-D1418/A,
10-D1418/AP



10-D1418

Climatic chambers

Standards

EN 1367-1 | EN 12390-2 | EN 196-1



Cabinet

Constructed from monobloc stainless steel, the cabinet has four shelves supported on stainless steel guides capable of holding heavy specimens.

Thermostatic unit

The CFC free cooling system is designed to condition the air circulating in the cabinet. The cooling circuit is made entirely of copper and comprises a dewater/receiver filter, spy glass to verify the passage of Freon, high pressure manostat and inlet connectors. The heating element consists of a finned stainless steel tube with a limiting thermostat.

Control console

The front panel includes a large digital display with switches and alarm LEDs. A multifunction control unit simultaneously displays the set points and absolute output values.

Temperature sensor

The PT100 sensor can be moved within the cabinet area and can also be located inside the test sample, in conformance with specific standard requirements.

Humidity sensor

Allows measurement of humidity up to RH 100%.

Two versions of this advanced climatic chamber are offered:

10-D1429 - temperature controlled from -25 to +70 °C, for testing aggregates in conformance with EN 1367-1 as well as other similar tests on concrete and other construction materials, and

10-D1429/A - temperature and humidity controlled from -25 to +70 °C and 10 to 95% respectively, for aggregates and various other applications such as concrete and cement specimen curing (EN 12390-2, EN 196-1).

Both models can be upgraded with an internal data recording facility, data output port and dedicated PC software. See accessory 10-D1429/REC.

For the determination of resistance to freezing and thawing of aggregates, the accessory 48-D0457 should be used. See accessories.

main features

- > Advanced controller with cycle programmer for 50 programs and 1000 segments
- > Temperature sensor can be positioned anywhere inside the cabinet or inside the sample, in conformance with requirements of the Standards
- > High accuracy: $\pm 1^\circ\text{C}$, $\pm 5\%$ RH (RH with 10-D1429/A model only)
- > A multipurpose climatic chamber suitable for testing applications in aggregates, cement, concrete, bricks, blocks, asphalt and other construction materials
- > Optional internal data recording facility, data output port and dedicated PC software.

Technical specifications

- Capacity: 520 litres
- Function controller: cycle programmer for 50 programs and 1000 segments
- Temperature range / accuracy: -25 to +70 °C / $\pm 1^\circ\text{C}$
- Humidity range / accuracy (model 10-D1429/A only): from 10 to 95% / $\pm 5\%$
- Rated power: Cooling system 1000 W, Heating system 1500 W
- Internal air circulation: 450 m³/hr
- Shelf loading capacity: 60 kg each
- Internal dimensions: 600 x 670 x 1300 mm (w x d x h)
- External dimensions: 720 x 800 x 2020 mm (w x d x h)
- Weight: 180 kg (approx.)

10-D1429

Temperature controlled cabinet, 520 litre capacity, temperature range -25 to +70 °C. 230 V, 50-60 Hz, 1 ph. [10-D1429/Z](#)
As above but 110 V, 60 Hz, 1 ph.

10-D1429/A

Temperature and humidity controlled cabinet, 520 litre capacity, temperature range -25 to +70 °C, humidity range from 10 to 95%. 230 V, 50-60 Hz, 1 ph. [10-D1429/AZ](#)
As above but 110 V, 60 Hz, 1 ph.

Accessories

10-D1429/REC

Upgrade of the cabinet controller with internal data recording facility, data output port and dedicated PC software. Note: This upgrade must be factory installed.

48-D0457

Metal can, 2000 ml capacity with removable lid and 1 kg ballast. Conforming to EN 1367-1. Used for determining the resistance to freezing and thawing of aggregates including lightweight types. Weight: 2.5 kg (approx.)

Balances

Balances are a general purpose laboratory apparatus used either for soil, aggregates, cement, concrete or asphalt testing. CONTROLS supply a wide range of electronic models suitable for different applications ranging from large central laboratories and on-site laboratories, to educational facilities. The battery operated models are particularly suitable for use in the field (battery pack can be provided on request). We also offer a range of accessories and calibration weights for periodically checking the balances.

How to select balances

Where specifications for a balance are not stated by the relevant Standard, the tables below may be used to select an appropriate balance that conforms to the general specifications given in the ASTM D4753-95, BS 1377:Part 1 and EN 932-5.

Very often a single specification requires that the balance has a readability and tolerance of 0.1% of the specimen mass to be measured and this can also be used as a choice criteria.

Other Standards covering aggregates and granular materials in general give information about the quantity of aggregate to be tested depending upon

its size (UNI 8520 Part 5, BS 812:Part 1, BS 598 etc.). The different standards give practically the same recommendations so we have included this information in a separate table.

Selection guide for weighing in conformance with ASTM, BS and EN standards

Minimum sample weight, g	Standards	Resolution (scale interval or decimal), g	Minimum accuracy (tolerance), g
20 to 200	ASTM C114 (Cement testing)	0.0002	± 0.0002
200	ASTM D4753 (GP2) BS1377:1 EN 932-5	0.1 0.001 0.001	± 0.2 ± 0.005 ± 0.005
1200	ASTM D4753 (GP2) BS1377:1 EN 932-5	0.1 0.01 0.01	± 0.2 ± 0.05 ± 0.05
2000	ASTM D4753 (GP5) BS1377:1 EN 932-5	1 0.1 0.1	± 2 ± 0.3 ± 0.3
5000	ASTM D4753 (GP10) BS1377:1 EN 932-5	5 0.5 0.5	± 5 ± 1 ± 1
10000	ASTM D4753 (GP10) BS1377:1 EN 932-5	5 1 1	± 5 ± 3 ± 3
25000	ASTM D4753 (GP10) BS1377:1 EN 932-5	5 5 5	± 5 ± 10 ± 10
50000	ASTM D4753 (GP10) BS1377:1 EN 932-5	50 10 10	± 50 ± 20 ± 30

Minimum mass of sample for sieve analysis¹

Nominal size of material, mm	Minimum mass of sample, kg
63	50
50	35
40	15
28	5
20	2
14	1
10	0.5
6	0.2
5	0.2
3	0.2
<3	0.1

¹BS 812:1

Top loading electronic balances

Standards EN 932-5 | ASTM D4753

Specifications and ordering information

Models 11-	Capacity, g	Resolution g	Pan dimensions mm	Calibration	Power adapter, V	Weight, kg (approx.)
D0630/04	420	0.001	80 diameter	DKD	230	2.5
D0630/04Z	420	0.001	80 diameter	DKD	110	2.5
D0630/06	600	0.01	130 diameter	Traceable	230/110	1.5
D0630/4	4200	0.01	150 diameter	DKD	230	2.3
D0630/4Z	4200	0.01	150 diameter	DKD	110	2.3
D0630/6	6000	0.1	140 x 150	Traceable	230/110	3
D0630/10	10000	0.1	150 x 170	DKD	230	1.1
D0630/10Z	10000	0.1	150 x 170	DKD	110	1.1
D0630/15	15000	0.2	225 x 300	Traceable	230/110	5.1
D0630/16	16000	0.1	210 x 230	Traceable	230	7.2
D0630/16Z	16000	0.1	210 x 230	Traceable	110	7.2
D0630/24	24100	0.1	160 x 200	DKD	230	4
D0630/24Z	24000	0.1	160 x 200	DKD	110	2.7
D0630/30	30000	0.5	225 x 300	Traceable	230/110	5.1
D0630/30A	30000	1	340 x 240	DKD	230	6.5
D0630/30AZ	30000	1	340 x 240	DKD	110	6.5
D0630/60	65000	1	340 x 240	DKD	230	6.5
D0630/60Z	65000	1	340 x 240	DKD	110	6.5
D0632/30	4500	0.1	210 x 230	Traceable	230	7.2
Dual range	32000	1				
D0632/30Z	4500	0.1	210 x 230	Traceable	110	7.2
Dual range	32000	1				
D0632/150	60000	2	318 x 308	DKD	230	4
Dual range	150000	5				
D0632/150Z	60000	2	318 x 308	DKD	110	4
Dual range	150000	5				

main features

- > Mains and rechargeable battery operated (battery pack not included)
- > Under balance weighing facility (except for the 150 kg model)
- > RS232 serial port
- > Supplied complete with traceable or DKD (Deutscher Kalibrierdienst, the German Accreditation Authority) calibration certificate



11-D0630/04



11-D0630/24



11-D0630/30A



11-D0630/6, /15, /30



11-D0630/06



11-D0630/150



11-D0630/10



11-D0630/16

Analytical and moisture determination balances | Standard calibration weights

Analytical balance

This balance is particularly suitable for testing the heat of hydration of cement, where a high accuracy is requested.



11-D0613/B

Electronic analytical balance, 210 g capacity, 0.1 mg resolution, 110-230 V, 50-60 Hz, 1 ph.

Technical specifications

- Capacity: 210 g
- Resolution: 0.1 mg
- Accuracy: ± 0.3 mg
- Tare range: by subtraction up to full capacity
- Display: seven-character LCD
- Data interface: bi-directional RS 232
- Pan diameter: 80 mm
- Dimensions: 215 x 345 x 345 mm (w x d x h)
- Weight: 5.9 kg (approx.)



19-D0602/B

Specific gravity determination

Standards

EN 12697, EN 12390-7, EN 1097-6 | ASTM C127, ASTM C128 | AASHTO T84 | BS 812:2, BS 1881:14

11-D0612/B

Specific gravity frame

Note

For more details and information see page 204



11-D0612/B with balance and accessories

Moisture determination balance

This model automatically and simultaneously dries and weighs solid samples for the determination of moisture content. With a built-in timer, the balance provides a continuous direct readout for both weight and percentage moisture loss throughout the entire cycle.

19-D0602/B

Moisture determination balance, 160 g capacity, 1 mg resolution, 230 V, 50-60 Hz, 1 ph.

Specifications

- Capacity: 160 g
- Resolution: 1 mg
- Timer: 0-99 minutes
- Dimensions: 194 x 340 x 235 mm (w x d x h)
- Weight: 11.5 kg (approx.)

Standard calibration weights M1 Class, 50 g to 20kg

Used for periodic checking of balances. The standard weights 11-D0700/C to 11-D0707/C are supplied complete with a manufacturer's certificate of conformity. Calibrated models, with ACCREDIA certificate also available and are identified adding suffix 1 to the code. Ex.: 11-D0700/C1.

11-D0700/C

50 g calibration weight, M1 Class, ± 3 mg tolerance.

11-D0701/C

100 g calibration weight, M1 Class, ± 5 mg tolerance.

11-D0702/C

200 g calibration weight, M1 Class, ± 10 mg tolerance.

11-D0703/C

500 g calibration weight, M1 Class, ± 25 mg tolerance.

11-D0704/C

1 kg calibration weight, M1 Class, ± 50 mg tolerance.

11-D0705/C

2 kg calibration weight, M1 Class, ± 100 mg tolerance.

11-D0706/C

5 kg calibration weight, M1 Class, ± 250 mg tolerance.

11-D0707/C

10 kg calibration weight, M1 Class, ± 500 mg tolerance, calibration certificate.

11-D0708/C

20 kg cast iron calibration weight, M1 class, ± 1 g tolerance



11-D0700/C - D0707/C

Accessories

11-D0708

Wooden box for single weights up to 500 g

11-D0708/1

Wooden box for 1 kg weight

11-D0708/2

Wooden box for 2 kg weight

11-D0708/3

Wooden box for 5 kg weight

11-D0708/4

Wooden box for 10 kg weight

Set of weights 1mg to 50 g

11-D0709/C

Set of weights, 1 mg to 50 g, 20 pieces in total.

Testing Sieves

We propose a complete range of full depth testing sieves with 200 mm, 8", 250 mm, 300 mm, 12", 315 mm and 450 mm dia., with woven wire cloth and perforated plate conforming to the different Standards. On request we can also supply models with round holes perforated plate from 1 to 100 mm dia.

All frames except the 450 mm dia., and wire cloth sieves are manufactured from stainless steel. Perforated plates are made from tinned steel. Sieves having the same nominal diameter are designed to nest one in each other. Using 200 mm (8") sieves it is possible to test up to 1000 g of aggregates and 3000 g with 300 mm (12") dia.

Standards

European

Conforming to the new European EN Standards all sieves for the construction industry are specified by the following Standards:

EN 933-2

Test for geometrical properties of aggregates
Determination of particle size distribution
Test sieves, nominal size of apertures

ISO 3310-1

Test sieves of woven wire cloth

ISO 3310-2

Test sieves of perforated metal plate

ISO 565

Nominal size of openings for woven wire and perforated plate sieves.

The most common national Standards including BS 410, NF X11-504, DIN 4187-1, UNI 2331 - 2333, UNE 7050 are practically identical to the ISO 3310-1 and 2, except for some missing openings which have been included in the list for those users who prefer to complete or substitute existing old sets. The new European Standards also specify that: "Sieves with aperture size of 4 mm and above shall be perforated plate square hole test sieves. Below that size they shall be woven wire test sieves."

American

The sieves are conforming to the following Standards:

ASTM E11

Wire-cloth sieves for testing purposes.

Note. The sieve specifications are clearly marked on the label comprising the serial number and other information for the identification and traceability of the product as requested by the international specifications.

Traceable certificate of calibration

All sieves can be supplied, on request, with traceable certificate of calibration. In that case just add to the code number the suffix "C". Example: for an ISO 3310-1 test sieve, 200 mm dia. 1 mm opening, the code becomes 15-D2215/JC.



ISO 3310-1* Test sieves of woven cloth

Nominal aperture	Code 200 mm dia.	Code 250 mm dia.	Code 300 mm dia.	Code 315 mm dia.	Code 450 mm dia.
20 µm	15-D2365/J	15-D2365/F	15-D3365/J	15-D3365/F	15-D4365/J
38 µm	15-D2360/J	15-D2360/F	15-D3360/J	15-D3360/F	15-D4360/J
40 µm	15-D2355/J	15-D2355/F	15-D3355/J	15-D3355/F	15-D4355/J
45 µm	15-D2350/J	15-D2350/F	15-D3350/J	15-D3350/F	15-D4350/J
50 µm	15-D2345/J	15-D2345/F	15-D3345/J	15-D3345/F	15-D4345/J
53 µm	15-D2340/J	15-D2340/F	15-D3340/J	15-D3340/F	15-D4340/J
63 µm	15-D2335/J	15-D2335/F	15-D3335/J	15-D3335/F	15-D4335/J
75 µm	15-D2330/J	15-D2330/F	15-D3330/J	15-D3330/F	15-D4330/J
80 µm	15-D2325/J	15-D2325/F	15-D3325/J	15-D3325/F	15-D4325/J
90 µm	15-D2320/J	15-D2320/F	15-D3320/J	15-D3320/F	15-D4320/J
100 µm	15-D2315/J	15-D2315/F	15-D3315/J	15-D3315/F	15-D4315/J
106 µm	15-D2310/J	15-D2310/F	15-D3310/J	15-D3310/F	15-D4310/J
125 µm	15-D2305/J	15-D2305/F	15-D3305/J	15-D3305/F	15-D4305/J
150 µm	15-D2300/J	15-D2300/F	15-D3300/J	15-D3300/F	15-D4300/J
160 µm	15-D2295/J	15-D2295/F	15-D3295/J	15-D3295/F	15-D4295/J
180 µm	15-D2290/J	15-D2290/F	15-D3290/J	15-D3290/F	15-D4290/J
200 µm	15-D2285/J	15-D2285/F	15-D3285/J	15-D3285/F	15-D4285/J
212 µm	15-D2280/J	15-D2280/F	15-D3280/J	15-D3280/F	15-D4280/J
250 µm	15-D2275/J	15-D2275/F	15-D3275/J	15-D3275/F	15-D4275/J
300 µm	15-D2270/J	15-D2270/F	15-D3270/J	15-D3270/F	15-D4270/J
315 µm	15-D2265/J	15-D2265/F	15-D3265/J	15-D3265/F	15-D4265/J
355 µm	15-D2260/J	15-D2260/F	15-D3260/J	15-D3260/F	15-D4260/J
400 µm	15-D2255/J	15-D2255/F	15-D3255/J	15-D3255/F	15-D4255/J
425 µm	15-D2250/J	15-D2250/F	15-D3250/J	15-D3250/F	15-D4250/J
500 µm	15-D2245/J	15-D2245/F	15-D3245/J	15-D3245/F	15-D4245/J
600 µm	15-D2240/J	15-D2240/F	15-D3240/J	15-D3240/F	15-D4240/J
630 µm	15-D2235/J	15-D2235/F	15-D3235/J	15-D3235/F	15-D4235/J
710 µm	15-D2230/J	15-D2230/F	15-D3230/J	15-D3230/F	15-D4230/J
800 µm	15-D2225/J	15-D2225/F	15-D3225/J	15-D3225/F	15-D4225/J
850 µm	15-D2220/J	15-D2220/F	15-D3220/J	15-D3220/F	15-D4220/J
1 mm	15-D2215/J	15-D2215/F	15-D3215/J	15-D3215/F	15-D4215/J
1.18 mm	15-D2210/J	15-D2210/F	15-D3210/J	15-D3210/F	15-D4210/J
1.25 mm	15-D2205/J	15-D2205/F	15-D3205/J	15-D3205/F	15-D4205/J
1.4 mm	15-D2200/J	15-D2200/F	15-D3200/J	15-D3200/F	15-D4200/J
1.6 mm	15-D2195/J	15-D2195/F	15-D3195/J	15-D3195/F	15-D4195/J
1.7 mm	15-D2190/J	15-D2190/F	15-D3190/J	15-D3190/F	15-D4190/J
2 mm	15-D2185/J	15-D2185/F	15-D3185/J	15-D3185/F	15-D4185/J
2.36 mm	15-D2180/J	15-D2180/F	15-D3180/J	15-D3180/F	15-D4180/J
2.5 mm	15-D2175/J	15-D2175/F	15-D3175/J	15-D3175/F	15-D4175/J
2.8 mm	15-D2170/J	15-D2170/F	15-D3170/J	15-D3170/F	15-D4170/J
3.15 mm	15-D2165/J	15-D2165/F	15-D3165/J	15-D3165/F	15-D4165/J
3.35 mm	15-D2160/J	15-D2160/F	15-D3160/J	15-D3160/F	15-D4160/J
4 mm	15-D2155/J	15-D2155/F	15-D3155/J	15-D3155/F	15-D4155/J
4.75 mm	15-D2150/J	15-D2150/F	15-D3150/J	15-D3150/F	15-D4150/J
5 mm	15-D2145/J	15-D2145/F	15-D3145/J	15-D3145/F	15-D4145/J
5.6 mm	15-D2140/J	15-D2140/F	15-D3140/J	15-D3140/F	15-D4140/J
6.3 mm	15-D2135/J	15-D2135/F	15-D3135/J	15-D3135/F	15-D4135/J
6.7 mm	15-D2130/J	15-D2130/F	15-D3130/J	15-D3130/F	15-D4130/J
7.1 mm	15-D2128/J	15-D2128/F	15-D2128/J	15-D2128/F	15-D2128/J
8 mm	15-D2125/J	15-D2125/F	15-D3125/J	15-D3125/F	15-D4125/J
9.5 mm	15-D2120/J	15-D2120/F	15-D3120/J	15-D3120/F	15-D4120/J
10 mm	15-D2115/J	15-D2115/F	15-D3115/J	15-D3115/F	15-D4115/J
11.2 mm	15-D2110/J	15-D2110/F	15-D3110/J	15-D3110/F	15-D4110/J
12.5 mm	15-D2105/J	15-D2105/F	15-D3105/J	15-D3105/F	15-D4105/J
13.2 mm	15-D2100/J	15-D2100/F	15-D3100/J	15-D3100/F	15-D4100/J
14 mm*	15-D2096/J	15-D2096/F	15-D3096/J	15-D3096/F	15-D4096/J
16 mm	15-D2095/J	15-D2095/F	15-D3095/J	15-D3095/F	15-D4095/J
18 mm*	15-D2091/J	15-D2091/F	15-D3091/J	15-D3091/F	15-D4091/J
19 mm	15-D2090/J	15-D2090/F	15-D3090/J	15-D3090/F	15-D4090/J
20 mm	15-D2085/J	15-D2085/F	15-D3085/J	15-D3085/F	15-D4085/J
22.4 mm	15-D2080/J	15-D2080/F	15-D3080/J	15-D3080/F	15-D4080/J
25 mm	15-D2075/J	15-D2075/F	15-D3075/J	15-D3075/F	15-D4075/J
26.5 mm	15-D2070/J	15-D2070/F	15-D3070/J	15-D3070/F	15-D4070/J
31.5 mm	15-D2065/J	15-D2065/F	15-D3065/J	15-D3065/F	15-D4065/J
37.5 mm	15-D2060/J	15-D2060/F	15-D3060/J	15-D3060/F	15-D4060/J
40 mm	15-D2055/J	15-D2055/F	15-D3055/J	15-D3055/F	15-D4055/J
45 mm	15-D2050/J	15-D2050/F	15-D3050/J	15-D3050/F	15-D4050/J
50 mm	15-D2045/J	15-D2045/F	15-D3045/J	15-D3045/F	15-D4045/J
53 mm	15-D2040/J	15-D2040/F	15-D3040/J	15-D3040/F	15-D4040/J
56 mm	15-D2035/J	15-D2035/F	15-D3035/J	15-D3035/F	15-D4035/J
63 mm	15-D2030/J	15-D2030/F	15-D3030/J	15-D3030/F	15-D4030/J
75 mm	15-D2025/J	15-D2025/F	15-D3025/J	15-D3025/F	15-D4025/J
80 mm	15-D2020/J	15-D2020/F	15-D3020/J	15-D3020/F	15-D4020/J
90 mm	15-D2015/J	15-D2015/F	15-D3015/J	15-D3015/F	15-D4015/J
100 mm	15-D2010/J	15-D2010/F	15-D3010/J	15-D3010/F	15-D4010/J
125 mm	15-D2005/J	15-D2005/F	15-D3005/J	15-D3005/F	15-D4005/J
Pan and cover	15-D2004/J	15-D2004/F	15-D3004/J	15-D3004/F	15-D4004/J
Pan only	15-D2003/J	15-D2003/F	15-D3003/J	15-D3003/F	15-D4003/J
Cover only	15-D2002/J	15-D2002/F	15-D3002/J	15-D3002/F	15-D4002/J
Frame only	15-D2001/J	15-D2001/F	15-D3001/J	15-D3001/F	15-D4001/J
Receiver/Separator	15-D2000/J	15-D2000/F	15-D3000/J	15-D3000/F	15-D4000/J

* Apertures conforming also to BS, NF, DIN, UNE, UNI Standards. See introduction

ISO 3310-2* Test sieves of perforated metal plate

Nominal aperture	Code 200 mm dia.	Code 250 mm dia.	Code 300 mm dia.	Code 315 mm dia.	Code 450 mm dia.
4 mm	15-D2550/J	15-D2550/F	15-D3550/J	15-D3550/F	15-D4550/J
4.75 mm	15-D2545/J	15-D2545/F	15-D3545/J	15-D3545/F	15-D4545/J
5 mm	15-D2540/J	15-D2540/F	15-D3540/J	15-D3540/F	15-D4540/J
5.6 mm	15-D2535/J	15-D2535/F	15-D3535/J	15-D3535/F	15-D4535/J
6.3 mm	15-D2530/J	15-D2530/F	15-D3530/J	15-D3530/F	15-D4530/J
6.7 mm	15-D2525/J	15-D2525/F	15-D3525/J	15-D3525/F	15-D4525/J
7.1 mm	15-D2520/J	15-D2520/F	15-D3520/J	15-D3520/F	15-D4520/J
8 mm	15-D2515/J	15-D2515/F	15-D3515/J	15-D3515/F	15-D4515/J
9 mm	15-D2514/J	15-D2514/F	15-D3514/J	15-D3514/F	15-D4514/J
9.5 mm	15-D2510/J	15-D2510/F	15-D3510/J	15-D3510/F	15-D4510/J
10 mm	15-D2505/J	15-D2505/F	15-D3505/J	15-D3505/F	15-D4505/J
11.2 mm	15-D2500/J	15-D2500/F	15-D3500/J	15-D3500/F	15-D4500/J
12.5 mm	15-D2495/J	15-D2495/F	15-D3495/J	15-D3495/F	15-D4495/J
13.2 mm	15-D2490/J	15-D2490/F	15-D3490/J	15-D3490/F	15-D4490/J
14 mm	15-D2485/J	15-D2485/F	15-D3485/J	15-D3485/F	15-D4485/J
16 mm	15-D2480/J	15-D2480/F	15-D3480/J	15-D3480/F	15-D4480/J
18 mm*	15-D2479/J	15-D2479/F	15-D3479/J	15-D3479/F	15-D4479/J
19 mm	15-D2475/J	15-D2475/F	15-D3475/J	15-D3475/F	15-D4475/J
20 mm	15-D2470/J	15-D2470/F	15-D3470/J	15-D3470/F	15-D4470/J
22.4 mm	15-D2465/J	15-D2465/F	15-D3465/J	15-D3465/F	15-D4465/J
25 mm	15-D2460/J	15-D2460/F	15-D3460/J	15-D3460/F	15-D4460/J
26.5 mm	15-D2455/J	15-D2455/F	15-D3455/J	15-D3455/F	15-D4455/J
28 mm	15-D2450/J	15-D2450/F	15-D3450/J	15-D3450/F	15-D4450/J
31.5 mm	15-D2445/J	15-D2445/F	15-D3445/J	15-D3445/F	15-D4445/J
37.5 mm	15-D2440/J	15-D2440/F	15-D3440/J	15-D3440/F	15-D4440/J
40 mm	15-D2442/J	15-D2442/F	15-D3442/J	15-D3442/F	15-D4442/J
45 mm	15-D2435/J	15-D2435/F	15-D3435/J	15-D3435/F	15-D4435/J
50 mm	15-D2430/J	15-D2430/F	15-D3430/J	15-D3430/F	15-D4430/J
53 mm	15-D2425/J	15-D2425/F	15-D3425/J	15-D3425/F	15-D4425/J
56 mm	15-D2426/J	15-D2426/F	15-D3426/J	15-D3426/F	15-D4426/J
63 mm	15-D2420/J	15-D2420/F	15-D3420/J	15-D3420/F	15-D4420/J
75 mm	15-D2415/J	15-D2415/F	15-D3415/J	15-D3415/F	15-D4415/J
80 mm	15-D2416/J	15-D2416/F	15-D3416/J	15-D3416/F	15-D4416/J
90 mm	15-D2410/J	15-D2410/F	15-D3410/J	15-D3410/F	15-D4410/J
100 mm	15-D2402/J	15-D2402/F	15-D3402/J	15-D3402/F	15-D4402/J
106 mm	15-D2405/J	15-D2405/F	15-D3405/J	15-D3405/F	15-D4405/J
125 mm	15-D2400/J	15-D2400/F	15-D3400/J	15-D3400/F	15-D4400/J
Pan and cover	15-D2004/J	15-D2004/F	15-D3004/J	15-D3004/F	15-D4004/J
Pan only	15-D2003/J	15-D2003/F	15-D3003/J	15-D3003/F	15-D4003/J
Cover only	15-D2002/J	15-D2002/F	15-D3002/J	15-D3002/F	15-D4002/J
Frame only	15-D2001/J	15-D2001/F	15-D3001/J	15-D3001/F	15-D4001/J
Receiver/Separator	15-D2000/J	15-D2000/F	15-D3000/J	15-D3000/F	15-D4000/J

* Apertures conforming also to BS and DIN Standards. See introduction



Test sieves of perforated metal plate

The new European Standards also specify that: "Sieves with aperture size of 4 mm and above shall be perforated plate square hole test sieves. Below that size they shall be woven wire test sieves."

main features

- > Each sieve is supplied complete with certificate of conformity

ASTM E11 US Sieve series

Woven wire cloth sieves (coarse)



Woven wire cloth sieves (fine)



Aperture mm/in.		Code 8" dia.	Code 12" dia.
100 mm	4 in.	15-D0100/2J	15-D0100/3J
90 mm	3½ in.	15-D0101/2J	15-D0101/3J
75 mm	3 in.	15-D0102/2J	15-D0102/3J
63 mm	2½ in.	15-D0103/2J	15-D0103/3J
53 mm	2.12 in.	15-D0104/2J	15-D0104/3J
50 mm	2 in.	15-D0105/2J	15-D0105/3J
45 mm	1¾ in.	15-D0106/2J	15-D0106/3J
37.5 mm	1½ in.	15-D0107/2J	15-D0107/3J
31.5 mm	1¼ in.	15-D0108/2J	15-D0108/3J
26.5 mm	1.06 in.	15-D0109/2J	15-D0109/3J
25.0 mm	1 in.	15-D0110/2J	15-D0110/3J
22.4 mm	7/8 in.	15-D0111/2J	15-D0111/3J
19.0 mm	¾ in.	15-D0112/2J	15-D0112/3J
16.0 mm	5/8 in.	15-D0113/2J	15-D0113/3J
13.2 mm	.530 in.	15-D0114/2J	15-D0114/3J
12.5 mm	½ in.	15-D0115/2J	15-D0115/3J
11.2 mm	7/16 in.	15-D0116/2J	15-D0116/3J
9.5 mm	3/8 in.	15-D0117/2J	15-D0117/3J
8.0 mm	5/16 in.	15-D0118/2J	15-D0118/3J
6.7 mm	.265 in.	15-D0119/2J	15-D0119/3J
6.3 mm	1/4 in.	15-D0120/2J	15-D0120/3J
5.6 mm	No. 3½	15-D0121/2J	15-D0121/3J
4.75 mm	No. 4	15-D0122/2J	15-D0122/3J
4.00 mm	No. 5	15-D0123/2J	15-D0123/3J

Aperture mm/in.		Code 8" dia.	Code 12" dia.
3.35 mm	No. 6	15-D0124/2J	15-D0124/3J
2.8 mm	No. 7	15-D0125/2J	15-D0125/3J
2.36 mm	No. 8	15-D0126/2J	15-D0126/3J
2 mm	No. 10	15-D0127/2J	15-D0127/3J
1.7 mm	No. 12	15-D0128/2J	15-D0128/3J
1.4 mm	No. 14	15-D0129/2J	15-D0129/3J
1.18 mm	No. 16	15-D0130/2J	15-D0130/3J
1 mm	No. 18	15-D0131/2J	15-D0131/3J
850 µm	No. 20	15-D0132/2J	15-D0132/3J
710 µm	No. 25	15-D0133/2J	15-D0133/3J
600 µm	No. 30	15-D0134/2J	15-D0134/3J
500 µm	No. 35	15-D0135/2J	15-D0135/3J
425 µm	No. 40	15-D0136/2J	15-D0136/3J
355 µm	No. 45	15-D0137/2J	15-D0137/3J
300 µm	No. 50	15-D0138/2J	15-D0138/3J
250 µm	No. 60	15-D0139/2J	15-D0139/3J
212 µm	No. 70	15-D0140/2J	15-D0140/3J
180 µm	No. 80	15-D0141/2J	15-D0141/3J
150 µm	No. 100	15-D0142/2J	15-D0142/3J
125 µm	No. 120	15-D0143/2J	15-D0143/3J
106 µm	No. 140	15-D0144/2J	15-D0144/3J
90 µm	No. 170	15-D0145/2J	15-D0145/3J
75 µm	No. 200	15-D0146/2J	15-D0146/3J
63 µm	No. 230	15-D0147/2J	15-D0147/3J
53 µm	No. 270	15-D0148/2J	15-D0148/3J
45 µm	No. 325	15-D0149/2J	15-D0149/3J
38 µm	No. 400	15-D0150/2J	15-D0150/3J

Pan and cover	15-D0151/2J	15-D0151/3J
Pan only	15-D0152/2J	15-D0152/3J
Cover only	15-D0153/2J	15-D0153/3J
Frame only	15-D0154/2J	15-D0154/3J
Receiver/Separator	15-D0155/2J	15-D0155/3J

Sieve shakers

Digital Air Jet sieve shaker

Standards EN 933-10

15-D0413

Digital Air Jet sieve shaker.
230 V, 50-60 Hz, 1 ph

This apparatus is ideal for dry sample grading of powders, fragile samples and material with particle sizes from 5 µm to 4 mm that cannot be wet sieved. The device achieves highly effective sieving thanks to the air flow which forces fine particles to pass through the sieve by producing a controlled suction effect.

The Air Jet shaker is manufactured from anodized aluminium with a polyurethane resin shell. It has a digital control panel with a timer and vacuum meter and also features a suction regulation valve so that multiple tests can be performed with the same time and suction conditions. The shaker is supplied with a vacuum unit capable of producing a negative pressure of up to -20 kPa. The special airtight sieves are not included and have to be ordered separately (see accessories).

Technical specifications

- Sieving range: from 5 µm to 4 mm
- Product motion: airstream
- Minimum pressure: -20 kPa
- Time display: 1-99 minutes
- Sieve capacity: One 200 mm diameter
- Sieve (see accessories)
- Power rating: 1200 W (approx.)
- Voltage*: 230 V, 50-60 Hz, 1ph
- Total weight: 25 kg (approx.)
- *110 V, 60 Hz, available on request



15-D0413 with sieves

Accessories

Air Jet test sieves, 200 mm diameter:

Nylon cloth mesh type

Model 15-D0413/	Mesh size
005	5 µm
010	10 µm
015	15 µm
020	20 µm
025	25 µm
028	28 µm

Stainless steel mesh type

Model 15-D0413/	Mesh size	Model 15-D0413/	Mesh size
030	30 µm	160	160 µm
037	37 µm	180	180 µm
041	41 µm	200	200 µm
048	48 µm	212	212 µm
050	50 µm	224	224 µm
053	53 µm	250	250 µm
055	55 µm	280	280 µm
058	58 µm	300	300 µm
060	60 µm	315	315 µm
063	63 µm	355	355 µm
065	65 µm	400	400 µm
070	70 µm	425	425 µm
071	71 µm	450	450 µm
075	75 µm	500	500 µm
080	80 µm	560	560 µm
090	90 µm	600	600 µm
100	100 µm	630	630 µm
106	106 µm	710	710 µm
112	112 µm	800	800 µm
125	125 µm	850	850 µm
140	140 µm	900	900 µm
150	150 µm	1000	1.00 mm

Spares

15-D0413/1

Pack of 5 replacement bags for vacuum unit

15-D0413/2

Reusable plastic bag for vacuum unit

Sieve shakers

Standards EN 932-5

Electro-mechanical sieve shaker 15-D0410, 15-D0410/A series

This new electro-mechanical shaker combines efficient sieving action with a simple but heavy duty design.

The shaker must be secured to the base cabinet using the four holes in the base. Alternatively, if floor-mounting the shaker, it can be fitted with the Steel base plate for better stability. A Noise reduction cabinet is also available for housing the shaker. See accessories.

Two versions of this shaker are available:

15-D0410, for sieves up to 315 mm diameter, and 15-D410/A, for sieves up to 450 mm diameter.

Ordering information

15-D0410

Electro-mechanical sieve shaker for sieves up to 315 mm diameter. 230V, 50 Hz, 1 ph.

15-D0410/Y

As above but 220 V, 60 Hz, 1 ph.

15-D0410/Z

As above but 110 V, 60 Hz, 1 ph.

15-D0410/A

Electro-mechanical sieve shaker for sieves up to 450 mm diameter. 230V, 50 Hz, 1 ph.

15-D0410/AY

As above but 220 V, 60 Hz, 1 ph.

15-D0410/AZ

As above but 110 V, 60 Hz, 1 ph.



15-D0410 with sieves

15-D0410/A with sieves

main features

- > Dual effect electro-mechanical sieving
- > High sieve capacity
- > Accommodates sieves up to 315 mm (15-D0410) and 450 mm dia. (15-D410/A)
- > Ergonomic and fast clamping system
- > Timer function included
- > Noise reduction cabinet available. See accessories.
- > Wet sieving attachments available. See accessories

Model 15-	D0410 D0410/Y D0410/Z	D0410/A D0410/AY D0410/AZ
Max no. of sieves / diameter, mm	12 / 200 - 203 10 / 300 - 315	10 / 200 - 203 8 / 300 - 315 6 / 450
Power, W	200	200
Timer scale, minutes	30	30
Dimensions, mm (w x d x h)	660 x 500 x 1510	740 x 640 x 1510
Weight, kg (approx.)	60	70



Detail of the fast clamping system

Accessories

15-D0400/CB

Noise reduction cabinet for the 15-D0410 shaker. Ideal for reducing noise in the laboratory and essential for working within CE limits. The cabinet is manufactured from sheet steel and lined internally with soundproofing material.

Overall dimensions: 870 x 672 x 1562 mm (w x d x h)

Weight: 90 kg (approx.)

15-D0410/1

Steel base plate for floor-mounting the 15-D0410 shaker.



15-D0410 installed inside the Noise reduction cabinet 15-D0400/CB. Easy ergonomic double access door and foldable top cover



Detail of the adjustable base for 200 to 450 mm diameter sieves

Electro-mechanical, triple motion sieve shaker 15-D0411 series

This shaker features a unique combination of jarring and rotational action, providing superb sieving and grading performance. It can be completed with the noise reduction cabinet and wet sieving accessories. See accessories.

Technical specifications

- Sieve capacity:
- up to ten 200 - 203 mm (8") diameter sieves plus pan and cover;
- up to six 300 - 315 mm (12") diameter sieves plus pan and cover
- Maximum sample weight: from 1500 to 4500 g depending on the sieve size
- Rotational action: 327 oscillations per minute (approx.)
- Jarring action: 40 vertical blows per minute
- Power: 250 W
- Dimensions: 540 x 372 x 1013 mm (w x d x h)
- Weight: 75 kg (approx.)

Ordering information

15-D0411

Electro-mechanical, triple motion sieve shaker. 230V, 50-60 Hz, 1 ph.

15-D0411/Z

As above but 110V, 60 Hz, 1 ph.



15-D0411

main features

- > Vertical two way jarring action
- > Rotational action
- > Quick release clamps
- > Robust and efficient sieving motion
- > Timer included

Electro-magnetic sieve shaker 15-D0407/B series

15-D0407/B

Electromagnetic sieve shaker. 230V, 50-60 Hz, 1 ph.

15-D0407/BZ

As above but 110V, 60 Hz, 1 ph.

This unit has a vertical sieving motion provided by a very effective electro-magnetic unit.

The shaker has a built-in timer, and can be used with the wet sieving attachment for washing fine materials through the sieves without any loss of sample. The noise reduction cabinet is recommended for use in CE countries. See accessories.

Technical specifications

- Sieve capacity:
- up to twelve 203 mm (8") diameter sieves plus pan and cover;
- up to eight 300 - 315 mm (12") diameter sieves plus pan and cover
- Power: 400 W (approx.)
- Dimensions: 496 x 406 x 946 mm (w x d x h)
- Weight: 30 kg (approx.)



15-D0407/B

Accessories

15-D0400/CAB

Noise reduction cabinet for 15-D0407 and 15-D0411 shakers. Ideal for reducing noise in the laboratory and essential for working within CE limits. The cabinet is manufactured from sheet steel and is lined internally with soundproofing material.

- Overall dimensions: 770 x 772 x 1415 mm (w x d x h)
- Weight: 60 kg (approx.)

Wet sieving attachments (for all sieve shakers)

This set comprises a locking lid with a spray nozzle, a stainless steel base pan with a drainage plate and spout, a location plate and 10 watertight seals (O-rings). Three models are available:

15-D0400/A1

Wet sieving attachment for 200 mm diameter sieves. Weight 2.5 kg (approx.).

15-D0400/A2

Wet sieving attachment for 203 mm (8") diameter sieves. Weight 2.5 kg (approx.).

15-D0400/A3

Wet sieving attachment for 300 mm diameter sieves. Weight 5 kg (approx.).



15-D0400

High capacity Shaker and Screen trays

Standards EN 932-5

High capacity screen shaker

15-D0420/A

High capacity mechanical screen shaker.
230 V, 50-60 Hz, 1 ph.

15-D0420/AZ

As above but 110 V, 60 Hz, 1 ph.

The screen shaker has a capacity of about 30 litres (1 ft³) of sample and is ideal for sizing large quantities of crushed stones, sand, gravel, slag, coal, coke, ores, pellets and similar materials. Able to perform between two and six separations simultaneously, the vibrating unit consists of interlocking sections, which support and separate the screen trays. An equal clearance between trays allows each tray to be removed independently. The unit can hold six screen trays (which are ordered separately - see Screen trays) of 457 x 660 x 75 mm size, and one dustpan. For a complete system adhering to CE country regulations, use of the soundproof safety cabinet is recommended. See accessories.

Technical specifications

- Power: 250/300 W (250 W at 220 V, 60 Hz)
- Overall dimensions: 548 x 787 x 850 mm (w x d x h)(approx.)
- Tray dimensions: 457 x 660 x 75 mm
- Sample capacity: up to 30 litres (1ft³)
- Weight: 170 kg (approx.)



15-D0420/A with trays

15-D0420/A fitted with 15-D0420/A1 Dust cover

main features

- > Can separate up to 30 litres (1ft³) of aggregates (approx. 65 kg)
- > Also suitable for sizing crushed stones, slag, coal, coke, ores, pellets etc.
- > Large selection of screen trays available, ASTM and EN standards. See Screen trays.

Accessories

15-D0420/A2

Soundproof safety cabinet, manufactured from sheet steel and lined internally with soundproofing material to reduce noise and for protection from dust. Complete with electrical safety device which automatically stops the machine when the door is opened. The control panel of the shaker is mounted inside the cabinet.
Overall dimensions:
900 x 900 x 1250 mm (w x d x h)(approx.)
Weight approx: 120 kg



15-D0420/A installed inside cabinet 15-D0420/A2

15-D0420/A1

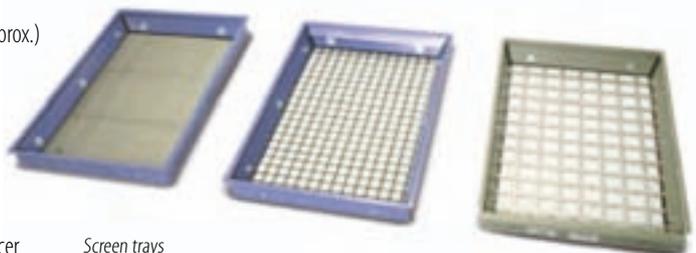
Dust cover.

15-D0428/10

Tray only, without mesh. Used as spacer between trays.

15-D0428/09

Dustpan tray.



Screen trays

Screen trays for use with 15-D0420/A Shaker

ISO 3310-1 and 3310-2: woven wire stainless steel mesh and perforated steel metal plate.

Made from steel, the trays are available in several versions:
 ASTM E11, woven wire mesh: coarse, intermediate, fine and fine with reinforced mesh, made from stainless steel;

Tray dimensions:
 457 x 660 x 75 mm (w x d x h)
 Weight: 6.5 kg (approx.)

Screen trays conforming to ASTM E11

Woven wire mesh type

15-D0425 Coarse series

Model 15-D0425/	Mesh opening	
	mm	inches
01	101.6	4
02	90.5	3 ½
03	76.1	3
04	64.0	2½
05	53.8	2.12
06	50.8 (•)	2
07	45.3	1¾
08	38.1 (•)	1½
09	32.0	1¼
10	26.9	1.06
11	25.4 (•)	1
12	22.6	7/8
13	19.0 (•)	3/4
14	16.0	5/8
15	13.5	.530
16	12.7 (•)	1/2
17	11.2	7/16
18	9.51	3/8
19	8.00	5/16
20	6.73	.265
21	6.35	1/4
	mm	US Std
22	5.66	No.3½
23	4.76	No. 4

(•) Standard set recommended by ASTM

15-D0426 Intermediate series

Model 15-D0426/	Mesh opening	
	mm	US std
01	4.00	No. 5
02	3.36	No. 6
03	2.83	No. 7
04	2.38	No. 8
05	2.00	No. 10
06	1.68	No. 12
07	1.41	No. 14

15-D0427 Fine series

Model 15-D0427/	Mesh opening	
	mm	US std
01	1.190	No. 16
02	1.000	No. 18
03	0.841	No. 20
04	0.707	No. 25
05	0.595	No. 30
06	0.500	No. 35
07	0.420	No. 40
08	0.354	No. 45
09	0.297	No. 50
10	0.250	No. 60
11	0.210	No. 70
12	0.177	No. 80
13	0.149	No. 100

15-D0428 Fine series with reinforced mesh

Model 15-D0428/	Mesh opening	
	mm	US std
01	0.125	No. 120
02	0.105	No. 140
03	0.088	No. 170
04	0.074	No. 200

Screen trays conforming to ISO 3310-1

Woven wire mesh type

15-D0427 Series

Model 15-D0427/	Mesh opening
E02	80 µm
E04	100 µm
E08	160 µm
E10	200 µm
E12	250 µm
E14	315 µm
E15	355 µm
E16	400 µm
E20	630 µm
E22	800 µm
E26	1.25 mm
E28	1.60 mm
E34	3.15 mm

Screen trays conforming to ISO 3310-2

Perforated metal plate type

15-D0425 Series

Model 15-D0425/	Nominal aperture
	mm
E04	4.0
E05	5.6
E08	7.1
E09	8.0
E12	10.0
E13	11.2
E14	12.5
E16	14.0
E17	16.0
E18	18.0
E19	20.0
E20	22.4
E24	31.5
E26	40.0
E28	50.0
E30	56.0
E31	63.0
E33	80.0

Wet washing sieves | Ultrasonic cleansing apparatus | Sieve brushes

Wet washing sieves

Standards ASTM E11

Used for wet sieving fine granular materials, these sieves have a stainless steel frame and woven mesh base and are available in 200 mm and 203 mm (8") diameter versions, 100 or 200 mm high, with 75 or 63 µm mesh size.

Weight: 0.5 kg (100 mm high versions), 0.9 kg (200 mm high versions) (approx.).

100 mm high versions

15-D0160

Wet washing sieve, 203 mm (8") diameter, 75 µm opening.

15-D0160/1

As above but 200 mm diameter.

15-D0160/2

Wet washing sieve, 200 mm diameter, 63 µm opening.

200 mm high versions

15-D0160/A

Wet washing sieve, 203 mm (8") diameter, 75 µm opening.

15-D0160/A1

As above but 200 mm diameter.

15-D0160/A2

Wet washing sieve, 200 mm diameter, 63 µm opening.

Ultrasonic cleansing apparatus

15-D0405

Ultrasonic cleansing apparatus for sieves up to 203 mm (8") diameter. 230 V, 50-60 Hz, 1 ph.

15-D0405/B

Ultrasonic cleansing apparatus for sieves up to 315 mm diameter. 230 V, 50-60 Hz, 1 ph.

Used to thoroughly clean test sieves without causing distortion, this apparatus is particularly suitable for fine mesh sieves which could be damaged by ordinary

cleaning methods (using brushes or knocking the frame). Complete with timer, sieve rack and lid.

Two models are available:

15-D0405, suitable for 200 and 203 mm (8") diameter sieves and 15-D0405/B suitable for sieves up to 315 mm diameter.

Accessories

15-D0405/3

Cleaning liquid, 5 litre can.



15-D0405



15-D0405/B

Models	Power, W	Internal tank dimensions mm, (diameter x height)	Weight, kg (approx.)
15-D0405	240	245x130	6
15-D0405/B	500	410x200	10



15-D0160/A, 15-D0160

Sieve Brushes

86-D1672

Soft hair brush, 3 mm diameter (BS 812).

86-D1673/G

Brass sieve brush.

86-D1673/G1

Double ended brass/nylon sieve brush.

86-D1675

Round bristle brush, 33 mm diameter.

86-D1685

Nylon sieve brush 33 mm diameter.

86-D1685/G

Double ended nylon sieve brush.



86-D1685, 86-D1675, 86-D1672, 86-D1673/G1, 86-D1685/G

Riffle boxes (sample splitters)

Standards EN 932-5 | EN 933-5 | ASTM C136 | ASTM C702 | AASHTO T27

Riffle boxes

Used to divide representative dry samples into the required batch sizes for testing. Made from sheet steel and supplied complete with 3 metal pans.

Ordering information

15-D0438

EN riffle box, 7 mm slot width

15-D0438/A

EN riffle box, 15 mm slot width

15-D0438/B

EN riffle box, 30 mm slot width

15-D0438/C

EN riffle box, 50 mm slot width

15-D0438/D

EN riffle box, 19 mm slot width

15-D0438/F

EN riffle box, 38 mm slot width

15-D0438/G

EN riffle box, 64 mm slot width

15-D0438/H

EN riffle box, 45 mm slot width

15-D0431

Stainless steel sample splitter, sixteen 5 mm slots.



15-D0438 to 15-D0438/H

Model	Maximum particle size, mm	Slot width, mm	Number of slots	Capacity, dm ³	Weight, kg
15-D0438	5	7	12	0.24	1.5
15-D0438/A	10	15	12	2	5
15-D0438/B	20	30	10	4.6	19
15-D0438/C	40	50	8	14	23.5
15-D0438/D	13	19	10	3	5.5
15-D0438/F	25	38	8	9.6	19
15-D0438/G	50	64	8	21	27
15-D0438/H	35	45	8	28	23
15-D0431 MINI	3-4	5	16	0.15	1.4

Bar sieves (Grids)

Standards EN 933-1

Used to determine the flakiness index of aggregates.

Aluminium frame with steel bars.

For more information see page 193



Bar sieves

Large capacity sample splitter

15-D0430

Large capacity sample splitter

This large sample splitter is designed for reducing large quantities of sample to a manageable size.

Specifications

- Aggregate particle size: up to 150 mm
- Adjustable openings: from 12.5 mm at 12.5 mm intervals
- Clam shell hopper capacity: 28 dm³
- Number of pans: 2
- Overall height: 991 mm
- Hopper size: 737 x 483 mm (w x d)
- Weight: 50 kg (approx.)

Ordering information

15-D0430

Large capacity sample splitter



15-D0430

Accessories

15-D0430/1

Spare metal pan



15-D0431

Soil Classification

- 16** | Field classification
- 19** | Moisture content
- 22** | Laboratory classification
- 24** | Chemical tests



In all sections of civil engineering and in particular in soil mechanics, the engineer during the design stage must ensure that the analysis of soil properties relates directly to the relevant foundation or structure. Using procedures involving extracting, examining and testing representative samples the engineer can compute a model very close to the real situation. In recent years we have seen a significant contribution to experimental analysis resulting from more sophisticated testing procedures, updating of many International Standards, and publication of good testing manuals and procedures. We propose a large range of testing equipment which satisfy all requirements.

16	Field classification		
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	Particle density and particle size analysis	36	
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Augers

Standards ASTM D420 | ASTM D1452 | AASHTO T86 | AASHTO T202

Augers

Augers are used for general exploration in soil investigation to obtain samples that are representative of each layer of material. Made of special plated steel, they have a 'T' handle with a 1 m shaft which has to be ordered separately. See accessories, code 16-T0005/1.

16-T0005/A

Hand auger head, 80 mm diameter.
Weight 2 kg (approx.).

16-T0006/A

Hand auger head, 100 mm diameter.
Weight 2.5 kg (approx.).

16-T0007/A

Hand auger head, 150 mm diameter.
Weight 3 kg (approx.).

16-T0008/A

Spiral soil auger head, 40 mm diameter.
Weight 3 kg (approx.).

16-T0008/B

Dutch soil auger head, Edelman model, 70 mm diameter, for soft fine soils. Weight 2 kg (approx.).

16-T0008/C

Gravel auger head, 150 mm diameter.
Weight 1.3 kg (approx.).

16-T0010/6

Stainless steel sample tube, 38 x 230 mm (diameter x length). Weight 0.3 kg (approx.).



16-T0005/A, T0006/A and T0007/A with 16-T0005/1 T-handle

Accessories

16-T0005/1

'T' handle with 1 m shaft.

16-T0005/2

Shaft extension rod, 1 m long.

16-T0005/3

Chisel, 300 mm long.



16-T0007/A, 16-T0008/A, 16-T0006/A, 16-T0008/C, 16-T0005/A, 16-T0010/6, 16-T0008/B

16-T0010/G

Soil prospecting kit

Standards

ASTM D420 | ASTM D1452 | AASHTO T86

This set comprises all the most popular auger and sampler components, housed in a practical carrying case. It consists of:

16-T0005/A
Hand auger head, 80 mm diameter

16-T0006/A
Hand auger head, 100 mm diameter

16-T0007/A
Hand auger head, 150 mm diameter

16-T0008/A
Spiral soil auger head, 40 mm diameter

16-T0008/B
Dutch soil auger head, Edelman model, 70 mm diameter

16-T0008/C
Gravel auger head, 150 mm diameter

16-T0010/6
Six stainless steel sample tubes, 38 x 230 mm (diameter x length)

16-T0010/7
Twelve plastic end caps for sample tubes (16-T0010/6)

16-T0010/3
Jarring link

16-T0010/8
Hand extruder for sample tubes (16-T0010/6)

16-T0005/2
Six shaft extension rods, 1 m long

16-T0010/G



16-T0005/1

'T' handle with 1 m shaft

16-T0005/5

Two Stillson wrenches

- Case dimensions: 1050 x 480 x 190 mm

- Weight: 50 kg (approx.)



Detail of 16-T0010/8, Hand extruder with 16-T0010/6 Sample tube

Sampling device

This apparatus is designed for taking undisturbed 38 mm diameter samples in soft and fine soils. Comprises a 'T' handle with shaft, shaft extension rod, jarring link and a 38 mm diameter, 230 mm long stainless steel sample tube.

The sample is obtained by percussion - the upper assembly is lifted with a sliding action inside the jarring link and then dropped down, driving the sample tube into the soil.



16-T0010

Sampling device to take undisturbed 38 mm diameter soil samples. Weight: 7 kg (approx.)

Accessories and spares

16-T0010/6

Stainless steel sample tubes, 38 x 230 mm (diameter x length), 6 pieces.

16-T0010/7

Plastic end caps for 16-T0010/6 sample tubes, 12 pieces.

16-T0010/8

Hand extruder for 38 mm diameter sample tubes.

Auger power head

The auger head is used in conjunction with sampling tubes to obtain disturbed or undisturbed soil samples.

Two models are available:

16-T0009/L, 2hp, two-stroke engine, complete with 80 mm diameter auger, drilling capacity up to 200 mm diameter, and

16-T0009/M, 4.5hp, four-stroke engine, with reverse gear, drilling capacity up to 400 mm diameter. Auger to be ordered separately. See accessories.



Models 16-	T0009/L	T0009/M
Piston displacement, cc	44.9	135
Engine	2 hp, two-stroke	4.5 hp, four-stroke
Fuel	Fuel mixture	Gasoline
Ignition	Electronic	Electronic
Augers	80 x 800 mm (diameter x length) included	Not included - see accessories
Maximum drilling diameter, mm	200	400
Maximum drilling depth, m	1.4	2.0
Operation	One operator	Two operators
Weight, kg (approx.)	10.5	27.0

16-T0009/L

Auger power head, 2 hp, two-stroke engine, complete with 80 mm diameter auger.

16-T0009/M

Auger power head, 4.5 hp, four-stroke engine, reverse gear. Auger not included.

Accessories

Augers and extension rods for 16-T0009/M

16-T0009/M1

Auger shaft, 100 mm diameter x 1000 mm long.

16-T0009/M2

As above but 150 mm diameter.

16-T0009/M3

As above but 200 mm diameter.

16-T0009/MEX

Extension rod 1000 mm long.

Note: Augers of 100 to 200 mm diameter for 16-T0009/L and 250 to 400 mm diameter for 16-T0009/M are also available on request.

Penetrometers | Lab vanes | Water level indicators

Pocket penetrometers

Penetrometers are used to quickly and easily obtain an approximate measurement of shear strength for cohesive and semi-cohesive soils.

16-T0171

Standard pocket penetrometer

With a range of 0 to 5 kgf/cm² (0-490 kPa), this penetrometer is designed for measuring field classification values for cohesive soils in terms of consistency, shear strength and approximate unconfined compressive strength.



16-T0171

Specifications

- Measurement range: 0 to 5 kgf/cm² (0-490 kPa)
- Dimensions: 20 x 173 mm (diameter x length)
- Weight: 0.5 kg (approx.)



16-T0163

16-T0163

Heavy duty pocket penetrometer

This penetrometer has a range of 0 to 10 kgf/cm² (0-980 kPa) and is constructed of stainless steel with three interchangeable tips: 4.5 mm diameter for very hard soil, 6.35 mm for medium and soft soil and 8.98 mm for soft soil. The penetration stem allows relatively deep penetration into the soil (up to 6 cm), reducing errors and uncertainties typical of more shallow measurements.

Supplied complete with plastic case.

Specifications

- Measurement range: 0 - 10 kgf/cm² (0-980 kPa)
- Dimensions (assembled): 20 x 210 mm (diameter x length) (approx.)
- Weight: 0.5 kg (approx.)

Dial penetrometers

We offer a range of three different versions of dial penetrometer that can satisfy any requirement, depending upon the application. They feature a 60 mm diameter dial and a peak hold device with a zero reset button. The 16-T0161 version is also used for evaluating the angle of internal friction "φ" of sandy soils and the cohesion "C" in clay soils. Supplied in a plastic case.

- Weight: 255 g (approx.).

16-T0160

Dial penetrometer, range 0- 6 kgf/cm² (0-588 kPa), plunger diameter 6.35 mm, for soft soil.

16-T0161

Geopocket dial penetrometer, dual scale. 0- 6 kgf/cm² (0-588 kPa) and 0 - 11 kgf/cm² (0-1079 kPa), with interchangeable plungers 6.35, 10, 15, 20 and 25 mm diameter.

16-T0162

Dial penetrometer, range 0-14 kgf/cm² (0-1373 kPa), plunger diameter 6.35 mm, for medium and hard soil.



16-T0160



16-T0161



16-T0162

Hand vane testers

Standards

ASTM D2573 | AASHTO T202

Two versions of hand vane tester are offered:

16-T0175/A, particularly suitable for field use, for taking measurements at the ends of sample tubes, and

16-T0174, featuring more professional specifications, recommended for field applications where surface and deep measurements are required.

16-T0175/A

Pocket shear vane device

This hand vane includes three vane adaptors: a standard 25 mm diameter vane, range 0- 10 N/cm² (0-100 kPa); a sensitive vane adaptor, range 0- 2 N/cm² (0-20 kPa) and a high capacity vane adaptor, range 0- 25 N/cm² (0-250 kPa). Complete with plastic case. Weight: 300 g (approx.).



16-T0175/A



16-T0174

Field inspection vane tester

Field inspection vane tester, range 0 - 24 N/cm² (0-240 kPa), with 3 interchangeable vanes and extension rod.

The field inspection vane tester is designed for taking field surface and deeper measurements, and is supplied complete with three interchangeable vanes and an extension rod for deeper measurements.

Specially designed to measure the undrained shear strength (CU) of cohesive soils. During operation the vane is driven 5 to 6 cm into the soil and then turned with the handle. Deep measurements (e.g. at the top of undisturbed samples) can be obtained. Supplied complete with plastic case.

Specifications

- Vane dimensions: 32 x 16, 40 x 20, 50.8 x 25.4 mm (height x diameter)
- Measuring range: 0 - 24 N/cm² (0 - 240 kPa)
- Max torque value: 3.5 N·m
- Extension rod: 500 mm long
- Overall dimensions (assembled): 310 x 105 mm
- Weight: 1.3 kg (approx.)

Accessories and spares

16-T0174/1

Extension rod, 500 mm long. (Additional)



16-T0174

16-T0174/A

Field inspection kit

This determination refers to ASTM D2573 concerning the in-situ determination using field vane apparatus.

This set consists of the 16-T0163 Heavy duty pocket penetrometer, and the 16-T0174 Field inspection vane tester which have been previously described.



16-T0174/A

Ideal for geo-technicians, geologists and agronomists, the instrument is contained in a practical carrying case.

Specifications

- Case dimensions: 385 x 290 x 105 mm
- Weight: 2 kg (approx.)

Water level indicators

Used for determining the water level in boreholes, wells and other open underground structures. Drum mounted, with an ON/OFF indicator and audio signal when the probe touches water. The sensing portion of the probe has a stainless steel tip with plastic shielding to prevent false readings. A probe diameter of 10 mm allows an easy passage through 1/2" tubing. The cable is marked at 1 cm intervals.



16-E0096, /A, /B

Specifications

- Battery operated: 9V DC
- Weight: 6 kg (approx.)

16-E0096

Water level indicator, 50 m cable.

16-E0096/A

As above but 100 m cable.

16-E0096/B

As above but 200 m cable.

Dynamic penetrometers

16-T0012/A

TRL*Dynamic Cone Penetrometer (DCP)

Standards ASTM D6951

*Manufactured under license of TRL, Transport Research Laboratory, UK

This apparatus has been designed for the rapid in-situ measurement of the structural properties of existing road pavements constructed with unbound materials. Continuous measurements can be made down to a depth of approximately 850 mm or, when extension shafts are used, to a recommended maximum depth of 2 m*. Where pavement layers have different strengths, the boundaries can be identified and the thickness of the layers determined. Correlations have been established in earlier work (Van Vuuren, Klein and Van Herden, Smith and Pratt) between the TRL penetrometer and CBR (California Bearing Ratio) so that results can be interpreted and compared with CBR specifications. Supplied complete with a carrying case.

Specifications

The DCP penetrometer consists of:

- 8 kg dropping weight with a drop of 575 mm
- Anvil with driving rod
- Penetration rod with 60°, 20 mm diameter cone
- Spanners, Tommy bar, bottle of adhesive
- Case dimensions: 1200 x 350 x 200 mm (approx.)
- Weight: 30 kg (approx.)

***Note:** The maximum depth of 2 m can be obtained adding the following extensions:

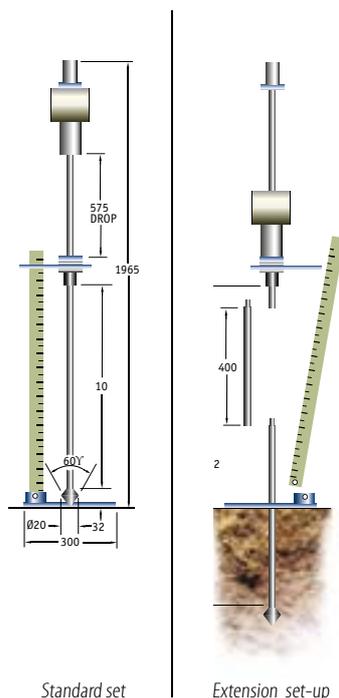
- No. 1 Extension 16-T0012/2
- No. 1 Extension 16-T0012/3
- No. 3 Extensions 16-T0012/4



16-T0012/A

Accessories and spares

- 16-T0012/1** Spare 60° cone.
- 16-T0012/2** Upper extension shaft.
- 16-T0012/3** Lower extension shaft.
- 16-T0012/4** Extension rod set.
- 16-T0012/5** Spare anvil coupling.
- 16-T0012/6** Handle guard.
- 16-T0012/7** Handle.
- 16-T0012/8** Hammer shaft.
- 16-T0012/9** Standard shaft.
- 16-T0012/10** 4,6 kg dropping weight.



Standard set

Extension set-up



16-T0013 assembled



16-T0013

16-T0013

Lightweight dynamic penetrometer

Standards DIN 4094

This penetrometer is used to establish the thickness of different stratifications when investigating the suitability of a site for bridge, road or other construction works. In general if the ground is not too compacted, penetration tests with this apparatus can be carried out to depths of about 8 to 12 m. Supplied complete with a carrying case.

Specifications

The apparatus includes:

- Anvil with driving rod
- 10 kg rammer, rammer fall 50 cm
- 11 sounding rods
- 1 grooved rod
- 2 drive points, 90°, 500 and 1000 mm²
- Lifting device for sounding rods
- Couplings
- Case dimensions: 1160 x 370 x 220 mm
- Weight: 71 kg (approx.)

Accessories and spares

- 16-T0013/8** Drive conical point, 500 mm² area, 25.2 mm diameter, 90° angle.
- 16-T0013/9** Drive conical point, 1000 mm² area, 35.6 mm diameter, 90° angle.
- 16-T0013/4** Sounding rod, 22 mm diameter.
- 16-T0013/7** Threaded nipple to connect sounding rods.

16-T0013/E**Motor operated
20-30 kg drop weight
dynamic penetrometer****Standards** DIN 4094

The apparatus comprises: a four-stroke engine which drives - through a flexible shaft - the lifting mechanism; a 20 kg weight; a 10 kg supplementary weight; 10 rods; 5 cones each of 500 and 1000 mm² sizes and a rod lifting device. The heaviest part of this apparatus is the 20 kg dropping weight so it is very simple to use and easy to carry on site. The apparatus satisfies DIN 4094 standards for medium weight test apparatus with 30 kg mass x 20 cm drop height. We suggest the accessory 16-T0013/E1 to make the apparatus easier to use.

Supplied complete with carrying case for sounding rods.

Specifications

- Engine: 1.9 kW, four-stroke
- Driving rate: up to 45 blows/min
- Drop height: 20 cm
- Drop weight: 20 or 20 + 10 kg
- Total net weight: 70 kg (approx.)
(without sounding rods and accessories)

Accessories and spares**16-T0013/E1**

Tripod for hanging the lifting mechanism.

16-T0013/8

Drive conical point, 500 mm² area,
25.2 mm diameter, 90° angle.

16-T0013/9

Drive conical point, 1000 mm² area,
35.6 mm diameter, 90° angle.

16-T0013/4

Sounding rod, 22 mm diameter.



16-T0013/E during operation



16-T0013/E with 16-T0013/E1

Sample Extruders

Standards

EN 13286-2 | EN13286-47

We offer two models:

16-T0082/A, hand operated, 60 kN capacity, vertical extrusion, suitable for compacted soil samples, and

16-T0083/A, motor operated, 60 kN capacity, horizontal extrusion, 900 mm ram stroke, suitable for extruding soil samples at various levels of compactness from Shelby tubes and other samplers. It can also be set for vertical extrusion.

16-T0083/A

Motorized soil extruder

This extruder features one of the largest capacities available on the market (ram stroke 900 mm), and due to the large number of standard adaptors, is considered the most versatile extruder, ideal for central laboratories.

Sampling tubes are held in place by an adjustable "V" shaped bearing which can extrude either in a vertical or horizontal position. Both the hydraulic cylinder assembly and the receiving tray can easily be lowered alongside the machine to save space when not in use. The machine is supplied without tube adaptors which have to be ordered separately. See accessories.

Specifications

- Power: 750 W
- Maximum loading capacity: 60 kN
- Maximum ram stroke: 900 mm
- Maximum working ram speed: 6 mm/sec
- Maximum external diameter of sample tubes: 160 mm
- 230 V, 50 Hz, 1 ph.

Overall dimensions:

- Horizontal working position: 2730 x 409 x 1180 mm (wxdxh)
- Vertical working position: 1025 x 409 x 1080 mm (wxdxh)
- Weight: 160 kg (approx.)



16-T0083/A in vertical extrusion position

Accessories

16-T0083/A4

Adaptor for extruding 101.6 mm OD Shelby tubes.

16-T0083/A5

Adaptor for extruding 100 mm OD Shelby tubes.

16-T0083/A6

Adaptor for extruding 88.9 mm OD Shelby tubes.

16-T0083/A7

Adaptor for extruding 83 mm OD Shelby tubes.

16-T0082/A

Hand operated vertical soil extruder

This hydraulic extruder can accommodate standard U4 tubes and a range of adaptors to extrude soil samples of 35, 38, 101.6, 106 and 152.4 mm diameter. It can also be used to remove Marshall, Proctor and CBR specimens. Appropriate accessories and adaptors are available and have to be ordered separately. See accessories.

Specifications

- Maximum loading capacity: 60 kN (6000 kgf)
- Maximum ram stroke: 480 mm
- Dimensions: 1140 x 300 x 370 mm
- Weight: 50 kg (approx.)



16-T0082/A

(without accessories)

Accessories

16-T0082/1

Adaptor for extruding 35, 38, 101.6, 106 and 152.4 mm diameter samples. Total length 280 mm (approx.).

16-T0082/3

Adaptor for extruding 38 mm diameter samples only.

16-T0082/4

Frame and adaptor only for extruding three 38 mm dia. tubes from a U4 tube.

16-T0082/5

106 mm adaptor for extruding a soil sample from U4 tubes.

16-T0082/A16

Extension for extruding samples up to 450 mm long.

16-T0083/A during operation



16-T0082/1



16-T0082/A16 Extension fitted onto the 16-T0082/1

Sample Extruders | Pestle and Mortar | Colour Charts

Universal specimen extruder

Standards

ASTM D1883 | ASTM D698 |
BS 1377:4 | BS 1924:2 | BS 598

16-T0080

Universal specimen extruder, for moulds of 100 - 152.4 mm diameter.

This extruder is used to remove 101.6 mm (4"), 152.4 mm (6"), 100 mm and 150 mm diameter specimens from Proctor, CBR and Marshall moulds. Constructed from steel, it has adapters that fit easily within the mould's diameter.

Specifications

- Maximum loading capacity: 50 kN
- Maximum ram stroke: 197 mm (ram) + 68 mm (screw)
- Weight: 25 kg (approx.)



16-T0080

Melting pot

Used to melt wax to seal the ends of soil samples and other materials, the melting pot can also be used to melt the capping compound for concrete cylinders, as specified on page 298

55-D1403

Melting pot. 230V, 50-60 Hz, 1 ph.

55-D1403/Z

As above but 110V, 60 Hz, 1 ph.

Specifications

- Capacity: 5 litres (approx.)
- Temperature range: +30 to +130°C
- Power: 700 W
- Internal dimensions: 200 x 160 mm (diameter x height)
- External dimensions: 285 x 275 mm high (diameter x height)
- Weight: 2.7 kg (approx.)



55-D1403



Pestle and mortar

Standards

ASTM D421 | BS 1924:1 | BS 1337:2

The pestle and mortar are used to gently break down soil samples into individual particles for chemical tests.

86-D1180/1

Porcelain mortar, 125 mm diameter (approx.). Weight 700 g (approx.).

16-D1179/A

Rubber headed pestle. Weight 60 g (approx.).

16-D1860/B

Soil colour charts

Using Munsell Soil Colour Charts is an affordable way of evaluating and classifying soil colour in the field and in the laboratory. The soil classification method that has been developed around the Munsell colour system is an established and accepted way of building accurate soil descriptions. The book of charts is laid out in a way that makes soil colour evaluations quick and easy, and using it enables practitioners from a wide range of professions to share reliable and consistent information about the colour of soils at a particular site with colleagues anywhere around the world.

Specifications

- Dimensions: 200 x 120 x 60 mm
- Weight: 500 g (approx.)



Laboratory planetary mixers



We propose three versions: 5, 10, and 20 litres capacity (respectively models 76-B0702, 76-B0072 and 76-B0075/B). They all feature a robust construction with a bowl and whisk that are easy to fit and to remove. When lifting the cover, a safety switch turns the mixer off for operator safety conforming to CE directives. A planetary mixing action ensures a complete and uniform mixing of the materials. All models are supplied complete with whisk. For mixing asphalt samples, the mixers have to be fitted with the suitable Isomantle heater (see page 421).



76-B0702/6S, 76-B0072/8, 76-B0075/6

Ordering information

76-B0702

Laboratory planetary mixer, 5 L capacity, complete with whisk. 230 V, 50-60 Hz, 1 ph.

76-B0704

As above but 110 V, 60 Hz, 1 ph.

76-B0072

Laboratory planetary mixer, 10 L capacity, complete with whisk. 230 V, 50 Hz, 1 ph.

76-B0072/Y

As above but 220 V, 60 Hz, 1 ph.

76-B0072/Z

As above but 110 V, 60 Hz, 1 ph.

76-B0075/B

Laboratory planetary mixer, 20 L capacity, complete with whisk. 230 V, 50 Hz, 1 ph.

76-B0075/BY

As above but 220 V, 60 Hz, 1 ph.

76-B0075/BZ

As above but 110 V, 60 Hz, 1 ph.

Accessories and spares

76-B0702/9

Mixing hook for 76-B0702 mixers.

76-B0072/9

Mixing hook for 76-B0072 mixers.

76-B0075/9

Mixing hook for 16-B0075/B mixers.

76-B0702/2

Spare bowl for 76-B0702 mixers.

76-B0072/6

Spare bowl for 76-B0072 mixers.

76-B0075/1

Spare bowl for 76-B0075/B mixers.

76-B0702/6S

Spare whisk for 76-B0702 mixers

76-B0072/8

Spare whisk for 76-B0072 mixers.

76-B0075/6

Spare whisk for 76-B0075/B mixer

Note: for complete and detailed information see page 421



76-B0072/9, 76-B0075/9

16-T0004

Soil cutter

Standards NF P94-093

Ideal for breaking up lumps of clay to prepare soil specimens for compaction. Made of anodised aluminium and stainless steel.

Specifications

- Power: 2800 W
- Capacity: 13 liters
- Dimensions: 815 x 590 x 500 (w x d x h)
- Weight: 110 kg (approx.)
- 400 V, 50 Hz, 3 ph



Soil Lathes | Trimmers | Cutters and Tools

16-T0028/B

Soil lathe/trimmer and extruder for soil samples from 35 to 110 mm diameter

Soil samples from 35 to 110 mm diameter can be trimmed and extruded with this simple yet complete device. To reduce samples initially, an open wire saw is required. See accessory 16-D1689.

Specifications

- Lathing capacity: from 35 x 70 mm to 100 x 200 mm (diameter x height)
- Trimming and extruding capacity: from 35 x 70 mm to 50 x 100 mm (diameter x height)
- Vertical clearance: adjustable up to 240 mm
- Overall dimensions: 270 x 320 x 580 mm (w x d x h)
- Weight: 12 kg (approx.)

Accessories

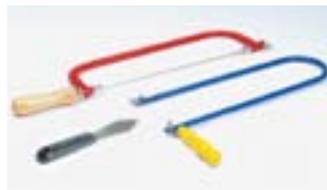
16-D1689 Open wire saw.

16-D1690 Wire saw.

16-D1691 Trimming knife.



16-T0028/B



16-D1689, 16-D1690, 16-D1691



16-T0026/A with cutter

Soil die-cutter/sampler

16-T0026/A

This versatile sampler can be used to prepare soil samples from 35 to 100 mm diameter and up to 200 mm high for consolidation, shear, triaxial and other tests. Various circular, cylindrical and square cutters are available, which are pushed into the sample core and then extruded with the extrusion dolly. See the table for details.

Specification Cutters

- Upper plate size: 120 mm diameter
- Maximum vertical clearance: 620 mm (approx.)
- Weight: 22 kg (approx.)

Model	Application	Type of cutter	Sample size, mm
26-WF0320/3	Consolidation (Oedometer)	Ring	50.47 x 20 (diameter x height)
26-WF0321/3	Consolidation (Oedometer)	Ring	63.5 x 20 (diameter x height)
26-WF0325/3	Consolidation (Oedometer)	Ring	71.4 x 20 (diameter x height)
26-WF0326/3	Consolidation (Oedometer)	Ring	75 x 20 (diameter x height)
26-WF0335/3	Consolidation (Oedometer)	Ring	112.8 x 25 (diameter x height)
27-WF0215/B7	Shearbox	Square	60 x 60 x 20 (w x d x h)
27-WF0216/B7	Shearbox	Square	100 x 100 x 20 (w x d x h)
27-WF0217/B7	Shearbox	Ring	50 x 20 (diameter x height)
27-WF0218/B7	Shearbox	Ring	60 x 20 (diameter x height)
27-WF0219/B7	Shearbox	Ring	63.5 x 20 (diameter x height)
27-WF0222/B7	Shearbox	Ring	100 x 20 (diameter x height)
28-WF0420/9	Triaxial	Cylinder	35 x 70 (diameter x height)
28-WF4031/G	Triaxial	Cylinder	38 x 76 (diameter x height)
28-WF4051/G	Triaxial	Cylinder	50 x 100 (diameter x height)
28-WF4071/G	Triaxial	Cylinder	70 x 140 (diameter x height)
28-WF4101/G	Triaxial	Cylinder	100 x 200 (diameter x height)

Carbide Meters

Moisture determination by carbide meters

We offer two series of carbide moisture meters:

Universal and Speedy

All of the models can be used for soils, sand and fine aggregates. The operating principle is identical for all models: the sample is introduced into the bottle with the reagent and the water in the sample reacts with calcium carbide and produces a gas, the pressure of which is indicated on the manometer and easily converted into the percentage of moisture.

Universal Carbide meters 19-T0019 Series

Four versions are available - the specifications are detailed in the following table

Accessories

19-T0019/1

Moisture tester reagent ampules. Pack of 100.

19-T0019/2

Calibration kit for Universal carbide meters, including manometer and accessories.

Important note

When the 19-T0019/1 reagent is for export there are limitations on the method of transportation. The reagent has to be shipped separately in special packs according to international regulations for dangerous materials.



19-T0019



19-T0019/F



19-T0019/H



19-T0019/G

Model 19-	Description	Comprising	Sample mass / Moisture range (up to)	Case dimensions	Weight (approx.)
T0019	Classic moisture meter with analogue manometer and digital balance	Digital balance, 20 carbide ampules, hammer, chisel, digital timer and other accessories	20 g/10% 50 g/4% 100 g/2%	520 x 340 x 140 mm	6 kg
T0019/F	Classic moisture meter, long bottle version, with analogue manometer and digital balance	As above	20 g/20%	520 x 340 x 140 mm	6 kg
T0019/G	Digital moisture meter with 0-3 bar high-resolution digital manometer and digital balance	As above	20 g/10% 50 g/4% 100 g/2%	520 x 340 x 140 mm	6 kg
T0019/H	Digital moisture meter with 0-3 bar high-resolution digital manometer, digital balance and log printer for printing test certificates	As above, plus log printer	20 g/10% 50 g/4% 100 g/2%	520 x 340 x 140 mm	8 kg

Carbide Meters | Desiccators

Speedy moisture meters

We offer two models:

47-T0024/A, 6 g capacity, 0-20% humidity measuring range,

47-T0023/A, 20 g capacity, 0-20% humidity measuring range.

Both are supplied complete with an electronic balance and other accessories as shown.

Specifications

- Case dimensions: 510 x 380 x 200 mm
- Weight: 5.5 kg (47-T0024/A) and 6 kg (47-T0023/A)(approx.)

47-T0023/A

Speedy moisture tester, 20 g capacity, 0-20% humidity range, 0.2% gauge divisions. Complete with electronic balance, accessories and carrying case.

47-T0024/A

As above but 6 g capacity.

Accessories and spares

47-T0020/B

Speedy calibration kit.

19-T0019/1

Moisture tester reagent ampules (pack of 100)

as alternative

47-T0021

Moisture tester reagent powder. 0.4 kg box.



47-T0024/A with 47-T0021



47-T0023/A and 47-T0021



47-T0020/B

Important note

When the 47-T0021 reagent is for export there are limitations on the method of transportation. The reagent has to be shipped separately in special packs according to international regulations for dangerous materials.

Desiccator cabinet

86-D1113/A

Made from transparent plastic for a clear view of the contents. The unit includes adjustable stainless shelves. 450 x 480 x 450 mm (w x d x h). Weight: 30 kg (approx.).

Accessories

(for glass desiccators and cabinet)

86-D0819

Silica gel (desiccator salts), 1000 g bottle.

19-D0602/B

Moisture determination balance, 160 g capacity, 1 mg resolution.

230 V, 50-60 Hz, 1 ph.

(for more details and information see page 10)



86-D1113/A

Desiccators

These desiccators are designed for cooling samples dried in an oven to avoid absorption of moisture from the air.

We offer three standard borosilicate glass models 86-D1110 to 86-D1111 and, as an alternative for bigger samples, the Desiccator cabinet 19-D1113/A. Both versions have to be used with the 86-D0819 desiccator salts. See accessories.

Glass desiccators

86-D1110

Desiccator, 200 mm diameter, complete with perforated plate. Weight 5 kg approx.

86-D1110/A

As above but 250 mm diameter. Weight 5.5 kg approx.

86-D1111

As above but 300 mm diameter. Weight 8.5 kg approx.



19-D0602/B



86-D1110

Gas Jars | Pyknometers | Hydrometers

Particle density

Both ASTM and BS Standards describe different methods and apparatus for determining particle density which relate to the type of soil as follows:

Gas jar method, BS1377:2, suitable for most soils including those containing gravel-sized particles;

Small pyknometer method, BS 1377:2 and ASTM D854, suitable for soils consisting of clay, silt and sand-sized particles;

Pyknometer method, BS 1377:2, suitable for soils containing particles up to medium gravel size.

The above determinations also require other general laboratory equipment which are described by the Standards.

Gas jar method

Standards

BS 1377:2

This method applies to soils containing up to 10% of particles retained on a 37.5 mm sieve and requires a gas jar and shaker.

22-D0445

End-over-end shaker, used to rotate two gas jars(22-D1132) at approximately 50 rpm.230 V, 50-60 Hz, 1 ph. Weight: 20 kg (approx.).

22-D1132

Glass gas jar, 1 liter capacity, supplied complete with rubber bung and glass cover. Weight: 1.3 kg (approx.).

Small pyknometer method

Standards

BS 1377:2 | ASTM D854 | AASHTO T100 | NF P94 054

This method involves determining the particle density of soils consisting of clay, silt and sand-sized particles (BS 1377:2) and the specific gravity of soils that pass the 4.75 mm sieve (ASTM D854), using small pyknometers.

86-D1125

Specific gravity bottle, 25 ml capacity, complete with capillary vent stopper.

86-D1126

As above but 50 ml capacity.

86-D1127

As above but 100 ml capacity.

86-D1128

As above but 250 ml capacity (as required ASTM).



86-D1125, 86-D1126, 86-D1127



22-D1132



22-D0445 with 2 glass jar 22 - D1132

Pyknometer method

Standards

BS 177:3 | BS 812

This method applies to soils containing particles up to medium gravel size and uses a large pyknometer.

48-D0441

Large glass pyknometer, 1 liter capacity, complete with non-corrodible metal cone and rubber seal.

Weight: 500 g (approx.).



48-D0441

Accessories

Listed here are some of the items that are more commonly required for particle density / specific gravity determination:

86-D1110

Glass desiccator, 200 mm diameter.

86-D1110/A

As above but 250 mm diameter.

86-D1111

As above but 300 mm diameter.

Weight: 5 to 8.5 kg (approx.).



86-D1112/A, 86-D1110

86-D1112

200 mm diameter with vacuum.

86-D1112/A

As above but 250 mm diameter.

86-D1113

As above but 300 mm diameter.

Weight: 3 to 6 kg (approx.).

Safety cage for desiccators

86-D1113/1

Safety cage conforming to BS 1377:2.

Weight: 2 kg (approx.).

86-D0819

Silica gel (desiccating salts), 1000 g bottle.



86-D1112/A with two 86-D1126 Pyknometers, Vacuum pump, 86-D1113/1 Safety cage and accessories.

Water bath

Standards BS 1337:2

The water bath is used to maintain particle density test specimens at a consistent temperature. It can be used with the adjustable tray and the cover with a cooling coil, if required. See accessories.

76-B0066/B

Digitally-controlled water circulating bath, temperature range ambient to +60°C. 230 V, 50-60 Hz, 1 ph.

76-B0066/BZ

As above but 110 V, 60 Hz, 1 ph.

For full description and specifications, see page 453

Accessories

76-B0066/1

Cover with cooling coil, for connection to mains water.

76-B0066/2

Adjustable tray.

Particle size distribution by the Hydrometer method.

Standards

ASTM D422 | AASHTO T88

Hydrometers are used for determining the particle size distribution of very fine materials such as silt and clay.

We offer a complete set containing all the items required to perform the analysis on six samples, but each item can also be purchased individually.

The Standards specify that a water bath is not necessary in cases where the test is performed in a temperature-controlled environment but our standard set includes a glass water bath with heater, thermostat and circulating unit which is suitable for ambient temperatures of 20°C maximum.



22-T0059/A set

22-T0059/A

ASTM Hydrometer test set

230 V, 50-60 Hz version

22-T0059/Z

Same as above but 110 V, 60 Hz

This set includes:

22-D1006/A - Six hydrometer cylinders

22-T0060/31 - Rubber bung for cylinders

22-D1006/A

22-T0060/A* - Soil hydrometer, 151 H, 0.995 to 1.030 g/ml

82-D1199 - Glass thermometer, 0-50°C, 0.5°C divisions

22-T0058/A - Constant temperature glass water bath, complete with heater, thermostat and circulating unit. Capacity up to 6 hydrometer cylinders. Dimensions 600 x 300 x 380 mm (w x d x h). 230 V, 50-60 Hz, 1 ph., or

22-T0058/AZ - Same as above but 110 V, 60 Hz

22-T0060/1 - High speed stirrer, 11000 rpm, with cup and baffle. 230 V, 50-60 Hz, 1 ph., or

22-T0060/1Z Same as above but 110 V, 60 Hz

86-D0802 - Sodium hexametaphosphate, 1000 g

86-D1073 - Beaker, 250 cc

22-T0060/B* Soil hydrometer, 152 H, 5 to 60 g/l is available as an alternative to the 22-T0060/A model.

All the above components can be purchased individually.

NF-BS hydrometer items (basic components)

Standards

NF P94-057 | BS 1377:2

22-D1007/A

Hydrometer cylinder, 2500 cm³ capacity, 85 ± 5 mm diameter, graduated at 500, 1500 and 2000 cm³ (only NF P9-057). Weight: 1 kg (approx.)

22-T0062/A

Soil hydrometer. 0.995 to 1.030 g/ml.

22-D1007/A1

Hand stirrer, 600 mm long (only NF P9-057).



76-B0066/B



76-B0066/1



76-B0066/2 with two 86-D1127



22-T0060/1, 86-D0802, 22-D1007/A, 22-T0062/A, 22-D1007/A1

Pipettes | Cone penetrometers

Particle size distribution by the Pipette method

Standards

BS 1377:2

Pipettes are used for determining the particle size distribution of very fine soils. The following few basic items are required to perform the test.

22-T0062/1

Andreasen pipette, 10 ml capacity. Weight: 300 g (approx.).

22-T0062/2A

Pipette stand with scale in millimetres. Weight: 10 kg (approx.).

22-T0062/3

Sedimentation cylinder, 500 ml capacity, with rubber bung. Weight: 300 kg (approx.).

22-T0058/A

Constant temperature water bath, complete with heater, thermostat and circulating unit. 230 V, 50-60 Hz, 1 ph.

22-T0058/AZ

As above but 110 V, 60 Hz, 1 ph.

22-T0062/5

Conical beaker 1000 ml.

Soil index properties

Types of index tests include:

- Liquid limit
Cone penetrometer and Casagrande methods
- Shrinkage limit and Linear shrinkage
- Plastic limit

Liquid limit: Cone penetrometer method

Standards

BS 1377:2 | NF P94-052-1 | CEN ISO/TS 17892-06 | CEN ISO/TS 17892-12

Cone penetrometers
22-T0029 series

Cone penetrometers are used to determine the moisture content at which clay soils pass from a plastic to a liquid state (the liquid limit). The result can also be used to evaluate the undrained shear strength (CEN ISO/TS 17892-12).

Two versions are available:

22-T0029/D

Digital liquid limit penetrometer with micrometric vertical adjustment.

22-T0029/E

Semi-automatic digital liquid limit penetrometer with vertical micrometric adjustment and electronic release mechanism. 230 V, 50-60 Hz, 1 ph.

22-T0029/EZ

As above but 110 V, 60 Hz, 1 ph.

Penetration cones and sample cups have to be ordered separately. See accessories. Weight: 8.5 kg (approx.).



22-T0029/E and 22-T0029/D with accessories

main features

- > Cast iron base with levelling feet
- > 0.01 mm precision digital penetration measurement gauge
- > Micrometric vertical adjustment device
- > Automatic zeroing
- > Electronic release mechanism (22-T0029/E model only)

Accessories

22-T0029/1

Penetration test cone, 30° angle.

22-T0029/2

Cone test gauge to check the condition of the cone.

22-T0029/3

Penetration sample cup, 55 mm diameter, 50 mm deep.

86-D1332

As above but 75 mm diameter.

22-T0029/4

Penetration test cone, 60° angle, weight 60 g.

22-T0029/5

Cone test gauge for cone 22-T0029/4.

22-T0029/7

Penetration test cone, 30° angle, weight 100 g.

22-T0029/8

Penetration test cone, 30° angle.



22-T0029/1

22-T0029/4

22-T0029/7

22-T0029/2

22-T0029/8

22-T0029/5

Casagrande apparatus

Liquid limit: CASAGRANDE method

Standards

ASTM D4318 | AASHTO T89 |
 BS 1377:2 | NF P94-051-1 |
 CEN ISO/TS 17892-06 & 17892-12 |
 UNI 10014 | UNE 7377

Liquid limit devices 22-T0030-31 series

Casagrande apparatus are used, as an alternative to the cone penetrometer, to determine the moisture content at which clay soils pass from a plastic to a liquid state (the liquid limit).

Different versions are available conforming to the various Standards. They are identical in shape and differ mainly in the type of base. Furthermore all models are available in either manually or motor operated versions. The grooving tools, which must also comply with the different Standards, are not included and have to be ordered separately. See the table below.

Weights:

Standard versions: 2 kg (approx.)
 Motorized versions: 4 kg (approx.)



22-T0030/F



22-T0031/F

Standards	Liquid limit device code		Grooving tool code
	Standard	Motorized	
BS 1377:2	22-T0030/E	22-T0031/E	22-T0032/P
ASTM D4318 AASHTO T89 CEN ISO TS 17892	22-T0030/F	22-T0031/F (230 V, 50 Hz) 22-T0031/FY (220 V, 60 Hz) 22-T0031/FZ (110 V, 60 Hz)	22-T0032/AP
NF P94-051	22-T0030/G	22-T0031/G (230 V, 50 Hz)	22-T0032/A
UNE 7377	22-T0030/F	22-T0031/F (230 V, 50 Hz)	22-T0032/A
UNI 10014	22-T0030/F	22-T0031/F (230 V, 50 Hz)	22-T0033

22-T0030/E

Casagrande liquid limit device, BS 1377:2 version.

22-T0030/F

Casagrande liquid limit device, ASTM D4318, AASHTO T89, CEN ISO TS 17892-06 & 17892-12, UNE 7377 and UNI 10014 version.

22-T0030/G

Casagrande liquid limit device, NF P94-051 version.

22-T0031/E

Motorized Casagrande liquid limit device, BS 1377:2 version. 230 V, 50 Hz, 1 ph.

22-T0031/F

Motorized Casagrande liquid limit device, ASTM D4318, AASHTO T89, CEN ISO TS 17892-06 & 17892-12, UNE 7377 and UNI 10014 version. 230 V, 50 Hz, 1 ph.

22-T0031/FZ

As above but 110 V, 60 Hz, 1 ph.

22-T0031/FY

As above but 220 V, 60 Hz, 1 ph.

22-T0031/G

Motorized Casagrande liquid limit device, NF P94-051 version. 230 V, 50 Hz, 1 ph.

Accessories and spares

22-T0032

Metal grooving tool, BS version.

22-T0032/P

Plastic grooving tools, BS version. Pack of 10.

22-T0032/A

Metal grooving tool, ASTM version.

22-T0032/AP

Plastic grooving tools, ASTM version. Pack of 10.

22-T0033

Grooving tool, UNI version.

22-T0034

Spare brass cup.

22-T0034/1

Spare roughened cup.



22-T0032/AP



22-T0032/P



22-T0034/A

Shrinkage | Plastic limit

Shrinkage limit

Standards

ASTM D427 | AASHTO T92 |
BS 1377:2 | NF P94-060-1 |
UNE 103-108 | UNI 10014

22-T0035

Shrinkage limit test set, including carrying case.

This test is performed to determine the maximum moisture content at which the soil stops shrinking when dried. We offer the following test set:

The set comprises:

22-T0035/1

Two shrinkage dishes, 45 mm diameter x 12.7 mm high

22-T0035/2

Crystallizing dish, 57 mm diameter x 31 mm deep

22-T0035/3

Shrinkage prong plate, manufactured from transparent acrylic and fitted with 3 metal prongs

86-D1171

Evaporating dish

86-D1630

Flexible spatula

86-D1001

Graduated cylinder, 25 ml

Supplied complete with a plastic carrying case.

All the above items can also be purchased individually.

Specifications

- Case dimensions: 300 x 280 x 120 mm
- Weight: 950 g (approx.)



22-T0035

Linear shrinkage

Standards

BS 1377:2

22-T0037

Brass linear shrinkage mould.
Internal dimensions: 140 mm long,
12.5 mm radius.
Weight: 300 g (approx.).

The purpose of this test is to determine the linear shrinkage of the fraction of a soil sample passing a 425 µm test sieve by measuring the change in length of the bar of soil as it dries out.



22-T0037

Plastic limit

Standards

ASTM D4318 | AASHTO T90 | BS 1377:2 |
NF P94-051 | UNE 103-104 | UNI 10014

22-T0041/A

Plastic limit test set.

This test is for determining the moisture content of a soil at the boundary between the plastic and semi-solid states.

The set comprises:

22-T0040/1

Glass plastic limit plate, 300 x 300 mm

22-T0040/2

Stainless steel rod, 3 mm diameter

86-D1171

Mixing dish, 120 mm diameter

86-D1630

Flexible spatula

86-D1329/A

Six moisture content tins, 75 mm diameter x 30 mm high

All contained in a plastic case.

All above items can also be purchased individually.

Specifications

- Case dimensions: 500 x 380 x 125 mm
- Weight: 2 kg (approx.)



22-T0041/A

Chemical tests

Water testing kits

24-D1870/A

Acidity test kit

For determining, by titration, the total acidity of water caused by mineral and organic acids.

Case dimensions: 250 x 120 x 55 mm

Weight: 480 g (approx.)

24-D1870/B

Chloride test kit

For determining, by titration, the chloride content in water and waste water.

Case dimensions: 190 x 120 x 60 mm

Weight: 445 g (approx.)

24-D1870/C

Hardness test kit

For determining the water total hardness.

Case dimensions: 190 x 120 x 60 mm

Weight: 424 g (approx.)

24-D1870/E

Alkalinity test kit

For determining the total alkalinity of water

Weight: 1.5 kg (approx.)



24-D1870/B

24-D1870/A

24-D1870/E



24-D1870/C

Chloride content: Rapid method

Standards BS 812:117 | BS 1377:3

Quantab chloride titrators can be used for estimating the chloride content of aqueous solutions. Two models are available:

48-D0543

Quantab chloride titrator, type 1175 (711195), range 0.005% to 0.1% NaCl. Pack of 40 strips.

48-D0543/A

Quantab chloride titrator, type 1176 (711196), range 0.05% to 1% NaCl. Pack of 40 strips. Weight: 10 g (approx.)

Sulphate content: Rapid method



48-D0543, 48-D0543/A

Standards

BS 812:117 | ASTM C88 | AASHTO T104 | EN 1367-2

24-D0852

Sulphate test strips, detection range 200 to 1600 mg/l. Pack of 100.

Useful for the preliminary assessment of sulphate ions in aqueous solutions.

Weight: 10 g (approx.)

Sulphate content: Laboratory method



24-D0852

Standards BS 1377:3

24-D1840

Ion exchange apparatus



24-D1840

Used for determining the sulphate content of ground water and aqueous soil extracts, the apparatus consists of an ion exchange column 400 mm long and 10 mm diameter, a swan-neck outlet and a 1500 ml round-bottomed flask to give a constant head. The apparatus is supplied assembled on a stand.

Dimensions: 200 x 100 x 600 mm
Weight: 5 kg (approx.)

Accessories

24-D1840/1

Ion exchange resin, 500 g.

Chemical tests

pH Meters

Standards

ASTM D1067 | BS 1377:3

We propose the following different models, suitable for field and laboratory use, as follows:

24-D1847

Pocket digital pH meter, battery operated.

Specifications

- pH range: 0.00 to 14.00
- Resolution: pH 0.01

- Accuracy at 20°C: +/- 0.2 pH
- pH calibration: manual, 2 points
- Battery life, 3000 hours use approx.
- Dimensions: 66 x 50 x 25 mm
- Weight approx.: 70 g

Accessories

24-D1847/7

Calibration kit of pH 4 and pH 7, 5 pieces each.

24-D1848

Magnetic stirrers

Used for titration and stirring all the models in this range have variable speeds and include a magnetic Teflon coated follower. 81-B0145/D version feature a hot plate which can be useful for particular applications.

24-D0448

Magnetic stirrer, mixing capacity 1 liter. 230 V, 50-60 Hz, 1 ph

24-D0448/B

Magnetic stirrer, mixing capacity 2.5 liters. 230 V, 50-60 Hz, 1 ph

81-B0145/D

Hot plate with magnetic stirrer. 230 V. 50-60 Hz, 1 ph

Code	24-D0448	24-D0448/B	81-B0145/D
Rotation speed, rpm	100 to 1200	100 to 1200	100 to 1200
Power, W	-	-	700
Dimensions, mm	120 x 120 x 45	180 x 180 x 70	170 x 230 x 150
Max temperature, °C	-	-	400
Weight approx. kg:	0.6	1.6	3



81-B0145/D



24-D0448

Papers

24-D1858/1

pH strips 1 to 11 pH. 5 meter dispenser

24-D1858/2

pH indicator papers 0 to 14 pH. 5 meter dispenser

24-D1859/1

Litmus paper red 5 to 8 pH. Pack of 100 strips



pH Papers



24-D1847



24-D1848 Complete set

Portable digital pH, mV, temperature meter, complete with stand for laboratory use. Battery and mains operated.

Specifications

- pH range: 0.00 to 14.00, accuracy $\pm 0.01 + 1$ digit, resolution 0.01 pH
- mV range: ± 1999 , accuracy $\pm 1 + 1$ digit, 1 mV
- temp. range: 0-100°C, accuracy $\pm 0.2^\circ\text{C} + 1$ digit, resolution 0.1°C
- pH calibration: pH 4.00 – 7.00
- 9 V battery, and mains adapter
- Dimensions: 96 x 120 x 46 mm
- Weight approx.: 260 g

Accessories

24-D1845/3

pH 4.00 buffer solution, 500 ml

24-D1845/4

pH 7.00 buffer solution, 500 ml

24-D1845/5

pH 9.18 buffer solution, 500 ml

24-D1845/7

Electrode storage solution. 500 ml

24-D1845/8

Electrode cleaning solution. 500 ml

24-D0448

Magnetic stirrer

Note Supplied complete with pH4 and pH7 solutions, combined electrode, 9 V battery, Pt 100 temperature probe, stand for electrode and carrying case.



24-D1848

Soil Mechanics

26 | Consolidation

27 | Direct/Residual shear

28	Triaxial testing	66
29	Automatic triaxial testing	96
30	Data acquisition system	108
31	Dynamic testing system	112



Wykeham Farrance is one of the longest established manufacturing companies in the world of Geotechnical Testing Systems. It has always been synonymous with high technology and quality. A close working relationship with several premier Universities in Europe ensures a flow of new ideas for development of new testing techniques and systems. WYKEHAM FARRANCE was originally formed in 1941 by Geoff Wykeham and Geoff Farrance. The original company is now part of the CONTROLS GROUP as the Soil Mechanics Division.

The consolidation test determines the rate and magnitude of consolidation of a soil specimen restrained laterally and subjected to a number of successive increments of vertical loads. We propose Front loading oedometers, the ACE, Automatic computerized oedometer and other similar goods.

The Direct/Residual shear test covers the determination of the consolidated drained shear strength of a soil material in direct shear. Various models are available to satisfy all requirements.

26 Consolidation

Front loading oedometer	46
ACE, Automatic computerized oedometer	48
Hydrocon hydraulic consolidation cells	50
Continuous consolidation apparatus	52

27 Direct/Residual shear

DIGISHEAR, direct/residual digital shear machine	54
AUTOSHEAR, direct/residual shear testing machine, digital control	56
SHEARMATIC, digital automatic direct/residual shear machine	58
SHEARMATIC 300, Large digital shear box apparatus	60
Consolidation bench for shear box	61
Laboratory vane apparatus	61
TORSHEAR, digital ring shear apparatus	62





Front Loading Oedometer

Standards

BS 1377:5 | ASTM D2435 | ASTM D3877 |
ASTM D4546 | AASHTO T216 |
NF P94-090-1 | NF P94-091 |
UNE 103-405 | UNE 103-602

26-WF0302

Front loading oedometer

The oedometer consolidation test determines the rate and magnitude of consolidation of a soil specimen restrained laterally and subjected to a number of successive vertical load increments.

The oedometer apparatus has a rigid aluminium alloy frame which avoids distortion under load. The lever arm assembly is supported in precision self-aligning bearings. Consolidation cells, dial gauge/displacement transducer, weight sets and bench are not included and have to be ordered separately. See Accessories.

Technical specifications

- Max loading (using 11:1 lever arm ratio): 1848 kg, corresponding to 9.061 MPa (92.40 kgf/cm²) on a 20 cm² specimen (50.47 mm diameter)
- Overall dimensions: 500 x 200 x 750 mm (height without hanger x width x length)
- Weight: 21 kg (approx.)



Slotted steel weights

Accessories

Weight sets

26-WF0230/C2

Weight set, 64 kg in total, comprising: 2 x 0.25, 1 x 0.5, 1 x 1, 1 x 2, 1 x 4 and 7 x 8 kg weights.



Three oedometers (26-WF0302) complete with cells and electronic displacement transducers ⁽¹⁾ (30-WF6207), mounted on a consolidation bench (26-WF0312) and connected to the Geodatalog and PC (not included)

⁽¹⁾ As an alternative to the standard dial gauges.

26-WF0230/D2

Weight set, 80 kg in total, comprising: 2 x 0.25, 3 x 0.5, 1 x 1, 1 x 2, 3 x 5 and 6 x 10 kg weights.

Single slotted weights

See pages...

Mechanical (analogue) Measuring device

30-WF6401

Dial gauge, 10 mm travel, 0.002 mm resolution.

Permeability attachment

26-WF0338/A

Permeability attachment with 50 ml graduated burette. Complete with clamps, stand and rubber hose for connection to the cell. Weight 4 kg.

Consolidation bench

26-WF0312

Bench for up to three oedometers. Weight 30 kg

Electronic measuring devices

30-WF6207

Linear potentiometric transducer, 10 mm travel.

Note: in case displacement transducer is supplied complete with data acquisition system, then a traceable calibration certificate on request.

Data acquisition and processing system

Note: For more information on the Geodatalog, see page. . . .

30-WF6016/T1

Consolidation Geo-Analysis template conforming, to BS 1377:5.

30-WF6016/T8

Consolidation Geo-Analysis template conforming, to ASTM D2435.

main features

- > Rigid aluminium alloy frame
- > 3 lever arm position: 9:1, 10:1, 11:1. Max loading 1848 kg
- > Can be fitted with traditional dial gauge or linear transducer for connection to the Geodatalog data acquisition and processing system



26-WF0338/A fitted to the 26-WF0302 with cell 26-WF0320



Exploded view of consolidation cell 26-WF0320

Consolidation cells and spare parts

Suitable for both fixed ring oedometer consolidation and falling head permeability tests. The cell is constructed of aluminium and comes complete with all the parts illustrated in the exploded view.



Code	Specimen Dimensions (dxh) mm	Specimen area cm ²	Cell dim. (dxh) mm	Weight kg	Calibration disc, code 26-	Upper porous disc code 26-	Lower porous disc code 26-	Cutting ring code 26-
<u>26-WF0320</u>	50.47 x 20	20.00	139 x 74	1.3	<u>WF0320/9</u>	<u>WF0320/4</u>	<u>WF0325/10</u>	<u>WF0320/3</u>
<u>26-WF0321</u>	63.50 x 20	31.67	139 x 74	1.3	<u>WF0321/9</u>	<u>WF0321/4</u>	<u>WF0326/10</u>	<u>WF0321/3</u>
<u>26-WF0325</u>	71.40 x 20	40.00	139 x 74	1.3	<u>WF0325/9</u>	<u>WF0325/4</u>	<u>WF0325/10</u>	<u>WF0325/3</u>
<u>26-WF0326</u>	75.00 x 20	44.16	139 x 74	1.3	<u>WF0326/9</u>	<u>WF0326/4</u>	<u>WF0326/10</u>	<u>WF0326/3</u>
<u>26-WF0335</u>	112.80 x 25	100.00	200 x 74	3.0	<u>WF0335/9</u>	<u>WF0335/4</u>	<u>WF0335/10</u>	<u>WF0335/3</u>

Weight application guide

This information is intended to make it easy to select the weight set that is appropriate for the cell size, the beam ratio and the maximum load applied.

Cell model	26-WF0320 Beam ratio 1:10	26-WF0321 Beam ratio 1:11	26-WF0325 Beam ratio 1:10	26-WF0326 Beam ratio 1:9	26-WF0335 Beam ratio 1:10
For max. pressure	32 kg/cm ² 64 kg/cm ²	20 t/ft ² 40 t/ft ²	16 kg/cm ² 32 kg/cm ²	16 kg/cm ² 32 kg/cm ²	8 kg/cm ² 16 kg/cm ²
Weight set 26-WF	0230/C2 0230/C2	0230/C2 0230/C2	0230/C2 0230/C2	0230/D2 0230/D2	0230/D2 0230/D2
Add. weight 27-WF	- 8 x 0275/A	- 8 x 0275/A	- 8 x 0275/A	- 8 x 0277/A	- 8 x 0277/A
Total weight kg	64 128	64 128	64 128	80 160	80 160

Typical consolidation configurations

Standard, with analogue dial gauge

Code	Quantity	Description
26-WF0302	1	Front loading oedometer
26-WF032 X ⁽¹⁾	1	Consolidation cell
26-WF0230/C2	1	Weight set, 64 kg in total
30-WF6401	1	Dial gauge, 10 mm x 0.002 mm divisions
26-WF0312	1	Consolidation bench for up to 3 oedometers

⁽¹⁾ To be selected

With digital data acquisition and processing

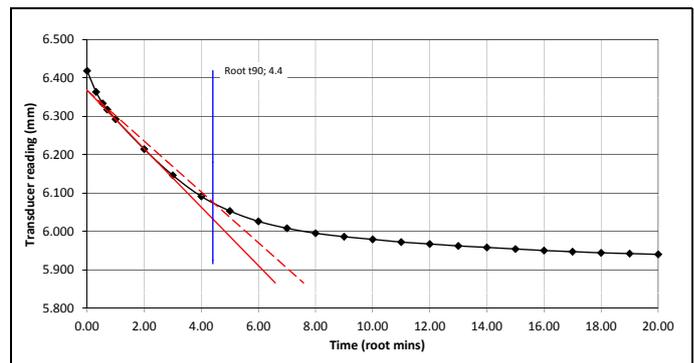
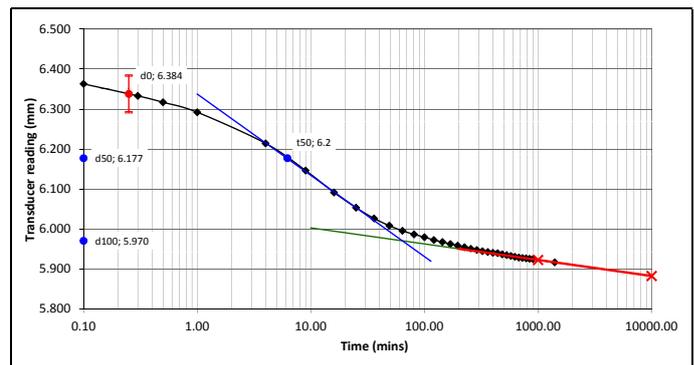
Code	Quantity	Description
26-WF0302	1	Front loading oedometer
26-WF032 X ⁽¹⁾	1	Consolidation cell
26-WF0230/C2	1	Weight set, 64 kg in total
30-WF6207	1	Linear potentiometric transducer, 10 mm travel
30-WF6042	1	Transducer extension cable, 6 m long
82-P9008/ELT	1	Set of four cables
30-WF6008	1	Geodatalog, 8-channel data acquisition system
30-WF6016/T1 30-WF6016/T8	1	Geo-Analysis template to BS or Geo-Analysis template to ASTM
26-WF0312	1	Consolidation bench for up to 3 oedometers

⁽¹⁾ To be selected

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS USING INCREMENTAL LOADING
Tested in accordance with ASTM Designation: D 2435
TEST DATA

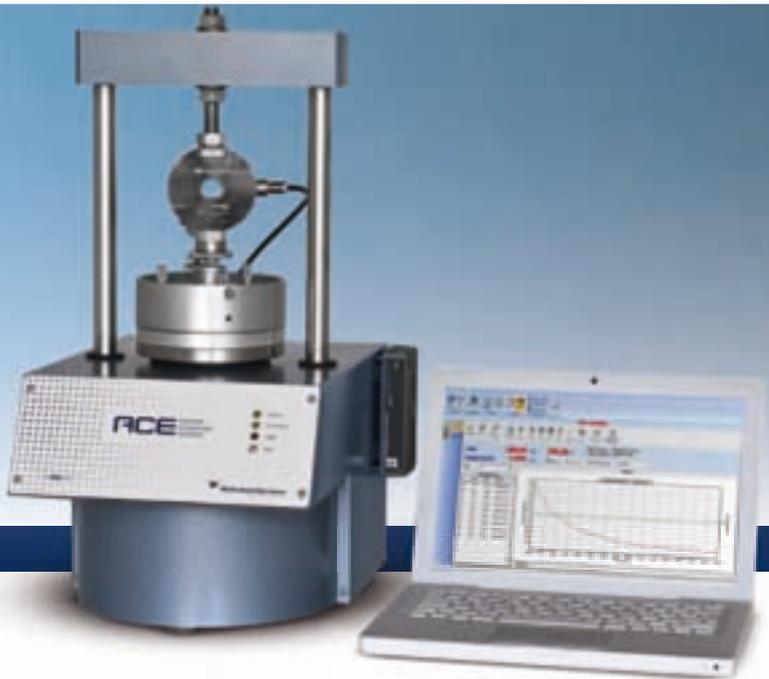
Project location	EXAMPLE	
Project reference	12345	Specimen number 3A
Borehole number	BH2	Specimen depth (m) 1.5

Increment number 5 - Loading Vertical stress (kPa) 1280 Mass (kg) 25.70



ACE

ACE Automatic Computerized Oedometer

**Standards**

BS 1377:5 | ASTM D2435 | ASTM D3877 | ASTM D4546 | AASHTO T216 |
NF P94-090-1 | NF P94-091 | UNE 103-405 | UNE 103-602

26-WF3120**Automatic Computerized Oedometer**

110-240 V, 50-60 Hz, 1 ph.

The oedometer consolidation test is used to determine the rate and magnitude of consolidation of a soil specimen restrained laterally and subjected to a number of successive increments of vertical load.

The ACE (Automatic Computerized oEdometer) consists of a small and compact load frame housing two coaxial pneumatic cylinders: the smaller one for low loads and the other for higher loads, with automatic switching from one to the other when needed. There are two analogue channels: one for the displacement transducer and the other for the load cell with closed-loop feedback, which controls application of the required pressure using a high precision pneumatic servo-actuator. Test parameters are pre-programmed and saved in the ACE software by the operator, including the test end, which

can be programmed on a time or increment basis. The software can control up to 60 ACE units from a single PC, giving the operator the choice of controlling single or multiple units.

Once the software is installed (mandatory) with the first ACE unit, it is possible to extend the control of further units just by enabling the communication without additional interventions and costs. An IP address is given to each unit for the LAN communication: system modularity is ensured for subsequent integrations.

ACE software allows to set up, save and recall different load/unload sequences: for each of them applied pressure steps, recording mode, time of application, swelling control and secondary consolidation rate limit can be defined by the user.

Besides the traditional time limit control for transition from one step of pressure to another, further automatic controls are included in the software with great

main features

- > Fully automatic PC-controlled test execution
- > Three conditions for the automatic switch to the next step are available: time, swelling, rate of secondary consolidation.
- > Testing can continue 24 hours a day, 7 days a week without interruption giving greater throughput of tests with a considerable cost decrease
- > Automated loading eliminates negative factors such as operator error and manual handling of dead weights
- > 15 kN maximum loading capacity, 10 mm travel displacement transducer
- > Real-time data and graph display
- > Single ACE software installation controls up to 60 units
- > Test management software supplied including calibration facility
- > High speed LAN network communication



Detail of load cell and displacement transducer

Templates conforming to BS or ASTM Standards.

The frame can accept all standard consolidation cells, from 50.47 to 112.80mm diameter.

Consolidation cells, Geo-Analysis templates and test software are not included. See Accessories. PC is not included.

Technical specifications

- Maximum vertical force: 15 kN - 30 kN available on request
- Load cell capacity: 15 kN
- Displacement transducer: 10 mm maximum travel
- Maximum air pressure supply: 10 bar. (If the air pressure source is not available in the laboratory, our air compressor model 86-D2015, 50 l capacity may be used.
- Specimen size: from 50.47 to 112.80 mm diameter using our consolidation cells. See Accessories.
- Software: can control up to 60 ACE units (not included, see Accessories)
- PC connection: LAN cable (included)
- Measurement accuracy: better than 1%
- Overall dimensions: 280 x 300 x 600mm (w x dx h)
- Weight approx.: 25 kg (approx.)

advantage to the users, as:

- Swelling control: if the specimen under test tends to expand, a swelling limit can be pre-set: in case the pre set limit is exceeded, the system will automatically skip to the next loading step.
- Secondary consolidation rate control: the system will automatically skip to next loading step if the secondary consolidation rate is lower than a pre-set limit.

Test results are recorded and displayed in real time and calculations are performed automatically. Test data can be processed using the proper Geo-Analysis



AUTOLAB



Modularity concept: up to 60 ACE units can be connected to the same PC via LAN and controlled by the same software 26-WF3120/SOF.

Accessories

Test software

26-WF3120/SOF

ACE automatic computerized oedometer test software

Consolidation cells (see page 47)

Permeability accessory (optional)

26-WF0338/B

Permeability attachment with 50 ml graduated burette.

Geo-Analysis templates for data processing

30-WF6016/T1

Consolidation Geo-Analysis template conforming to BS1377:5 Standard.

30-WF6016/T8

Consolidation Geo-Analysis template conforming to ASTM D2435 Standard.

Hub

26-WF4645

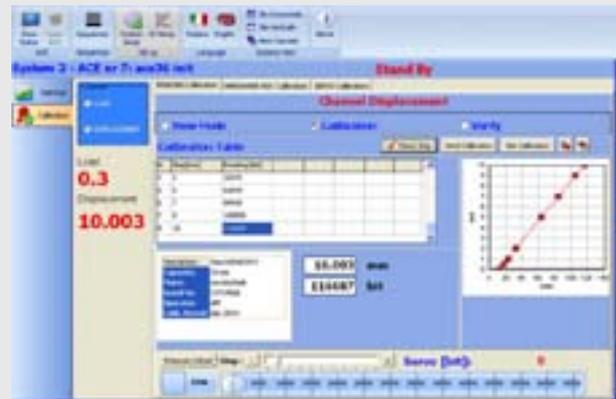
LAN Hub with 8 ports for Wykeham Farrance devices. LAN cable from hub to PC is included.

Air supply

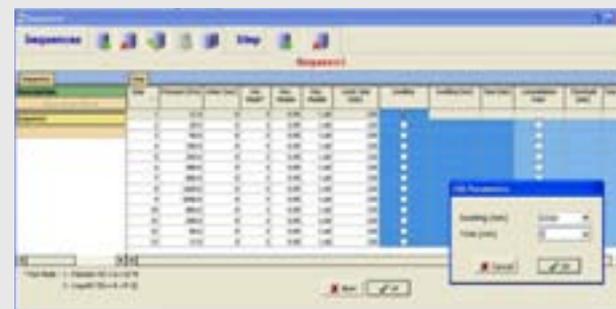
See page 571

Software:

ACE software operates as interface for all testing processes: the possibility to pre-set all test conditions and let each oedometer unit to work independently and to perform the whole test automatically is the great advantage of ACE testing system, ensured by the dedicated software developed by the geotechnical experts.



Calibration and verification facilities for force and displacement transducers are included in the software. Txt files are automatically generated for calibration reports. Each system is factory calibrated but verifications have to be ensured by the users at least once a year



The screenshot above shows an example of test sequences setting, where swelling monitoring and control option is activated.



For each step, test data are displayed in real time and recorded according to the pre-set logging mode. Testing unit status is continuously displayed and time scale can be switched immediately from linear to logarithmic and square root.

Hydraulic Consolidation Cells

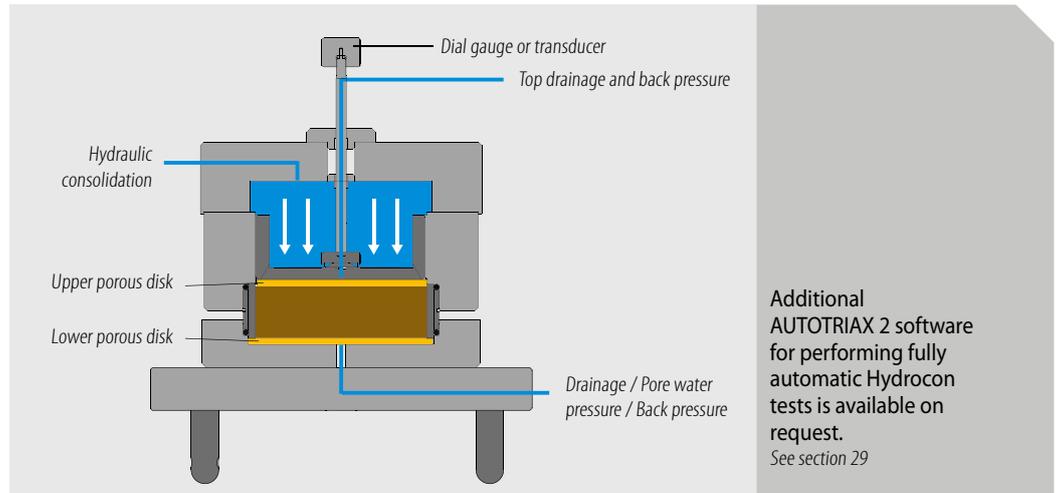
Standards BS 1377:6

26-WF0345

Hydrocon, hydraulic consolidation cell for 100 mm diameter samples



The Hydrocon hydraulic consolidation apparatus is used to determine the magnitudes and rates of consolidation of soil specimens of relatively low permeability by hydraulic pressure. This type of cell overcomes the complexity usually associated with hydraulic oedometers and allows more information to be gathered from the soil sample. Pore water pressure is measured using a pressure transducer and vertical settlement using a linear strain transducer (or a dial gauge). As the Hydrocon is a confined consolidation system, it is possible to measure both pore and back pressure during testing. The coefficient of consolidation can be directly computed from pore pressure dissipation tests. In addition it is possible to make an accurate permeability measurement by generating a vertical flow of water through the sample. The complete test apparatus includes the Hydrocon cell, pressure



Additional AUTOTRIAX 2 software for performing fully automatic Hydrocon tests is available on request. See section 29

system, water de-airing system and measuring system (manual, or electronic with the Geodatalog data acquisition system. See the table showing the configuration of a complete system.)

The Hydrocon is also available for testing unsaturated samples. See model 26-WF0346.

Technical specifications

- Manufactured from anodized light alloy, complete with three valves, one porous base disc and one top loading porous disc. Three support legs for stability.
- Suitable for 100 mm diameter soil samples
- Maximum working pressure: 3500 kPa
- Overall dimensions: 260 x 450 mm (diameter x height)
- Weight: 10 kg (approx.)

Accessories

See the table configuration of a complete testing system.



28-WF4330 with 28-WF4330/2

Typical configuration of a complete system

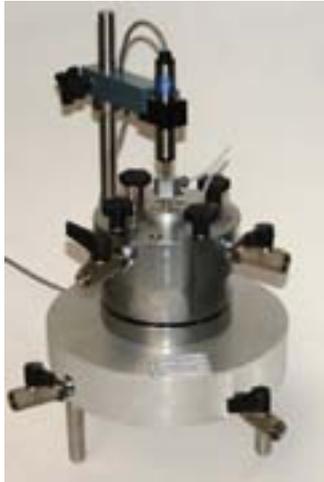
Manual or electronic option, with pore and back pressure facilities

Code	Description	Q.ty
26-WF0345	Hydrocon, hydraulic consolidation cell	1
Pressure system		
28-WF4330	Triaxial panel, two way	1
28-WF4330/2	Digital pressure gauge for 28-WF4330	1
28-WF4320	Bladder air/water interface	2
28-WF4320/1	Spare bladder for 28-WF4320	1
86-D2015	Laboratory air compressor	1
28-WF2016/2	Air filter for 86-D2015 air compressor	1
28-WF4191	Nylon tubing, OD 8 mm / ID 6 mm, 10 m coil	1
Water de-airing system		
28-WF4220/A	De-airing tank, 7 l capacity	1
86-D2005	Air drying unit	1
86-D0819	Silica gel desiccator, 1 kg bottle	2
86-D2001	Vacuum pump	1
86-D2064	Rubber tubes	2
28-WF4225	Valve panel for de-airing tank	1
Measuring system - manual option		
30-WF6401	Dial gauge, 10 mm travel, 0.002 mm subdivisions	1
28-WF6300	Pressure transducer, 0-10 bar	1
28-WF6310	De-airing block	1
28-WF4450	Digital readout unit for pore press. measurement	1
28-WF4400	Double burette volume change apparatus	1
28-WF4400/1	Red dye hydrocarbon soluble pack for 500 ml	1
Measuring system - electronic option		
30-WF6207	Linear displacement transducer, 10 mm travel	1
28-WF6300	Pressure transducer, 0-10 bar	1
28-WF6310	De-airing block	1
28-WF4410	Automatic volume change apparatus	1
30-WF6044	Transducer extension cable, 12 m	3
82-P9008/ELT	Set of four cables	1
30-WF6008	Geodatalog 8-channel data acquisition unit	1
30-WF6016/T12	Hydrocon consolidation Geo-Analysis template	1

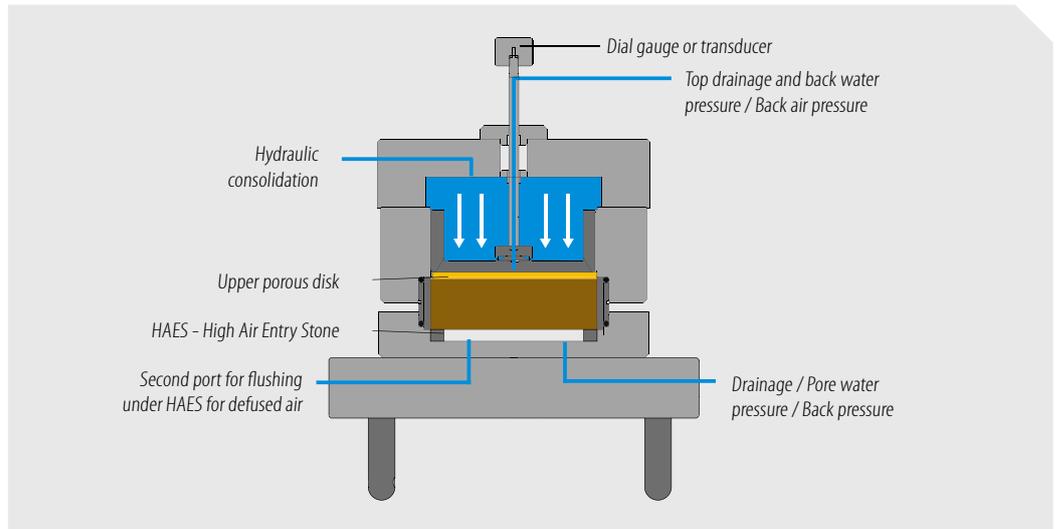
26-WF0346

Hydrocon SWCC consolidation cell

for 100 mm diameter unsaturated samples.



The Hydrocon SWCC consolidation apparatus is used to determine the magnitude and rate of settlement and pressure of unsaturated soil specimens. Because of the low permeability of some materials, performing a drying and wetting stage can take several weeks. The Hydrocon SWCC cell is a flexible soil testing apparatus capable of applying uniaxial pressures of up to 3500 kPa to a 100 mm diameter specimen. Its base is fitted with a High Air Entry Stone (HAES) which enables a soil/water characteristic suction curve to be obtained. This type of stone allows water to pass through but not air so that the soil matrix potential can be controlled at various values: 1, 2, 5, 10 and 15 bar. During a test it is possible to load the soil specimen in such a way that the overburden pressure in the field is recreated, whilst measuring the chamber and pore water pressure using a pressure transducer and the vertical settlement using a linear strain transducer.



As the Hydrocon SWCC is a confined consolidation system, it is possible to measure both pore and back pressure during testing and to make accurate permeability measurements.

For a complete system, see the table showing a typical test set configuration.

Technical specifications

- Same as 26-WF0345, but complete with four valves, compensator ring and 2 bar High Air Entry Stone sealed on aluminium ring.

Accessories

26-WF0346/1B

1 bar High Air Entry Stone for 100 mm diameter samples.

26-WF0346/2B

2 bar High Air Entry Stone for 100 mm diameter samples.

26-WF0346/5B

5 bar High Air Entry Stone for 100 mm diameter samples

26-WF0346/10B

10 bar High Air Entry Stone for 100 mm diameter samples

26-WF0346/15B

15 bar High Air Entry Stone for 100 mm diameter samples

Typical configuration of a complete system

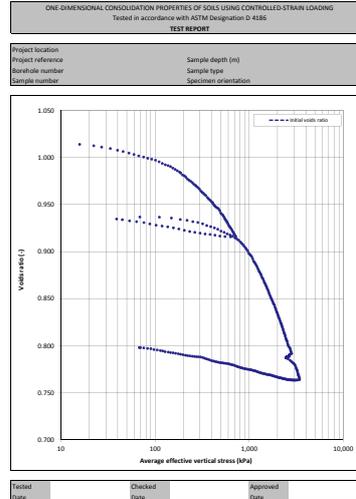
Code	Description	Q.ty
26-WF0346	Hydrocon, SWCC hydraulic consolidation cell with 2 bar High Air Entry Stone and compensator ring	1
Pressure system		
28-WF4331	Triaxial panel, three way	1
28-WF4330/2	Digital pressure gauge for 28-WF4331	1
28-WF4320	Bladder air/water interface, 1000 kPa maximum	2
28-WF4320/1	Spare bladder for 28-WF4320	1
86-D2015	Laboratory air compressor	1
28-WF2016/2	Air filter for 86-D2015 air compressor	1
28-WF4191	Nylon tubing, OD 8 mm / ID 6 mm, 10 m coil	1
Water de-airing system		
same as indicated on page 50		
Measuring system - electronic option		
30-WF6207	Linear displacement transducer, 10mm travel	1
28-WF6300	Pressure transducer 0-10 bar	3
28-WF6310	De-airing block	3
28-WF4410	Automatic volume change apparatus	1
30-WF6044	Transducer extension cable, 12 m	5
82-P9008/ELT	Set of four cables	2
30-WF6008	Geodatalog 8, data acquisition unit	1
30-WF6016/T13	Hydrocon SWCC Geo-Analysis Template	1
Alternative Pressure system for pressures up to 3500 kPa		
28-WF4312	Oil and water constant pressure system, 3500 kPa	1
28-WF4302/1	High viscosity oil, 5 kg	1
28-WF4191	Nylon tubing, OD 8 mm / ID 6 mm, 10 m coil	1
28-WF4050/1	Normal action coupling for fitting lines to cell	1
28-WF6302	Pressure transducer 0-35 bar	3

Continuous consolidation cell

Standards ASTM D4186

26-WF0360

Continuous consolidation cell (CRS)



Additional AUTOTRIAX 2 software for performing fully automatic CRS (constant rate of strain) tests is available on request. See section 29

main features

- > Continuous monitoring of test data (vertical load, pore pressure, vertical compression) and detailed plotting of the consolidation curve
- > Relatively short time to perform the test: less than half the time of an incremental loading consolidation test
- > More accurate and reliable evaluation of consolidation and compressibility parameters
- > Particularly suitable for cohesive saturated soils

Technical specifications

- Specimen size: 63.5 x 25.4 mm (diameter x height)
- Maximum working pressure: 800 kPa
- Maximum vertical load: 50 kN
- Overall dimensions: 240 x 410 mm (approx.) (diameter x height)
- Weight: 10 kg (approx.)

Accessories

See table for Configuration of a complete test system.



Typical Configuration of a complete system

Code	Description	Q.ty
26-WF0360	Continuous consolidation cell	1
26-WF0360/1	Cutting ring	1
28-WF0490	Nylon tubing, OD 6 mm / ID4 mm, 20 m coil	1
28-WF0490/1	Flaring tool	1
28-WF4330	Triaxial panel, two way	1
28-WF4330/2	Digital pressure gauge for 28-WF4330	1
28-WF4320	Bladder air/water interface	2
28-WF4320/1	Spare bladder for 28-WF4320	1
28-WF4005	Triaxial load frame, 50 kN capacity	1
30-WF4459	De-airing block	1
28-WF6301	Pressure transducer, 0-20 bar	1
30-WF6207	Linear transducer, 10 mm travel	1
30-WF0375/T	Load cell, 50 kN capacity	1
28-WF4220/A	De-airing tank, 7 l capacity	1
86-D2001	Vacuum pump	1
86-D2064	Rubber tubes	2
86-D2005	Air drying unit	1
86-D0819	Silica gel desiccator, 1 kg bottle	2
28-WF4225	Valve panel for de-airing tank	1
86-D2015	Laboratory air compressor	1
28-WF2016/2	Air filter for 86-D2015 air compressor	1
28-WF4191	Nylon tubing, OD 8 mm/ID 6 mm, 10 m	1
82-P9008/ELT	Set of four cables	1
30-WF6008	Geodatalog, 8-channels data acquisition unit	1
30-WF6016/T6	CRS Geo-Analysis template	1
30-WF6044	Transducer extension cable, 12 m	3

The purpose of the Constant Rate of Strain (CRS) oedometer test is to determine the magnitude and rate of consolidation of a soil restrained laterally, drained axially from the top and subjected to controlled-strain loading.

The 26-WF0360 continuous consolidation cell is used to perform this test, with other equipment such as a triaxial load frame, pressure system, data acquisition and processing components and other accessories required to complete the system. See configuration of a complete system.

The cell features a double chamber for two different and independent water pressure systems, with pore pressure measured at the base of the specimen by a pressure transducer and drainage connected to the top of the specimen.

Direct/residual shear testing machines

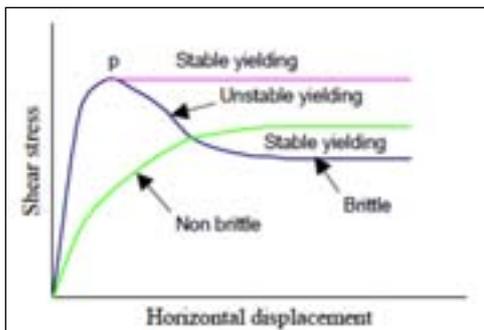
Standards

ASTM D3080 | AASHTO T236 | BS 1377:7 | NF P94 071-1/2 | CEN-ISO/TS 7982-10

If a failure occurs in the ground (for example for deep excavations performed without retaining structures), a slip circle surface is generally created within the soil. After a first immediate general failure, the soil will stabilize, since the soil can still offer a residual strength. Different laboratory testing methods have been developed and standardized:

Direct shear tests

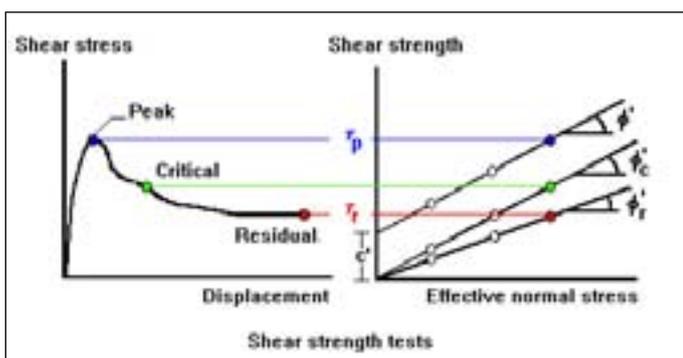
In the traditional direct shear test the soil specimen (either undisturbed, remoulded or compacted) is placed in a rigid metal box and subjected to a normal constant stress. The metal box consists of two halves that can slide horizontally each other and will apply an increasing horizontal force to the lower part of the specimen while the upper part is reacting against the shearing action. From the measurement of this shearing action the shear strength of the soil is calculated.



Direct/residual shear test with cycles

(forward & reverse)

The main limitation of the conventional shear box is that it is not possible to apply the shearing action for large displacement of the soil specimen by repeating several times the shearing action on the same surface of the specimen already subjected to the shearing action of the traditional direct shear test. This type of test is standardized as multi-reversal direct shear.



Both tests can be performed, at different level of automation, with all our Shear testing machines:

DIGISHEAR

27-WF2060 DIGISHEAR,
with digital control and display of speed (see page 54)

AUTOSHEAR

27-WF2160 AUTOSHEAR,
with digital speed control and data acquisition control system (see page 56)

SHEARMATIC

27-WF2180 SHEARMATIC,
digital automatic version with pneumatic automatic loading by a closed-loop control system (see page 58)

SHEARMATIC 300

27-WF2304 SHEARMATIC 300
digital automatic version 100 kN cap. with shear box assembly for 300 mm square samples. (see page 60)

Residual shear tests by the ring shear apparatus

Standards

ASTM D6467 | BS 1377:7

The ring shear apparatus, also known as Bromhead Apparatus, has been developed to overcome the main disadvantage of the multi-reversal shear test, where the shearing action is reversed, causing the continuous re-orientation of the soil particles.

In the ring shear apparatus the specimen is annular shaped and subjected to an unlimited rotational displacement from the lower part, while the upper part is reacting against a couple of load rings or load cells. The main advantages of this test is that large displacements make reliable the measurement of the residual strength of a soil specimen, where the area of contact on the shear plane is maintained constant. The disadvantage is that the specimen is tested only under remoulded conditions.

This test can be performed with the following machine:

TORSHEAR

27-WF2202 TORSHEAR
Bromhead ring shear apparatus. (see page 62)

DIGISHEAR**Direct/residual Shear Machine****Standards**

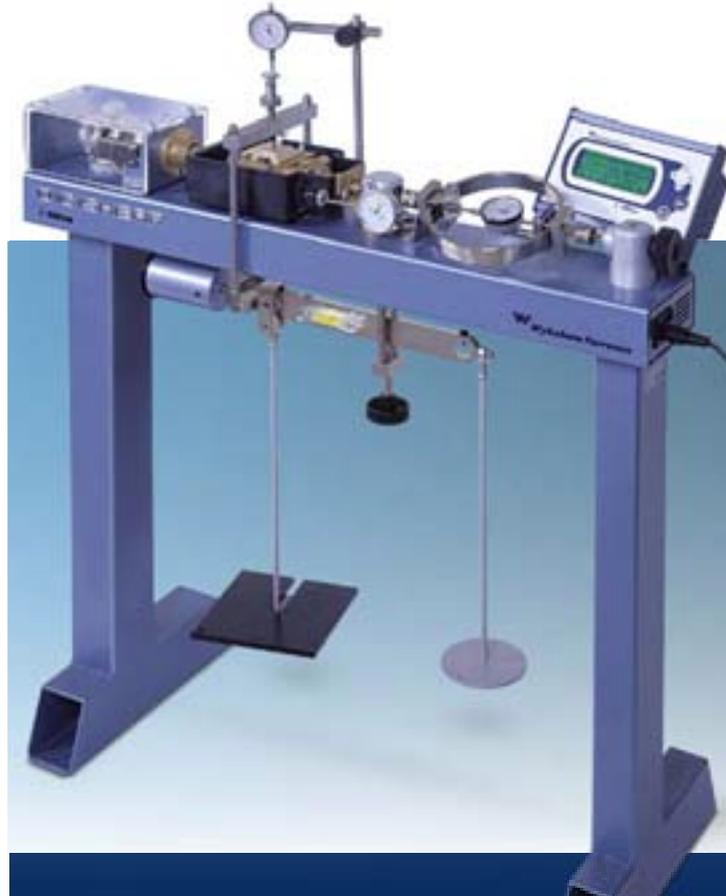
ASTM D3080 | AASHTO T236 | BS 1377:7 |
NF P094 071-1/2 | CEN-ISO/TS 7982-10

27-WF2060**DIGISHEAR, direct/residual shear machine**

Digital control and display of speed.
110-240 V, 50-60 Hz, 1 ph.

The DIGISHEAR machine, with digital control and display of speed, is driven by a high resolution stepper motor and worm reduction unit and can accommodate all standard-sized specimens up to 10 cm square and 10 cm diameter. Vertical load is applied directly to the specimen via a loading yoke and weight hanger, and can be increased by using the counterbalanced lever-arm loading hanger which amplifies the load by a factor of 10. The loading yoke can hold up to 50 kg of weights so that the total load on the specimen can reach 500 N, or 5000 N when the lever-arm hanger is used.

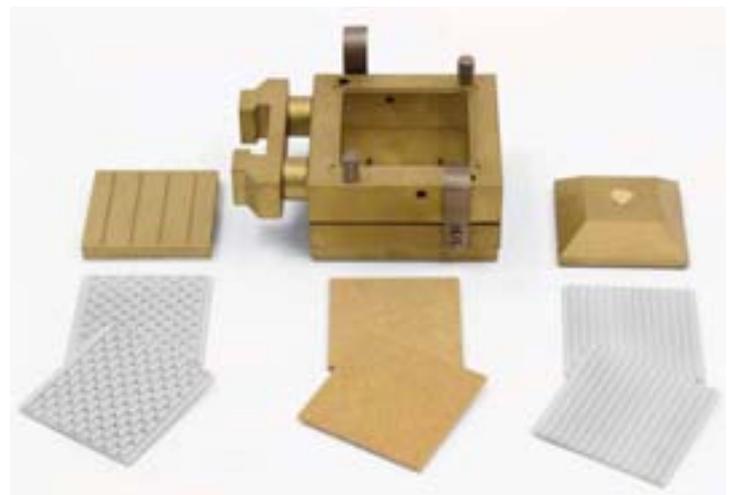
The machine is supplied without a shear box assembly, slotted steel weights and load/displacement measurement apparatus, which can be analogue (load ring and dial gauges), or electronic with data acquisition and processing (load cell, displacement transducers and data acquisition system). All these items have to be selected and ordered separately - see Accessories.

**main features**

- > Reversible stepping motor for residual strength testing
- > Infinitely variable speed drive from 0.00001 to 9.99999 mm/min
- > Compact ergonomic design
- > Safety device to prevent overload and overtravel
- > Can be fitted with mechanical (analogue) measuring equipment, or electronic with data acquisition and processing

Technical specifications

- Speed range: adjustable from 0.00001 to 9.99999 mm/min (preset via firmware)
- Maximum shear force: 5000 N
- Maximum vertical load: 500 N or 5000 N using 10:1 lever-arm device
- Speed drive ratio: stepper motor 1/10000 resolution
- Horizontal travel: preset via firmware up to 20 mm
- Displacement limits: controlled by optical safety switch
- Digital display: 4-row / 20-character LCD. Easy to operate with the membrane keyboard
- Specimen sizes: 60 and 100 mm square; 50, 60, 63.5 and 100 mm diameter
- Overall dimensions: 953 x 387 x 1180 mm (w x d x h)
- Weight: 120 kg (approx.)



Shear box

Accessories

Shear box assemblies

These shear box assemblies are designed to be used with our 27-WF2060 Digishear, 27-WF2160 Autoshear and 27-WF2180 Shearmatic shear testing machines.

The box is manufactured from brass and is designed to confine the specimen whilst permitting free drainage of the surrounding water. The complete assembly consists of a square box with a rigid-walled round or square hole, with a loading pad, base plate, 2 plain grid plates, 2 perforated grid plates and 2 porous plates. Weight: from 2.5 to 4 kg (approx.)

27-WF0215/B

Shear box assembly for 60 mm square specimens.

27-WF0216/B

Shear box assembly for 100 mm square specimens.

27-WF0217/B

Shear box assembly for 50 mm diameter specimens.

27-WF0218/B

Shear box assembly for 60 mm diameter specimens.

27-WF0219/B

Shear box assembly for 63.5 mm diameter specimens.

27-WF0222/B

Shear box assembly for 100 mm diameter specimens.

Mechanical (analogue) measuring devices

27-WF1002/ST

Load ring, 2000 N capacity, with adapter, or, alternatively:



27-WF1002/ST
Load ring with adapter

Accessories for shear box assemblies

Box code, 27-	WF0215/B	WF0216/B	WF0217/B	WF0218/B	WF0219/B	WF0222/B
Sample cutter*	<u>WF0215/B7</u>	<u>WF0216/B7</u>	<u>WF0217/B7</u>	<u>WF0218/B7</u>	<u>WF0219/B7</u>	<u>WF0222/B7</u>
Extrusion dolly*	<u>WF0215/8</u>	<u>WF0216/8</u>	<u>WF0217/8</u>	<u>WF0218/8</u>	<u>WF0219/8</u>	<u>WF0222/8</u>

Spare parts for shear box assemblies

Box code, 27-	WF0215/B	WF0216/B	WF0217/B	WF0218/B	WF0219/B	WF0222/B
Loading pad	<u>WF0215/B2</u>	<u>WF0216/B2</u>	<u>WF0217/B2</u>	<u>WF0218/B2</u>	<u>WF0219/B2</u>	<u>WF0222/B2</u>
Base plate	<u>WF0215/B3</u>	<u>WF0216/B3</u>	<u>WF0217/B3</u>	<u>WF0218/B3</u>	<u>WF0219/B3</u>	<u>WF0222/B3</u>
Porous plate**	<u>WF0215/4</u>	<u>WF0216/4</u>	<u>WF0217/4</u>	<u>WF0218/4</u>	<u>WF0219/4</u>	<u>WF0222/4</u>
Plain grid plate**	<u>WF0215/B5</u>	<u>WF0216/B5</u>	<u>WF0217/B5</u>	<u>WF0218/B5</u>	<u>WF0219/B5</u>	<u>WF0222/B5</u>
Perforated grid plate**	<u>WF0215/B6</u>	<u>WF0216/B6</u>	<u>WF0217/B6</u>	<u>WF0218/B6</u>	<u>WF0219/B6</u>	<u>WF0222/B6</u>

* Not supplied with the shear box. They must be order separately.

** Two pieces are supplied with each shear box

27-WF1003/ST

Load ring, 5000 N capacity, with adapter.

30-WF6401

Dial gauge for measuring vertical deformation, 10 mm travel, 0.002 mm resolution.

30-WF6402

Dial gauge for measuring horizontal deformation, 30 mm travel, 0.01 mm resolution.

Electronic measuring devices

27-WF0377/ST

Load cell, 5 kN cap., complete with adapters

30-WF6207

Linear potentiometric transducer, 10 mm travel, for vertical deformation, complete with mounting block

30-WF6208

Linear potentiometric transducer, 25 mm travel, for horizontal displacement, complete with mounting block

Note: in case displacement transducers and load cell are supplied complete with data acquisition system, then a traceable calibration certificate is available on request.

Data acquisition and processing system

Note For more information on the Geodatalog, see page 108

30-WF6016/T2

Direct and residual shear Geo-Analysis template BS

30-WF6016/T9

Direct and residual shear Geo-Analysis template ASTM

Weight sets

27-WF0230/C3

Weight set, 37.5 kg in total, comprising: 2 x 0.25, 2 x 0.5, 2 x 1, 3 x 2, 3 x 4 and 2 x 8 kg weights.

27-WF0230/C4

Weight set, 34 kg in total, comprising: 2 x 1, 1 x 2 and 3 x 10 kg weights. (additional)

Single slotted weights

27-WF0270/A

Slotted steel weight, 0.25 kg ± 3 g.

27-WF0271/A

Slotted steel weight 0.5 kg ± 3 g.

27-WF0272/A

Slotted steel weight, 1 kg ± 5 g.

27-WF0273/A

Slotted steel weight, 2 kg ± 5 g.

27-WF0274/A

Slotted steel weight, 4 kg ± 5 g.

27-WF0275/A

Slotted steel weight, 8 kg ± 10 g.

27-WF0276/A

Slotted steel weight, 5 kg ± 5 g.

27-WF0277/A

Slotted steel weight, 10 kg ± 10 g.



Slotted steel weights

AUTOSHEAR

Direct/residual Shear Machine

**main features**

- > Microprocessor-controlled drive system
- > Large 240 x 128-pixel display
- > Test speed, direction and cycles (up to 10) programmable using the keyboard
- > Rapid approach and automatic positioning
- > Infinitely variable speed from 0.00001 to 11.00000 mm/min
- > Possibility to set different speed and direction (forward and reverse) in the residual shear test
- > Three analogue channels: one for load cell, and two for displacement transducers, 130,000-point resolution
- > Different protocols for downloading data to PC through RS-232 serial port
- > Standard load ring and dial gauges also compatible for manual recording

Standards

ASTM D3080 | AASHTO T236 | BS 1377:7 | NF P094 071-1/2 | CEN-ISO/TS 7982-10

27-WF2160**AUTOSHEAR, direct/residual shear machine**

digital control of speed and data acquisition control system.

110-240 V, 50-60 Hz, 1 ph.

The AUTOSHEAR machine is controlled by a microprocessor system which reads and processes horizontal force and displacement readings and manages the motor and safety limits via a closed-loop control system. The unit provides the following important features:

- Automatic running of tests
- Closed-loop control of test speed
- Large, monochromatic, 240 x 128-pixel graphic display for viewing and recording data in real time
- Different calibration functions (linear and polynomial)
- Language selection
- Travel and cycles programmable using a 10 button membrane keyboard with 4 specific interactive icons
- Continuous monitoring and display of horizontal force, vertical and horizontal displacement
- Maximum horizontal displacement limit (20 mm) controlled by mechanical and optical safety switch
- Different recording modes, including linear, exponential (square root) and logarithmic
- High capacity data memory (up to 1000 lines of data)
- RAM memory with battery back-up with clock/calendar, operative even when the unit is switched off



Detail of shear box carriage made of high resistance techno-polymeric material

The design of the horizontal loading system provides rigid linear alignment of the loading ram, shear box and force measurement system, ensuring that the horizontal shearing force is transmitted along the shearing plane of the specimen.

Techno-polymeric material of excellent quality and high resistance has been used for the carriage of the shear box. It offers excellent resistance to corrosion and wear and tear, and it is resistant to all chemicals found in soil specimens. The carriage is lightweight and easy to clean.

The machine is supplied without load cell, transducers for horizontal and vertical displacement, shear box assembly and weights. All these items have to be ordered separately - see Accessories.

The machine can also be fitted with mechanical (analogue) measuring devices.

The microprocessor control system allows the machine to work as an automatic stand-alone unit: the test measurements (force and displacement) are directly displayed and stored in the unit memory according to pre-set recording modes. The PC is only required once the test is completed, to download the test data via the RS-232 port. The data can be processed using the Direct and residual shear Geo-Analysis templates - see Accessories.

Technical specifications

- Speed range: 0.00001 – 11.00000 mm (preset via firmware)
- Maximum shear force: 5000 N
- Maximum vertical load: 500 N or 5000 N using 10:1 lever-arm device
- Speed drive ratio: stepper motor 1/10000 resolution
- Horizontal travel: preset via firmware up to 20 mm
- Displacement limits: controlled by optical safety switch
- Maximum shear cycles: up to 10 (forward and reverse)
- Digital: large 240 x 128 pixel display
- Specimen sizes: 60 and 100 mm square; 50, 60, 63.5 and 100 mm diameter
- Overall dimensions: 953 x 387 x 1180 mm (w x d x h)
- Weight: 120 kg (approx.)

Accessories

Electronic measuring devices

27-WF0377/ST

Load cell, 5 kN capacity, complete with adapters.



30-WF6207

Linear potentiometric transducer, 10 mm travel for vertical deformation, complete with mounting block.



30-WF6208

Linear potentiometric transducer, 25 mm travel for horizontal displacement, complete with mounting block.

Note: Traceable calibration certificate is available on request.

Data processing software

30-WF6016/T2

Direct and residual shear Geo-Analysis templates conforming to BS 1377:7.

30-WF6016/T9

Direct shear Geo-Analysis template conforming to ASTM D3080.

Shear box assemblies

For a general description and related accessories and spares, see page 55

Weight set

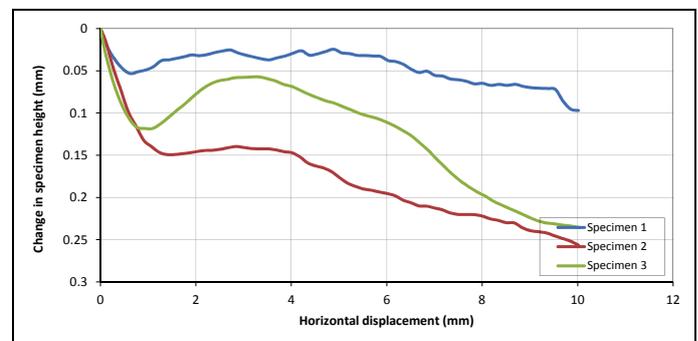
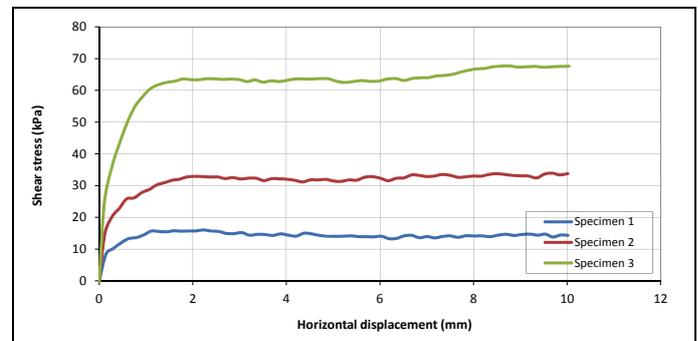
See page 55

Mechanical (analogue) measuring devices

See page 55

DETERMINATION OF SHEAR STRENGTH BY DIRECT SHEAR (in the small shearbox apparatus)
Set of single stage tests - tested in accordance with BS 1377:1990:Part 7: Clause 4 (procedure 4.5.4)
TEST REPORT - SHEARING

Project location	<i>EXAMPLE</i>		
Project reference	12345	Sample depth	0.50
Borehole number	BH1	Sample type	Compacted cohesionless
Sample number	2A	Specimen orientation	N/A



Tested	JKW	Checked	Approved
Date	30/01/2013	Date	Date

Example of a direct shear test processed with the 30-WF6016/T2 Geo-Analysis template (BS standard): the top plot shows shear stress versus horizontal displacement; the bottom plot shows change in specimen height versus horizontal displacement

SHEARMATIC

Direct/residual Shear Machine

**main features**

- > Automatic pneumatic application of pre-set consolidation steps (up to 50)
- > Automatic test management from consolidation to failure
- > No dead weights or lever-arm required
- > Infinitely variable speed from 0.00001 to 11.00000 mm/min
- > Linear connection between shear box, drive unit and load cell for transmission of the horizontal force along the shearing plane, instead of the classic "swan neck"
- > High-resistance techno-polymeric carriage
- > Possibility to set different speeds and travel (forward and reverse) in the residual shear tests
- > Each single step of vertical pressure can be applied instantaneously or by means of a linear ramp over a pre-set time interval

Standards

ASTM D3080 | AASHTO T236 | BS 1377:7 | NF P094 071-1/2 | CEN-ISO/TS 7982-10

27-WF2180**SHEARMATIC Automatic direct/residual shear machine**

with programmable pneumatic loading. 110-240 V, 50-60 Hz, 1 ph.

This microprocessor-based advanced model is a stand-alone machine, driven by a high-resolution stepper motor with epicyclical reduction gear with reduced backlash. A pneumatic closed-loop system with a high-performance pressure regulator is incorporated for the automatic application of vertical pressure, with the main advantage that manual loading of dead weights is eliminated.

Techno-polymeric material of high quality and resistance has been used for the carriage of the shear box. It offers excellent resistance to corrosion and wear and tear, and it is resistant to all chemicals found in soil specimens. The carriage is light-weight and easy to clean. The microprocessor system reads and processes the force, vertical pressure and displacement readings, and manages the motor, the pressure valve, the safety system and the test steps through the closed-loop system. It has a scratchproof membrane keyboard and a large monochromatic graphic display.

The machine is supplied complete with the following electronic transducers:

- ± 5 kN capacity load cell, bi-directional type (compression and tension), nominal sensitivity 2 mV/V, accuracy $\pm 0.03\%$
- 10 mm displacement transducer, 1 kOhm nominal resistance, $\pm 0.25\%$ linearity, 0.002 mm repeatability
- 25 mm displacement transducer, 1 kOhm nominal resistance, $\pm 0.25\%$ linearity, 0.002 mm repeatability
- 1000 kPa pressure transducer, 0.1 kPa accuracy, nominal sensitivity 2 mV/V

Note The Shear box assemblies have to be selected and ordered separately. The machine requires a compressed air supply of 10 bar maximum pressure. For a suitable air compressor, laboratory model, see Accessories.

The **Shearmatic** unit, along with the **ACE** Automatic oedometer and **Autotriax 2**, Automatic Triaxial test system, makes up a unique equipment for providing complete automation of a Consolidation, Shear and Triaxial Soil Mechanics laboratory.

The unit provides the following important features:

Automatic test termination:

- When a pre-set horizontal load or displacement is reached
- After a pre-set duration of the shear stage (from 1 minute to about 7 days)

Safety micro switch:

- Optical for zero and end of travel
- Mechanical for maximum horizontal displacement

Application of vertical load:

- Pneumatic piston with a high-resolution regulator, motor-driven via Automax electronic board with closed-loop control via a 10 bar pressure transducer

Input channels:

- One for a load cell transducer with 130,000-point resolution
- Two for potentiometric displacement transducers

3 calibration modes for transducers:

- 1st step linear
- 2nd degree polynomial
- Up to 10 steps linearization

Data recording:

- Consolidation stage: vertical pressure and displacement
- Shear stage: horizontal force and displacement; vertical pressure and displacement

Recording mode:

- Linear, exponential (square root) and logarithmic
- At pre-set intervals of recorded data

Recorded data capacity:

- 2000 lines of data

Blocks of memory:

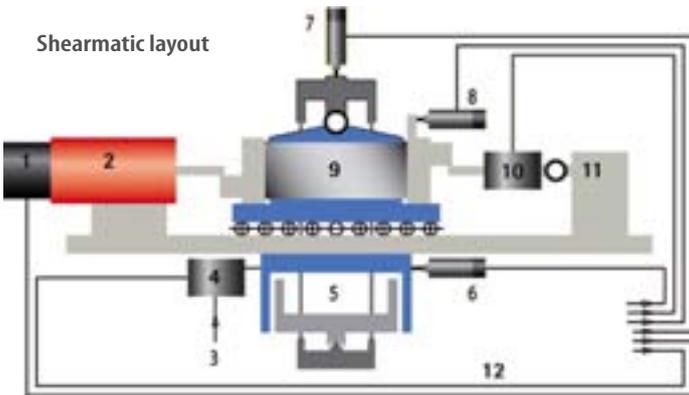
- Up to 25

Communication protocol:

- Selectable via RS-232 serial port:
- ASCII for use with Windows Hyper Terminal or CONTROLS for use with 82-Q0800/TRM



AUTOLAB



- | | |
|--|---------------------------------------|
| 1. Stepper motor | 7. Vertical displacement transducer |
| 2. Horizontal loading assembly | 8. Horizontal displacement transducer |
| 3. Compressed air supply | 9. Shear box |
| 4. Proportional valve to control the vertical load | 10. Load cell |
| 5. Vertical loading assembly | 11. Machine frame |
| 6. Vertical load air pressure transducer | 12. Control console |

Technical specifications

- Motor: high-accuracy stepper motor 1/10000 resolution
- Test speed: infinitely variable from 0.00001 to 11.00000 mm/min
- Maximum horizontal force: 5 kN
- Maximum vertical force: 8 kN = 800 kPa on a 100x100 mm square specimen
- Maximum shear cycles: 10 (forward and reverse)
- Maximum travel: 20 mm
- Maximum air pressure supply: 10 bar
- Maximum working air pressure: 8 bar
- RS-232 serial port
- Overall dimensions: 973 x 421 x 427 mm (wxdxh)
- Weight: 100 kg (approx.)

Accessories

Shear box assemblies
See page 55

Air compressors

86-D2015

Laboratory air compressor, 10 bar maximum pressure, 50 litre capacity, 230 V, 50 Hz, 1 ph.

86-D2015/Z

As above but 110 V, 60 Hz, 1 ph.

86-D2015/Y

As above but 220 V, 60 Hz, 1 ph.

28-WF2016/2

Air filter/water trap for air compressor.

Data processing software

30-WF6016/T2

Direct and residual shear Geo-Analysis templates conforming to BS 1377:7.

30-WF6016/T9

Direct shear Geo-Analysis template conforming to ASTM D3080.

Serial communication box

27-WF2180/LINK

4 channels serial communication box (4 input and 1 output) for the multi-connection of up to 4 shear testing machine to PC for data downloading.

Note: it's required when more than one unit are connected to a single PC

Example of a direct shear test processed with the 30-WF6016/T9 Geo-Analysis template (ASTM standard): the top plot shows the consolidation (vertical deformation versus time); the bottom plot shows the shearing (shear stress versus relative lateral displacement).

Set up of the consolidation steps

Each row of this table represents a pressure step which is defined by:

- Initial pressure (set point) that is equal to the pressure of the previous step
 - Final pressure (target) will be reached automatically at a constant rate
 - Pre-set time to pass from initial to final pressure
- For example, rows 3 and 4 of this table mean that:
- The pressure will be increased instantaneously (time = 0) from 100 to 300 kPa
 - The pressure of 300 kPa will be maintained for the time of consolidation (in this case 500 minutes).

SET. PT	TARGET	TIME	EN
0000	0100	00000	Yes
0100	0100	01000	Yes
0100	0300	00000	Yes
0300	0300	02000	Yes
0000	0000	00000	No
0000	0000	00000	No
0000	0000	00000	No
0000	0000	00000	No
0000	0000	00000	No
0000	0000	00000	No

Direct shear test

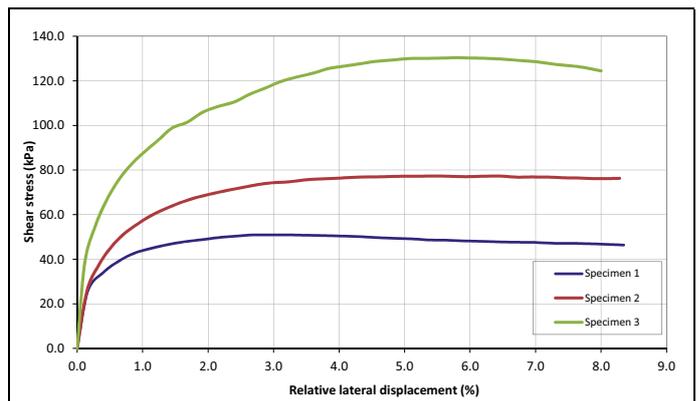
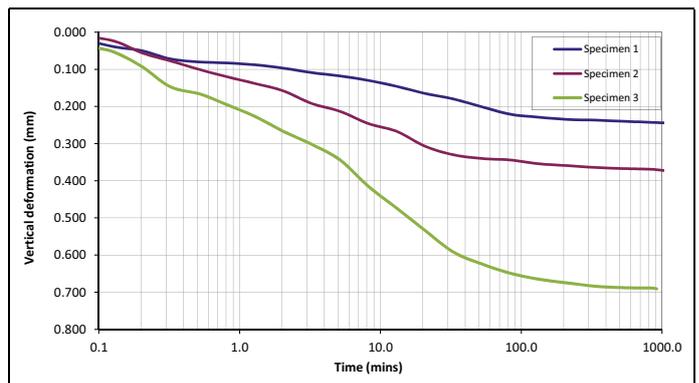
This screen shows the status of and information about the test, and displays real-time values of:

- Horizontal force
- Vertical pressure (maintained constant)
- Horizontal displacement
- Vertical displacement

Test name	CONSOLID. + DIRECT
Specimen	EXP000001
Test type	DIRECT SHEAR
Load cell [kN]	0.00778
Pressure [kPa]	0001
Horiz. displac. [mm]	0.000
Vert. displac. [mm]	00.000

DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS
Tested in accordance with ASTM Designation: D 3080

Project location	Specimen number
Project reference	Specimen depth (m)
Borehole number	



SHEARMATIC 300

Large Shear testing machine

AUTOLAB

**main features**

- > Ideal for testing shale, industrial slag, brick rubble, and colliery spoils
- > Sample size 150 and 300 mm square
- > 100 kN vertical pressure and horizontal force
- > Infinitely variable speed control from 0.00001 to 11.00000 mm/min
- > Automatic hydraulic application of pre-set consolidation steps (up to 50)
- > Automatic test management from consolidation to failure.
- > Linear connection between shear box, drive unit and load cell for transmission of the horizontal force along the shearing plane
- > Possibility to set different speeds and travel (forward and reverse) in the residual shear tests
- > Each single step of axial force can be applied instantaneously or by means of a linear ramp over a pre-set time interval

**Standards**

ASTM D3080 | AASHTO T236 | BS 1377:7 | NF P094 071-1/2 | CEN-ISO/TS 7982-10

27-WF2304**SHEARMATIC 300, large automatic shear box apparatus**

100 kN capacity, with shear box assembly for 300 mm square samples. 230 V, 50 Hz, 1 ph.

27-WF2304/Z

As above but 110 V, 60 Hz, 1 ph

The SHEARMATIC 300 automatic machine is ideal for soil and other materials that contain large particles of up to 20 mm largest dimension. Sample sizes up to 300 mm square can be tested, with inserts also allowing the testing of smaller sample sizes

Vertical pressure for consolidating the sample is applied and controlled by an automatically programmable closed-loop hydraulic system and horizontal deformation is driven by a high-resolution stepper motor. The machine is entirely managed by the software of a microprocessor unit that reads and processes the force, vertical pressure and displacement readings, and manages the motor, the vertical hydraulic loading system and the test steps, through closed-loop systems. The user interface is a ten-key scratchproof membrane keyboard with large monochromatic graphic display.

The machine works as an automatic stand-alone unit: the test measurements (horizontal and vertical force and displacement) are directly displayed and stored in the unit's memory according to the pre-set recording modes. The PC is only required once the test is completed, to download the test data via the RS-232 port. The data can be processed using the 30-WF6016/T2 or 30-WF6016/T9 Direct and residual shear Geo-Analysis templates - see Accessories.

By using a large sample it is possible to gain a more representative indication of shear strength. Furthermore, the large shear box can be used to obtain the angle of friction between many materials. Particular applications include the construction of earth dams and other embankment work.

The machine includes a shear box, one 100 kN load cell and two linear potentiometric transducers, 100 and 50 mm travel, with mounting brackets.

**Technical specifications**

- Sample size: up to 300 mm square. Can be reduced to 150 mm using 27-WF2304/1 150 mm sample insert. See Accessories.
- Shear and vertical force: 100 kN
- Speed range: infinitely variable from 0.00001 to 11.00000 mm/min
- Maximum travel: 75 mm
- Consolidation steps: up to 50
- Data acquisition: RS-232 serial port for use with Direct and residual Geo-Analysis templates (see Accessories).
- Power rating: 2000 W
- Overall dimensions: 1470 x 758 x 1570 mm approx. (w x d x h)
- Weight: 800 kg (approx.)

Accessories**27-WF2304/1**

150 mm square sample insert for 300 mm shearbox.

Data processing software**30-WF6016/T2**

Direct and residual shear Geo-Analysis templates conforming to BS 1377:7.

30-WF6016/T9

Direct shear Geo-Analysis template conforming to ASTM D3080.

Consolidation bench

27-WF0226

Consolidation bench for shear boxes

Where only one direct shear machine is available, this bench can be used to maintain constant loads on up to three shear box specimens, in order to reduce the testing time when more than one sample has to be tested.

It consists of a steel frame with three locating plates, three loading yokes and weight hangers, and three lever-arm loading hangers which can be used to extend the range of applied pressure by 10:1. The frame can hold up to 3 shear boxes and requires displacement transducers or dial gauges to measure the settlement and a set of weights to apply the load. It is suitable for all standard shear boxes, 27-WF0215/B to 27-WF0222/B (not included).



Technical specifications

- 3 loading yokes and hangers
- 3 lever-arm loading devices with a load amplification ratio of 10:1
- Holds up to 3 shear boxes
- Dimensions: 2310 x 500 x 1215 mm (w x d x h)
- Weight: 120 kg (approx.)

Accessories

Mechanical (analogue) measuring devices

30-WF6401

Dial gauge, 10 mm travel, 0.002 mm resolution:

Electronic measuring devices

30-WF6207

Linear potentiometric transducer, 10 mm travel.

Data acquisition and processing system

Note For more information on the Geodatalog and Geo-Analysis templates, see page 108

Weight sets/Slotted steel weights

See page 55

Laboratory Vane Apparatus

Standards

ASTM D4648 | BS 1377:7

27-WF1730

Laboratory vane apparatus

The laboratory vane apparatus is based on an original concept of the Transport and Road Research Laboratory of the United Kingdom. It can be used with a wide range of vane sizes, although as standard, it is sold with the 12.7 mm square vane and a set of four calibrated springs. The test can be performed directly on the sample or on a sample contained in a sampling tube. In this case the 27-WF1736 attachment for 38 and 100 mm diameter sampling tubes should be used - see Accessories.

- A motorizing unit is also available
- Weight: 11 kg (approx.)

Accessories

Alternative vanes

27-WF1732

Vane 25.4 x 25.4 mm.

27-WF1733

Vane 12.7 x 25.4 mm.

27-WF1734

Vane 12.7 x 19.0 mm.

Sampling tube holding attachment.

27-WF1736

Attachment to hold sample tubes of 38 and 100 mm diameter.



27-WF1736

Motorizing attachments

27-WF1730/2

Motorizing attachment to convert 27-WF1730 apparatus, including drive belt, pulley set and fixing studs. Testing speed 6 to 12°/min, conforming to BS 1377:7. 240 V, 50 Hz, 1 ph.

27-WF1730/2Y

As above but 220 V, 60 Hz, 1 ph.



main features

- > Manual or motorized versions available
- > Lightweight, compact and portable, ideal for site or main laboratory
- > Convenient and rapid method of determining shear strength of soft soils



27-WF1730/2

27-WF1730/3

Motorizing attachment to convert 27-WF1730 apparatus, including drive belt, pulley set and fixing studs. Testing speed 60 to 90°/min, conforming to ASTM D4648. 240 V, 50 Hz, 1 ph.

27-WF1730/3Y

As above but 220 V, 60 Hz, 1 ph.

27-WF1730/4

As above but 110 V, 60 Hz, 1 ph.

Spares

27-WF1731

Spare vane 12.7 x 12.7 mm.

27-WF1735

Spare set of four calibrated springs.

TORSHEAR**Ring Shear Apparatus****main features**

- > Microprocessor controlled drive system
- > Speed range adjustable from 0.001 to 180°/min
- > Rapid approach without any limit of rotation
- > Two measurement options: mechanical with load rings and dial gauge, and electronic with data acquisition, using load cells, displacement transducer and Geodatalog data acquisition system

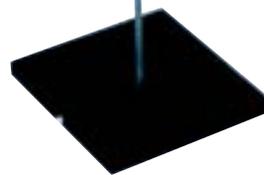
27-WF2202 with accessories
for electronic measurement option

Standards ASTM D6467 | BS 1377:7

27-WF2202

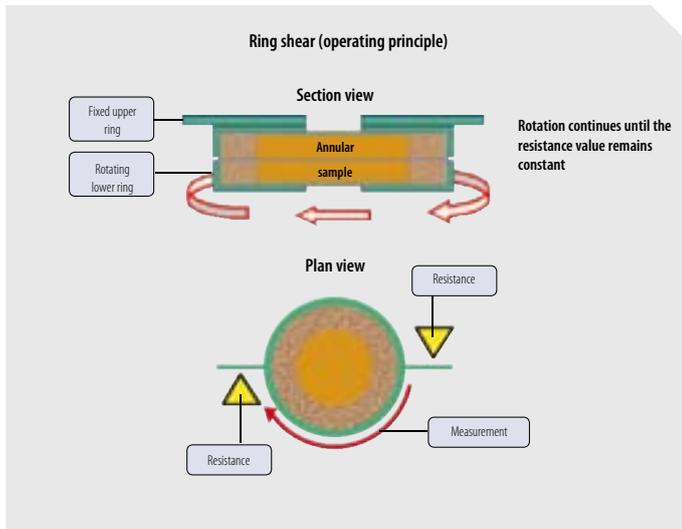
TORSHEAR, Bromhead ring shear apparatus.

110-240V, 50-60Hz, 1ph.

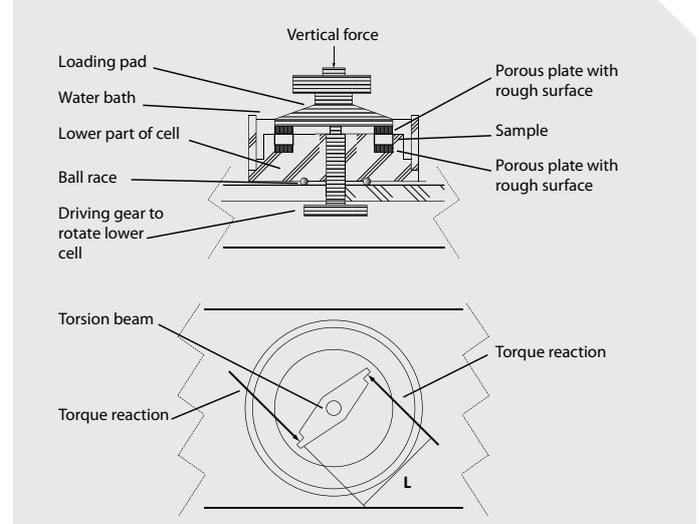


The TORSHEAR machine is dedicated to the determination of the residual shear strength. The residual shear strength of soils is sometimes also termed the ultimate shear strength. This is the strength of soil when it is sheared to large displacements, for example along the failure plane of a landslide or in a fault zone.

A remoulded specimen is used to determine the residual shear properties of the soil. A slip surface is formed in the test specimen as part of the test procedure. It can also be useful to know what sort of value the residual shear strength of an intact soil can have, because this (when taken in conjunction with the peak shear strength of the same soil) indicates its brittleness or susceptibility to progressive failure. Soils with high brittleness need to be used with caution, in engineering works such as embankments, or if they cannot be removed, for example in a natural slope. In the unfortunate event of a slope failure occurring, the general scale of displacement will depend on the magnitude of the brittleness.



Typical arrangement of ring shear apparatus



The TORSHEAR apparatus tests the residual shear strength of re-moulded soil samples. The main advantage of this method, when compared to using a shearbox apparatus, is that the shearing is continuous with a constant area. This method allows the field conditions to be recreated in the laboratory, giving very accurate residual shear strength values.



Detail of linear potentiometric transducer with mounting block

The sample is loaded vertically between two porous stones by a counterbalanced lever arm loading system with a ratio of 10:1. The base of the cell and lower platen are rotated by means of a variable speed motor, while rotation of the upper part of the cell is restrained by a pair of matching load rings or load cells which measure the torque transmitted to the sample.

The settlement of the upper platen during consolidation and shear can be monitored using a sensitive dial gauge or linear transducer mounted on the top of the loading yoke. A linear transducer and strain gauge load cells

can be connected to the GEODATALOG for data acquisition and processing See Accessories.

Using the waterproof membrane keyboard and the LCD 4-row / 20-character display, it is possible to set the speed in degrees/min and position the sample using the fast approach function. The test can be stopped using the keyboard or by setting a time or rotation limit.

Dial gauges or linear transducers, load rings or cells and weights are not included and have to be ordered separately - see Accessories.

Technical specifications

- Speed range: 0.001 to 180°/min
- Maximum shear stress: 500 kPa
- Maximum vertical stress: 1000 kPa (lever ratio 10:1)
- Specimen dimensions: area 40 cm² (internal diameter 70 mm, external diameter 100 mm), thickness 5 mm
- Power rating: 570 W
- Overall dimensions: 770 x 400 x 750 mm (excluding lever) (w x d x h)
- Weight: 72.5 kg (approx.)

Accessories

Electronic measuring devices

27-WF2202/3

Pair of load cells, 1 kN capacity, with adapters.

30-WF6207

Linear potentiometric transducer, 10 mm travel, complete with mounting block.

Note: in case displacement transducers and load cell are supplied complete with data acquisition system, then a traceable calibration certificate is available on request.

Data acquisition and processing system

Note For more information on the Geodatalog, see page 108

30-WF6016/T3

Ring shear Geo-Analysis template conforming to BS 1377:7.

30-WF6016/T16

Ring shear Geo-Analysis template conforming to ASTM 6467.

Mechanical (analogue) measuring devices

27-WF2202/1

Pair of matched load rings, 1 kN capacity.

30-WF6401

Dial gauge 10 mm travel, 0.002 mm resolution.

Weights for vertical load

27-WF2202/2

Set of slotted steel weights, total 50 kg.

Stand (optional)

27-WF2202/4

Metal stand for 27-WF2202 apparatus.

Spares

27-WF2202/5

Pair of porous stones.

Soil Mechanics

28 | Triaxial testing

29 | Automatic triaxial testing

30 | Data acquisition system

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The triaxial tests are performed to determine the stress-strain relation of a soil specimen subjected to different strain levels and drainage conditions. We propose various models of triaxial load frames, triaxial cells and all related accessories. Section 29 concerns the AUTOTRIAX 2, Automatic triaxial system, the advanced apparatus to control up to six independent systems and the section 30 concerns the Data acquisition systems for geotechnical tests.

28 Triaxial testing

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29 AUTOTRIAX 2

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30 Data acquisition system

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Introduction

Investigation of stress-strain relationships in soil is usually carried out with triaxial tests where undisturbed, remoulded or compacted specimens are subjected to different stress level sand drainage conditions to simulate as closely as possible the different situations that can occur in the subsoil on site and the possible effects of construction, excavations, embankments, landslides, etc.

This section contains descriptions of different testing solutions and details of the equipment required to carry out the various types of triaxial test in manual, semi-automatic or automatic mode.

A summary table is presented below in order to help the user to select the right equipment, from basic manual systems up to fully automatic advanced solutions.

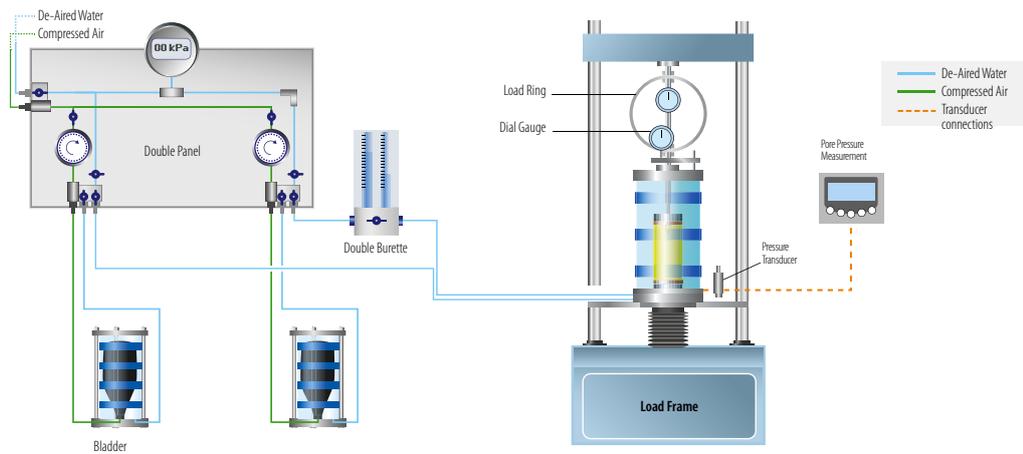
Test mode	Applications	Standards	Test equipment required
Manual with analogue measurement system	Total stress: UU (Unconsolidated Undrained) Effective stress: CU, CD (Consolidated Undrained, Consolidated Drained) Permeability	ASTM 2850 / 4767 / D7181 / D5084 BS 1377:6 / 7 / 8 CEN-ISO/TSI 17892-8 / 9 / 11 NF P94 070 /P94 074	<ul style="list-style-type: none"> • Triaxial load frame • Analogue measuring system:..... <ul style="list-style-type: none"> - Axial strain dial gauge - Load measuring ring - Pore water pressure - Double burette measuring volume change • Triaxial cell with accessories (standard or banded)..... • Pressure system..... • De-airing system • Geo-Analysis processing templates
Manual with electronic measurement system	As above plus: Unsaturated	ASTM 2850 / 4767 / D7181 / D5084 BS 1377:6 / 7 / 8 CEN-ISO/TSI 17892-8 / 9 / 11 NF P94 070 /P94 074	<ul style="list-style-type: none"> • Triaxial load frame • Electronic measuring system:..... <ul style="list-style-type: none"> - Displacement transducer - External / submersible load cell - Pore pressure transducer - Volume change device • Triaxial cell with accessories (standard, banded or double-wall unsaturated cell)..... • Pressure system..... • De-airing system • Data acquisition system • Geo-Analysis processing templates
Automatic (PC- controlled) with digital measurement system AUTOTRIAX-2	As above plus: Stress path	ASTM 2850 / 4767 / D7181 / D5084 BS 1377:6 / 7 / 8 CEN-ISO/TSI 17892-8 / 9 / 11 NF P94 070 /P94 074	<ul style="list-style-type: none"> • Triaxial load frame • Digital measuring system:..... <ul style="list-style-type: none"> - Displacement transducer - External / submersible load cell - Pore pressure transducer • Triaxial cell with accessories (standard, banded or double-wallunsaturated cell)..... • Pressure/volume controller..... • De-airing system • Data acquisition and control units..... • Triaxial test automatic controland processing software

Page

General system layout schematic

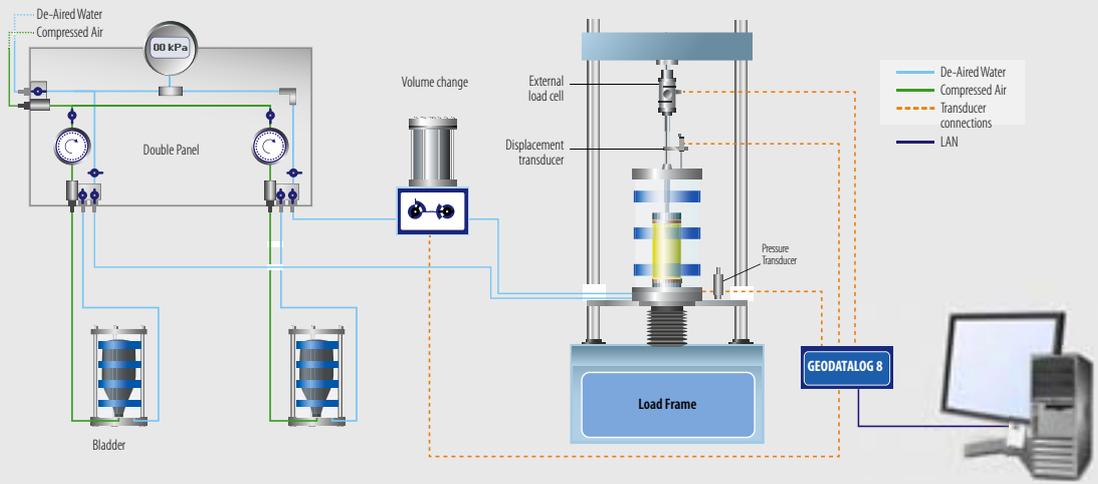
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78/80
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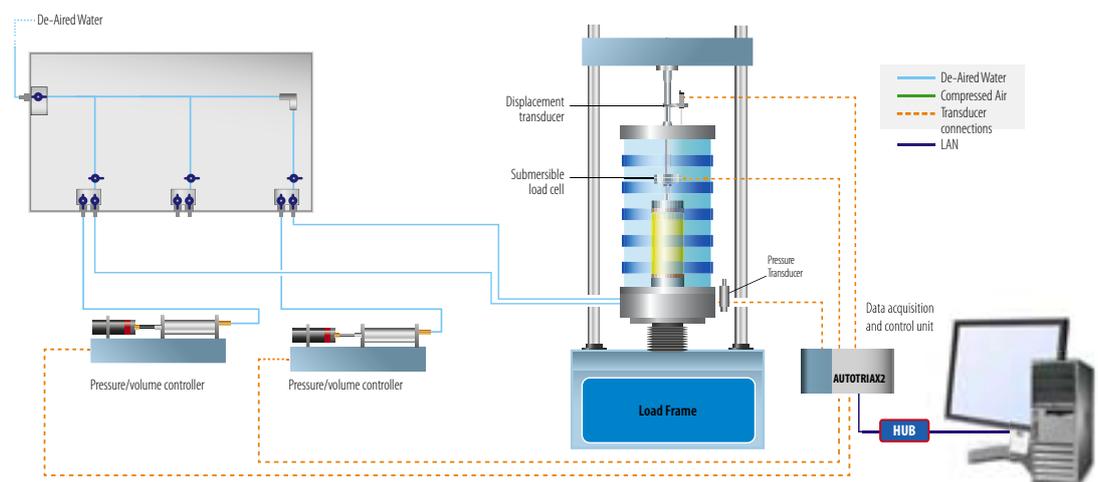
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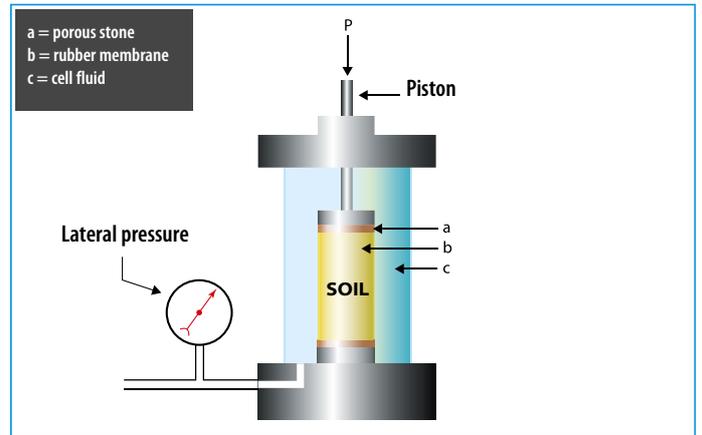
Types of triaxial test: test descriptions

Total stress - Unconsolidated Undrained (UU) test

ASTM D2850, BS 1377:7, CEN-150/TS17892-8, NF P94 070, NF P94 074

With this method the shear strength is measured in terms of total stress. The soil specimen is not allowed to consolidate and maintains its original structure and water content, so that its compressive strength depends only on the level of geostatic stress in the field.

Tests are often carried out on three specimens from the same sample, each subjected to a different confining pressure. Provided that the soil is fully saturated, the shear strength will be the same for each test and is known as "undrained shear strength".

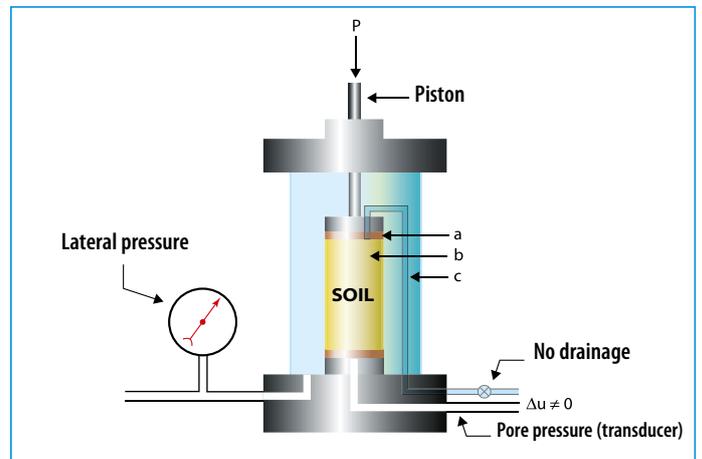


Effective stress - Consolidated Undrained (CU) test

ASTM D4767, BS 1377:8, CEN-150/TS17892-9, NF P94 070, NF P94 074

With this test method the shear strength is measured in terms of effective stress. The specimen is saturated and allowed to consolidate (i.e. to change its structure and water content) at the required confining pressure. At the end of consolidation, the specimen is subjected to a controlled application of load, during which no drainage is allowed and pore pressure is measured. The effective stresses are calculated as the difference between the total stress and the pore pressure.

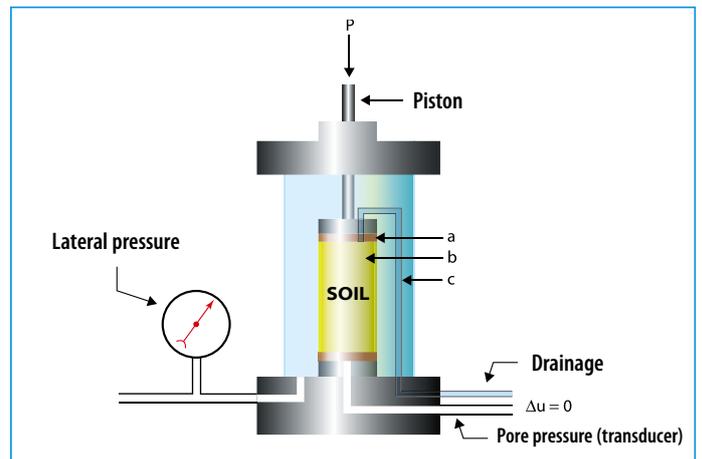
Since the shear strength is affected by the effective stresses, by testing a set of three specimens at different confining pressures, it is possible to define the failure envelope according to Coulomb's model and define the parameters c' and ϕ' .



Effective stress - Consolidated Drained (CD) test

ASTM D7181, BS 1377:8, CEN-150/TS17892-9, NF P94 070, NF P94 074

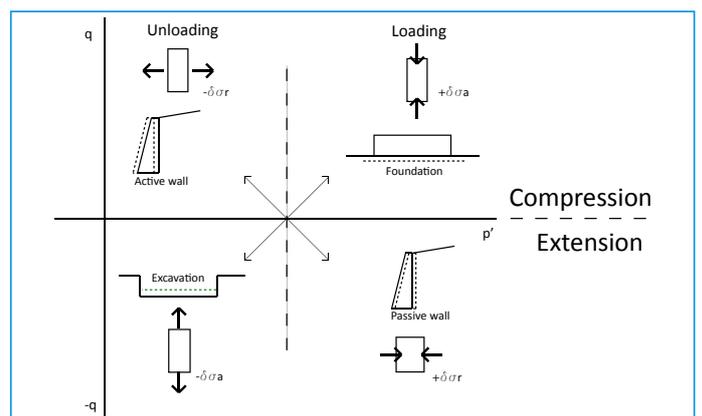
This test method is the same as the CU test except that the failure stage is carried out very slowly to prevent any change in the pore pressure inside the specimen, which is allowed to drain. Calculation of the total and effective stresses and failure envelope are also the same as for the CU.



Stress path test

Events on site such as excavation, construction or natural occurrences can produce changes in the magnitude and ratio of the principal stresses (major and minor). In a stress path test the horizontal and vertical pressures applied to the specimen are managed independently, which allows the behaviour of a soil subjected to anisotropic loading and unloading to be replicated and measured in the laboratory.

This test can only be accurately and reliably performed with an automatic servo-controlled closed-loop system.

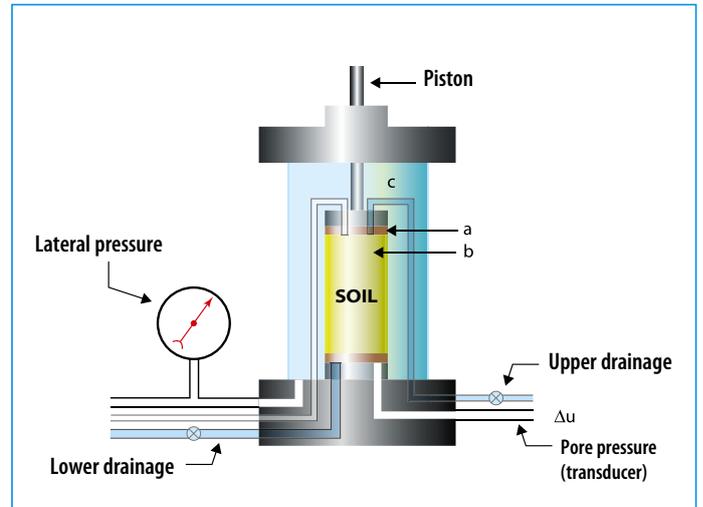


Permeability test in a triaxial cell

ASTM D5084, BS 1377:6,CEN-ISO/TS17892-11

The triaxial permeability test involves saturating and consolidating the specimen to the required effective stress in the same way as for a CD or CU test, but instead of a failure stage, water is allowed to flow through the specimen under a pre-defined difference of pressure and the rate of flow is measured. From this measurement the soil permeability is calculated.

Three independent pressure systems are used for the test; for the confining pressure, the drainage line to the top of the specimen and the drainage line to the base of the specimen.



Unsaturated soil test

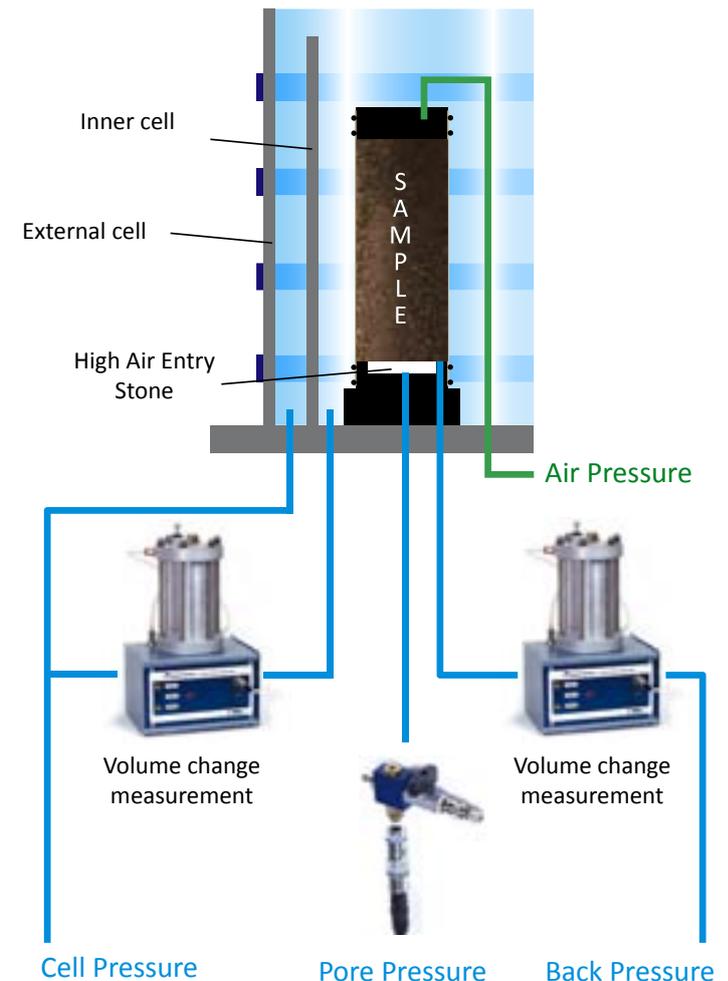
An unsaturated testing system is used when effective stress testing is required that recreates in-situ conditions of specimens that exist in a naturally unsaturated state (for example soil that is higher than the water table).

In an unsaturated soil, the voids between soil particles are filled with both air and water, and surface tension forces create a negative pore water pressure (or suction) which pulls the soil particles together and increases the strength of the soil. Saturating the soil (replacing the air in the voids with water) results in a positive pore water pressure which pushes the soil particles apart and reduces the overall strength. Because of this, it is not desirable to saturate unsaturated or partially saturated material, but neither can it be tested using conventional triaxial systems because the negative suction causes problems with the equipment.

The solution to this problem is to use what is known as the axis translation method, which involves applying an air pressure via the top cap (in the same way as a water back pressure in a saturated test). This raises the pressure inside the sample to a positive value which, in turn, applies a positive pressure to the porous stone and to the pore water pressure transducer.

A special triaxial cell is used for the test, with a double wall which allows the total change in sample volume to be measured, and a high air entry stone in the base pedestal that allows water to pass but not air.

Using the axis translation method with the double-wall cell allows effective stress testing to be carried out on unsaturated material.



TRITECH

Triaxial load frames



28-WF4005



28-WF4010

common main features

28-WF4005, 28-WF4005/4C, 28-WF4010 and 28-WF4010/4C

- > Designed for soil testing laboratories to perform UU, CU, CD and stress path* (compression/extension) tests
- > Suitable for automatic PC-controlled triaxial testing (see AUTORIAX 2 system)*
- > Allows dynamic tests to be performed when fitted with a suitable actuator (see Dynatriax system)*
- > Maximum compression capacity: 50 kN or 100 kN
- > Speed range from 0.00001 to 99.99999 mm/min
- > Maximum sample diameter (for triaxial testing): 150 mm
- > The quality of the design avoids vibrations that may affect the specimen or measurements accuracy
- > Ideal solution for advanced and research laboratories that require high productivity and high quality testing
- > High-contrast 4 x 20-character display with 6-key membrane keyboard*
- > Very wide variable speed range suitable to perform also unconfined, CBR and Marshall tests

* Only for model without built in data acquisition

Standards

BS 598 | BS 1377: 4 | BS 1377:7 | BS 1377:8 | ASTM D1559 | ASTM D1883 | ASTM D2166 | ASTM D2850 | ASTM D4767 | ASTM D5581 | ASTM D6927 | ASTM D7181 | NF P94 070 | NF P94 074 | NF P94-078 | NF P98-251 | CEN- ISO/TS 17892-9 | CEN- ISO/TS 17892-8 | EN 12697-34 | EN 13286-47

WYKEHAM FARRANCE's electro-mechanical TRITECH machines are the original high-performance load frames for triaxial tests. Introduced by the company over 50 years ago, they have undergone continuous development and are the ideal solution for advanced and research laboratories that want to perform high quality tests at high levels of productivity. Based on heavy duty triaxial load frames, with advanced electronics and high quality components, these frames are the top of the range currently available for triaxial testing on soils. The load frames are built around a robust twin chromed-column structure, ensuring extremely high rigidity. The loading platen is made from stainless steel.

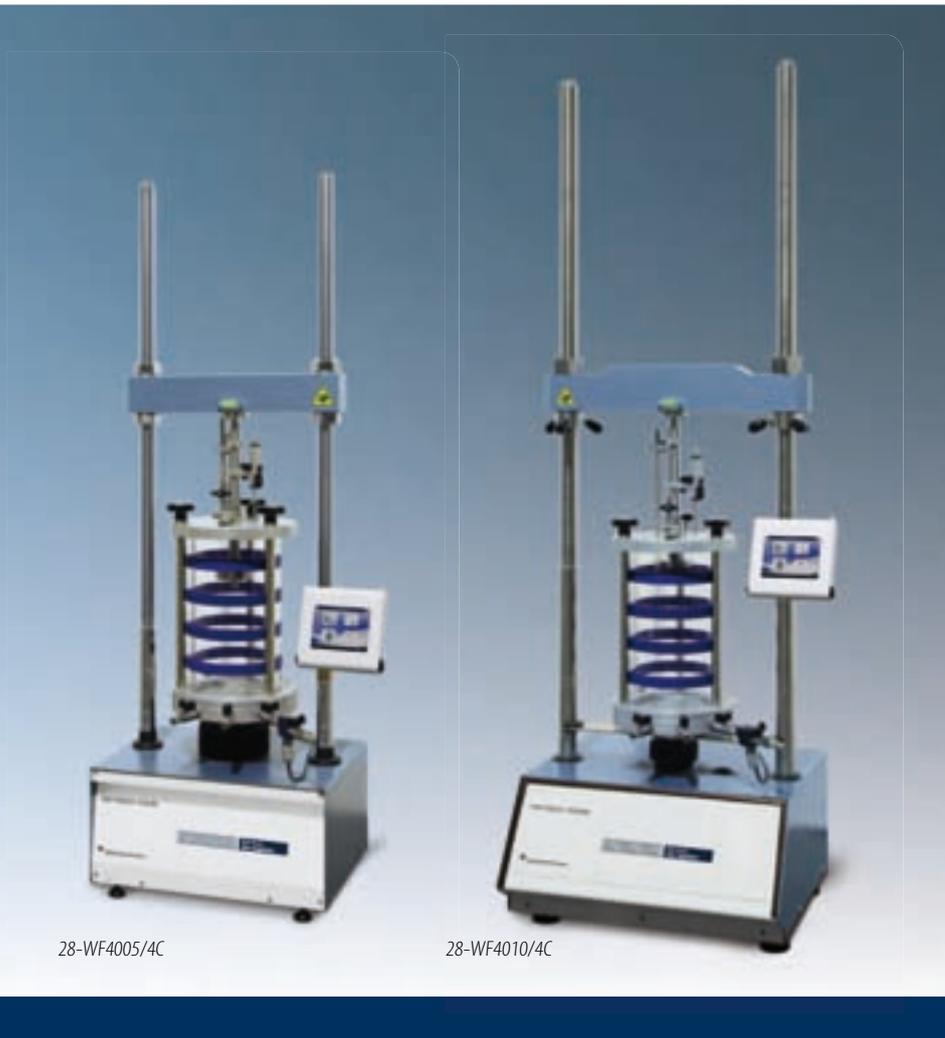
Four models are available depending on the max capacity and if equipped or not with a built-in data acquisition.

28-WF4005 and 28-WF4010, 50 and 100 kN cap.

The models 28-WF4005 - 50 kN capacity and 28-WF4010 - 100 kN capacity can be used either as parts of a computer-controlled automatic testing system or as high-performance units under manual control with an external data acquisition. In manual mode the user-friendly keyboard on the front panel allows to manage all the frame's functions, including rapid approach facility that reduces test set-up time. For efficient use the last settings are stored and automatically recalled after switch on and micro switches prevent over-travel problems.

In the Automatic PC-controlled triaxial systems the frame is driv-

en through the RS 232 serial port, in order to operate under load or displacement closed loop control. These two models can also be equipped with a pneumatic actuator to perform both static and dynamic testing.



28-WF4005/4C

28-WF4010/4C

additional features

28-WF4005/4C and 28-WF4010/4C

(models with 4 built-in channels data acquisition)

- > Data acquisition by 4 in-built channels
- > Double control mode including machine and data acquisition via local touch screen display or from remote PC (not included) and software (included)
- > USB port to connect a memory stick (included with the machine) for test data storage
- > Effective sampling rate up to 50 / sec
- > LAN communication
- > Automatic test start and stop according preset conditions
- > Wide 5.7" waterproof touch screen color graphic display allowing machine control, live on screen data plot and tabulation
- > Local and remote transducers calibration through the dedicated software
- > Graphical and Numerical display of readings.

**28-WF4005/4C,
28-WF4010/4C,
50 and 100 kN cap.,
4 channels built-in data
acquisition.**

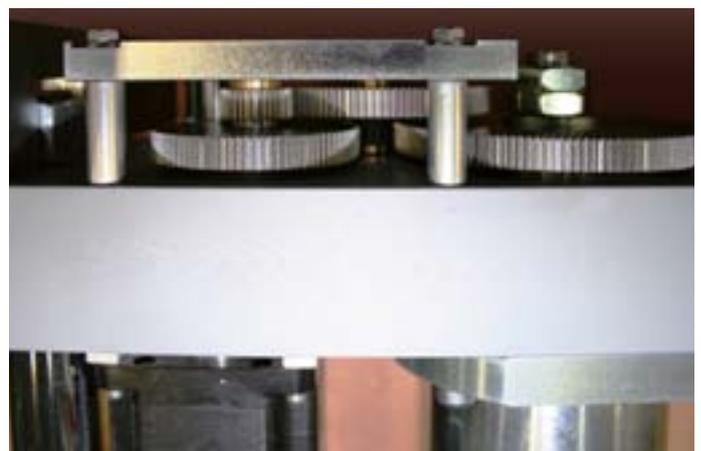
The models 28-WF 4005/4C – 50 kN capacity and 28-WF4010/4C – 100 kN capacity are fitted with 4 built-in channels and data acquisition, to be used either in stand-alone mode or connected to a PC. These load frames are equipped with a wide user friendly touch screen display, side mounted and very ergonomic allowing local control of the main functions and data acquisition.

In each model the panel and display are protected from water and dust by a waterproof membrane.

The touch screen display is extremely versatile to start, pause and stop the test, to set up data recording mode, to show live readings of the transducers in real time and to perform calibrations.

In addition a LAN connection and a dedicated software (included with the machine) allows remote control from the PC.

In remote control mode the software allows the user to control the main functions via PC as well as to calibrate the channels with linear, polynomial and multi-coefficient calibration mode, and to display the readings (figures and plots).



Detail of the Trittech legendary gearbox. The system is designed to minimize the vibration and allow smooth transmission

TRITECH

Triaxial load frames (continued)

Models	28-WF4005	28-WF4010	28-WF4005/4C	28-WF4010/4C
4 built-in channels	-	-	✓	✓
Maximum sample diameter, mm	150	150	150	150
Minimum testing speed, mm/min	0.00001	0.00001	0.00001	0.00001
Maximum testing speed, mm/min	99.99999	99.99999	99.99999	99.99999
Maximum compression force, kN	50	100	50	100
Maximum tensile force, kN	5	5	5	5
Minimum vertical clearance, mm	335	390	335	390
Maximum vertical clearance, mm	1100	1140	1100	1140
Horizontal clearance, mm	364	498	364	498
Platen diameter, mm	158	158	158	158
Platen travel, mm	100	100	100	100
Dimensions, mm (h x w x d) (approx.)	1460 x 505 x 380	1830 x 600 x 520	1460 x 655 x 380	1830 x 750 x 520
Power, W	600	680	600	680
Weight, kg (approx.)	98	120	98	120



Detail of the adjustable 5.7" touchscreen color graphic display

Ordering information

28-WF4005

TRITECH50, Triaxial load frame 50 kN,
220-110 V / 50-60 Hz / 1 ph

28-WF4010

TRITECH100, Triaxial load frame 100 kN,
220-110 V / 50-60 Hz / 1 ph

28-WF4005/4C

TRITECH50 – 4 channels, Triaxial load frame 50 kN with 4 built-in data acquisition channels, 220-110 V / 50-60 Hz / 1 ph

28-WF4010/4C

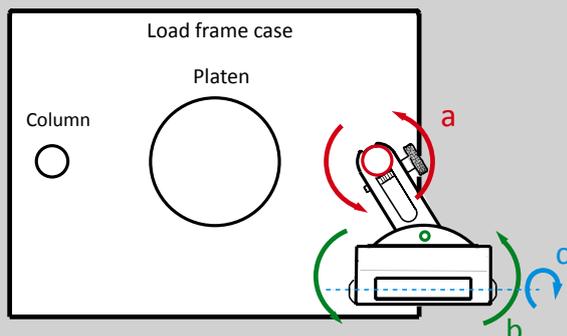
TRITECH100 – 4 channels, Triaxial load frame 100 kN with 4 built-in data acquisition channels, 220-110 V / 50-60 Hz / 1 ph

Accessories

A complete range of parts and accessories is available from WYKEHAM FARRANCE to configure these machines for any typical triaxial soil testing application.

Triaxial cells	see page 75, 78
Measurement instruments	see page 86, 88
Pressure systems	see page 82
Water de-airing system	see page 84
Data acquisition and processing	see pag 108

Note: see our web site for the list of accessories to perform CBR, Marshall and Unconfined tests with TRITECH



The touchscreen controller is mounted on an ergonomic, multi-jointed support that allows its position to be adjusted in four different ways:

- changing the height of the support
- rotating the support (a)
- swiveling the touchscreen (b)
- tilting the touchscreen (c)

TRIAX

Triaxial Load frames



28-WF4001

28-WF4001/4C

Standards

BS 598 | BS 1377: 4 | BS 1377:7 | BS 1377:8 | ASTM D1559 | ASTM D1883 | ASTM D2166 | ASTM D2850 | ASTM D4767 | ASTM D5581 | ASTM D6927 | ASTM D7181 | NF P94 070 | NF P94 074 | NF P94-078 | NF P98-251 | CEN- ISO/TS 17892-9 | CEN- ISO/TS 17892-8 | EN 12697-34 | EN 13286-47

WYKEHAM FARRANCE's electro-mechanical TRIAX machines have been specifically designed for triaxial applications and are ideal for commercial laboratories that need a versatile machine capable of performing a wide range of tests. The load frame is built around a robust twin chromed-column structure, ensuring extremely high rigidity up to 50 kN.

Two versions are available: both 50 kN capacity, with or without built-in data acquisition:

28-WF4001

The model 28-WF4001 requires an external data acquisition unit or can be fitted with analogical measurement system.

In manual mode, the user-friendly keyboard on the front

panel allows to manage all the frame's functions, including rapid approach facility that reduces test set-up time. For efficient use the last settings are stored and automatically recalled after switch on and micro switches prevent over-travel problems

28-WF4001/4C

The model 28-WF4001/4C is fitted with 4 built-in channels and data acquisition, to be used either in stand-alone mode or connected to a PC.

This load frame is equipped with a wide user friendly touch screen display, side mounted and very ergonomic allowing local control of the main func-

tions and data acquisition.

The panel and display are protected from water and dust by a waterproof membrane. The touch screen display is identical to that one fitted to the 28-WF4005/4C model.

common main features

28-WF 4001 and 28-WF4001/4C models

- > Designed for soil testing laboratories to perform UU, CU and CD triaxial tests on samples from 38 to 70 mm dia.
- > Also suitable for a wide range of other tests such as unconfined, CBR and Marshall tests
- > Maximum load frame capacity: 50 kN
- > Speed range from 0.00001 to 50.8 mm/min
- > Large High-contrast 4 x 20-character display and 6-keys membrane keyboard*
- > Maximum sample diameter (for triaxial testing): 70 mm
- > Ideal solution for small laboratories that need a very versatile machine suitable to perform a wide range of tests

** Only for model without built in data acquisition*

additional features

28-WF4001/4C

(model with 4 built-in channels data acquisition)

- > Double control mode including machine and data acquisition via local touch screen display or from remote PC (not included) and software (included)
- > USB port to connect a memory stick (included with the machine) for test data storage
- > Effective sampling rate up to 50 / sec
- > LAN communication
- > Automatic test start and stop according preset conditions
- > Wide 5.7" waterproof touch screen color graphic display allowing machine control, live on screen data plot and tabulation
- > Local and remote transducers calibration through the dedicated software
- > Graphical and Numerical display of readings.

TRIAx

Triaxial Load frames (continued)

Model	28-WF4001	28-WF4001/4C
4 built-in channels		✓
Maximum sample diameter, mm	70	70
Minimum testing speed, mm/min	0.00001	0.00001
Maximum testing speed, mm/min	50.8	50.8
Maximum load frame capacity, kN	50	50
Minimum vertical clearance, mm	390	390
Maximum vertical clearance, mm	725	725
Horizontal clearance, mm	380	380
Platen diameter, mm	158	158
Platen travel, mm	100	100
Dimensions, mm (h x w x d) (approx.)	1250 x 495 x 495	1250 x 645 x 495
Power, W	600	600
Weight, kg (approx.)	90	90



Ordering information

28-WF4001

TRIAx, Triaxial load frame 50 kN, 220-110 V / 50-60 Hz / 1 ph

28-WF4001/4C

TRIAx – 4 channels, Triaxial load frame 50 kN, 220-110 V / 50-60 Hz / 1 ph

Accessories

A complete range of parts and accessories is available from WYKEHAM FARRANCE to configure these machines for any typical triaxial soil testing application.

Triaxial cells	see page 75, 78
Measurement instruments	see page 86, 88
Pressure system	see page 82
Water de-airing systems	see page 84
Data acquisition and processing	see page 108

Note: see our web site for the list of accessories to perform CBR, Marshall and Unconfined tests with TRIAX

Banded triaxial cells and accessories

Standards

ASTM D2850 | ASTM D4767 | ASTM 7181 | BS 1377:8 | BS 1377:9 | CEN-ISO/TS 17892-8-9 | NF P94 070 | NF P94 074

The cell essentially consists of a transparent chamber which is banded to prevent excessive expansion during the test.

The design of the cell ensures vertical alignment of the loading ram by clamping the Perspex wall separately from the cell top.

The cell has to be completed with a pedestal, top cap (standard or vacuum) and other accessories conforming to the specimen size. The cells can be fitted not only with accessories of the nominal size, but also with those of smaller sizes (e.g. the 28-WF4070 70 mm cell can be adapted to test specimens with diameters of 38 and 50 mm). 28-WF4070 to 28-WF4150 cells can be fitted with an upgrading kit so that tests can be performed using local strain transducers and bender elements.

See Upgrading options.

- Maximum working pressure of 2000 kPa or 3500 kPa (28-WF4070 model only)
- Separate cell chamber clamping prevents over stressing chamber and ensures correct alignment
- Light alloy construction with stainless steel ram and O-ring seal
- Built-in ram clamp
- Includes rod and rest for strain dial gauge or displacement transducer
- Five on/off no-volume-change valves fitted as standard
- For samples with diameters of 38, 50, 70, 100 and 150 mm
- Chamber height is suitable for submersible load cells
- Rapid assembly design
- Designed to accommodate a specimen with a height twice its diameter
- Models 28-WF4070, 28-WF4100 and 28-WF4150 can be used to perform stress path and dynamic testing, using a vacuum attachment with the appropriate pedestal and top cap
- Models 28-WF4070, 28-WF4100 and 28-WF4150 can be upgraded with an advanced kit to make them compatible with local strain transducers and bender elements

Specifications

Product code 28-	WF4050	WF4070	WF4100	WF4150
Nominal sample diameter, mm	50	70	100	150
Sample diameter range, mm	38 to 50	38 to 70	38 to 100	38 to 150
Maximum working pressure, kPa	2000	3500	2000	2000
Maximum cell height, mm	410	550	600	710
Cell diameter, mm (inc. valves)	350	400	440	520
Weight, kg (approx.)	7	18	21	40
No. of inlet points	5 (for top drainage/back pressure, cell pressure and base drainage/pore pressure)			
Attachment for vacuum top cap for extension tests	—	✓	✓	✓
Upgrading option for use of local strain transducers and bender elements	—	✓ 28-WF 4070/ADV	✓ 28-WF 4100/ADV	✓ 28-WF 4150/ADV
Effective stress/Total stress testing	✓	✓	✓	✓
Stress path testing	—	✓	✓	✓
Dynamic testing	—	✓	✓	✓

Ordering information

28-WF4050

Banded triaxial cell for samples up to 50 mm diameter.

28-WF4070

Banded triaxial cell for samples up to 70 mm diameter.

28-WF4100

Banded triaxial cell for samples up to 100 mm diameter.

28-WF4150

Banded triaxial cell for samples up to 150 mm diameter.

Note: Pedestals, top caps, porous discs, rubber membranes, O-rings etc. are not included - see Accessories



28-WF4150, 28-WF4100, 28-WF4070 and 28-WF4050

Accessories

Triaxial cell pedestals

Each cell has to be fitted with a pedestal corresponding to the size of the specimens to be tested. Using specific adaptive pedestals it is possible to test specimens with different diameters in the same triaxial cell - see the table below.

Diameter, mm	Banded triaxial cell product code			
	28-WF4050	28-WF4070	28-WF4100	28-WF4150
38	<u>28-WF4031/5</u>	<u>28-WF4031/7</u>	<u>28-WF4031/10</u>	<u>28-WF4031/15</u>
50	<u>28-WF4051/5</u>	<u>28-WF4051/7</u>	<u>28-WF4051/10</u>	<u>28-WF4051/15</u>
70	-	<u>28-WF4071/7</u>	<u>28-WF4071/10</u>	<u>28-WF4071/15</u>
100	-	-	<u>28-WF4101/10</u>	<u>28-WF4101/15</u>
150	-	-	-	<u>28-WF4151/15</u>



Triaxial cell and sample accessories

Diameter, mm	38	50	70	100	150
Top cap	<u>28-WF4032/A</u>	<u>28-WF4052/A</u>	<u>28-WF4072/A</u>	<u>28-WF4102/A</u>	<u>28-WF4152/A</u>
Vacuum top cap	<u>28-WF4032/AV</u>	<u>28-WF4052/AV</u>	<u>28-WF4072/AV</u>	<u>28-WF4102/AV</u>	<u>28-WF4152/AV</u>
Base disc	<u>28-WF4033</u>	<u>28-WF4053</u>	<u>28-WF4073</u>	<u>28-WF4103</u>	<u>28-WF4153</u>
Porous discs (2)	<u>28-WF4034</u>	<u>28-WF4054</u>	<u>28-WF4074</u>	<u>28-WF4104</u>	<u>28-WF4154</u>
Membranes (pack of 10)	<u>28-WF4035</u>	<u>28-WF4055</u>	<u>28-WF4075</u>	<u>28-WF4105</u>	<u>28-WF4155</u>
O-rings (pack of 10)	<u>28-WF4036</u>	<u>28-WF4056</u>	<u>28-WF4076</u>	<u>28-WF4106</u>	<u>28-WF4156</u>
Membrane stretcher	<u>28-WF4031/A</u>	<u>28-WF4051/A</u>	<u>28-WF4071/A</u>	<u>28-WF4101/A</u>	<u>28-WF4151/A</u>
O-ring placing tool	<u>28-WF4031/B</u>	<u>28-WF4051/B</u>	<u>28-WF4071/B</u>	<u>28-WF4101/B</u>	<u>28-WF4151/B</u>
Two-part split former	<u>28-WF4031/C</u>	<u>28-WF4051/C</u>	<u>28-WF4071/C</u>	<u>28-WF4101/C</u>	<u>28-WF4151/C</u>
Two-part split mould	<u>28-WF4031/D</u>	<u>28-WF4051/D</u>	<u>28-WF4071/D</u>	<u>28-WF4101/D</u>	<u>28-WF4151/D</u>
Lateral filter drains (pack of 50)	<u>28-WF4031/E</u>	<u>28-WF4051/E</u>	<u>28-WF4071/E</u>	<u>28-WF4101/E</u>	<u>28-WF4151/E</u>
Filter discs(pack of 100)	<u>28-WF4031/F</u>	<u>28-WF4051/F</u>	<u>28-WF4071/F</u>	<u>28-WF4101/F</u>	<u>28-WF4151/F</u>
Hand sampler	<u>28-WF4031/G</u>	<u>28-WF4051/G</u>	<u>28-WF4071/G</u>	<u>28-WF4101/G</u>	-
Two-part split former with vacuum attachment	<u>28-WF4031/H</u>	<u>28-WF4051/H</u>	<u>28-WF4071/H</u>	<u>28-WF4101/H</u>	<u>28-WF4151/H</u>

28-WF4005/E

Extension test accessory for connecting the load cell ram to the cross bar of the load frame. This accessory must be used with a submersible load cell and a vacuum top cap.



Pedestals 28-WF4071/7, 28-WF4051/7 and 28-WF4031/7

Triaxial cell and sample preparation accessories



Two-part split mould with vacuum attachment
28-WF4101/H



Upgrading kits 28-WF4150/ADV, 28-WF4100/ADV, 28-WF4070/ADV

Upgrading options

Upgrading kits are available that allow local strain transducers and bender elements to be used inside the banded cells. An access ring is provided that fits between the cell base and the cell body with holes for the cables to go through. Watertight plugs are included to seal the unused holes.

28-WF4070/ADV

Advanced upgrading kit for triaxial cell WF4070 allowing use of local strain transducers and bender elements.

28-WF4100/ADV

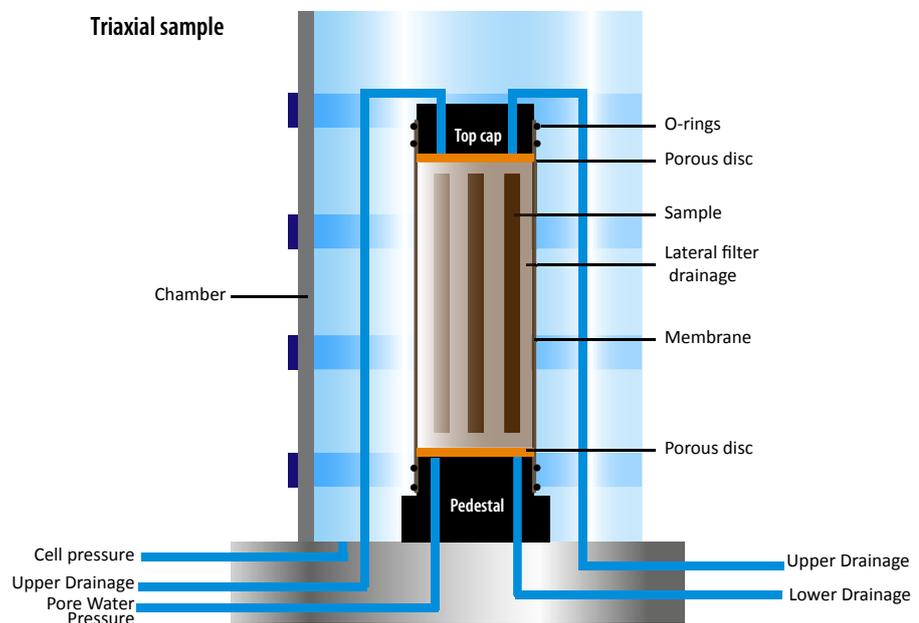
As above but for triaxial cell WF4100.

28-WF4150/ADV

As above but for triaxial cell WF4150.



Banded triaxial cells fitted with upgrading kits for using local strain transducers and bender elements



Standard triaxial cells and accessories

These cells essentially consist of a transparent polycarbonate chamber which has a top plate with a piston assembly fitted into it and a double flange base fitted to the bottom. Three (or six) simple thumbscrews are used to clamp the upper part of the cell to the base, which makes assembly and disassembly a very quick and simple operation. The base of the cell has four inlet points for top drainage/back pressure, cell pressure and base drainage/pore water pressure. Two of these are supplied with special no-volume-change valves.

Pedestals, top caps, porous discs, rubber membranes and O-rings are not included and have to be ordered separately - see Accessories.

Specifications

Product code	28-WF0410/A	28-WF0411/A	28-WF0416/A
Nominal sample diameter, mm	50	70	100
Sample diameter range, mm	35 to 50	35 to 70	70 to 100
Maximum working pressure, kPa	1700	1700	1700
Maximum cell height, mm	450	500	560
Cell diameter, mm (inc. valves)	270	310	340
Weight, kg (approx.)	5	8	15
No. of inlet points	4* (for top drainage/back pressure, cell pressure and base drainage/pore pressure)		
Effective stress/Total stress testing	✓	✓	✓

* Two valves are already included, the other two must be ordered separately.

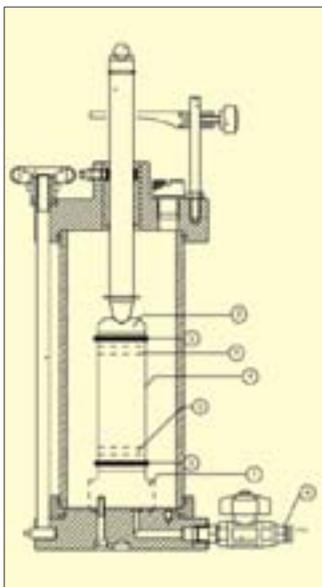


28-WF0416/A, 28-WF0411/A, 28-WF0410/A



Legend

- 1. Pedestal.** Used to adapt the triaxial cell base for different sample sizes. Supplied complete with a solid disc for tests without drainage.
- 2. Top cap.** Used to spread the load evenly over the whole cross-sectional area of the sample when drainage to the top of the sample is required. Includes a nylon tube and connector for the drainage line.
- 3. Porous disc.** Acts as a filter ensuring that the passage of water into and out of the sample is evenly spread over the whole cross-sectional area. Two are required - one for the top of the sample and one for the base.
- 4. Rubber membrane.** Provides a protective waterproof barrier around the sample. Made of rubber latex and supplied in packs of 10.
- 5. O-rings.** Used to seal the membrane against the pedestal and the top cap at either end of the sample. Supplied in packs of 10.
- 6. Membrane stretcher.** Used to the membrane open so it can be easily placed over the specimen without any disturbance.
- 7. Filter paper drains.** Used as side drains when specimens have low permeability. They are particularly useful when saturating clays before consolidation and shearing. Pack of 50.
- 8. Split sand former.** A specially designed piece of equipment for use when preparing non-cohesive soils which otherwise could not be mounted in a triaxial cell.
- 9. Drainage burette.** 10 ml capacity burette used to prepare non-cohesive specimens by applying a negative pressure to the base of the specimen and for measuring drainage into and out of the specimen when testing with the specimen open to the atmosphere. Supplied with connections for triaxial cell.
- 10. O-ring placing tool.** Used for applying the O-rings with the minimum disturbance to the sample.
- 11. No-volume change valve.** Identical to the two valves supplied with the triaxial cells and used for opening and closing the base drainage line when measuring pore pressure or fitting the drainage burette.
- 12. Split mould.** Used for trimming the ends of undisturbed soil specimens.



Ordering information

28-WF0410/A

Standard triaxial cell for 35, 38 and 50 mm diameter samples.

28-WF0411/A

Standard triaxial cell for 35, 38, 50 and 70 mm diameter samples.

28-WF0416/A

Standard triaxial cell for 70 and 100 mm diameter samples.

- 1 Base adapter
- 2 Porous top cap
- 3 Porous disc
- 4 Rubber membrane
- 5 Sealing rings
- 6 No-volume change valve

Triaxial cell pedestals

Each cell has to be fitted with a pedestal corresponding to the size of the specimens to be tested. Using specific adaptive pedestals it is possible to test specimens with different diameters in the same triaxial cell - see the table below. All pedestals are permeable, with holes for base drainage/pore pressure measurement, and are supplied complete with a solid disc for use in undrained tests.

Diameter, mm	Standard triaxial cell product code		
	28-WF0410/A	28-WF0411/A	28-WF0416/A
35	28-WF0410/A1	28-WF0411/A1	-
38	28-WF0410/A2	28-WF0411/A2	-
50	28-WF0410/A3	28-WF0411/A3	-
70	-	28-WF0411/A4	28-WF0416/A1
100	-	-	28-WF0416/A2



Hand sampler comprising cutter, wooden dolly and receiver

Triaxial cell and sample accessories

Diameter, mm	35	38	50	70	100
Top cap	28-WF0420/A3	28-WF0422/A3	28-WF0425/A3	28-WF0428/A3	28-WF0432/A3
Porous discs (2)	28-WF0420/A4	28-WF4034	28-WF4054	28-WF4074	28-WF4104
Membranes (pack of 10)	28-WF0420/A5	28-WF4035	28-WF4055	28-WF4075	28-WF4105
O-rings (pack of 10)	28-WF0420/7	28-WF4036	28-WF4056	28-WF4076	28-WF4106
Membrane stretcher	28-WF0420/8	28-WF4031/A	28-WF4051/A	28-WF4071/A	28-WF4101/A
O-ring placing tool	28-WF0420/10	28-WF4031/B	28-WF4051/B	28-WF4071/B	28-WF4101/B
Two-part split former	28-WF0420/A6	28-WF0422/A6	28-WF0425/A6	28-WF0428/A6	28-WF0432/A6
Two-part split mould	28-WF0420/13	28-WF4031/D	28-WF4051/D	28-WF4071/D	28-WF4101/D
Lateral filter drains (pack of 50)	28-WF0420/A9	28-WF4031/E	28-WF4051/E	28-WF4071/E	28-WF4101/E
Drainage burette	28-WF0420/11	28-WF0420/11	28-WF0420/11	28-WF0420/11	28-WF0432/11 ¹
Filter discs (pack of 100)	-	28-WF4031/F	28-WF4051/F	28-WF4071/F	28-WF4101/F
Hand sampler	28-WF0420/9	28-WF4031/G	28-WF4051/G	28-WF4071/G	28-WF4101/G

¹ 50 ml model.

Other accessories

28-WF4005/39

Platen adapter to fit standard triaxial cell onto TRITECH50 and TRITECH100 frames.

86-D0845

Water-repellent grease, 1 kg box.

28-WF0420/15

Greaser for triaxial cells.

28-WF0490/1

Flaring tool.

28-WF0490

Nylon tubing, OD6 mm x ID 4 mm, 20 m.

28-WF0420/12

No-volume-change valve.

Double-wall triaxial cells for unsaturated tests

In traditional triaxial systems, where saturated samples are tested, the change in specimen volume is measured simply by monitoring how much water enters or leaves the sample using a volume change transducer. When testing unsaturated samples however, this is not possible since volume change measurements are complicated by the compressibility of the air in the voids.

If an increase of confining pressure is applied to an unsaturated sample, a movement of water out of the sample will occur but an additional change in size will result from the compression of the air in the voids.

Correct determination of volume change requires both the volume of water leaving the sample and the total volume change of the sample to be measured.

For detailed information visit our web site...

Beside is shown the double-wall triaxial cell, with inner wall made from glass, complete with access ring for transducer cables. The cell has to be completed with a base pedestal with High-Air Entry Stone.

Two models are available:

Product code	28-WF4170	28-WF4171
Nominal sample diameter, mm	70	100
Sample diameter range, mm	50 to 70	50 to 100
Maximum working pressure, kPa	2000	2000
Maximum cell height [mm]	690	795
Cell diameter, mm (inc. valves)	478	535
Weight, kg (approx.)	30	50
No. of inlet points	5 (for top drainage/back pressure, cell pressure and base drainage/pore pressure)	
Attachment for vacuum top cap for extension tests	Included	

Axis translation method with High Air Entry Stone (HAES): operating principle.

One of the problems with testing a sample with high suction (negative pore water pressure) is that it will suck the water from the porous stone on the base pedestal and cause cavitation in the pore water pressure measuring system.

To prevent this happening the porous disc has been replaced with a high air entry stone. These stones allow water to pass through but air at pressures below the rating of the stone cannot pass. For example, a 5 bar stone will not allow air at pressures under 5 bar to pass through. The stone is cemented into an anodised aluminium ring which fits into a recess in the pedestal with an o-ring seal to prevent water passing around the outside of the stone.



28-WF4170

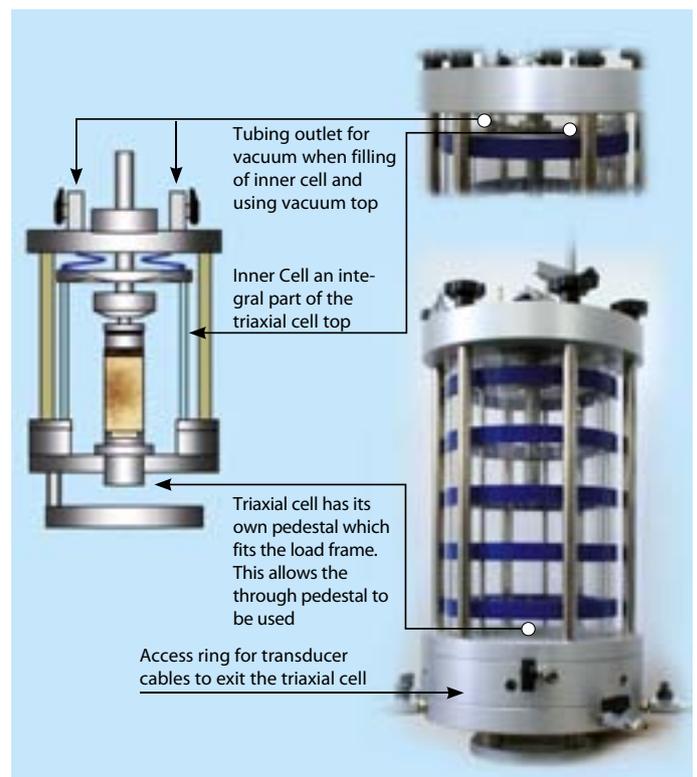
Ordering information

28-WF4170

Double-wall triaxial cell for unsaturated tests on 70 mm diameter soil samples, complete with 6 ports for transducer cables

28-WF4171

Double-wall triaxial cell for unsaturated tests on 100 mm diameter soil samples, complete with 6 ports for transducer cables.



Accessories

Double-wall triaxial cell unsaturated pedestal

Pedestal set for unsaturated cell, comprising pedestal, 2 bar High Air Entry Stone sealed into an aluminium ring and a height compensation ring. Using specific adaptive pedestals it is possible to test specimens with different diameters in the same triaxial cell – see the table below.

Diameter, mm	Double-wall triaxial cell product code	
	28-WF4170	28-WF4171
50	28-WF4170/50	28-WF4171/50
70	28-WF4170/70	28-WF4171/70
100	-	28-WF4171/100

High Air Entry Stones (HAES)

A 2 bar capacity HAES is included with the pedestals as standard but it can be easily replaced with stones of other capacities for 50, 70 and 100 mm diameter pedestals – see the table below.

Maximum air pressure	Pedestal diameter		
	50 mm	70 mm	100 mm
1 bar	28-WF4150/1B	28-WF4170/1B	28-WF4171/1B
2 bar	28-WF4150/2B	28-WF4170/2B	28-WF4171/2B
5 bar	28-WF4150/5B	28-WF4170/5B	28-WF4171/5B
10 bar	28-WF4150/10B	28-WF4170/10B	28-WF4171/10B
15 bar	28-WF4150/15B	28-WF4170/15B	28-WF4171/15B

For top cap and accessories see page 76

Spare parts

Pedestal diameter, mm	50	70	100
Aluminium plate for testing saturated samples	28-WF4150/3	28-WF4170/3	28-WF4171/3
Aluminium retaining ring	28-WF4150/4	28-WF4170/4	28-WF4171/4
Base pedestal	28-WF4150/5	28-WF4170/5	28-WF4171/5

Components of pedestal set for unsaturated cell

- 1 Pedestal set for unsaturated test
- 2 High air Entry stone (HEAS) sealed on aluminium ring
- 3 Aluminium compensation ring
- 4 Aluminium plate for saturated soil test
- 5 Porous stone for saturated soil test



Typical configuration of a system to perform triaxial tests on unsaturated samples 70 mm dia. with the axis translation method with the double wall cell 28-WF4170

Product code	Description	Q.ty
28-WF4170	Double-wall triaxial cell for 70 mm diameter samples	1
28-WF4170/70	Pedestal with HAES for 70 mm diameter samples	1
28-WF4072/A	Top cap for 70 mm diameter samples	1
28-WF4005	Tritech triaxial testing machine, 50 kN capacity	1
86-D2015	Air compressor, 50 L	1
28-WF2016/2	Air filter/water trap for air compressor	1
28-WF4220/A	De-airing tank, 7 L	1
86-D2001	Vacuum pump	1
86-D2005	Air drying unit	1
86-D2064	Rubber tube for vacuum	2
86-D0819	Silica gel dessicant with indicator	1
28-WF4225	Valve panel for de-airing tank	1
28-WF4331	Pressure control panel, 3 lines	1
28-WF4330/2	Digital gauge for 28-WF4331	1
28-WF4320	Bladder air/water cylinder	2
28-WF4191	Nylon tubing 6x 8 mm diameter, 10 m	2
28-WF6353	Submersible load cell, 5 kN capacity	1
30-WF6208	Displacement transducer, 25 mm travel	1
28-WF6221	Mounting bracket for 25 mm diameter cell ram	1
28-WF6300	Pressure transducers, 10 bar	2
28-WF6310	De-airing block	2
28-WF4410	Automatic volume change apparatus	2
30-WF6008	Geodatalog 8-channels datalogger	1
82-P9008/ELT	Set of four cables	2
30-WF6042	Transducer extension cables	6

Pressure systems

We produce three different systems for providing water at controlled pressures to triaxial systems:

- **Oil/Water pressure apparatus**, suitable for pressures up to 1700 kPa and 3500 kPa
- **Air/Water pressure system**, consisting essentially of a distribution panel with air/water bladder cylinders and an air compressor, suitable for pressures up to 1000 kPa
- **Hydromatic** stand-alone pressure/volume controller

Each system has to be completed with the De-airing water system. See page 84

Oil/Water pressure apparatus



main features

- > Generates and automatically controls the set pressure up to a maximum of 3500 kPa (500 p.s.i.) within $\pm 0.5\%$
- > Very stable over long periods
- > Required pressure set using precision hand wheel control
- > Stepless pressure increments
- > No weights or calibration required

This apparatus provides an infinitely variable constant pressure using an adjustable spring type dead weight pressure feedback system connected in-line with a pump and an oil/water interchange vessel.

The apparatus comprises: hydraulic pump, honed piston/spring assembly, cylindrical oil/water interchange vessel, pressure gauge, valves and 2 kg of oil.

The 28-WF4334 water distribution panel can be used to simplify the process of refilling the water in the vessel - see Accessories.

Two versions are available:

- 28-WF4302 / 28-WF4304 for pressures up to 1700 kPa
- 28-WF4312 / 28-WF4314 for pressures up to 3500 kPa

Dimensions: 310 x 300 x 400 mm

Weight: 16 kg (approx.)

Ordering information

28-WF4302

Oil and water constant pressure apparatus for pressures up to 1700 kPa. 230 V, 50 - 60 Hz, 1 ph.

28-WF4304

As above but 110 V, 60 Hz, 1 ph.

28-WF4312

Oil and water constant pressure apparatus for pressures up to 3500 kPa. 230 V, 50 - 60 Hz, 1 ph.

28-WF4314

As above but 110 V, 60 Hz, 1 ph.

Accessories and spares

28-WF4334

Three-line water distribution panel for triaxial systems.

Dimensions: 520 x 400 x 100 mm

Weight: 3.5 kg (approx.)

28-WF4302/1

High viscosity oil, 5 kg.

28-WF4191

Nylon tubing ID 6 mm x OD 8 mm, 10 m length.

Hydromatic stand-alone pressure/volume controller

main features

- > Application of pressure up to 3500 kPa for triaxial or permeability tests
- > Recording and display of pressure and volume change measurements in real time
- > Temporary or continuous connection to PC for data downloading with different protocols through RS 232
- > Possibility to set pressure ramp and cycles
- > Easy connection to any kind of system



Technical specifications

- Output pressure: up to 3500 kPa
- Pressure accuracy: $\pm 0.1\%$ of full scale
- Volume accuracy: 0.1 cm^3
- Resolution: 131000 divisions
- Volumetric capacity: 250 cm^3
- Data downloading: via RS 232
- Overall dimensions: 250 x 220 x 150 mm
- Weight: 7 kg (approx.)

Ordering information

28-WF4300/A

Hydromatic stand-alone pressure/volume controller. 110-240 V, 50-60 Hz, 1 ph.

Accessories

28-WF4334

Three-line water distribution panel for triaxial systems.

Dimensions: 520 x 400 x 100 mm

Weight: 3.5 kg (approx.)

Air/Water pressure system

This system basically comprises a distribution panel, air/water bladder cylinders (one per required pressure line) and an air compressor.

Pressure distribution panels

Two models are available: 28-WF4330 for two pressure lines and 28-WF4331 for three pressure lines. They include precision air regulators, pressure outlets and quick release fittings.

They have to be fitted with a digital gauge (see Accessories, model 28-WF4330/2).

Dimensions/weight:

28-WF4330: 510 x 454 x 184 mm /10 kg (approx.)

28-WF4331: 690 x 454 x 184 mm /15 kg (approx.)

Air/water bladder cylinder

The air/water bladder cylinders are used to deliver pressurized water up to 1000 kPa to triaxial cells via the pressure distribution panels. The main advantages of using this apparatus are:

- High degree of accuracy
- Extremely simple to operate
- Future expansion of system very easy and relatively low cost
- Bladder enables the use of de-aired water
- Large reservoir to cope with long term tests and large samples

The cell, made of a transparent acrylic tube flanged between two light alloy disc with a rubber membrane fitted inside, can operate continuously at pressures up to 1000 kPa. The unit acts as a reservoir/interface between the compressed air (used as a pressure source) and the water (used as the pressurizing medium in the triaxial cell). The cylinders have to be used with a 28-WF4330 or 28-WF4331 two or three line distribution panel depending on the application.

Dimensions: 178 mm diameter x 410 mm height

Weight: 5.8 kg (approx.)

Air compressor

The air compressor requires air filter/water trap and has the following specifications:

- Max. pressure: 1000 kPa
- Continuous working pressure: 800 kPa
- Reservoir capacity: 50 liters
- Max air delivery: 234 L/min
- Power rating: 1500 W

Dimensions: 985 x 395 x 820 mm (w x d x h)

Weight: 62 kg (approx.)

Ordering information

28-WF4330

Two-line pressure distribution panel, complete with air regulators and pressure outlets.

28-WF4331

Three-line pressure distribution panel, complete with air regulators and pressure outlets.

28-WF4320

Air/water pressure bladder cylinder.

86-D2015

Laboratory air compressor, 10 bar maximum pressure, 50 L capacity. 230 V, 50 Hz, 1 ph.

86-D2015/Y

As above but 220 V, 60 Hz, 1 ph.

86-D2015/Z

As above but 110 V, 60 Hz, 1 ph.

28-WF2016/2

Water trap for air compressor.

Accessories and spares

28-WF4330/2

Digital pressure gauge, 1 kPa resolution.

28-WF4330/2C

As above but, with traceable calibration certificate.

28-WF4330/3

Spare air pressure regulator, 150 psi (1000 kPa), with fittings for OD 8 mm tubing.

28-WF4191

Nylon tubing, ID 6 mm x OD 8 mm, 10 m length.

28-WF0490

Nylon tubing, ID 4 mm x OD 6 mm, 20 m length.

28-WF4320/1

Spare rubber membrane for 28-WF4320 air/water bladder cylinder



28-WF4330 with digital pressure gauge 28-WF4330/2



28-WF4331 with digital pressure gauge 28-WF4330/2



28-WF4320



86-D2015

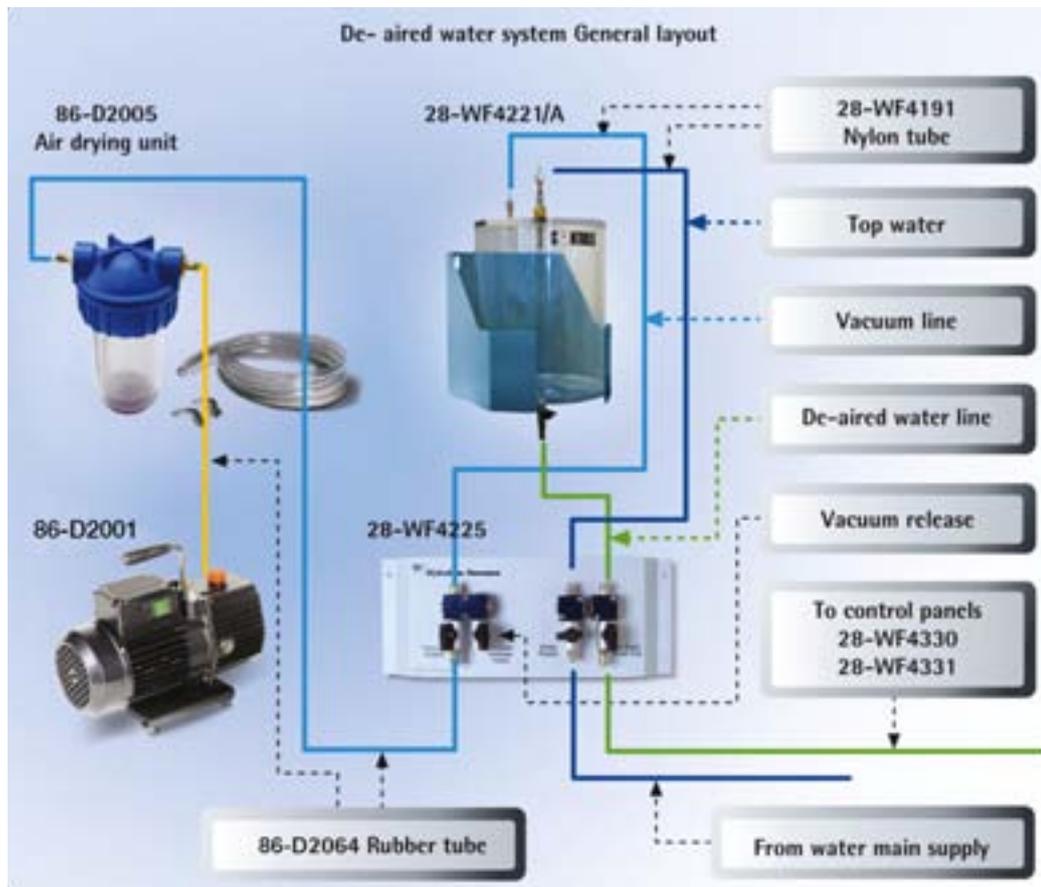
Water de-airing system

De-airing the water, that will be used to fill triaxial cells, pressure systems and volume change measurement apparatus, is essential for properly saturating soil specimens.

The system comprises the following:

- A de-airing tank (two versions are available with 7 or 23 L capacity)
- Vacuum pump with air drying unit
- Valve panel
- Tubing and accessories

During operation, the vacuum pump is connected to the air outlet of the tank the vacuum draws the air out of the water.



De-airing tanks

The tanks consist of a transparent acrylic cylinder fitted with a water spray inlet, an air outlet, a water outlet and a metal stand which can be wall-mounted at a suitable level to fill the triaxial system by gravity.

Two models are available:

- 28-WF4220/A, 7 litre capacity
Overall dimensions: 579 x 200 x 209 mm
Weight: 6.4 kg (approx.)
- 28-WF4221/A, 23 litre capacity
Overall dimensions: 619 x 320 x 311 mm
Weight: 12 kg (approx.)



28-WF4220/A

Vacuum pump, air drying unit and accessories

Our vacuum pump 86-D2001 has to be used with the air drying unit (86-D2005) filled with silica gel desiccant (86-D0819). This is recommended to avoid/limit water vapour mixing with the oil in the pump, which, in significant concentrations, may cause serious damage to the pump. When the pump will be used intensively, use of the outlet mist filter (86-D2001/3) is also recommended, which collects any oil vapour issuing from the oil reservoir during operation.

Specifications

86-D2001 Vacuum pump

- Free air displacement: 75 L/min
- Ultimate vacuum: 0.1 mbar
- Power: 180 W
- Dimensions: 300 x 150 x 240 mm (approx.)
- Weight: 8.5 kg (approx.)

86-D2005 Air drying unit

- Plastic frame with acrylic cylinder
- Dessicant capacity: 500 g (approx.)
- Overall dimensions: 185 mm diameter x 300 mm
- Weight: 1 kg (empty, approx.)

86-D2001/3 Outlet mist filter (optional)

- Weight: 0.7 kg (approx.)



86-D2001 Vacuum pump with 86-D2005 Air drying unit filled with 86-D0819 Silica gel desiccant



Vacuum pump 86-D2001 fitted with outlet mist filter 86-D2001/3

Valve panel

For connecting the de-airing tank to the vacuum pump. Includes water tap connection and two de-aired water outlets.

Dimensions: 510 x 200 x 30 mm

Weight: 3 kg (approx.)



28-WF4225

Ordering information

28-WF4220/A

De-airing tank, 7 litre capacity.

28-WF4221/A

De-airing tank, 23 litre capacity.

86-D2001

Vacuum pump. 230 V, 50 - 60 Hz, 1 ph.

86-D2064

Rubber tube for vacuum pump.

86-D2005

Air drying unit.

86-D0819

Silica gel desiccant, 1 kg.

28-WF4225

Valve panel.

Analogue measurement for triaxial systems

Load rings for triaxial frames

Load rings can be directly connected to the adapter fitted to the cross-head of triaxial frames. Using the 28-WF1049 connector (see Accessories) they can be adapted for use with our complete range of triaxial cells. Supplied complete with calibration chart.

Specifications

- High resolution dial gauge, 0.001 mm
- Dimensions:
182 mm diameter x 214 mm height
- Weight: 1.2 to 2.2 kg (approx.)

Ordering information

28-WF6450

Load ring, 1 kN capacity.

28-WF6451

Load ring, 2 kN capacity.

28-WF6452

Load ring, 5 kN capacity.

28-WF6453

Load ring, 10 kN capacity.

Accessories

28-WF1049

Connector for triaxial cells.

28-WF1048

Adaptor to connect load rings to the cross beam of WF load frame to CBR and Marshall test

82-T1000/9

Adaptor has to be used to connect WF load ring with Multispeed



Load ring with 28-WF1049 connector (fitted to the lower end)

Axial strain dial indicators

50 mm dial diameter, clockwise rotation. Supplied complete with rear mounts for connection to load rings. Two models are available: 30 and 50 mm travel.

Weight: 200 g (approx.)

Specifications

- High resolution dial gauge, 0.01 mm
- Accuracy: $\pm 1\%$
- Dimensions: 182 mm diameter x 214 mm height
- Weight: 1.2 to 2.2 kg (approx.)

Ordering information

29-WF6402

Dial gauge, 30 mm travel, 0.01 mm subdivisions.

29-WF6403

Dial gauge, 50 mm travel, 0.01 mm subdivisions.



28-WF6402

Double burette volume change apparatus

This apparatus has two measurement tubes consisting of a 25 ml burette mounted internally and an acrylic tube externally. The burette tubes are connected directly to a reversing valve system, which is used to reverse the direction of travel of the interface in the measurement tubes without affecting the direction of flow of water to or from the triaxial cell. The unit also includes a by-pass valve system when volume change measurement is not required. Burettes are calibrated to Class A.

Dimensions: 130 x 682 x 87 mm

Weight: 3 kg (approx.)



28-WF4400

Ordering information

28-WF4400

Double burette volume change apparatus.

Accessories

28-WF4400/1

Red dye hydrocarbon soluble pack for 500 ml.

Pore water pressure measurement

Pore pressure can be precisely measured using a pressure transducer connected to the triaxial cell via a de-airing block (28-WF6310 for the banded triaxial cells or 28-WF4459 for the standard triaxial cells). For triaxial tests with manual data recording, the transducer (e.g. our model 28-WF6300) can be plugged into the 28-WF4450 readout unit, eliminating the need for a data acquisition system.

Triple channel digital readout unit for pore pressure measurement

This digital pressure gauge consists of a long-term steady analogue section and a 16-bit A/D converter which guarantees 65,000 internal divisions. The unit has internal batteries, which is assisted by the AUTO-POWER-OFF function that activates if no change in readings is detected during any 30 minute period. The unit is fitted with a multiplexer selector switch.

Pressure transducers

Used for the measurement of pore pressure in conventional testing systems and also cell and back pressure in the automatic and dynamic testing systems.



Pressure transducer 28-WF6300 connected to the de-airing block 28-WF4459 for standard triaxial cells



Pressure transducer 28-WF6300 connected to the de-airing block 28-WF6310 for banded triaxial cells.

main features

- > Programmable in Imperial or metric units
- > Battery powered
- > Peak function (positive and negative)



Technical specifications

- Display: 4 x 20 characters
- Measuring units (programmable): mbar, bar, MPa, kPa, psi
- Accuracy: $\pm 0.2\%$ full scale
- Scanning rate: 50 readings per second
- Dimensions: 120 x 130 x 75 mm (w x d x h)
- Weight: 1 kg (approx.)

Ordering information

28-WF4450

Triple channel digital readout unit for pore pressure measurement. Battery powered. 110 - 220, 50 - 60 Hz, 1 ph.

Technical specifications

- Input voltage: 0-10V DC
- Output voltage: 100 mV to full scale
- Nominal sensitivity: 1.5 to 3 mV/V
- Resolution: infinite
- Accuracy: better than 0.1 kPa
- Weight: 150 g (approx.)

Note: the transducers have to be connected to triaxial cells using a suitable de-airing block - see Accessories

Ordering information

28-WF6300

Pressure transducer, 1000 kPa

28-WF6301

Pressure transducer, 2000 kPa

28-WF6302

Pressure transducer, 3500 kPa

Accessories

28-WF6310

De-airing block for connecting a pressure transducer to a banded triaxial cell.

28-WF4459

De-airing block for connecting a pressure transducer to a standard triaxial cell.

Electronic measurement for triaxial systems

External load cells

Used to measure the axial force applied to a specimen in a triaxial cell. Supplied complete with a connector for attaching to the crosshead of our triaxial load frames.



External load cell

Technical specifications

- Nominal sensitivity: 2mV/V
- Accuracy: better than 0.2%
- Dimensions (cell only)

3.5, 10, 25, 50 kN models

57 mm diameter x 80 mm height

100 kN model 82 mm diameter x 110 mm height

- Weight (approx.):

3.5, 10, 25, 50 kN models 2 kg approx

100 kN models: 5 kg approx

- Connecting thread:

3.5, 10, 25, 50 kN models female M20 x 1.5

100 kN model female M30 x 2

Ordering information

28-WF0370/T

External load cell, 3.5 kN capacity.

28-WF0373/T

External load cell, 10 kN capacity.

28-WF0374/T

External load cell, 25 kN capacity.

28-WF0375/T

External load cell, 50 kN capacity.

28-WF0376/T

External load cell, 100 kN capacity.

Note: in case the load cell is supplied complete with data acquisition system, then a traceable calibration certificate is available on request. For ordering info, add suffix 'C' to the relevant product code (e.g. 28-WF0370/TC)

Submersible load cells

Submersible (internal) load cells have been designed to work inside the triaxial cells. They have a low hysteresis and very good linearity together with a substantial overload safety feature and are supplied complete with rams to suit Banded triaxial cells 28-WF4050 to 28-WF4150 (Load cells with a 15.5 mm diameter ram fit the 28-WF4050 cell, whilst the 25 mm diameter ram fits all the other cell models).

Different models are produced for dynamic testing which are practically identical to the standard models except for the way they connect to the triaxial system.

Technical specifications

- Overload capacity: 200%
- Rate output: 2mV/V
- Excitation voltage: 10V DC
- Non linearity: $\pm 0.05\%$ full scale
- Hysteresis: 0.05% full scale
- Deflection at full load: 0.05 mm
- Maximum side force without effect: 50% full scale
- Compensated temperature range: 0 to 50°C
- Diameter: 75 mm
- Height (excluding ram): 50 mm
- Weight (excluding ram and extension kit): 850 g



Submersible load cell

The table below shows which triaxial cells the different models of submersible load cells are compatible with and the diameters of the fitted rams.

Load cell product code	Capacity (kN)	Compatible triaxial cells	Ram diameter (mm)
<u>28-WF6350</u>	1.0	28-WF4050	15.5
<u>28-WF6352</u>	5.0		
<u>28-WF6354</u>	10.0		
<u>28-WF6351</u>	1.0	28-WF4070, 28-WF4100, 28-WF4150 28-WF4170, 28-WF4171	25.0
<u>28-WF6353</u>	5.0		
<u>28-WF6355</u>	10.0		
<u>28-WF6356</u>	25.0		

Ordering information

28-WF6350

Submersible load cell, 1 kN capacity, complete with 15.5 mm diameter ram and extension kit for small samples.

28-WF6351

As above but with 25 mm diameter ram.

28-WF6352

Submersible load cell, 5 kN capacity, complete with 15.5 mm diameter ram and extension kit for small samples.

28-WF6353

As above but with 25 mm diameter ram.

28-WF6354

Submersible load cell, 10 kN capacity, complete with 15.5 mm diameter ram and extension kit for small samples.

28-WF6355

As above but with 25 mm diameter ram.

28-WF6356

Submersible load cell, 25 kN capacity, complete with 25 mm diameter ram and extension kit for small samples.

Note: in case the submersible is supplied complete with data acquisition system, then a traceable calibration certificate is available on request. For ordering, add the suffix 'C' to the relevant product code (e.g. 28-WF6350/C).



For data acquisition see our data logger see page 108

Axial displacement transducers and mounting brackets

Linear potentiometric transducers are used with various types of testing equipment, such as consolidation apparatus, shear testing machines and conventional triaxial testing systems, to measure sample deformation.



30-WF6209

Technical specifications

- Potentiometric transducers
- Input voltage: 10V DC
- Output: from 0 to 10V DC
- Repeatability: better than 0.002 mm
- Accuracy: better than 0.002 mm
- Connector: 6 pin

All the above transducers are supplied with a mounting block but have to be completed with the appropriate mounting bracket for connection to triaxial cells. See Accessories.

Ordering information

30-WF6207

Linear potentiometric transducer, 10 mm travel.

30-WF6208

Linear potentiometric transducer, 25 mm travel.

30-WF6209

Linear potentiometric transducer, 50 mm travel.

30-WF6210

Linear potentiometric transducer, 100 mm travel.

Note: in case the displacement transducer is supplied complete with data acquisition system, then a traceable calibration certificate is available on request. For ordering, add the suffix 'C' to the relevant product code (e.g. 30-WF6208/C).

Accessories

28-WF6220

Mounting bracket to fit 28-WF4050 banded triaxial cell (15.5 mm ram diameter).

28-WF6221

Mounting bracket to fit 28-WF4070, 28-WF4100 and 28-WF4150 banded triaxial cells (25 mm ram diameter).

28-WF1048/T

Mounting bracket to fit 28-WF0410/A, 28-WF0411/A and 28-WF0416/A standard triaxial cells.



30-WF6221



30-WF1048/T

Volume change apparatus

This apparatus, when connected to a suitable display or data acquisition system, measures change in sample volume by providing an electrical signal directly proportional to the volume of water flowing through the unit. The apparatus comprises a piston connected to a 25 mm linear potentiometric transducer, sealed against a precision-machined calibration chamber so that the linear movement of the piston is exactly proportional to the volume of water in the calibration chamber. The apparatus has a front control panel with a reversing valve system to measure the water flow in both directions.

Technical specifications

- Basic capacity: 100 cm³
- Transducer input: up to 12V DC
- Accuracy: ± 0.1 ml
- Dimensions: 260 x 280 x 400 (w x d x h)
- Weight: 5 kg (approx.)

Ordering information

28-WF4410

Automatic volume change apparatus.

Note: in case the volume change is supplied complete with data acquisition system, then a traceable calibration certificate is available on request. For ordering, add the suffix 'C' to the relevant product code (e.g. 28-WF4410/C).



28-WF4410

Pressure transducers

See pag 87



Note: in case pressure transducer is supplied complete with data acquisition system, then a traceable calibration certificate is available on request. For ordering, add the suffix 'C' to the relevant product code (e.g. 28-WF6300/C).

Measurement of the maximum shear modulus (G_{max})

Bender elements

Bender elements allow to measure the maximum shear modulus (G_{max}) of a soil sample and from this data to evaluate the stiffness of a soil. G_{max} is generally associated with shear strain levels of about 0.001% and is a key parameter in small strain dynamic analyses, such as those to predict soil behavior or soil structure interaction during earthquakes, explosion or machine and traffic vibrations.

The piezoceramic bender element is an electro-mechanical transducer, which is capable of converting mechanical energy (movement) either to or from electrical energy. The single bender element consists of two thin piezoceramic plates, which are rigidly bonded together with conducting surfaces between them and on the outsides.

The polarization of the ceramic material in each plate and the electrical connections are such that when a driving voltage is applied to the element, one plate elongates and the other shortens. The net result is a bending displacement, which is greater in magnitude than the length change in either of the two layers.

On the other hand, when the bender element is forced to bend, one layer will go into tension and the other into compression: this will result in an electrical signal, which can be measured.

In the soil application the bender elements are encapsulated and mounted into inserts, which are fixed into the pedestal and top cap of a triaxial cell. They protrude edge-first into the soil specimen as cantilevered. When excited the bender element bends from side to side pushing the soil in a direction perpendicular to the length of the element and thus having a large coupling factor with the soil. This produces a shear wave, which propagates parallel to the length of the element into the soil sample. On the other end of the soil sample another bender element is forced to bend and produces an electrical signal that can be measured.

Theory on shear wave propagation in an elastic body tells us that the value of the shear modulus G_{max} of the soil from measurement of shear wave velocity V_s is given by:

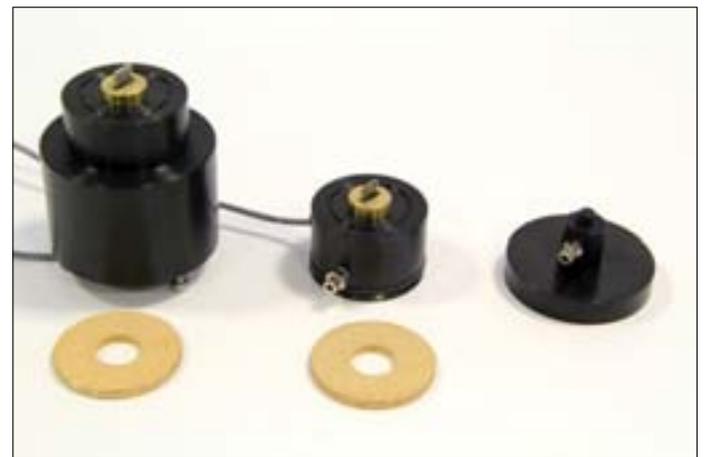
$$G_{max} = \rho \cdot (V_s)^2$$

where ρ is the mass density of the soil sample. The system consists of a transmitter, which is energized to produce the shear waves through the soil sample, and the receiver that receive the electrical signal.

The travel time of the shear wave from the transmitter to the receiver is determined via a specific software that allows the user to quickly and easily calculate the shear wave velocity.

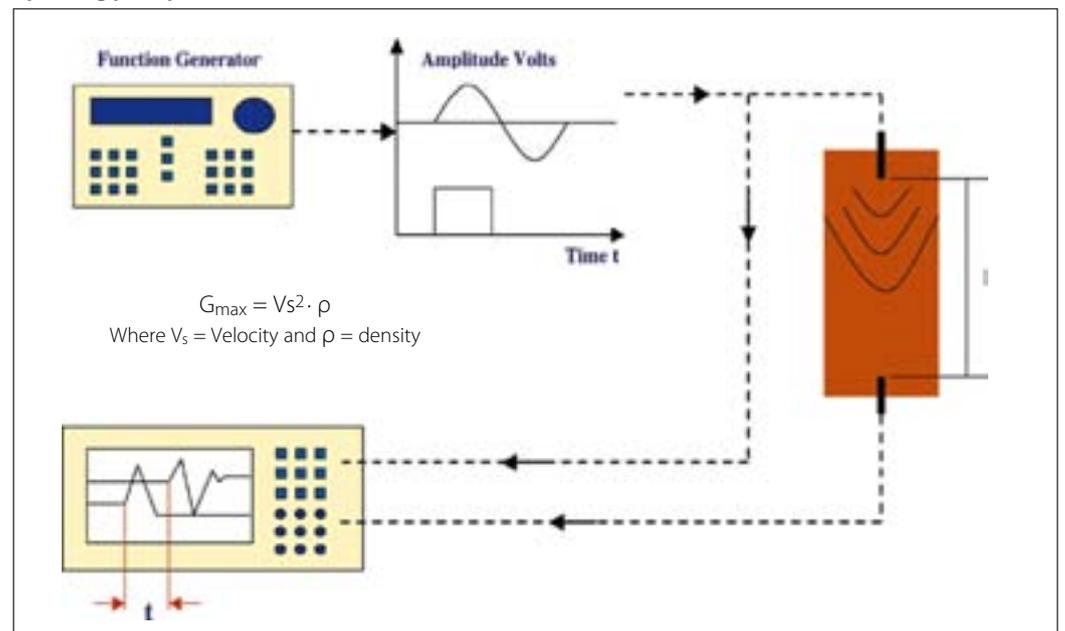
The complete power and measuring system 28-WF4190 includes:

- Waveform generator
- Analogic PC interface with virtual oscilloscope software
- Connecting cables
- Personal Computer is not included



Bender element with vacuum top cap and base pedestal

Operating principle



Ordering information

Models for compression testing only

28-WF4057/B

Bender elements, 50 mm top cap and base pedestal, for 70 mm diameter cell.

28-WF4077/B

Bender elements, 70 mm top cap and base pedestal, for 70 mm diameter cell.

28-WF4077/B1

Bender elements, 70 mm top cap and base pedestal, for 100 mm diameter cell.

28-WF4107/B

Bender elements, 100 mm top cap and base pedestal, for 100 mm diameter cell.

28-WF4157/B

Bender elements, 150 mm top cap and base pedestal, for 150 mm diameter cell.

Models for extension and compression testing (vacuum type)

28-WF4058/B

Bender element, 50 mm vacuum top cap and base pedestal for 70 mm diameter cell.

28-WF4078/B

Bender element, 70 mm vacuum top cap and base pedestal, for 70 mm diameter cell.

28-WF4078/B1

Bender element, 70 mm vacuum top cap and base pedestal, for 100 mm diameter cell.

28-WF4108/B

Bender element, 100 mm vacuum top cap and base pedestal, for 100 mm diameter cell.

28-WF4158/B

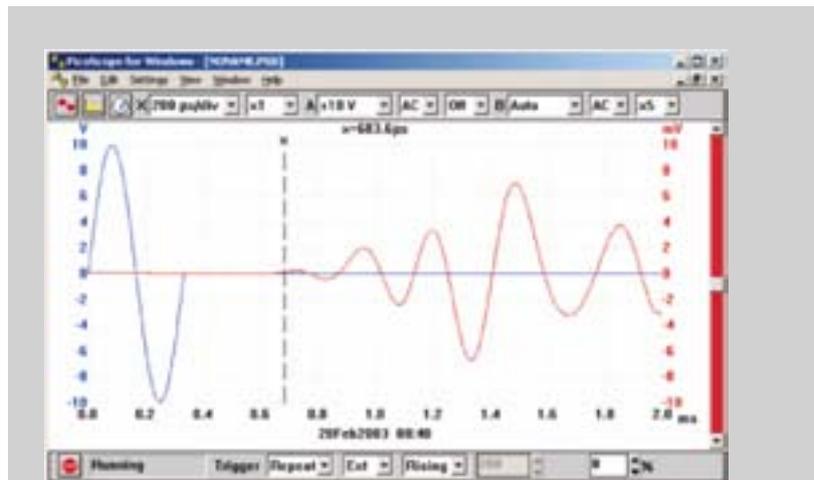
Bender element, 150 mm vacuum top cap and base pedestal, for 150 mm diameter cell.

Accessories

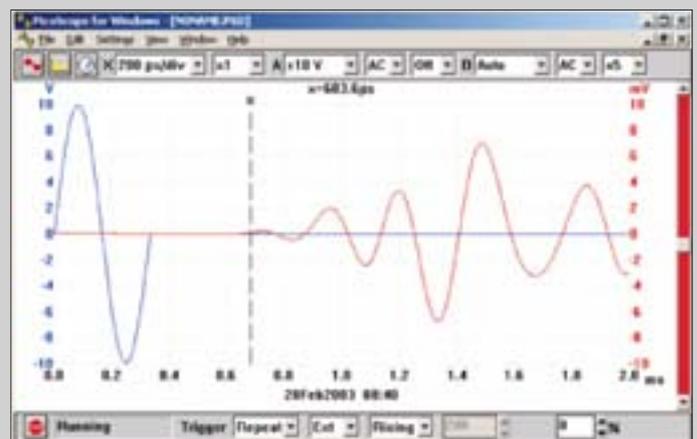
28-WF4190

Power and measuring system. 110-230 V, 50-60 Hz, 1 ph.

The bender elements have to be powered by a wave form signal generator. The output signal is converted into digital and transmitted to a PC via an interface and processed with the virtual oscilloscope software. The complete system includes waveform generator, analogic-PC interface with virtual oscilloscope software and connecting cables. PC not included.



Bender elements test results on clay. Frequency set at 3 kHz



Frequency set at 3 kHz



Banded triaxial cell 28-WF4070 fitted with upgrading kit 28-WF4070/ADV for using bender element and local strain transducers



28-WF4190

Local strain measurement in triaxial testing

main features

- > Suitable for specimen diameters from 38 to 150 mm
- > Maximum working pressure of 3500 kPa
- > Light and compact construction with reduced dimensions
- > For use with Banded triaxial cells fitted with suitable upgrading kits and Double-wall triaxial cells
- > Vertical and radial deformation measured directly on the triaxial test specimen
- > Suitable for static and dynamic data acquisition by triaxial systems



Local strain transducers

In conventional triaxial testing the stiffness of a soil specimen is determined by external measurement of displacement. Such measurements are subject to errors caused by deflections of the loading system and bedding of the porous stone onto the ends of the specimen.

Local vertical and radial strain transducers avoid these problems by providing the opportunity to measure the deformation, with high accuracy, directly on the triaxial test specimen.

Local strain transducers are supplied in a kit which includes one radial and two vertical transducers suitable for 38, 50, 70, 100 and 150 mm specimen diameters. Mounting accessories such as radial belt, mounting brackets and jig are also included.

All the models are supplied with dedicated in-line interface suitable for static or dynamic test, see the ordering information.

For more detailed information concerning the operating principle visit our web site



Transducers mounted on a sample

Technical specifications

- Input voltage: 10 V
- Output voltage (ratiometric):
± 350mV (radial); ± 950mV (vertical)
- Accuracy (average):
better than ± 0.5% FRO
- Temperature coefficient: ± 0.02/FRO/°C
- Weight: from 9 to 95 g (approx.)

Ordering information

Models for static testing

28-WF4039/KM

Local strain transducer kit for 38 mm diameter samples with two vertical and one radial miniature "on-specimen" transducers, radial belt, axial fixing pads and plugs.

28-WF4059/KM

As above but for 50 mm diameter samples.

28-WF4079/KM

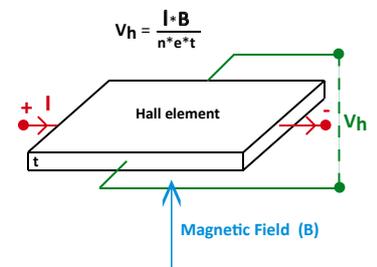
As above but for 70 mm diameter samples.

28-WF4109/KM

As above but for 100 mm diameter samples.

28-WF4159/KM

As above but for 150 mm diameter samples.



V_h : Hall voltage; B : Magnetic field; I : current across the plate length; e : elementary charge; t : thickness of the plate; n : charge carrier density

Models for dynamic testing (in the Dynamic triaxial system)

28-WF4039/KN

Local strain transducer kit for 38 mm diameter samples with two vertical and one radial miniature "on-specimen" transducers, radial belt, axial fixing pads and plugs.

28-WF4059/KN

As above but for 50 mm diameter samples.

28-WF4079/KN

As above but for 70 mm diameter samples.

28-WF4109/KN

As above but for 100 mm diameter samples.

28-WF4159/KN

As above but for 150 mm diameter samples.

Note: all the transducers mentioned above can be supplied, on request, with a traceable calibration certificate. For ordering, add the suffix 'C' to the relevant product code (e.g. 28-WF4039/KMC).

Calibration device for On-sample transducers (see page 111)

Specimen consolidation

main features

- > Allows simultaneous anisotropic consolidation of three triaxial specimens
- > Reduces the testing time when only one triaxial compression machine is available
- > Fits triaxial cells for specimens up to 100 mm diameter
- > Ergonomic design for better use of space in the laboratory
- > Suitable for other makes of triaxial cell (with little adjustment)



28-WF0493 with triaxial cells, dial gauges, beam loading devices and weights

Standards

ASTM D4767 | D7181 | BS 1377:8 | CEN-ISO/TS 17892-9

28-WF0493

Three-place consolidation bench for triaxial cells.

This apparatus has been designed to reduce the testing time for triaxial tests when only one compression machine is available. With this equipment it is possible to perform the consolidation stage of three triaxial specimens at the same time for CU and CD tests under anisotropic conditions. The apparatus consists of a steel bench complete with three load frames and centering platens, which fit any of our triaxial cells for specimens from 35 to 100 mm diameter. Each consolidation frame can be equipped with a beam loading device to reduce the number of dead weights required for anisotropic consolidation (see Accessories). Weights can be placed on both the centre hanger and on the lever hanger.

The apparatus has to be completed with vertical displacement gauges or transducers (which connect to data acquisition and processing systems for soil mechanics), and slotted weights and pressure system for cell and back pressure.

Overall dimensions: 1300 x 800 x 970 mm (w x d x h)

Weight: 145 kg (approx.)

Accessories

Slotted weights

28-WF0493/1

Set of weights for specimens from 35 to 70 mm diameter.

Each set, suitable for a single frame with a Beam loading device 28-WF0493/3, comprises:

- 4 x 250 g Slotted steel weights
- 4 x 500 g Slotted steel weights
- 4 x 1 kg Slotted steel weights
- 4 x 2 kg Slotted steel weights
- 4 x 4 kg Slotted steel weights

28-WF0493/2

Additional set of weights for specimens up to 100 mm diameter.

Each set, suitable for a single frame with a Beam loading device 28-WF0493/3, can be used in addition to the 28-WF0493/1 weight set for anisotropic consolidation of large specimens. The set consists of four 8 kg slotted steel weights.

Beam loading device

28-WF0493/3

Beam loading device, 10:1 ratio.

Used to amplify the vertical load to be applied to the specimen. The lever is supplied with a screw jack support with handle.

Three units must be ordered for one 28-WF0493

Dial gauges and displacement transducers for measuring axial displacement

These devices should be selected according to the specimen size and type of measurement system: either analogue with dial gauges or electronic with displacement transducers connected to suitable data acquisition equipment.

30-WF6402

Dial gauge, 30x0.01 mm.

30-WF6403

Dial gauge, 50x0.01 mm.

30-WF6208

Vertical displacement transducer, 25 mm travel.

30-WF6209

Vertical displacement transducer, 50 mm travel.

30-WF1048/T

Mounting bracket for dial gauges and displacement transducers.

Locking device

28-WF0410/A4

Piston locking device to hold the piston and top cap in place on the specimen. Only for triaxial cells 28-WF0410/A, 28-WF0411/A and 28-WF0416/A - the device is not necessary with the other triaxial cells.



Detail of the 28-WF0493/3 beam loading device and slotted steel weights

28-WF0493. Detail of the upper frame with the top screw for levelling and adjusting the position of the cross head to fit different triaxial cells.



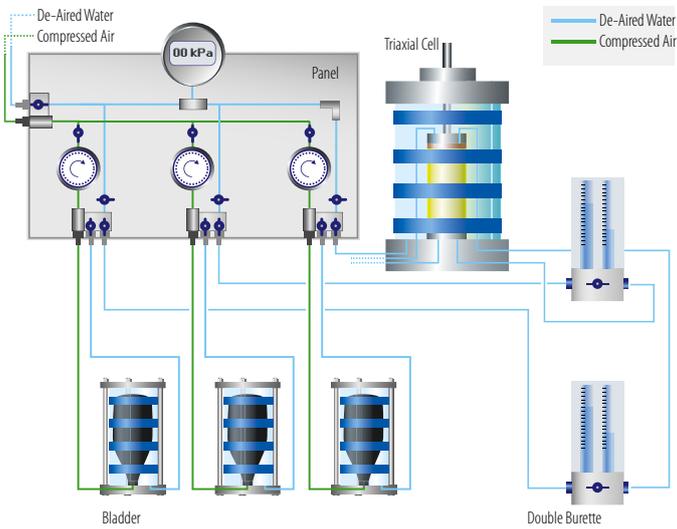
Determination of permeability of normal and contaminated soil samples

Standards

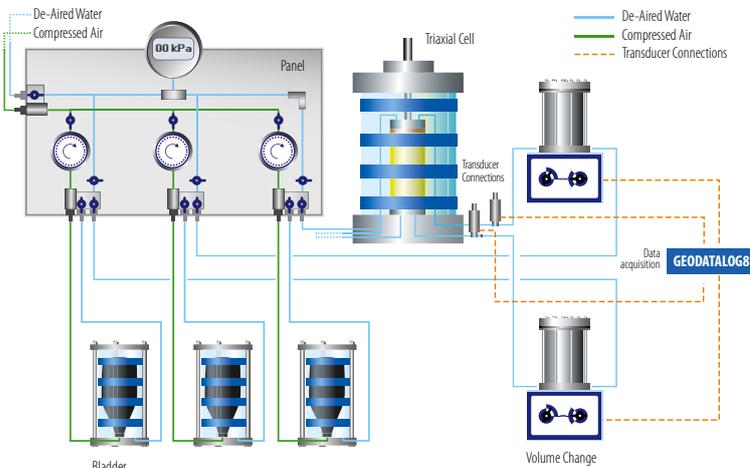
ASTM D5084 | BS 1377:6 | CEN-ISO/TS 17892:11

The permeability test is designed for measuring the hydraulic conductivity (coefficient of permeability) of water saturated porous materials. It can be performed using any of our triaxial cells, using the accessories described in the configuration table below. In cases where soil samples are contaminated, the special stainless steel cell 28-WF0194/B with toxic interface chamber 28-WF0194/3 should be used instead of triaxial cell.

Permeability tests in triaxial cell



Permeability tests in triaxial cell with data acquisition



Permeability testing system for water-saturated porous materials

The system consists of a number of standard testing items which are listed in the following table and described else where in this catalogue.

The table below gives a typical list of the parts and accessories required for a system performing triaxial permeability tests on 70 mm diameter samples*.

Code	Description	Q.ty
28-WF4070	Banded triaxial cell for 70 mm diameter samples	1
28-WF4071/7	Pedestal for 70 mm diameter samples	1
28-WF4072/A	Top cap for 70 mm diameter samples, with drainage leads	1
28-WF4074	Pair of porous discs for 70 mm diameter samples	1
28-WF4075	Rubber membranes (10 pieces) for 70 mm diameter samples	1
28-WF4076	O-rings (10 pieces) for 70 mm diameter samples	1
28-WF4071/A	Membrane stretcher for 70 mm diameter samples	1
28-WF4071/B	O-ring placing tool for 70 mm diameter samples	1
28-WF4071/C	Two-part split mould for 70 mm diameter samples	1
28-WF4071/D	Two-part split former for 70 mm diameter samples	1
28-WF4071/F	Filter discs (100 pieces) for 70 mm diameter samples	1
28-WF4071/G	Hand sampler for 70 mm diameter samples	1
28-WF6300	Pressure transducer, 1000 kPa	2
28-WF6310	De-airing block	2
28-WF6008	Geodatalog 8, data acquisition unit	1
82-P9008/ELT	Set of four cables	1
28-WF4331	Triaxial panel for three pressure lines	1
28-WF4330/2	Digital pressure gauge	1
28-WF4320	Air/water bladder cylinder	3
28-WF4410	Volume change apparatus	2
28-WF4221/A	De-airing tank, 23 litre capacity	1
28-WF2001	Vacuum pump	1
86-D2005	Air drying unit	1
86-D0819	Silica gel with indicator, 1000 g	1
86-D2064	Rubber tube for vacuum	2
28-WF4225	Valve panel for de-airing tank	1
86-D2015	Air compressor	1
28-WF2016/2	Water trap for air compressor	1
28-WF4191	Nylon tube ID 6 x OD 8 mm, 20 m	2

* Obviously the test can be performed with other sample diameters by substituting the items that are sample size dependent with those of the required size.

Permeability cell for contaminated soil samples

This model is used for contaminated soil samples. Made entirely of stainless steel, it has to be used with the toxic interface chamber to avoid toxic permeants from entering the control panel. This also prevents contact of air with the permeant so that no toxic or corrosive vapors can escape into the laboratory.

The cell can be fitted with accessories for 70 and 100 mm diameter samples.

Ordering information

28-WF0194/B

Permeability cell with stainless steel valves for use with contaminated soils.
 Dimensions: 300 mm diameter x 355 mm height (approx.)
 Weight: 5 kg (approx.)

28-WF0194/3

Toxic interface chamber.
 Weight: 3 kg (approx.)



Toxic interface 28-WF0194/3



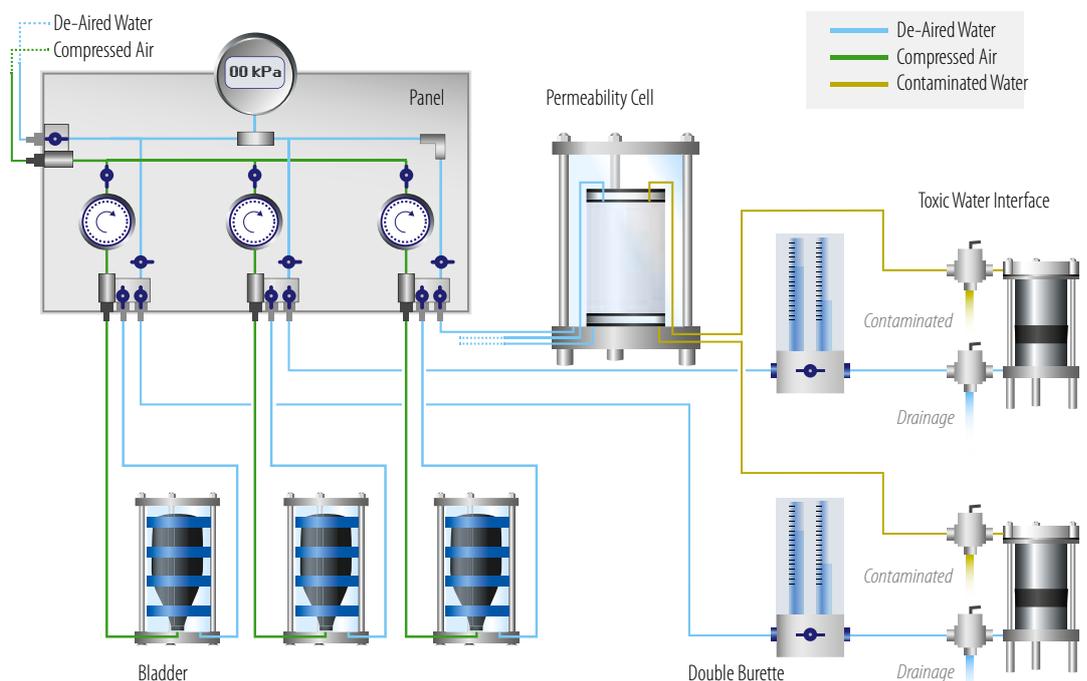
28-WF0194/B

Accessories

Top caps, base pedestals and sample accessories

Diameter sample	70 mm	100 mm
Top cap and base pedestal for contaminated materials	28-WF0194/B1	28-WF0194/B2
Porous discs	28-WF4074	28-WF4104
Membranes	28-WF4075	28-WF4105
O-rings	28-WF4076	28-WF4106
O-ring placing tool	28-WF4071/B	28-WF4101/B
Membrane stretcher	28-WF4071/A	28-WF4101/A
Two part split former	28-WF4071/D	28-WF4101/D
Hand sampler	28-WF4071/G	28-WF4101/G

Permeability tests in triaxial cell with contaminated water



AUTOTRIAX²**Automatic triaxial tests system****main features**

- > Automatic execution of up to 6 independent triaxial tests from start to finish with only one PC
- > Type of tests: total and effective stress, stress path, K_0 , permeability and unsaturated soils
- > High-speed PC closed loop control for continuous monitoring and instantaneous reaction of systems components
- > User-friendly software for remote control and test procedure
- > Ideal solution for high demands laboratories which requires high productivity and reliability
- > Space efficiency design
- > No need of air compressor (with exception of unsaturated soils tests)

Typical AUTOTRIAX 2 configuration for effective stress and stress path

AUTOTRIAX²

The optimization of advanced technologies for high efficiency triaxial tests

Standards

BS 1377:7 | ASTM D2850 | ASTM D4767 | BS 1377:8 | BS 1377:6 | ASTM D7181

The AUTOTRIAX 2 is an advanced triaxial testing system that can automatically perform up to 6 entire and independent tests at the same time, from start to finish, without any human intervention.

AUTOTRIAX 2 can perform different kinds of triaxial tests such as:

- Total and effective stress tests:
 - UU (unconsolidated undrained) BS and ASTM standards
 - CU (consolidated undrained) BS and ASTM standards
 - CD (consolidated drained) BS and ASTM standards
- Stress path tests following MIT and Cambridge methods;
- K_0 anisotropic volume controlled tests;
- Permeability tests in triaxial cells according to BS and ASTM standards
- Unsaturated soil testing with control of matric suction using the axis translation method.

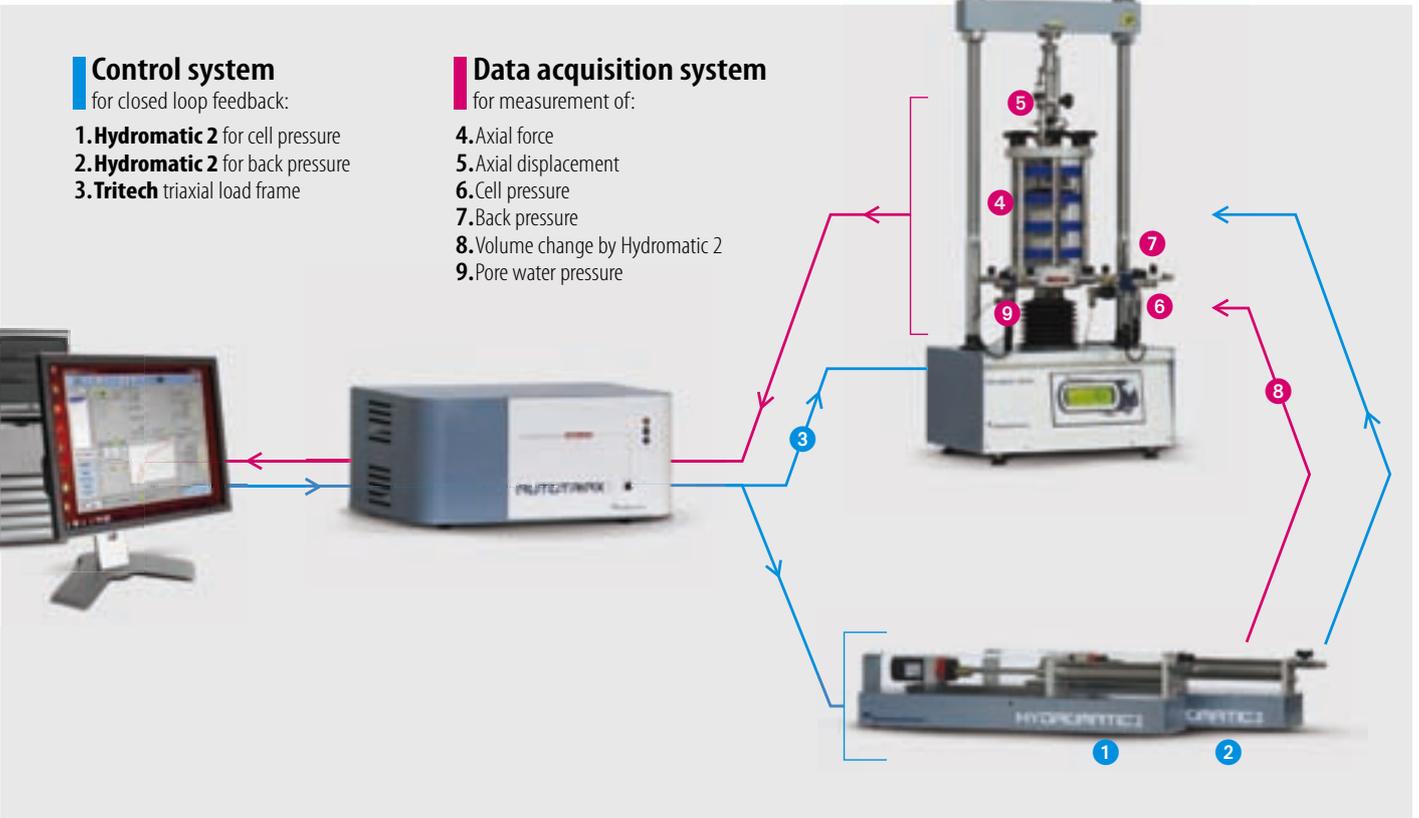
A typical automatic triaxial configuration comprises:

- Load frame and triaxial cell with accessories: a suitable model can be selected from our range (see triaxial load frames and triaxial cells banded or standard) or, alternatively, existing machines and cells can be used, after compatibility check with our specialists;
- Data acquisition and control unit connected to a PC (using a LAN network);
- Hydromatic 2 pressure/volume controllers with automatic open/close valves: the pressure controllers can reach up to 3500 kPa and have a volume capacity of 250 cc;
- Triaxial test automatic control and processing software.

The AUTOTRIAX 2 configurations can be extended and expanded in subsequent steps in order to control further tests by adding the relevant components. These operations can be easily made on site by simply configuring the user-friendly software, like a plug-and-play system.

The closed-loop feedback control system monitors the component status continuously in order to react to any change in the parameters pre-set for each test stage.

More than 30 system configurations are available. A practical guide for the most typical and common configurations limited to the part required for the main components is shown at pag 107



Data acquisition and Control Unit



main features

- > It manages pressure/volume controller, load frames, cell and back pressures, solenoid valves and transducers
- > Transmits data and information between the software and all the active components
- > Calibration data of connected transducers are saved in the firmware of the units
- > Four different versions are available to offer maximum flexibility
- > Can be stacked vertically reducing the footprint on the work bench
- > The modular design concept allows easy extension of the system

These are the brains of the AUTOTRIAX 2 system, transmitting data and information between the software and all the active components such as the pressure controllers and Trittech triaxial load frame. The units are produced in four different versions to offer maximum flexibility. They can be stacked vertically, making them very space-efficient, and power connectors of multiple units can be daisy-chained together, allowing them all to be run from a single mains socket. Transducer calibrations are saved directly in the firmware of the units.

29-WFD1A2

Master unit

A Master unit is always required, whatever combination of systems you want to put together. It has four active control channels for connecting the transducers that are needed for feedback to the software (for controlling vertical load or displacement and cell and back pressure) and eight passive channels for connecting a pore pressure transducer plus any other additional transducers, including local strain measuring devices. The Trittech compression frame, Hydromatic 2 pressure/volume controllers and solenoid valves (for opening and closing the pressure lines) also connect to the unit.

One Master unit is all that is needed for a single standard effective stress system.

Connections:

- 2 Hydromatic pressure/volume controllers
- 1 Trittech compression frame
- 12 transducers
- 2 solenoid valves

29-WFD0A1

Pressure extension unit

Used in addition to a Master unit, this extension unit provides control for one extra pressure system, with connections for a pressure transducer, solenoid valve and Hydromatic 2 pressure/volume controller, plus three spare passive transducer channels. It could be used, for example, in a system running permeability tests where three controlled pressures are required.

Connections:

- 1 Hydromatic pressure/volume controller
- 4 transducers
- 1 solenoid valve

29-WFD0A3

Triple pressure extension unit

Used in addition to a Master unit, this extension unit provides control for three extra pressure systems, with connections for three pressure transducers, solenoid valves and Hydromatic 2 pressure/volume controllers, plus nine spare passive transducer channels.

Connections:

- 3 Hydromatic pressure/volume controllers
- 12 transducers
- 3 solenoid valves

29-WFD0A1/UNS

Pressure extension unit for unsaturated test module only

Used in addition to a Master unit, this extension unit provides control for one air pressure system, with connections for a pressure transducer, solenoid valve and Servoflow Air pressure controller. There is also a connection for an Automatic Volume Change device to measure the change in cell volume, plus two spare passive transducer channels.

Connections:

- 1 Servoflow
- 4 transducers
- 1 solenoid valve
- 1 Automatic Volume Change device



Master unit 29-WFD1A2 rear panel



29-WFD1A2 + 29-WFD0A1 stacked vertically reducing the footprint on the work bench

Specifications

- Analogue/digital converter: 16-bit
- Additional transducer gain ranges: +/- 20 mV and +/-10 V
- Ethernet connection to PC: 100 Mb
- Dimensions: WFD1A2 or WFD0A3: W 330 x D 240 x H 144 mm, WFD0A1 or WFD0A1/UNS W 330 x D 240 x H 70mm
- Weight: 6 kg (29-WFD1A2/29-WFD0A3) 4 kg (29-WFD1A1/29-WFD0A1/UNS)
- Power supply: 110-240 V 50/60 Hz, 1ph

Note: the sensors connected to these units can be supplied, on request, complete with a traceable calibration certificate

Ordering information

- 29-WFD1A2**
AUTOTRIAX 2 Data acquisition and control unit: Master unit
- 29-WFD0A3**
AUTOTRIAX 2 Data acquisition and control unit: Triple pressure extension unit
- 29-WFD0A1**
AUTOTRIAX 2 Data acquisition and control unit: Pressure extension unit
- 29-WFD0A1/UNS**
AUTOTRIAX 2 Data acquisition and control unit: Air pressure extension unit for unsaturated testing

Accessories

- 29-WF4645/COMP**
High specification desktop PC with LCD monitor. Operating system MS Windows preinstalled. 8 port LAN HUB converter for AUTOTRIAX 2 connection. 110-240V/50-60Hz/1Ph
- 26-WF4645**
LAN Hub with 8 ports for Wykeham Farrance devices.



29-WFD0A1/UNS Pressure extension unit for unsaturated test

Pressure and volume controller



HYDRAMATIC 2

29-WF4502/B

Hydromatic 2 pressure/volume controller

Hydromatic 2 is used to generate water pressure in and around the test specimen. It is driven by a stepper motor, which enables the unit to measure volume change. The unit consists of a hydraulic piston, driven by a ball-screw and gearbox, mounted on a ball-slide, and is managed under closed-loop control by the Data acquisition and control unit. A 3500 kPa capacity pressure transducer and its de-airing block are included. The status of the unit is monitored by the AUTOTRIAX 2 software and safety microswitches are installed to prevent over-travel beyond mechanical limits or capacity.

Each Hydromatic 2, also includes a solenoid valve which is installed on the triaxial cell base to open and close the pressure lines. They are powered and controlled by the Data acquisition and control units.

For a standard effective stress system, two Hydromatic 2 units are required one for cell pressure and one for back pressure.

Specifications

- Output pressure: 3500 kPa
- Volume capacity: 250 cc
- Pressure resolution: 0.1 kPa
- Volume resolution: 0.001 cc
- Pressure accuracy: 0.1% of full scale
- Closed-loop control of pressure: regulated to 0.1 kPa
- Closed-loop control of volume: regulated to 0.001 cc
- Dimensions: W 740 x D 140 x H 160 mm
- Weight: 5 kg
- Power supply: 110-240 V 50/60 Hz, 1 ph
- Solenoid valve speed: < 10 mm/s

Accessories

29-WF4334

Water distribution panel for automatic triaxial testing

29-WF4191

Nylon tubing 6 mm bore x 8 mm outside diameter, 10 m length

29-WF6302/A

Pressure transducer 3500 kPa capacity for pore water pressure

29-WF6310

De-airing block for connecting a pressure transducer to a banded triaxial cell



Hydromatic 2 29-WF4502/B includes pressure transducer, de-airing block and on/off valve.



Water distribution panel 29-WF4334

main features

- > Generates water pressure regulated under closed-loop control
- > Measures the volume change, by counting the steps of the stepper motor
- > High-resolution measurement of pressure and volume change
- > High volume capacity
- > Lightweight and with a small footprint.
- > No air compressor is required

Air pressure controller and water volume change for unsaturated testing

29-WF4511

Servoflow air pressure controller

(for unsaturated testing module only)



Servoflow for unsaturated testing 29-WF4511

The Servoflow is an electro-pneumatic pressure controller that generates air pressures of up to 1000 kPa for one pressure line. Managed under closed-loop control by the Data acquisition and control unit that it is connected to, it consists of a chassis housing an electronic pressure regulator. The regulator reduces the supply air pressure to a regulated output which is directly proportional to an electrical input signal received from the control unit. In the AUTOTRIAX 2, the Servoflow is used to provide air pressure to the sample for unsaturated soils testing systems, based on the axis translation method.

Specifications

Servoflow air pressure controller

- Output pressure: 1000 kPa
- Pressure resolution: 0.1 kPa
- Pressure accuracy: 0.1% of full scale
- Closed-loop control of pressure: regulated to 0.1 kPa
- Dimensions: W 225 x D 210 x H 140 mm
- Weight: 5 kg
- Power supply: 110-240 V, 50/60 Hz, 1ph

29-WF4412

Automatic Volume Change apparatus

measuring the volume change of an unsaturated soil sample in the double wall triaxial cell.

(for unsaturated test module only)



Volume change apparatus for unsaturated testing 29-WF4412

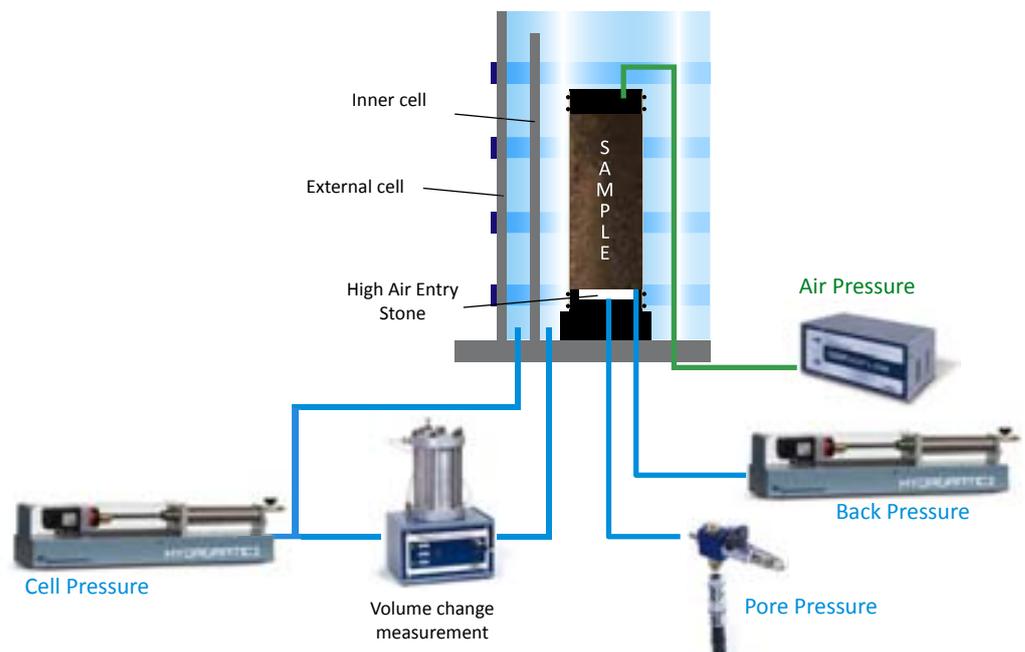
The device is used for unsaturated soils testing with the double wall triaxial cell to measure the volume change of the soil sample.

The design is based on the standard volume change device with integral solenoid valves that allow the flow direction and bypass functions to be controlled by the pressure extension unit - unsaturated. The device has a physical capacity of 100 cc but due to the automatic switching, it can measure volume change continuously. It is powered directly by the pressure extension unit - unsaturated and has LEDs on the front panel to show the flow status.

Specifications

Automatic Volume Change

- Capacity: 100 cc
- Accuracy: 0.1 cc
- Maximum operating pressure: 2000 kPa
- Dimensions: W 280 x H 400 x D 260 mm
- Weight: 9 kg
- Power supply: 24 V DC direct from the pressure expansion unit - unsaturated.



AUTOTRIAX 2 – Schematic layout for unsaturated test using axis translation method

Triaxial test automatic control and processing software



main features

- > Comprehensive and user-friendly interface between the operator and the testing systems
- > Up to 6 independent triaxial systems can be run at the same time from a single computer or multiple computers
- > Real-time display of all the transducers and calculated data for all live tests, with plots of measured and calculated data, selectable by the user.
- > Automatic control in real time of standard and non-standard tests (e.g. stress path tests)
- > Calibration and verification procedures for all the transducers
- > User-defined range limits and limit alarms for all the sensors and controllers
- > Data processing and reporting facility with customisable language

The AUTOTRIAX 2 software is a comprehensive and user-friendly interface between the operator and the testing system. Installed on a PC communicating with the system over a fast Ethernet connection, the software can be used to configure the system(s), calibrate transducers, specify test parameters, set system limits and control the system during a test, either manually or automatically. Due to the flexibility of the software, each triaxial system can either have its own, dedicated PC, or multiple systems can be run from one PC.

Three different software are available:

- **Device Management Software**
- **Test software**
- **Template for data processing**

Device Management Software

- This base software is supplied as standard with the AUTOTRIAX 2 system
- Designed for setting up the configuration and allocation of the components of each triaxial system
- Up to 11 points of calibration can be recorded with automatic polynomial best fitting (up to 7th order)
- The calibration data of different transducers can be stored for the same channel and easily recalled when connected
- Full scale limits can be set for all the transducers and pressure/volume controllers to prevent over-travel and possible damage
- Management of Hydromatic 2 pressure/volume controllers and Trittech compression frames outside of testing procedures (e.g. controller tuning, water refilling of pressure controllers)



System Select panel showing two triaxial systems are available, with one shared Trittech compression frame, one system is suitable for permeability test

Test software

Test software comprehends different modules.

All the test modules include the following basic features:

- Input of project, sample and test details and parameters
- Set up of test sequences, including selection of automatic or manual control
- Real-time data for all transducers are displayed throughout the test, as well as all calculated stresses, strains, ratios, volume change etc. Updated specimen dimensions are displayed at the end of each stage
- Graphical test data can be displayed on four separate user-definable graphs, each with up to six data series
- Manual control panel to control the solenoid valves, Hydromatic 2 and Tritech units before starting the test
- Transducer readings and zero-set options displayed in large font on a separate panel, enabling the user to easily view the readings from a distance
- Review option to look at data and graphs for tests already completed during a live test
- Data processing and reporting conforming to the relevant standards by quickly and easily importing test data into the Microsoft Excel® AUTOTRIAX 2 triaxial template
- Test pause option (automatic or by the user) for conditioning/refilling the Hydromatic 2 pressure/volume controllers
- Simultaneous and independent control of axial stress (displacement or load controlled), cell pressure, back pressure, base pressure (in the Permeability Module) and air pressure (in the Unsaturated Soils Module)
- Alarm display when travel or capacity limits of the system components are reached
- Set up of additional limits to stop or to hold the stress/strain conditions during the test

EFFECTIVE and TOTAL STRESS

This software module, supplied as standard, includes manual or automatic control of saturation, consolidation and shear stage, according to ASTM and BS Standards:

Saturation (ASTM D4767, ASTM D7181, BS 1377:Part 8)

Under manual control, three different options for running the stage are available:

- Increments of cell pressure only
- Increments of cell and back pressure
- Simultaneous ramps of cell and back pressure

Alternatively, automatic control can be selected to run the complete stage according to BS1377:8 Clause 5.3, BS1377:8 Clause 5.4 or ASTM 4767/7181.

Data monitoring and processing consists of:

- Multiple plot options including: cell pressure vs. pore pressure / B values; cell, back and pore pressure vs. time; volume change vs. time
- Summary table and plot of all the saturation steps performed

Consolidation (ASTM D4767, ASTM D7181, BS 1377:Part 8)

Automatic or manual isotropic consolidation with cell and back pressure targets set by the user.

Data monitoring and processing consists of:

- Multiple plot options including: volume change and pore pressure dissipation vs. time
- Graphical fitting methods, according to the relevant standards, for the evaluation of the end of consolidation
- Data processing of T50/T100 to calculate speed for monotonic as for BS / ASTM.

CU/CD test monotonic shear (ASTM D4767, ASTM D7181, BS 1377:Part 8)

Automatic or manual shear stage (drained / undrained) using calculated or user-defined rate of strain and failure criteria in compression or extension⁽²⁾

Data monitoring and processing consists of:

- Multiple plot options including: deviator stress, volume change, pore pressure vs. axial strain; MIT or Cambridge stress path

UU test monotonic shear (ASTM D2850, BS 1377:Part 7)

Automatic or manual undrained shear stage in compression, with rate of strain and cell pressure input.



Device Settings screenshot for Hydromatic 2 pressure/volume data acquisition and control device showing settings for the four channels

Triaxial test automatic control and processing software (continued)

STRESS PATH MODULE ⁽¹⁾⁽²⁾

This optional software module is for the automatic or manual control of stress path stages, with independent control of axial and radial stresses. The module can be used together with the standard stages of saturation, isotropic consolidation and monotonic shear provided by the Effective Stress Test Module to carry out what is generally known as stress path testing. This package includes the following:

- Total stress ramps
- Back pressure ramps
- MIT stress ramps to target values of s and t
- Cambridge stress ramps to target values of p and q
- Ramps to target change in axial displacement/strain
- Ramps to target volume change
- User-defined independent ramps / hold of deviator stress, cell pressure and back pressure

Data monitoring and processing consists of:

- Multiple plot options including: total and effective stress, volume change, pore pressure vs. axial strain; MIT or Cambridge stress path

K_0 MODULE ⁽¹⁾⁽²⁾

This optional software module is for the automatic or manual control of K_0 stages, with closed-loop control of the cross-sectional area of the soil sample. The module can be used together with the standard test stages of saturation, isotropic consolidation and monotonic shear provided by the Effective Stress Test Module. This package includes the following:

- Axial stress ramps with closed-loop control of radial stress to maintain the K_0 conditions
- Radial stress ramps with closed-loop control of axial stress to maintain the K_0 conditions
- K_0 conditions, controlled via the continuous monitoring of volumetric strain and axial strain
- K_0 conditions, controlled via the continuous direct measurement of the sample diameter by a local radial strain "on-sample" transducer

PERMEABILITY MODULE ⁽¹⁾

This optional software module is for the automatic or manual control of triaxial permeability stages in accordance with BS1377:Part 6 and ASTM D55084-10 methods A and D. The module is used together with the standard test stages of saturation and isotropic consolidation provided by the Effective Stress Test Module to carry out triaxial permeability tests. This package includes the following:

- control and measurement of base pressure
- measurement of permeability under a constant hydraulic gradient
- measurement of permeability under a constant rate of flow

Data monitoring and processing consists of:

- Multiple plot options including: change of volume / mean flow rate vs. time
- Evaluation tools to calculate in real time the permeability from the mean flow plot

UNSATURATED SOIL MODULE ⁽¹⁾

This optional software module is for the automatic or manual control of specific stages for unsaturated soils.

The module is used together with the standard test stages of saturation, isotropic consolidation and monotonic shear provided by the Effective Stress Test Module to carry triaxial testing on unsaturated soils. Stress path stages can also be performed when the Stress Path Module has been purchased. This package includes the following:

- control and measurement of air pressure
- control of matric suction during consolidation, monotonic shear and stress path stages
- measurement of pore pressure using the axis translation method
- SWCC (soil water characteristics curve) test stage

Data monitoring and processing consists of:

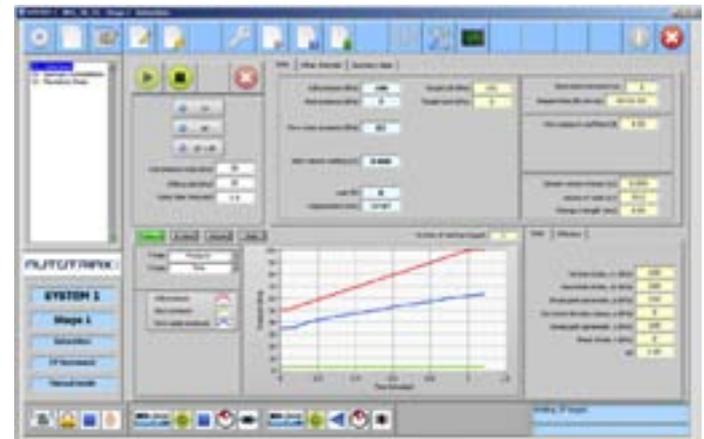
- Multiple plot options including: matric suction/pressures vs. strain; matric suction vs. moisture content
- Display of all unsaturated related stresses throughout the test

⁽¹⁾ An additional license must be purchased to unlock this module

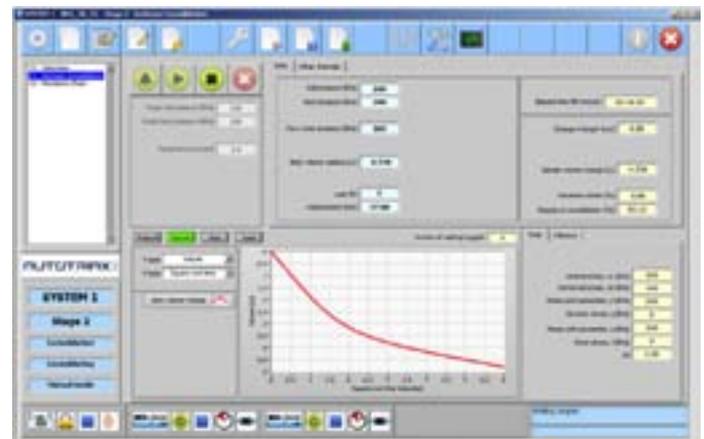
⁽²⁾ A vacuum top cap and submersible load cell must be used for tests with stages in extension



Deviator and shear stress plotted against axial strain during a monotonic shear stage



A saturation cell pressure increment with the graph showing the pore water pressure responding as the cell pressure is increased to the target.



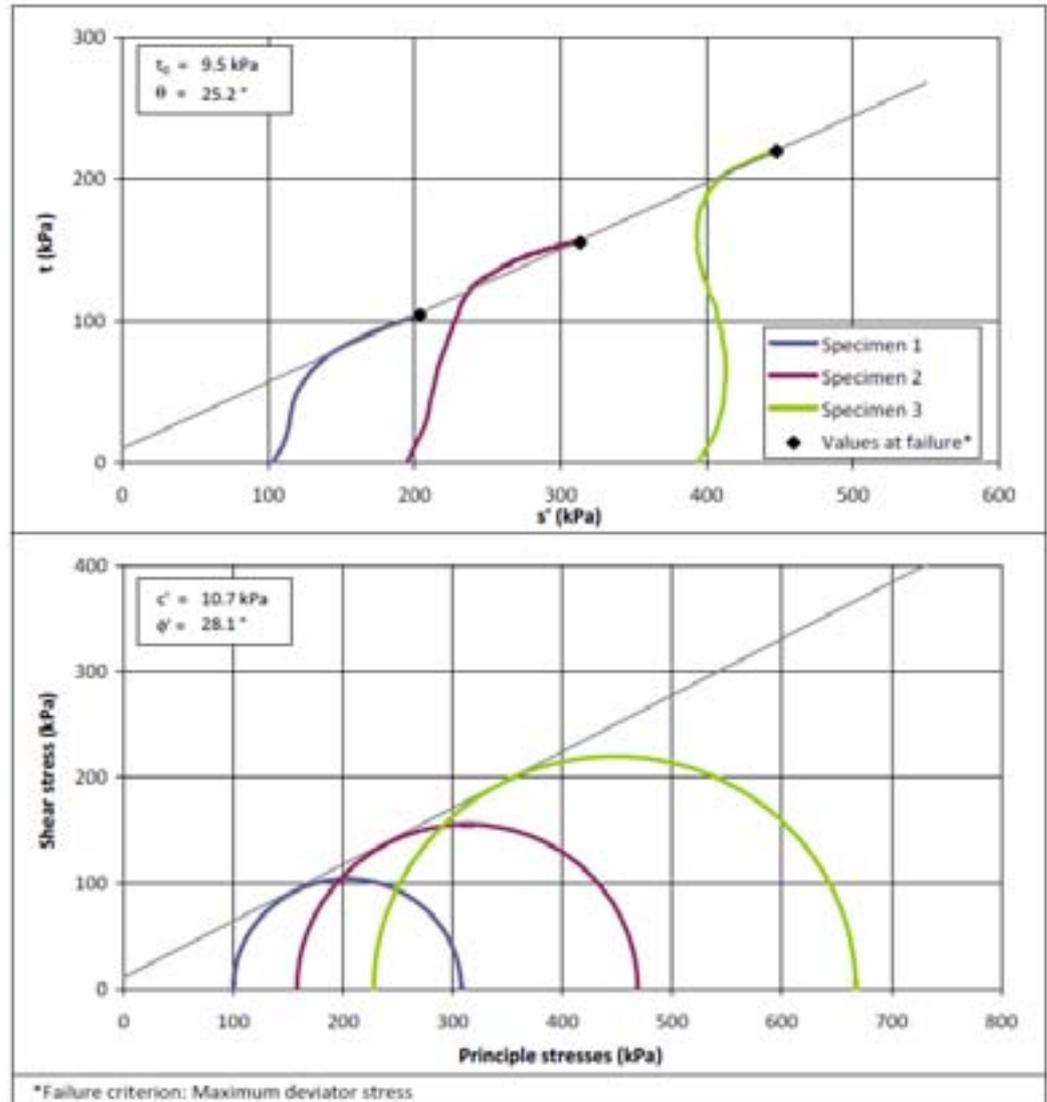
An isotropic consolidation stage in progress with volume change plotted against square root time on the graph

Template For Data Processing

The Triaxial Template is Excel®-based data processing software that has been specially designed for the AUTOTRIAX 2 testing system. Data for the entire test is imported at the click of a button, with individual worksheets created and completed automatically for each stage of the test. Test reports are generated conforming to the selected standard and can be printed.

- Automatic data importing
- Processing and reporting of results to BS or ASTM standards
- Includes presentation of Mohr circles and failure envelope with manipulation tools
- Triaxial permeability results can be post-processed to calculate the permeability value
- Possibility to plot a combined stress path graph of total and effective Cambridge and MIT stress path parameters over the whole test
- Can process multiple types of test*:
 - Unconsolidated Undrained (UU) triaxial - single, set of 3 or multistage
 - Consolidated Undrained triaxial (CU) - single, set of 3 or multistage
 - Consolidated Drained triaxial (CD) - single, set of 3 or multistage
- Triaxial permeability
- CU and CD tests with any type of stage can be processed:
 - Saturation
 - Isotropic consolidation
 - Monotonic shear
 - Unsaturated (soil/water curve)
 - Stress path
 - K_0

*The types of test that can be processed depend on which modules of the AUTOTRIAX 2 software are licensed



Typical data processing using template for AUTOTRIAX 2

Ordering Information

29-WFD1A2/SW1

Effective stress (CU / CD / UU) base test software with manual and automatic performance of saturation, consolidation and shear stages to ASTM and BS

29-WFD1A2/SW2

Activation code for Stress path test module with manual and automatic performance of stress path stages

29-WFD1A2/SW3

Activation code for K_0 test module with manual and automatic performance of K_0 stages

29-WFD1A2/SW4

Activation code for Unsaturated test module including manual and automatic modes for testing using the axis translation method

29-WFD1A2/SW5

Activation code for Permeability test module with manual and automatic performance of constant rate of flow and constant hydraulic gradient permeability stages

29-WFD1A2/TM

Triaxial Excel® Template for data processing software that has been specially designed for the AUTOTRIAX 2 testing system.

Automatic CRS and Hydrocon

Additional Autotriax 2 software for performing CRS (Constant Rate of Strain) and Hydraulic consolidation are available on request

Typical configurations

AUTOTRIAX 2

Automatic triaxial system to perform
Effective stress - Stress path - K_0 tests



AUTOTRIAX 2

Automatic triaxial system to perform
Effective stress - Stress path - K_0 - Permeability tests



AUTOTRIAX 2

Automatic triaxial system to perform
Unsaturated tests



Typical configurations (continued)

The following summary table is intended as a practical guide for the most typical and common configurations, limited to the part required for the main components, to cover different type of triaxial tests. However, due to the high flexibility of the system, many other configurations not included in the table here below, can be managed, according to the requirements of the user. To use the table below, first select the type of test starting from the left, then select the number of frames and triaxial cells

that will be managed simultaneously; then continue on the same row to find the main hardware components and software packages. If a single frame is dedicated to a single triaxial cell, the test can be controlled automatically from start to end. If a single frame is shared with several triaxial cells, the system can manage automatically saturation and isotropic consolidation simultaneously on the different triaxial cells.

The system shall be completed with the following components:

- Triaxial load frame, see TRITECH model page 70
- Banded triaxial cells and accessories, see page 75
- Sensors: Displacement transducer, pressure transducers, load cells, see page 87, 89
- Pressure system and water distribution panel see page 82

- De-airing water system see page 84

If additional measurements are required, the system can be upgraded with the following:

- Local strain measurements see page 92
- Bender elements see page 90

AUTOLAB



Test					Frame	TX cell								Software				
E	S	K _c	P	U			WFD1A2	WFD0A1	WFD0A3	WFD0A1/UNS	WF4502/B	WF4511	WF4412	SW1	SW2	SW3	SW4	SW5
•	•				1	1	1				2			•	•			
•	•	•			1	1	1				2			•	•	•		
•	•	•	•		1	1	1	1			3			•	•	•		•
•	•	•		•	1	1	1			1	2	1	1	•	•	•	•	
•	•	•	•	•	1	1	1	1		1	3	1	1	•	•	•	•	•
•					1*	3	1	1	1		6			•				
•			•		1*	3	1	2	1		7			•				•
•					1*	6	1	1	3		12			•				
•			•		1*	6	1	2	3		13			•				•
•	•				3	3	3				6			•	•			
•	•		•		3	3	3	1			7			•	•			•
•	•	•			6	6	6				12			•	•	•		
•	•		•		6	6	6	1			13			•	•			•
•	•			•	6	6	6			1	12	1	1	•	•		•	

Key:

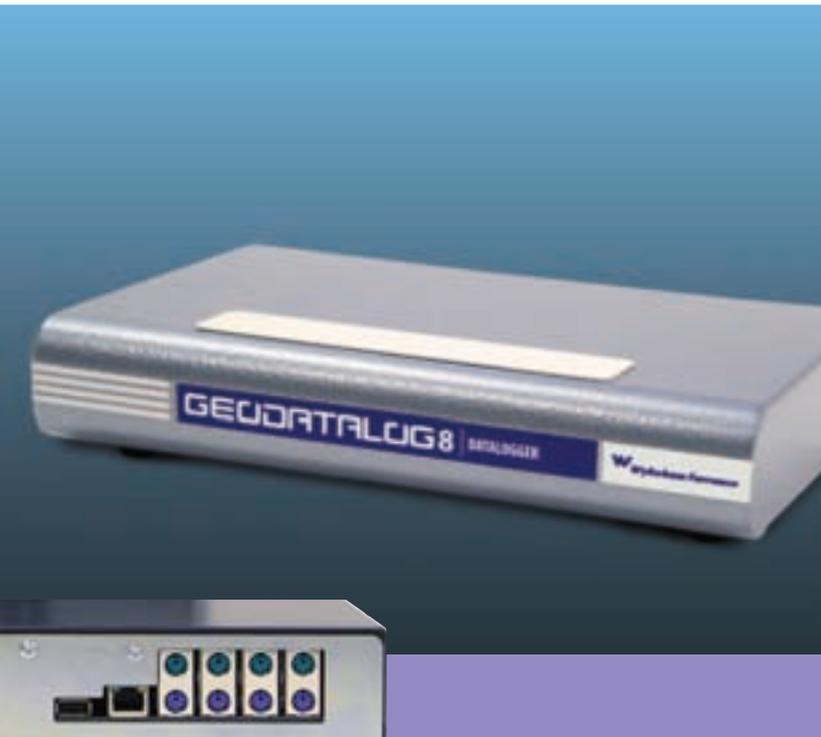
- E:** Total/effective stress according to BS and ASTM standards
- S:** Stress path (vacuum top cap and submersible load cell are required for tests with stages in extension)
- K_c:** K_c consolidation (vacuum top cap and submersible load cell are required for tests with stages in extensions)
- P:** Permeability (the items indicated in the table are intended to perform permeability tests in one cell)
- U:** Unsaturated (the test requires the double-wall triaxial cell; the items indicated in the table are intended to perform unsaturated test in one cell)

**Note: in these configurations it is not possible to follow strictly the ASTM standards in the consolidation stage, where the axial compression of the specimen should be recorded continuously (ref. ASTM D4767 point 8.3.4). To perform this measurement in a fully automatic mode, a dedicated load frame for each triaxial cell fitted with submersible load cell and vacuum top cap is required.*

Up to 6 independent systems are controller by the same PC



GEODATALOG 8



main features

- > 8 independent input channels
- > Up to 8 instruments can work in a network creating a modular system with up to 64 independent channels.
- > LAN / Ethernet connection to PC via dedicated software
- > Compatible with load cells, pressure transducers, strain gauges, LDT / LVDT / potentiometric displacement transducers.
- > Effective resolution: 131000 points
- > Sampling rate up to 500 readings per second per channel
- > Numerical and graphical display of readings via PC software
- > The transducers can be grouped and combined by the user for matching different applications.
- > Possibility to perform various tests (e.g. shear, consolidation, triaxial, ...) in parallel, each one having independent clock, channels and logging mode

30-WF6008

Geodatalog 8

Multipurpose datalogger, with dedicated software

GEODATALOG 8 is a multipurpose data logger which works directly connected to a PC. Data are automatically transferred to PC in real time for live monitoring of the tests.

GEODATALOG 8 records and monitors in real time the measurements requested for Soil Mechanics testing, in particular:

- Consolidation - Shear - Triaxial - Many others

It is compatible gauge load cells, pressure transducers, linear LDT transducers, LVDT conditioned transducers, with strain, potentiometric displacement transducers.

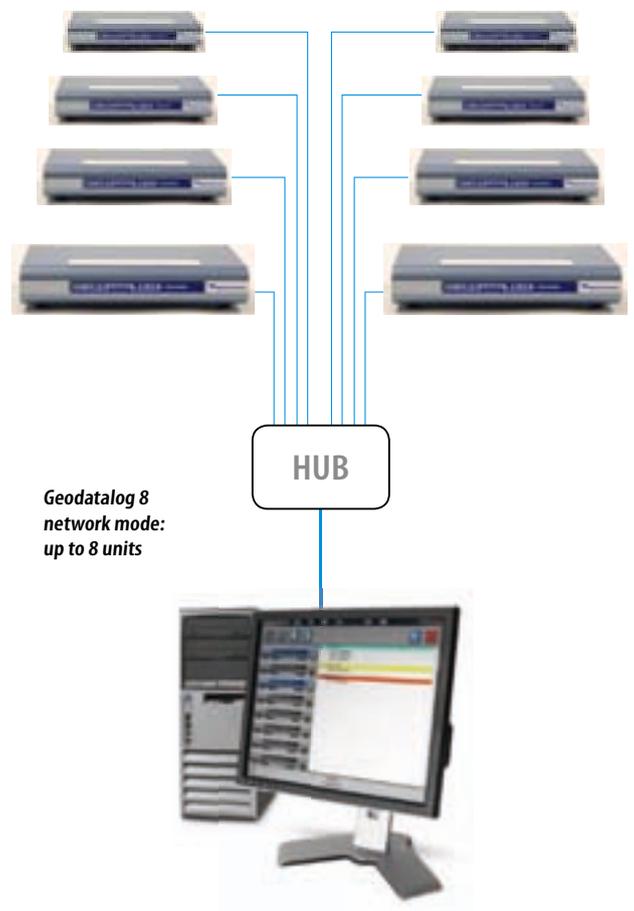
GEODATALOG 8 is conceived with a modular and flexible concept: up to 8 instruments can form a network (using a hub model 26-WF4645) and then create a modular system with up to 64 independent channels.

It is supplied complete with general purpose DATACOMM 2 PC software allowing remote calibration of the channels, and fully comprehensive data management.

GEODATALOG 8 should be always proposed complete with at least one set of 4 Lumberg-to-PS2 adaptor cables (see model 82-P9008/ELT).

Technical specification

- Requires connected PC
- Number of channels: 8
- Network mode: Up to 8 units
- Sampling rate: Up to 500 readings/second per channel
- Effective resolution: 131000 points
- Communication port: LAN / Ethernet
- Excitation (VEXC): from 1 V to 10 V for each couple of channels (up to 4)
- Datalogger input: 0-10 V; 0-20 mA
- Software: Included, DATACOMM 2
- Dimensions approx lxdxh [mm]:
- 290 x 195 x 61
- Weight approx [kg]: 1.6 kg
- Power supply: 110-220V, 50-60 Hz, 1ph





DATACOMM 2 software combines the active channels into customizable groups by the operator. Data acquisition for each group is an independent task which can be started / stopped automatically with specific acquisition and logging mode.

ASCII format data export is available for combination with our Geo-Analysis-Templates suitable for post-processing and printout of test certificates according to the most important international Standards . See data processing



DATACOMM 2 - Channels configuration. The transducers can be grouped and combined by the user for matching different applications.

Accessories

Electronic measurement device

See pag 88

Cable

82-P9008/ELT

Set of four cables for connecting sensors to DATALOG8 (82-P9008) and GEODATALOG8 (30-WF6008)

Extension cable

30-WF6042

Transducer extension cable, 6 m length

30-WF6044

Transducer extension cable, 12 m length

Lan Hub

26-WF4645

LAN Hub with 8 ports for Wykeham Farrance devices.

Data processing: Geo-Analysis Templates

Sixteen templates for different tests and Standards have been developed specifically for processing test data recorded by the DATACOMM 2 software. The templates are MS Excel® based programs with easy-to-use functions for importing data files, calculating results, producing test reports that conforms to the relevant international Standards.

Geo-Analysis Templates

Test	Standard	Ordering information	
Consolidation	Incremental loading	BS 1377:5, ASTM D2435	30-WF6016/T1 30-WF6016/T8
	CRS	ASTM D4186	30-WF6016/T6
	Hydraulic consolidation	BS 1377:6	30-WF6016/T12
	SWCC -Hydraulic consolidation	-	30-WF6016/T13
Shear	Direct/residual	BS 1377:7 ASTM D3080	30-WF6016/T2 30-WF6016/T9
	Ring	BS 1377:7 ASTM D6467	30-WF6016/T3 30-WF6016/T16
	Triaxial	Effective stress	BS 1377:8 ASTM D4767 - D7181
Total stress		BS 1377:7	30-WF6016/T5
		ASTM D2850	30-WF6016/T10
Other tests	Permeability	BS 1377:6	30-WF6016/T14
	CBR	BS 1377:4	30-WF6016/T7
	Unconfined	ASTM D2166	30-WF6016/T15

Other templates are available for processing data gathered with different type of tests

Calibration equipment for the geotechnical laboratory

Any laboratory needs to verify periodically the calibrations of their electronic measuring systems, in order to produce reliable and accurate results. Equipment for calibrating force, displacement, volume change and pressure measuring devices are described in this section.

Force Measurement

For calibration of force measuring devices we propose the following load cells fitted with digital readout unit, supplied complete with ACCREDIA calibration certificate according to EN ISO 376.

Load cells

30-WF0372/SIT

5 kN load cell complete with ACCREDIA calibration certificate* and stainless steel loading seat.



30-WF0372/SIT or
30-WF0373/SIT
with stainless steel
loading seat



30-WF0373/SIT

50 kN load cell complete with ACCREDIA calibration certificate* and stainless steel loading seat.

* In order to issue the calibration certificate, the load cells must be ordered complete with the digital readout unit.

Technical specifications

- Linearity: $\leq 0.03\%$
- Hysteresis: $\leq 0.03\%$
- Repeatability: $\leq 0.01\%$

Digital readout unit

30-WF6601

Digital readout unit for load cells**.



30-WF6601 digital readout unit

Technical specifications

- Accuracy: $\leq 0.02\%$
- Standard resolution: $(2\text{mV/V}) \pm 25000$ div.
- Internal resolution: ± 32000 div.
- Zero and peak functions
- Auto power off function.
- Supplied with four 1.5 V AA size alkaline batteries.
- Typical battery life 1 year.

** One digital readout unit can be used for both load cells

Pressure Measurement

Pressure calibrations are performed with a digital pressure gauge, similar to model 30-WF6601, supplied complete with ACCREDIA calibration certificate.

30-WF6305/SIT

50 bar digital pressure gauge complete with ACCREDIA calibration certificate.

Technical specifications

- Linearity and hysteresis: $\leq 0.05\%$
- Internal resolution: 65000 div.
- Zero and peak function
- Auto power off function.
- Supplied with four 1.5 V AA size alkaline batteries.



30-WF6305/SIT digital pressure gauge

Volume Change

Calibration of the volume change apparatus can be simply performed by weighing the water coming out of the device, using any digital balance with 0.01 g resolution, e.g. model 11-D0630/06

Displacement Measurement

Calibration of displacement measuring devices can be performed with either the analogue or digital micrometer 25 and 50 mm travel respectively, 0.001 mm resolution. They are both available, optionally, with a traceable calibration certificate.

Both types of micrometer basically consist of a stainless steel frame with two brackets: one for the transducer and the other for the micrometer gauge head. The bracket can hold transducers with nominal diameters of 8, 12, 19 and 22 mm, or 18 mm square.

Technical specification

Product code	30-WF0652	30-WF0653
Type	Analogue/mechanical	Digital
Maximum travel, mm	25	50
Resolution, mm	0.001	0.001
Dimensions, mm (w x d x h)	260 x 60 x 100	300 x 60 x 107
Weight, kg (approx.)	0.6	1.5

30-WF0652

Analogue micrometer, 25 mm travel x 0.001 mm resolution.

30-WF0652/C

As above with traceable certificate

30-WF0653

Digital micrometer, 50 mm travel x 0.001 mm resolution.

30-WF0653/C

As above with ACCREDIA certificate

Local Strain Measurement

These transducers are used to measure local strain in triaxial testing. The calibration is performed with a special device that can also be used for standard linear displacement transducers with up to 50 mm travel.

The set includes:

- Frame capable of positioning the micrometer horizontally and vertically
- Adaptors for both vertical and radial local strain transducers
- Holders for transducers with nominal diameters of 8, 12, 19 and 22 mm, or 18 mm square.

Technical specifications

- Max travel: 50 mm
- Resolution: 0,001 mm
- Dimensions: 260 x 60 x 100 mm (w x d x h)
- Weight: 1.5 kg (approx.)



30-WF0653/K

Calibration device for local strain transducers and standard linear displacement transducers up to 50 mm travel.

30-WF0653/KC

As above with ACCREDIA certificate



30-WF0652 analogue micrometer



30-WF0653 digital micrometer

Soil Mechanics

31 | Dynamic testing systems

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The response of soils to cyclic loading is determined mostly by the mechanical properties of the soil. There are several types of geotechnical engineering problems associated with dynamic loading, some examples include: wave propagation, machine vibrations, seismic loading, liquefaction and transient cyclic loading. We can provide several different systems to investigate these events: Dynamic triaxial, FACT, Resonant column/torsional shear and Cyclic simple shear.

31 Dynamic testing systems

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RESONANT COLUMN.....	126
CYCLIC SIMPLE SHEAR.....	129





Dynamic testing systems

The various advanced systems proposed are intended to reproduce in the laboratory the same vibration, shock and cyclic forces to the soil sample, to give engineers a better understanding of how a soil material behaves under these unique situations.



The DYNATRIAX Dynamic Triaxial, FACT, Resonant Column/Torsional Shear and Cyclic Simple Shear systems can replicate unusual in-situ events in the laboratory:

Construction

The preservation of archaeological sediments and artefacts during construction. To establish the effects of past stress regimes on archaeological remains seen in their contemporary, in-situ context.

To maximize site stability and integrity, thereby enhancing the future preservation of archaeological remains. Laboratory studies will simulate past loading regimes as a consequence of the historic accumulation of debris and sediment and future loading based on a range of construction scenario.

Liquefaction

Liquefaction is a phenomenon that occurs in saturated soils, in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. When there is no dynamic activity, the water pressure is relatively low. However, during an earthquake, the shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other and the soil begins to behave as a liquid.

The phenomena and problems associated with liquefaction most commonly occur in saturated cohesionless soils, even if they contain a considerable amount of fines. In recent years particular attention has been focused on sloping ground conditions where, although there might be no risk of earthquake loading, a flow failure would have catastrophic consequences.

Offshore

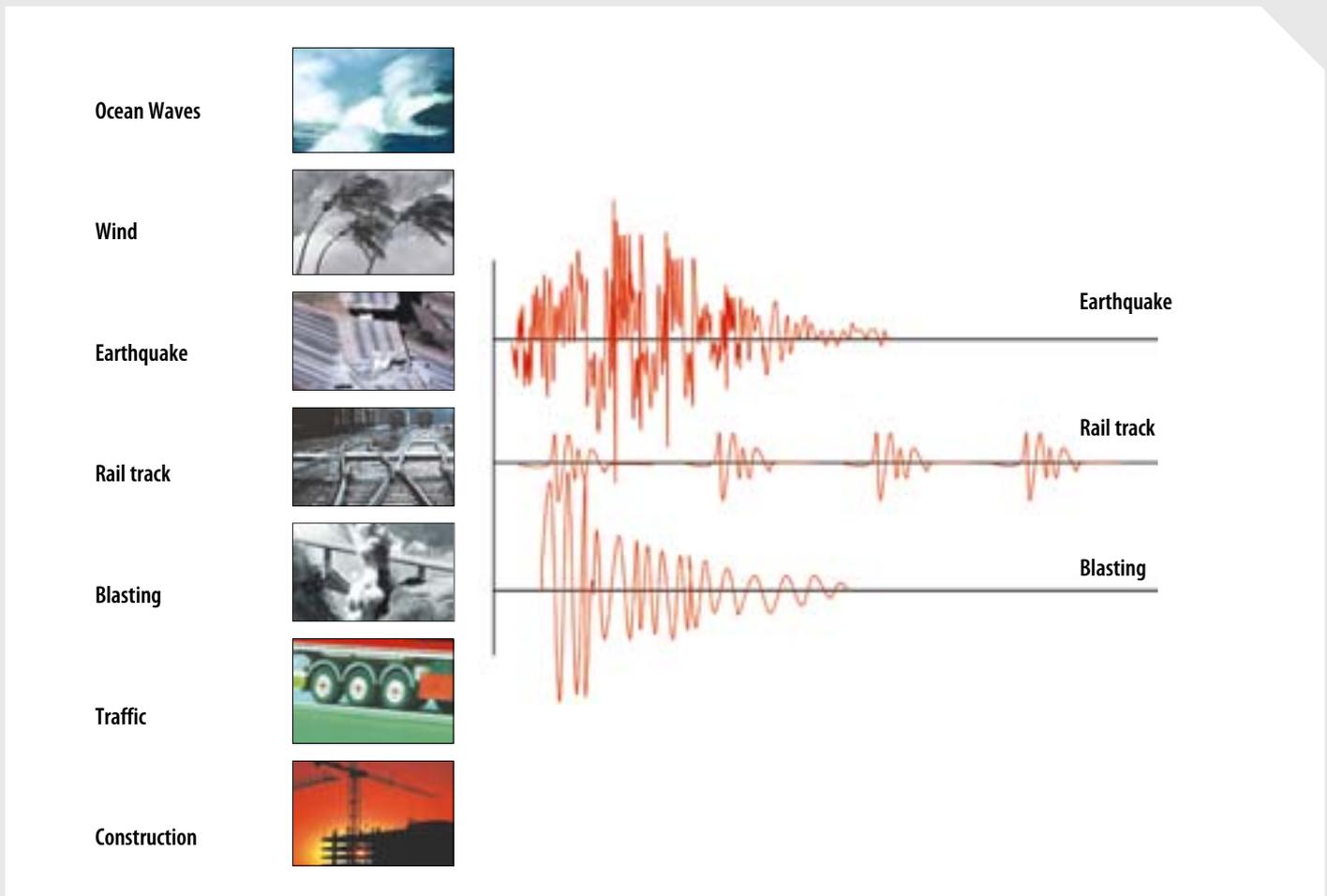
Investigating the effect of waves on offshore structures, waterside buildings, harbours and pipelines. Wave effect and pipeline vibrations can be recreated.

Blasting

What effect does blasting have on structures in the areas surrounding a quarry or blast site? How are the foundations of these structures affected? The blasting signature can be used for testing the foundation material.

Rail track

What effect do vibrations have on buildings close to railway tracks? Trains are becoming faster, creating vibrations of greater frequency which are transmitted into the surrounding ground. Cyclic tests on the track subbase material can be performed.



Dynamic Triaxial-Resonant Column/Torsional Shear-Cyclic simple shear

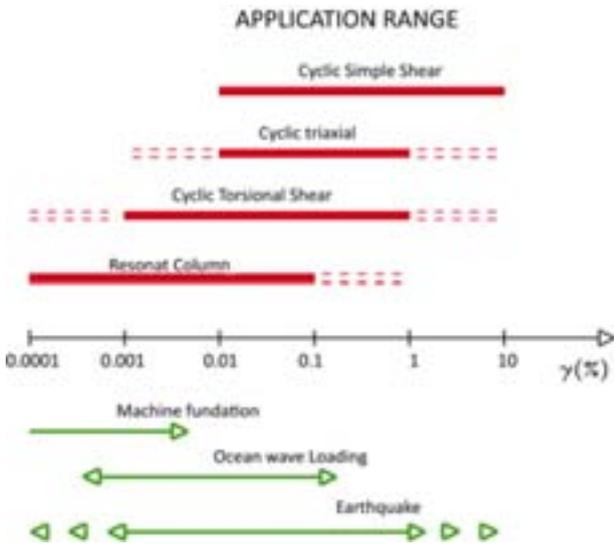
Dynamic properties of soils such as stress-strain characteristics have been recognized a very important part of many aspects of construction design as maritime, seismic engineering, placement of foundations of machines or structures subjected to different dynamic interactions. The correct description of the soil behavior within the range of small deformations is also an extremely important element in the prediction of the movement of structures cooperating with subsoil, and thus has a great impact on the quality of the actual mapping of the internal forces in the

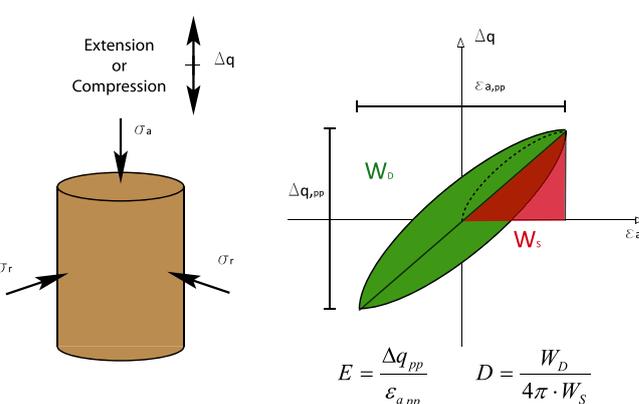
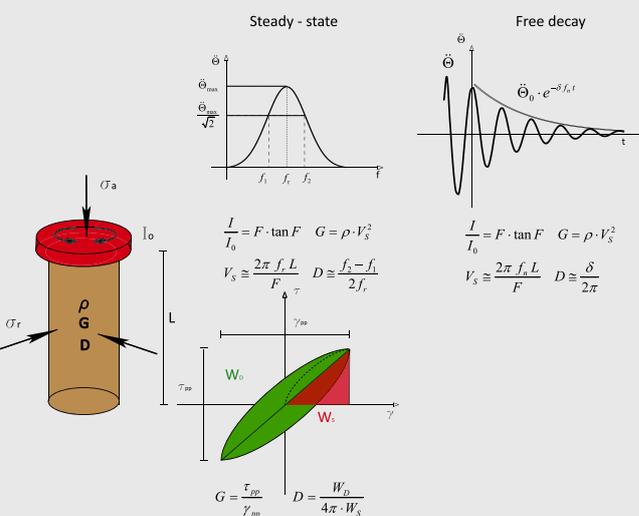
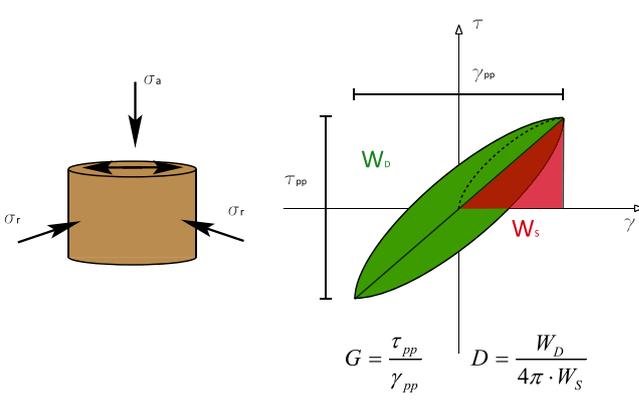
structural system of the whole building, including foundations. Stiffness modules for very small deformations are now recognized as fundamental properties of the soil. For this reason, in geotechnical engineering we commonly use information obtained from laboratory and field dynamic and seismic tests to solve also conventional problems of interaction between the building and the subsoil.

Different systems are available to cover the wide range of deformations due to different causes.

A summary table is presented here beside in order to show the different system and schematic representations of the different types of stresses.

System	Applications	Standards
DYNATRIAX Dynamic Triaxial	Dynamic triaxial	ASTM D5311 ASTM D3999
FACT	Static triaxial: Total stress (Unconsolidated Undrained) Effective stress: (Consolidated Undrained, Consolidated Drained) Stress path	ASTM D2850 ASTM D4767 ASTM D7181 BS 1377:7 BS 1377:8
Resonant Column	Resonant Column Torsional Shear	ASTM D4015
Cyclic Simple Shear	Static and Cyclic Simple Shear	ASTM D6528



Principe de l'essai	Configuration système	Page
 <p>Extension or Compression Δq</p> <p>σ_a</p> <p>σ_r</p> <p>Δq</p> <p>$\epsilon_{a,pp}$</p> <p>W_D</p> <p>W_S</p> <p>$E = \frac{\Delta q_{pp}}{\epsilon_{a,pp}}$</p> <p>$D = \frac{W_D}{4\pi \cdot W_S}$</p>		118
 <p>Steady - state</p> <p>Free decay</p> <p>$\frac{I}{I_0} = F \cdot \tan F$ $G = \rho \cdot V_s^2$</p> <p>$V_S \cong \frac{2\pi f_s L}{F}$ $D \cong \frac{f_s - f_1}{2f_s}$</p> <p>$\frac{I}{I_0} = F \cdot \tan F$ $G = \rho \cdot V_s^2$</p> <p>$V_S \cong \frac{2\pi f_s L}{F}$ $D \cong \frac{\delta}{2\pi}$</p> <p>$G = \frac{\tau_{pp}}{\gamma_{pp}}$ $D = \frac{W_D}{4\pi \cdot W_S}$</p>		126
 <p>σ_a</p> <p>σ_r</p> <p>τ_{pp}</p> <p>γ_{pp}</p> <p>W_D</p> <p>W_S</p> <p>$G = \frac{\tau_{pp}}{\gamma_{pp}}$ $D = \frac{W_D}{4\pi \cdot W_S}$</p>		129

DYNATRIAX

Dynamic triaxial systems

Standards

ASTM D7181 | ASTM D2850 | ASTM D3999 |
 ASTM D4767 | ASTM D5311 |
 BS 1377:7 | BS 1377:8 | AASHTO T307



main features

- > Capability to perform Static (effective stress and stress path), Dynamic and Unsaturated soil triaxial tests
- > Three axis closed loop control for axial load or displacement, cell and back pressure
- > Automatic compensation of cell/back pressure during dynamic stage
- > Operating frequency up to 10 Hz depending on test and sample conditions
- > Complete automation of all test stages using an high sensitivity closed loop P.I.D. feedback control
- > Two dynamic load/displacement options: Up to ± 25 mm with ± 5 kN double effect actuator or Up to ± 15 mm with ± 14 kN double effect actuator
- > Upgrade for bender elements testing and local strain measurements
- > Standard and user-defined wave shapes, including those derived from in situ measurements (from violent earthquakes to sedate ocean waves)
- > Management of transducer calibration and verification by software
- > Test set-up by unique programmable multi stage test procedure: the test structure and parameters can be edited during the test according to the response of the soil specimen
- > Manual and automatic emergency air shut-off function

The DYNATRIAX is a computer controlled servo-pneumatic system designed to perform the static and dynamic stages of a triaxial test.

The system manages three axis with closed loop control:

- Vertical load/displacement up to ± 25 mm (± 5 kN double effect actuator) or up to ± 15 mm (± 14 kN double effect actuator)
- Cell pressure up to 1000 kPa
- Back pressure up to 1000 kPa

The base system includes:

Tritech 50 or Tritrich 100 load machines

The TRITECH digital loading machine is a microprocessor controlled drive system:

- Static load capacity: 50 kN or 100 kN
- Static vertical displacement up to 100 mm (machine travel)

Actuator

The double acting pneumatic actuator is digitally controlled and includes an integrated LVDT displacement transducer to control the position and the movement of the piston during the test.

- Dynamic load capacity: ± 5 kN or ± 14 kN
- Dynamic vertical displacement with travel up to ± 25 mm or ± 15 mm
- Operating frequency up to 10 Hz (depending on test and sample conditions)
- Min. air supply: 800 kPa
- Max. servo valve frequency: 70 Hz.

Data Acquisition, process & control system

The CDC – Compact Dynamic Controller is a compact self contained unit that manages the three axis (vertical load/displacement, cell and back pressure) with a control loop rate of 10 kHz. It provides the automatic control of the system and drives the servo valve units of the three axis and two on/off valves, one connected to the drainage line and one connected to the air main supply of the system.

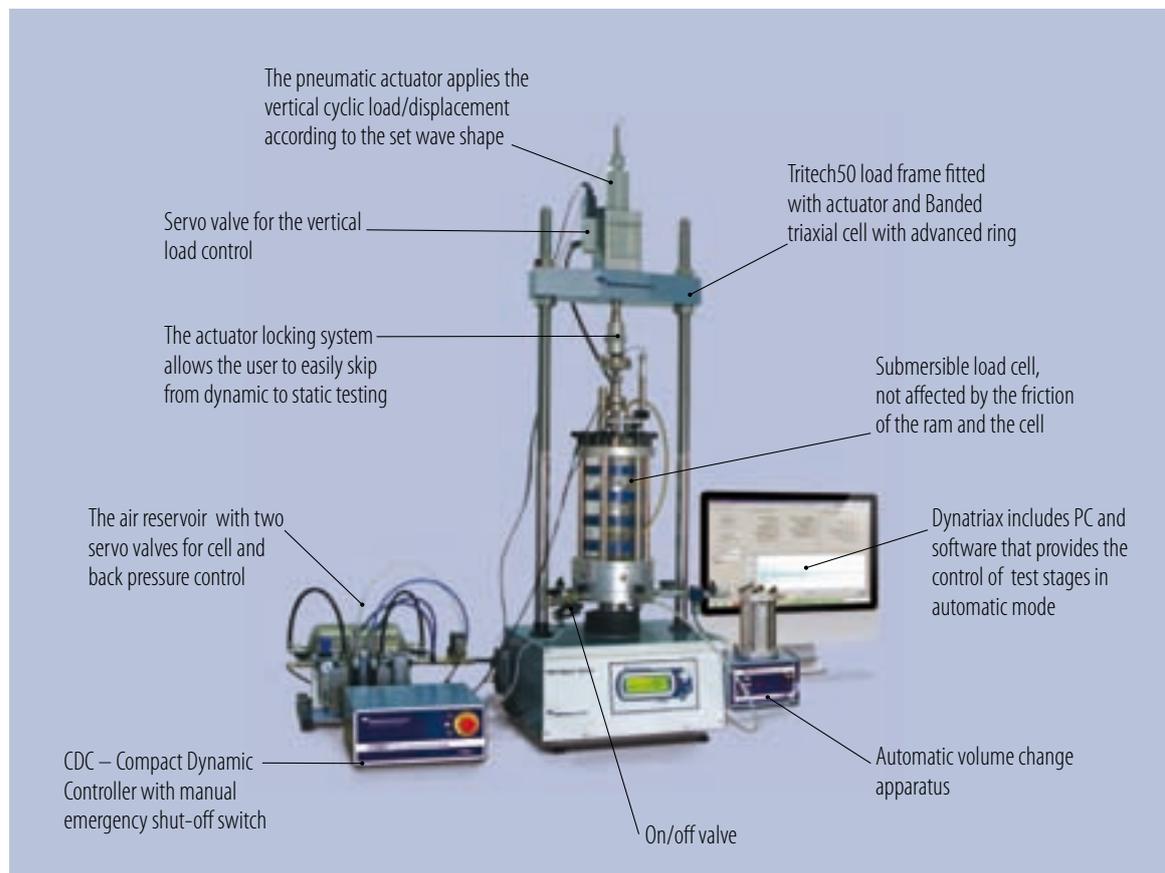
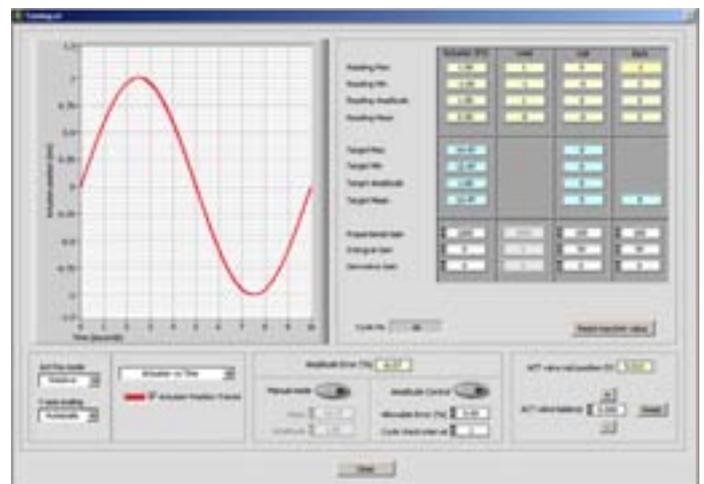
The CDC communicates with the PC through an Ethernet communication link (100 Mbit/s). The controller has sixteen transducers input channels, 16 bits ADC.

PID control

An extremely efficient algorithm with larger gain ranges gives enhanced sensitivity, making it easier to tune the system and achieving a more accurate wave-shape. The system includes manual and automatic amplitude controls which compensate for small changes that may occur in the system during cycling, ensuring

that the required peak and valley levels are consistently maintained.

The tuning panel, with its user-friendly interface, provides all the tools necessary to optimize system control during static and cyclic test stages.



DYNATRIAX

Software

Multitasking, user-friendly, Windows-based software is pre-installed on the computer supplied with the system. The software provides control of the following test stages and utilities of a cyclic triaxial test:

Saturation stage

Different methods of saturation can be performed, according to the relevant standards, through the application of incremental steps of cell and back pressure, with B value and volume change monitoring and summary table. Application of cell and back pressure ramps is also available.

Isotropic consolidation stage

Consolidation according to the relevant standards with continuous monitoring of volume change, pore pressure and degree of consolidation.

K_0 consolidation stage

Application of axial stress at a constant rate of strain, with control of sample diameter using either:

- Direct measurement by radial belt with a local strain transducer
- Indirect measurement with continuous monitoring of axial and volumetric strains

Stress path stage

Drained or undrained load-controlled ramping to targets of:

- Total horizontal and vertical stress
- s & t (average stress and shear stress)
- p & q (mean normal stress and deviator stress)
- Vertical stress at a specified rate of strain

Monotonic shear stage

Strain-controlled, drained or undrained static shear stage, in compression or extension, using either the actuator or the load frame platen.

Note: any or all of the above stages can be performed in "Automatic mode" where the test parameters are entered at the start of the test or stage and the software takes over, controlling the stages according to the pre-defined criteria.

Cyclic shear stage

A cyclic shear method can be selected from the following options:

- ASTM D5311 Load Controlled Cyclic Strength (Liquefaction Potential)
- ASTM D3999 Load Controlled Modulus & Damping Properties
- ASTM D3999 Displacement Controlled Modulus & Damping Properties
- Non Standard: single or multi cycle test
- User defined or imported wave shape
- Pre-definable stage parameters include:
 - Wave shape: sinusoidal, triangle, square, user-defined
 - Frequency
 - Peak to peak amplitude
 - Type of control (stress, strain, load, displacement)
 - End test conditions: number of cycles, pore pressure ratio, strain limits

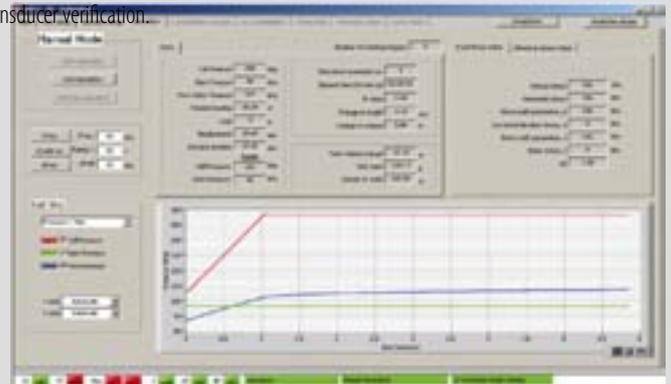
Transducer limits

The air shut-off valve can be programmed to be activated using defined channel limits.

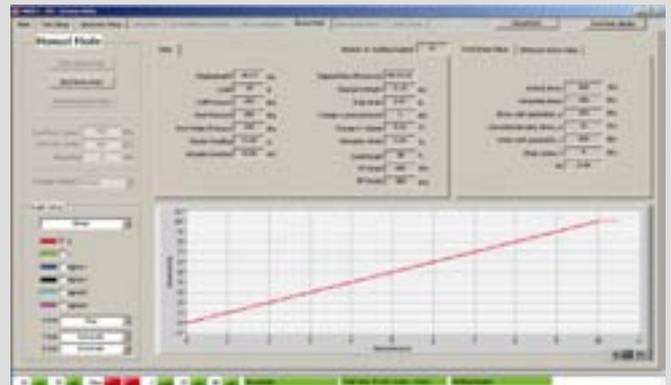
Calibration

Digital calibration with linear, polynomial or linearization fit methods and optional

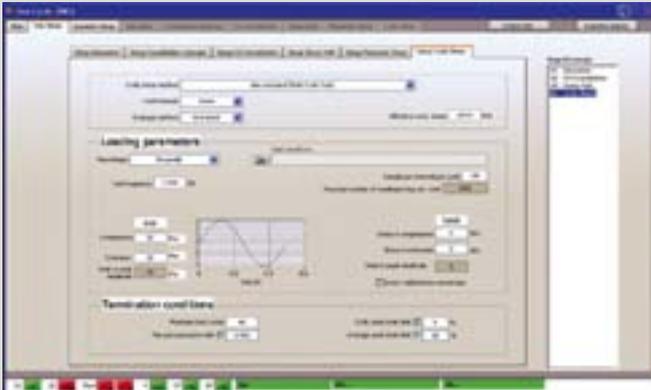
transducer verification.



The graph on the saturation panel can display cell, back, pore pressure and volume change vs. time.



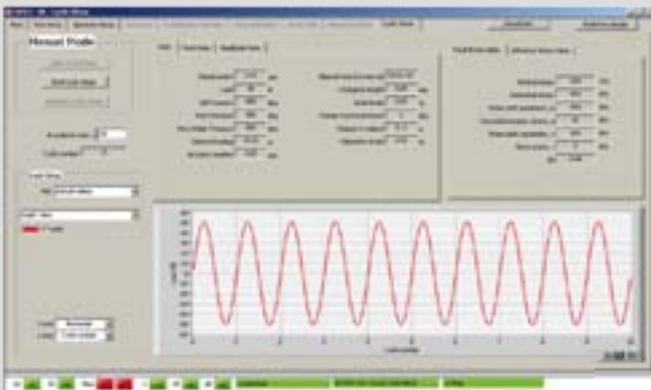
The graph on the stress path panel displays calculated stresses and strains vs. time



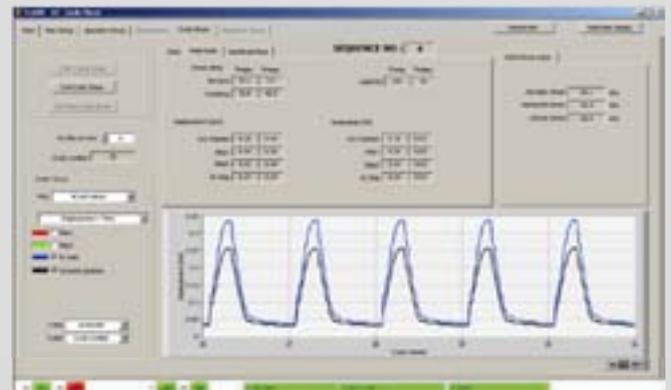
Cyclic stage setup panel showing parameters for a non-standard test method



Transducer calibration. Calibrations can be recalled and verified



Stress-controlled cyclic shear stage. Real time measurements, compression/extension and amplitude values are displayed



Resilient modulus software package: live monitoring of the compression of the sample during the application of the pulse sequence.



Young's and shear modulus are monitored during the cyclic stage



SWCC (soil-water characteristic curve) stage

DYNATRIAX



Ordering information

31-WF7005

DYNATRIAX 50/5, PC controlled automatic dynamic triaxial system, including ± 5 kN double acting pneumatic actuator, 50 kN cap. load triaxial frame, CDC Compact Dynamic Controller 16 channels cap., testing software and PC. 110–240 V, 50–60 Hz, 1 ph.

31-WF7006

DYNATRIAX 50/14, PC controlled automatic dynamic triaxial system, including ± 14 kN double acting pneumatic actuator, 50 kN cap. load triaxial frame, CDC Compact Dynamic Controller 16 channels cap., testing software and PC. 110–240 V, 50–60 Hz, 1 ph.

31-WF7010

DYNATRIAX 100/5, PC controlled automatic dynamic triaxial system, including ± 5 kN double acting pneumatic actuator, 100 kN cap. load triaxial frame, CDC Compact Dynamic Controller 16 channels cap., testing software and PC. 110–240 V, 50–60 Hz, 1 ph.

31-WF7015

DYNATRIAX 100/14, PC controlled automatic dynamic triaxial system, including ± 14 kN double acting pneumatic actuator, 100 kN cap. load triaxial frame, CDC Compact Dynamic Controller 16 channels cap., testing software and PC. 110–240 V, 50–60 Hz, 1 ph.

Upgrading options

31-WF7000/UNS

Unsaturated soil testing package. The package includes an additional servo-valve for air pressure control, a pressure transducer, and the software to automatically perform the test stages using the axis translation method:

- Simultaneous and independent control of air pressure, cell pressure, back pressure and axial load/displacement
- Performance of soil water characteristic curve stage in addition to all the stages offered by the standard software
- Matrix suction and change in air, water and cell volume calculated for each stage

31-WF7000/RES

Resilient modulus determination on compacted samples. This package provides software for performing the test according to AASHTO T307 standard, two 10 mm displacement transducers, and mounting brackets to fit the transducers to the piston of the triaxial cell.

The software includes:

- Two standard sequences of dynamic cyclic stress and static confining stress for subgrade soils and base/sub-base materials
- The possibility to set up customized sequences that the user can save and replicate automatically
- Continuous monitoring in real time of recorded and processed data of each single sequence

Accessories

Triaxial cell and accessories

Banded triaxial cell

See pag 75



28-WF4070 Banded triaxial cell

Double wall triaxial cell

See pag 80



28-WF4170 Double wall triaxial cell for unsaturated test

Sensors

Submersible load cell

31-WF7117

Submersible load cell 5 kN

31-WF7118

Submersible load cell 10 kN

31-WF7119

Submersible load cell 25 kN

- Overload capacity: 200%
- Nominal sensitivity: 2mV/V
- Excitation voltage: 10 V DC
- Non linearity: $\pm 0.05\%$ full scale
- Hysteresis: 0.05% full scale
- Deflection at full load: 0.05 mm
- Maximum side force without effect: 50% full scale
- Compensated temperature range: 0 to 50°C
- Diameter: 75 mm
- Height (excluding ram): 50 mm
- Weight (excluding ram and extension kit): 850 g

31-WF7119



31-WF7121

Axial displacement LVDT transducers

Capacity: ± 25 mm

Input voltage: 10 V DC

Nominal sensitivity: 165 mV/mm

Linearity: 0.50%

Connector: Lumberg type, 6-pin male



31-WF7121

Pressure transducers with de-airing block

28-WF6300

Pressure transducers 1000 kPa

28-WF6310

De airing block for pressure transducer, for banded triaxial cell
See pag 87



28-WF6300 with 28-WF6310

Volume change

29-WF4412

Automatic volume change device with remotely controlled flow inversion

- Capacity: 100 cc
- Accuracy: 0.1 cc
- Maximum operating pressure: 2000 kPa
- Dimensions: W280 x H400 x D260 mm
- Weight: 9 kg



29-WF4412

Note: the sensors are supplied with proper in-line conditioning unit; additional sensors require new in-line conditioning unit available on request

Pressure system

Water distribution panel

31-WF4335

Two pressure lines, complete with digital gauge and hand pump to build-up pressure*

- Dimensions: 605 x 270 x 500 mm (w x d x h)
- Weight: 8.5 kg (approx.)

*If the laboratory is already equipped with a pressure system, the model 28-WF4334 may be used as an alternative.

See page 100



31-WF4335

Bladder Air/water interface

28-WF4320

Air/water interface up to 1000 kPa
See pag 83



28-WF4320 Air/water interface

Air compressor

86-D2015/A

Used to supply the dynamic triaxial system and the air/water pressure system with compressed air.

- Maximum pressure: 10 bar
- Maximum pressure (continuous use): 8 bar
- Tank capacity: 200 l
- Air flow: 33.4 m³/h
- Power rating: 4 kW
- Power supply: 400 V, 50 Hz, 3 ph (for 220 V, 60 Hz, 3 ph ask for 86-D2015/AZ model)
- Overall dimensions: 1600 x 500 x 1050 mm (wxdxh)
- Weight: 125 kg (approx.)

Air treatment unit

86-D2019

Using this dryer ensures the production of clean and dry, high quality air, which is essential for preserving the testing system. It can be used for different applications, either as an independent unit or connected to the air compressor.

Supplied complete with particle filter 5µm and two oil filters 1 and 0,1 µm.

- Power rating: 190 W
- Power supply: 230 V, 50-60 Hz, 1 ph (for 110 V, 60 Hz, ask for 86-D2019/Z model)
- Capacity: 900 l/min
- Pressure: 16 bar
- Overall dimensions: 220 x 560 x 460 mm (wxdxh)
- Weight: 24 kg (approx.)



De airing water system

See pag 84

Upgrading accessories

Bender elements

See pag 90

Local strain transducers

See pag 92

Note: local strain transducers and bender elements require advanced kit to be fitted to the triaxial cells see pag 77

FACT: Fully-Automated Cyclic Triaxial



main features

- > Easy installation: assembled and ready to go all-in-one, streamlined instrument that's easy to install
- > Easy testing: fast and reliable results
- > Precision engineered, integrated load frame for excellent sample alignment.
- > Excellent waveform fidelity from the integrated acquisition and control functions
- > Measure and control—axial displacement, axial load, confining pressure, back pressure, pore pressure, volume change.
- > Zero friction and no need for shaft bushes because the shaft is integrated into the cell
- > Lightweight acrylic cell wall for improved specimen loading, less specimen disturbance and provides unobstructed specimen viewing and safe management of cell pressure.
- > Overload shut-off and protection switches that safeguard your equipment
- > 4x over-sampled data acquisition for highly accurate test data
- > Flash based firmware allows field updates of all modules
- > Communicate via Ethernet or USB
- > Optional: on-specimen axial displacement x2, on-specimen circumferential, mid-height pore pressure

Standards

ASTM D5311 | ASTM D3999 | ASTM D4746 | ASTH00 T0307 | BS 1377:8

FACT - Fully Automated Cyclic Triax

FACT is an all-in-one, streamlined instrument that's easy to install:

- Totally integrated system, ready to install straight out of the box
- Delivered fully plumbed and therefore easy to set-up, clean and service
- Internal vacuum generator for ease and simplicity
- Computer is conveniently pre-loaded with software applications
- Compact design, on wheels, for easy positioning in your laboratory

Controlling FACT is IPC Global's Integrated Multi-Axis Control System (IMACS). IMACS delivers leading edge performance, unparalleled control and the ultimate in flexible data acquisition.

For servo-controlled testing machines, the IMACS provides excellent waveform fidelity from integrated channel acquisition and control functions simultaneously on all channels.

FACT includes:

- Integrated Control & Data Acquisition System (IMACS)
- Integrated Reaction Frame
- Lightweight acrylic triaxial cell
- 11kN Servo-pneumatic actuator assembly
- Pneumatic reservoir assembly
- Submersible Load cell ($\pm 12\text{kN}$) w/ In-Line Conditioner (ILC) & Shaft
- Vertical LVDT ($\pm 25\text{mm}$) w/ In-Line Conditioner (ILC)
- Pressure Transducer (1000kPa)
- Control Panel Assembly
- Combined pressure/volume-change apparatus
- Cabinet assembly c/w water/vacuum distribution panel
- Vacuum platen kit
- Compressed air gun cleaning assembly
- UTS software



Technical specification

- Maximum axial loading: 11 kN*
- Load Cell: 25 kN Submersible
- Ram Displacement: 50 mm
- Cell Dimensions: 240 mm I.D. x 415 mm High
- Specimen sizes: 38/50/70/100 mm diameter (Other sizes available)
- Maximum test application frequency Typically 5 Hz
- Maximum dynamic cell pressure frequency 1 Hz
- Cell Pressure up to 1000 kPa*
- Back Pressure up to 1000 kPa*
- Control Modes Force/Stress/Displacement & Strain
- Reaction Frame 3 Integrated internal columns
- Dimensions: 1370 x 630 x 1140 mm (h x d x w)
- Weight: 165 kg
- Power supply: 110 V/240 V, 50-60 Hz, 1 ph.
- Operating Environment 5° C to 30° C

* Load and pressure achievable with 10 bar compressed air supply

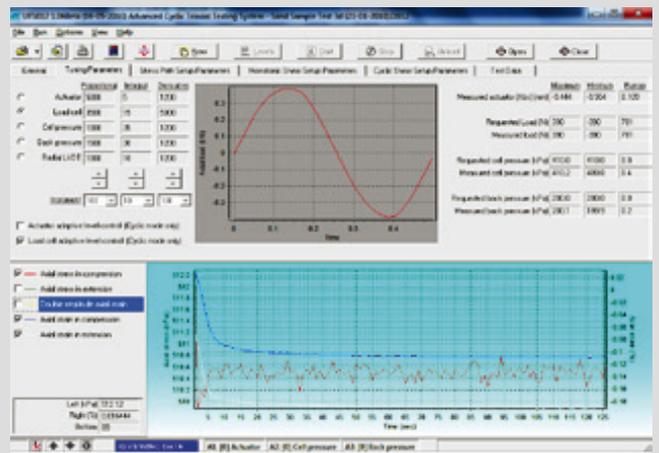


Floating Ram

For more details about technical features and ordering information contact Controls Group

Software

IPC Global's UTS software is purpose built and draws upon over 30 years of advanced materials testing experience. IPC Global's test and control software (UTS) is known for its simplicity in use, clarity of results and analytical power. UTS allows for real time graphing of results and configurable real time transducer levels screen, as well as customizable test templates to streamline the testing process.



TUNING PARAMETERS Easy to navigate menus to allow you to set up your test parameters with minimal hassle.

APPLY SIGNATURE AS CYCLIC SHEAR PARAMETERS simulate real world events from violent earth-quakes to sedate ocean waves.



RESONANT COLUMN



main features

- > Combined Resonant Column (RC)/Torsional Shear (TS) device
- > Pneumatically operated, confining pressure up to 1 MPa
- > Automatic detection of fundamental frequency
- > RC: damping ratio from half-power bandwidth and from free-vibration decay
- > TS: damping ratio from hysteresis loops
- > Internal floating frame for large angular and axial deformation
- > Suitable for 50 mm diameter specimens (or 38 mm on request)
- > Integrated data acquisition generation and elaboration

Standards ASTM D4015

31-WF8500

Resonant column, combined resonant column/torsional shear device

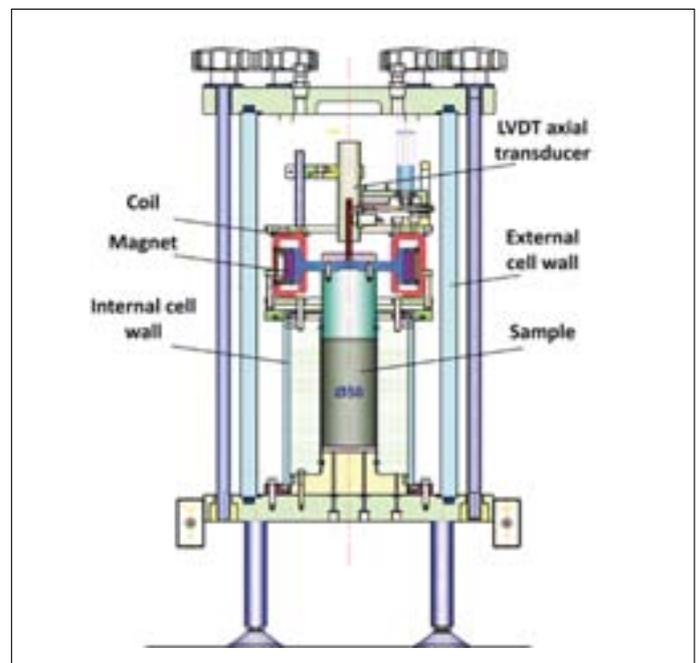
for the automatic determination of damping ratio from "half power bandwidth" and free vibration decay method 110-220V, 50-60 Hz, 1 ph.

Resonant Column combines the features of both resonant column and torsional shear into a single unit, including a current-driven motor to apply torsional load to the sample, a series of transducers with signal conditioning, a cell and back pressure electro-pneumatic control system and a data logger.

In the Resonant Column test a cylindrical soil specimen is restrained at the bottom and dynamically excited at the top. The torsional force at the top is generated using an electrical motor constituting eight drive coils encircling four magnets attached to a drive plate. The generated frequency is up to 300 Hz. The fundamental mode of vibration is determined from the maximum amplitude of motion; from the

resonant frequency, shear wave velocity and shear wave modulus are calculated using elasticity theory. The corresponding shear strain is evaluated from the motion amplitude. Material damping can be determined from the half-power bandwidth or from a free-vibration decay curve, which is generated by shutting off the driving power.

In the Torsional Shear test the soil specimen is deformed cyclically at a low frequency (a maximum of 10 Hz), whilst continuously monitoring torque and deformation. From the torque-deformation curves, a relationship between average shear stress and average shear strain is obtained, which in turn provides the shear modulus and the damping ratio.



Schematic layout of Resonant column



Detail of electric motor, coils and magnets

Saturation stage

During the saturation stage, small amounts of cell and back pressure are applied in steps, causing the air in the pore spaces to dissolve. A control system generates both cell and back pressures using air/water interfaces. Cell, back and pore pressures are measured by 1000 kPa capacity pressure transducers to an accuracy of 0.1 kPa. Volume change is measured by a high-sensitivity volume change apparatus that consists of a piston connected to a ±12.5 mm LVDT transducer sealed against a precision-machined calibration chamber with 40 cc capacity and 0.2% accuracy.

Consolidation stage

The sample is subjected to the same back pressure used during the last saturation step while the cell pressure depends on the effective stress required for the next stage. The consolidation stage is considered completed when pore water pressure is completely dissipated and volume change is negligible. During this stage the axial compression is measured using a LVDT transducer with ±12.5 mm travel.

RC and TS tests are usually performed under undrained conditions, closing the drainage lines

and measuring changes in pore water pressure.

Resonant Column test (RC)

A signal generator supplies a sinusoidal voltage to the driving amplifier and a proportional current to the coils attached to the cell body. The magnetic field in the coils interacts with the magnets attached to the driving plate which, in turn, conveys a torsional oscillation to the top of the specimen. As the frequency of the input signal varies, the dynamic response of the specimen results in a varying motion amplitude. The amplitude is captured either by an accelerometer attached to the driving plate or by proximity displacement transducers measuring the movement of the driving plate relative to the coils.

The frequency that maximizes the motion of the top of the specimen is associated with the first-mode resonance and is determined by applying an input signal with a frequency sweep. The secant shear modulus of the soil can be evaluated from the resonant frequency.

The damping ratio can be evaluated by two methods:

- in the domain of frequency, from the complete frequency

response of the soil specimen (half-power bandwidth);

- in the domain of time, from a free-vibration decay curve that is generated by shutting off the driving power (logarithmic decrement method).

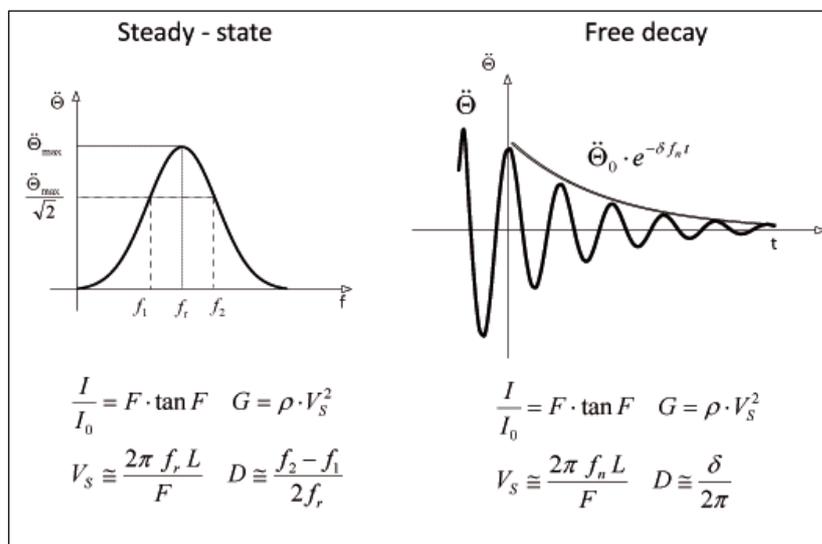
The half-power bandwidth is defined as the width of the peak, where the magnitude of the frequency response function is $1/\sqrt{2}$ times the peak value. In the logarithmic decrement method, the free vibration displacement amplitude history of the soil specimen to an impulse is measured and recorded. A typical free decay curve is shown below. Logarithmic decrement is the natural logarithmic value of the ratio of two adjacent values.

At a given effective stress, RC tests are repeated several times, progressively increasing the amplitude of the input voltage, thus obtaining the secant shear modulus and the damping ratio corresponding to increasing shear strain values.

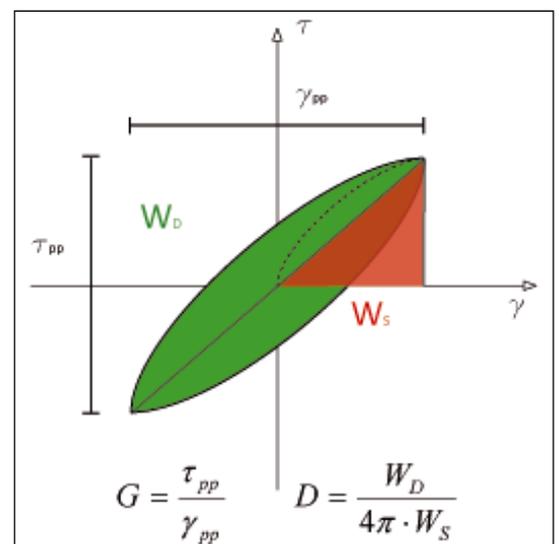
Torsional Shear test (TS)

A sinusoidal current is applied to the coils in a quasi-static condition and the motion of the top of the specimen is monitored using the proximity displacement transducers. The input current (proportional to the shear stress) and the corresponding torsional rotation (proportional to the shear strain) are simultaneously recorded. The shear modulus of the soil is determined from the average slope of the stress-strain loops, while material damping is related to the area of the hysteresis loop.

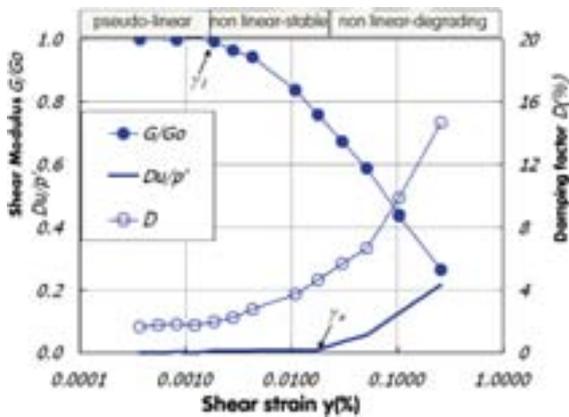
At a given effective stress, TS tests are repeated several times, progressively increasing the amplitude of the input voltage, thus obtaining the secant shear modulus and the damping ratio corresponding to increasing values of the shear strain.



RC: Resonant column test



Torsional Shear: determination of shear modulus (G) and damping ratio (D)



RC / TS: strain level and mechanical behaviour of the soil specimen

The system consists of the following components:

Triaxial cell

Aluminum cell with stainless steel columns and acrylic transparent cylinder with 170 mm int. dia. x 200 mm ext. dia., including channels for bottom drainage; internal floating frame for assembling the electrical motor that applies the torsional loads; this motor has four NeFeB 10 x 25 x 40 mm magnets and eight coils.

Test accessories for 50 mm (or 38 mm available on request) dia. specimens

n°2 calibration bars kit + n°1 calibration weight.

Main control box, PC and software

Compact unit connected to PC contains all control, power supply and electrical and pneumatic devices. This system contains also the air actuators (I/P converters) and the amplification equipment.

Sensor kit containing:

Axial LVDT transducer, volume change apparatus, three Pressure transducers, two Eddy current displacement sensors (with miniaturized driving system), MEMS accelerator.

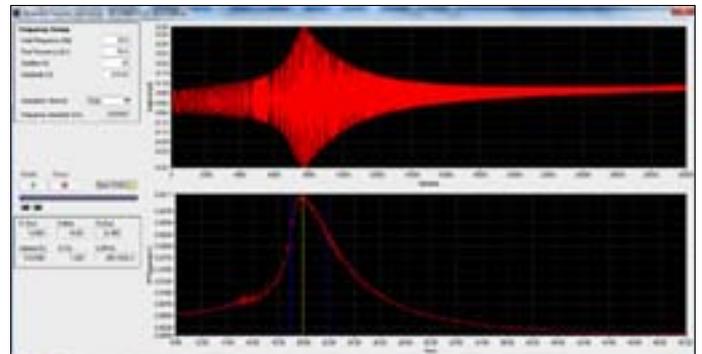
Technical specification

- Maximum torque: 1.2 Nm
- Maximum angular deformation: 10°
- Maximum cell and back pressure: 1 MPa.
- 8 channels signal conditioning unit
- USB data acquisition and signal generation board
- Two electro-pneumatic converters for cell and back pressure
- Excitation frequency: Dynamic (RC) 1-300 Hz; Cyclic (TS) from 0 to 50 Hz maximum
- Dimension: Control Box 51x45 x 35 cm (h x w x d); Cell 55 cm x 27 cm (h x diam.)
- Weight: approx 50 kg

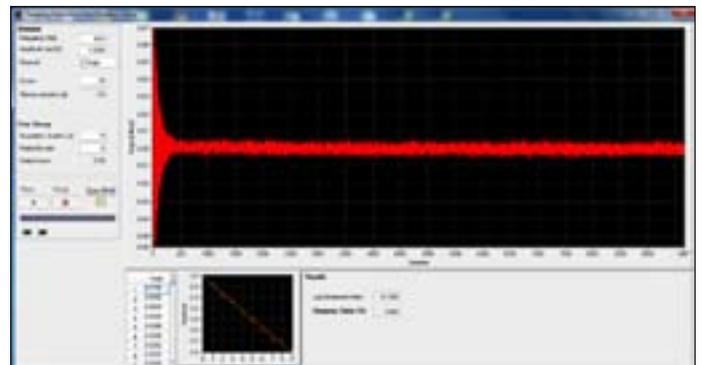
Accessories

- 28-WF4051/A**
Membrane stretcher for 50 mm diameter samples.
- 28-WF4051/B**
O-ring placing tool for 50 mm diameter samples.
- 28-WF4055**
Rubber membranes for 50 mm diameter samples (pack of 10).
- 28-WF4056**
O-ring for 50 mm diameter samples.
- 28-WF4051/E**
Lateral filter drains (pack of 50).
- 31-WF4051/H1**
Two-part split former for 50 mm diameter samples with vacuum attachment.
- 28-WF4051/G**
Hand sampler complete of cutter, wooden dolly and receiver for 50 mm samples.

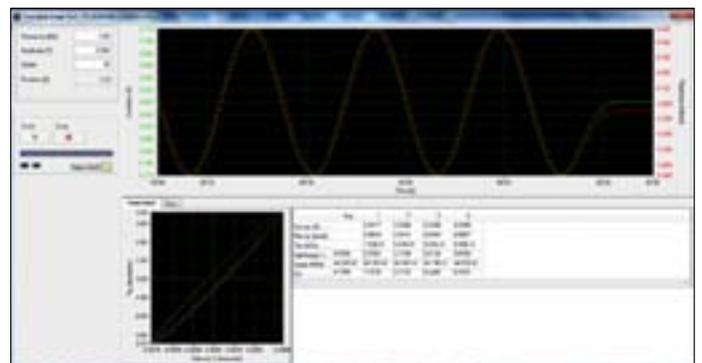
Software



Resonant Column "steady-state"



Resonant Column "free decay"



Torsional Shear: application of the cyclic torque

Air compressor

28-WF2016/A
Air compressor, 10 bar maximum working pressure (8 bar continuous) , output 234 l/min, 100 L receiver. 230 V, 50 Hz, 1 ph. (110 V, 60 Hz, 1 ph ; 220 V, 60 Hz, 1 ph models are available on request)

28-WF2016/2
Air filter/water trap for air compressor.

De-airing water system

See pag 84

Cyclic simple shear



main features

- > Constant diameter test performance
- > The system enables performance of cyclic and monotonic simple shear tests: at constant volume with strain control, at constant vertical stress with control of shear strain, at constant vertical stress with load control and with any superimposed static shear stress
- > Operating frequency up to 10 Hz (depending on test and sample conditions)
- > 5kN lateral (horizontal) and axial (vertical) actuators
- > 5kN load cells fitted in-line with actuators, 1 N accuracy

Cyclic simple shear 31-WF7500

31-WF7500

Cyclic Simple Shear machine

PC controlled, with IMACS, fitted in cabinet, including adapters for 70mm samples. 110-220V 50-60 Hz 1ph.

The cyclic simple shear apparatus is generally used for research as it can quite easily simulate many different field loading conditions in order to investigate the dynamic behaviour of soils, such as:

- Stability during seismic events of submerged slopes on the continental shelf characterized by layered clays
- Degradation of shear stress in cohesive soils under cyclic loading
- Evaluation of the liquefaction parameters of non-cohesive soils under cyclic loading

The cyclic simple shear is a plane strain device. The shear strain is induced by lateral (horizontal) movement at the bottom of the sample relative to the top. The diameter of the sample remains constant, therefore any change in volume can only be as a result of axial (vertical) movement of the

top platen.

The system is designed to allow a sample to be consolidated and sheared under drained conditions.

Sample

The standard sample is 70 mm diameter. The test can also be performed on 50mm diameter samples using the conversion kit 31-WF7500/1.

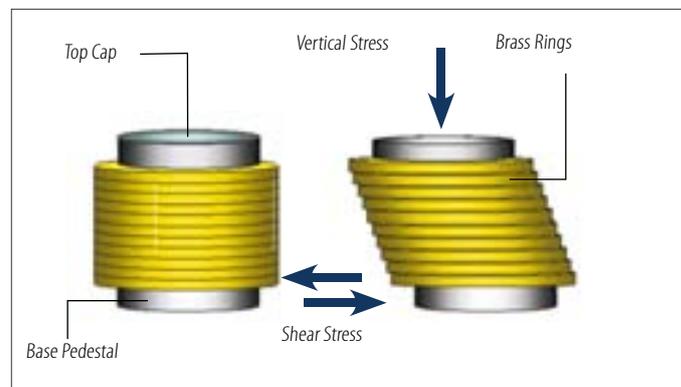
The sample is positioned on a pedestal with a top cap the same as a triaxial sample, and covered by a rubber membrane placed

and secured with O-rings. To maintain a constant diameter (K0 conditions) the sample is laterally confined by a series of brass rings.

Shear stage

During shear the rings slide across each other as shown below.

When the shear stage is running, the vertical height of the sample can be maintained constant by the vertical actuator in a closed loop control. Constant volume tests can therefore be performed on either dry or saturated samples, maintaining drained conditions.



Stress conditions of the sample in the cyclic simple shear machine 31-WF7500

Cyclic simple shear

Here below a general description of main components of the system:

Simple shear machine

The base machine consists of a simple shear load frame, an air receiver with axial (vertical) and lateral (horizontal) loading control valves and two 5 kN actuators, built into a specially designed floor-mounted cabinet, which also houses the IMACS and the PC. The axial and lateral actuators are fixed to the load frame, which supplies the reaction to the forces applied. Each actuator has an internal displacement transducer, which relays the actuator piston position back to the computer. This is very important when setting up a sample; it allows you to set enough travel for the test duration.

The top half of the area where the sample is set up is rigidly fixed and houses a 50 mm diameter vertical ram in a linear bearing to allow axial movement but prevent lateral movement. The bottom half is mounted on roller bearings in the same way as in a standard shear box apparatus.

Integrated Multi-Axis Control System (IMACS)

The IMACS is a compact self-contained unit that provides all critical control, timing and data acquisition functions for the test and the transducers.

The data acquisition module has six normalized (± 10 V range) transducer input channels. These channels are digitized by accurate, high speed 20-bit (A/D) converters for data analysis and presentation.

The control module has four channels for feedback control. Two are dedicated to the actuator for axial load/displacement, the other two are dedicated to the application of the lateral load/displacement.

Both modules have their own dedicated high speed USB 10 b/s or RS232 interface. This allows uninterrupted, simultaneous communication, enabling increased speed of cooperation and flexibility.

Supervised by the PC, the IMACS automatically controls the loading operation for individual types of test. The IMACS directly controls the servo-valve to apply the requested loading rate or waveform. While the specimen is being subjected to loading forces, the IMACS captures data from the transducers and transfers these, via the USB or RS232 link, to the PC for processing, display and storage.

Load cells

Two 5 kN load cells are assembled in-line with the axial and lateral actuators. They are fitted with a signal conditioning pod, allowing the transducers to be changed or moved within the data acquisition system without the need to be recalibrated. Accurate to 1N.

Displacement transducer

A transducer with ± 25 mm travel is built into each actuator to measure the actuator position and provide feedback control.

The vertical displacement transducer is calibrated over ± 2.5 mm for controlling and maintaining the sample height. Accurate to 1 μ m.

In-line signal conditioning pods

These units normalize all the transducer outputs, allowing transducers to be moved from channel to channel without the need to be recalibrate.

In summary, the system comprises the following:

- Cyclic simple shear machine with 5kN capacity lateral and axial actuators
- Accessories for sample preparation
- Load and displacement transducers
- Control and data acquisition system
- Software and PC

Technical specifications

- Simple shear machine: floor mounted, steel box frame including integral double-acting lateral and axial pneumatic actuators, each with a ± 25 mm internal displacement transducer (accuracy: 0.01 mm). The top cap is fixed and the pedestal is mounted on roller bearings.
- Sample size: 70 mm diameter (50 mm with conversion kit)
- Maximum load: ± 5 kN axial and lateral
- Operating frequency: up to 10 Hz (depending on test and sample conditions)
- Overall dimensions: 1500 x 700 x 1200 mm (w x d x h)
- Power supply: 240 or 110 V, 50-60 Hz, 1 ph
- Weight: 350 kg (approx.)

Accessories

31-WF7500/1

50mm diameter sample accessories including pedestal and top cap.

86-D2015/A

Air compressor, 10 bar maximum pressure, 200 L capacity, 5.5 kW. 400 V, 50 Hz, 3 ph.

86-D2019

Air treatment unit for the production of clean and dry, high quality air, comprising: particle filter 5 μ m and two oil filters 1 and 0,1 μ m. 230 V, 50-60 Hz, 1 ph.

SOFTWARE

Consolidation stage

The consolidation stage is simply the application of a static axial loading (normal) stress to the specimen while the lateral loading (shear) axis is held stationary. Axial stress and specimen displacement (axial and lateral) data are measured over time and logged by the system. Logged data is also displayed to the operator in the form of graphs and tables as the test stage proceeds. The consolidation stage is manually terminated by the operator once consolidation of the specimen is determined to be complete.

Cyclic simple shear stage

This stage of the test applies a lateral cyclic shear force, or optionally a displacement, to the specimen, while the axial axis is either maintained at the specified stress, or optionally, the specimen height is maintained. Both axial lateral load and specimen displacement together with shear induced pore pressure* are measured for each loading cycle. Measured data is obtained from 50 sample points captured over the cycle period. This data is displayed to the operator in the form of wave shapes, graphs and tables and also logged by the system to an archive data file. The loading cycle shape is operator-selectable from pre-defined functions but may also be a user-generated shape.

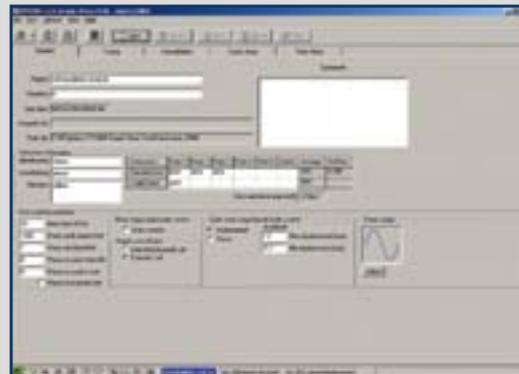
Linear displacement shear stage

The linear displacement shear stage of the test applies a rate of lateral shear displacement to the specimen. Both axial, lateral load and specimen displacement, together with shear induced pore pressure* are measured for each loading cycle. Measured data is displayed to the operator in the form of graphs and tables and also logged by the system to an archive data file.

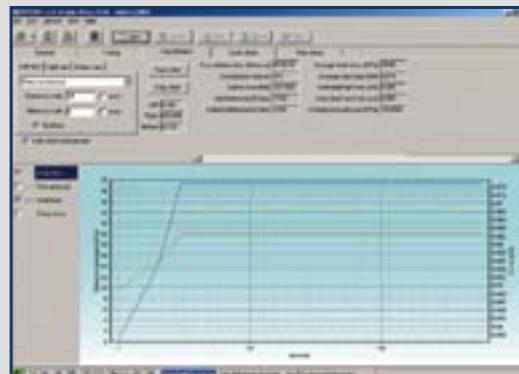
General test setup

The setup stage of the software allows you to select the type of test parameters you wish to use, for example: consolidation stage axial stress; shear stage under axial stress or constant height control; cyclic shear stage lateral axis under load or displacement control with choice of wave shape; rate of shear; test termination on cycle counts or percent axial strain.

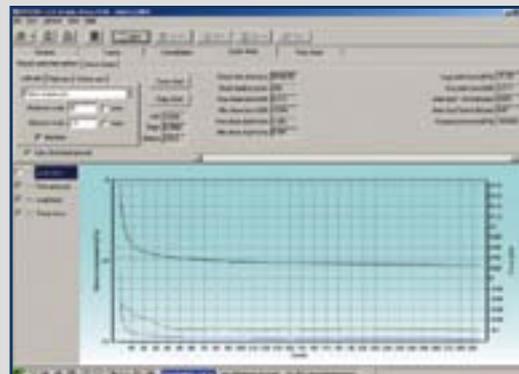
**Since the pore pressure is zero through shear, the shear induced pore pressure is calculated using the assumption that: the change in normal stress is equal to the change in effective stress and assumed to be equal to the change in pore water pressure that would occur in a sealed specimen confined by a constant total stress.*



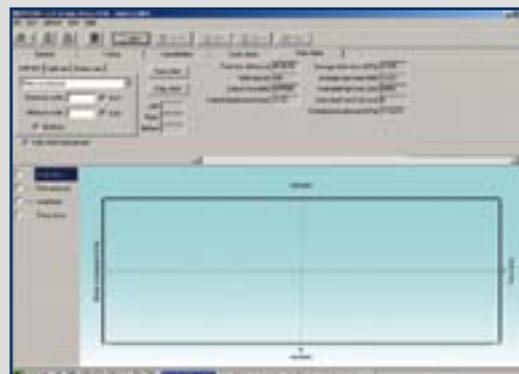
Set up parameters



Consolidation stage. The graph can display axial stress, induced pore pressure, axial load and lateral load vs. time



Cyclic shear stage. The graph can display axial stress, induced pore pressure, axial load and lateral load vs. time or cycles



Linear displacement shear stage. The graph can display axial stress, induced pore pressure, axial load and lateral load vs. time

Compacted road base and subbase soils

33 | Moisture/Density relationship

34 | CBR California Bearing Ratio

35 | Field density, Bearing capacity

38 | Soil permeability

When highway or railway earthworks, bases, subbases and dams are constructed and subgrades are prepared, it is necessary to compact the material mechanically, to confer a high degree of density. This procedure increases the shear strength, reduces the permeability and water absorption, and reduces the tendency to settle under repeated loading. Compaction is therefore defined as the process of increasing the density of a material by mechanical means. To simulate the procedure adopted in the earthworks to obtain a defined level of compaction in the field, several laboratory tests have been developed over the years; they only differ for the different level of energy applied to the soil sample.

The equipment proposed in section 33 concern mainly Proctor moulds and compactors.

Section 34 refers mainly to the CBR equipment and various models of loading presses.

The equipment shown in section 35 concerns mainly all devices for determining the in situ density and various models of plate bearing test apparatus.

Section 38 propose various apparatus for determining the permeability of soil.

33 Moisture/Density relationship

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34 CBR California Bearing Ratio

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35 Field density, Bearing capacity

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38 Soil permeability

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Proctor moulds and rammers

Proctor moulds and rammers conforming to EN

Standards EN 13286-2

Moulds

Code	Internal diameter (mm)	Body height (mm)	Approx. weight (kg)
33-T0070/EN	100 ± 1	120 ± 1	5.0
33-T0070/ENS*	100 ± 1	120 ± 1	5.0
33-T0071/EN	150 ± 1	120 ± 1	8.9
33-T0071/ENS*	150 ± 1	120 ± 1	8.9
33-T0074/E	250 ± 1	200 ± 1	32

*Split version

Steel plates

Code	Diameter (mm)	Thickness (mm)	Approx. weight
33-T0070/E1	99.5	10	0.6
33-T0071/E1	149.5	10	1.3
33-T0074/E1	249.5	20	7.6

Rammers

Code	Rammer diameter (mm)	Free fall height (mm)	Rammer weight (kg)	Approx. Weight (kg)
33-T0075/E	50 ± 0.5	305 ± 3	2.49	3.0
33-T0076/E	50 ± 0.5	457 ± 3	4.54	5.3
33-T0077/E*	125 ± 0.5	600 ± 3	15.0	23

*A semi-automatic high energy compactor is available on request.

Used for determining the relationship between the moisture content and density of compacted soil. The moulds include collar, mould body and base plate.

The rammer construction includes a guide sleeve with vent holes. Different versions are available that conform to the various commonly used standards. They are all made of plated steel and are identical in shape, only differing slightly in diameter and capacity. For the extrusion of soil specimens from the mould, the Universal specimen extruder may be used. See Accessories.

An alternative (and preferable) method of compacting is to use an automatic compactor. For more information, see AUTO-PROCTOR, the automatic Proctor-CBR compactor, pages 136-138.

Proctor moulds and rammers conforming to ASTM, AASHTO and CNR

Standards

ASTM D558, D698, D1557 | AASHTO T99, T134, T180 | CNR N°69

Moulds

Code	Volume (cm ³)	Internal diameter (mm)	Body height (mm)	Approx. weight (kg)
33-T0070/A	944	101.6	116.4	7.0
33-T0071/A	2124	152.4	116.4	9.0
33-T0072/A	944	101.6	116.4	7.5
33-T0073/A	2124	152.4	116.4	9.5

Rammers

Code	Rammer diameter	Free fall height (mm)	Rammer weight (kg)	Approx. weight (kg)
33-T0075	50.8	305.0	2.49	3.0
33-T0076	50.8	457.2	4.54	5.3

Accessories (for all moulds)

16-T0080

Universal extruder

Used to remove 4" (101.6 mm), 6" (152.4 mm), 100 mm and 150 mm diameter specimens from Proctor, CBR and Marshall moulds. Constructed of steel, with adapters that correspond to the diameter of the moulds and can easily be fitted. Capacity: 50 kN, Ram travel: 197 mm (ram) + 68 mm (screw), Weight: 25 kg (approx.)

Proctor moulds and rammers conforming to BS

Standards BS 1377:4, 1924:2

Moulds

Code	Volume (cm ³)	Internal diameter (mm)	Body height (mm)	Approx. weight (kg)
33-T0070/BS	1000	105.0	115.5	7.0

Rammer

Code	Rammer diameter (mm)	Free fall height (mm)	Rammer weight (kg)	Weight (kg)
33-T0075/B	50	300	2.5	3.0
33-T0076/B	50	450	4.5	5.3



16-T0080

Proctor moulds and rammers conforming to NF

Standards NF P94-078, P94-93, P98-231-1

Moulds

Code	Volume (cm ³)	Internal diameter (mm)	Body height (mm)	Approx. Weight (kg)
33-T0070/NF	944	101.6	116.4	7.0
33-T0072/NF*	944	101.6	116.4	7.5
33-T0089/NF	2758	152.0	152.0	9.0
33-T0089/NFS*	2758	152.0	152.0	10.0

*Split versions

Rammer

Code	Rammer diameter (mm)	Free fall height (mm)	Rammer weight (kg)	Weight (kg)
33-T0075	50.8	305	2.49	3.0
33-T0076	50.8	457	4.535	5.3

Proctor moulds and rammers conforming to NLT and UNE

Standards NLT-108/91, UNE 103-500

Moulds

Code	Volume (cm ³)	Internal diameter (mm)	Body height (mm)	Approx. Weight (kg)
33-T0070/C	1000	102.0	122.4	7.0
33-T0070/C3*	1000	102.0	122.4	7.0
33-T0071/C	2320	152.4	127.0	10.0
33-T0071/C3*	2320	152.4	127.0	10.0

*Split versions

Rammer

Code	Rammer diameter (mm)	Free fall height (mm)	Rammer weight (kg)	Weight (kg)
33-T0075	50.8	305	2.49	3.0
33-T0076	50.8	457	4.535	5.3



EN compaction equipment



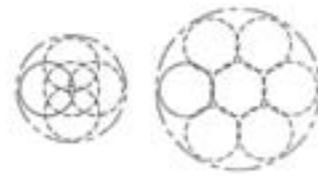
Compaction equipment

Universal Proctor/CBR automatic compactors | T3500 series

Standards

EN 13286-2 | EN 13286-47 | ASTM D698 | ASTM D1557 | ASTM D1883 | AASHTO T99 | AASHTO T180 | AASHTO T193 | BS 1377:4 | NF P94-093 | NF P94-066 | UNE 103-500

Mould Ø 100/4" Mould Ø 150/6"



Model 33-T3512 Detail of blow distribution, evidencing the central blow on 150-152 mm dia. specimens

- One model only to satisfy all Standard requirements (ASTM/AASHTO/EN/NF/BS/UNE etc.), including the central blow
- User friendly selection of Standards
- Possibility to program up to 15 user defined compaction cycles and sequences



main features

- > Universal application: one model only to satisfy all Standard requirements, including central blow
- > Fully automatic programmable micro-processor controlled
- > User friendly selection of Standards
- > The rammer is included. The face dia. and weight can be easily set conforming to the selected Standards
- > User defined compaction sequences, ideal for research purposes
- > Lateral transparent panel to follow the compaction evolution and to make easier the removal of the mould at the test end
- > Protection guards for operator safety
- > Noise reduction cabinet available
- > Unique hammer lifting device to guarantee correct drop height

Ordering information

33-T3512

Universal Fully Automatic Programmable, Proctor/CBR automatic compactor for specimens from 100 to 152.4 mm dia, conforming to EN, ASTM, AASHTO, BS, NF, UNE and major international Standards. Rammer kit included. 230V, 50 Hz, 1 ph [33-T3513](#)
Same as above but 220V, 60 Hz, 1 ph [33-T3514](#)
Same as above but 110V, 60 Hz, 1 ph

Conforming to all the above Standards, designed for moulds 100 to 102 and 150 to 152.4mm diameter, this programmable,microprocessor-controlled model is particularly suitable for research purposes as it is possible to program a user-defined compaction sequence and a sequence conforming to standards. A sophisticated compaction technique permits the central blow required for the 150-152.4 mm diameter moulds. The end of each layer compaction is indicated by a visual and acoustic signal. The machine is supplied complete with compaction hammer which can be easily set conforming to the Standard in use as specified in the table.

All models can be supplied complete with noise reduction cabinet. See page 139.

Models	33-T3512, 33-T3513, 33-T3514
Mould/specimen dia.	100 to 152.4 mm (4" and 6")
Rammer face dia. <i>(interchangeable conforming to Standards, see table below)</i>	50 and 50.8 mm.
Rammer weight <i>(interchangeable conforming to Standards, see table below)</i>	2.49-2.50-4.50-4.53 kg
Rammer drop <i>(interchangeable conforming to Standards, see table below)</i>	300, 305, 450, 457 mm
Blow rate	25 blows/min, approx.
CE protection	Included
Power rating	650 W approx.
Overall dimensions (wxdxh)	460 x 460 x 1390 mm
Weight approx.:	140 kg

Rammer application guide.

The Universal Automatic Compaction Hammer series 33-T3500 as specified, can be easily set with the different rammer face diameter, rammer and drop weight.

The following table summarizes all the Standard requirements. This model can surely satisfy other National Standards too.

Standards	Rammer face dia.	Rammer weight	Rammer drop height
ASTM 698	50.8 mm	2.49 kg	305 mm 457 mm
ASTM D1557	50.8 mm	4.53 kg	305 mm 457 mm
ASTM D1883	50.8 mm	2.49 kg 4.53 kg	305 mm 457 mm
AASHTO T99 AASHTO T180 AASHTO T193	50.8 mm	2.49 kg 4.53 kg	305 mm 457 mm
EN 13286-2 EN 13286-47	50 mm	2.50 kg 4.50 kg	305 mm 457 mm
BS 1377:4	50 mm	2.50 kg 4.50 kg	300 mm 450 mm
NF P94-093 NF P94-066	50 mm	2.49 kg 4.53 kg	305 mm 457 mm
UNE 103-500	50.8 mm	2.49 kg 4.53 kg	305 mm 457 mm



33-T3512 Detail of lifting mechanism. The system feature a unique device which automatically compensates the backlash and the mechanical wear for long durability and maintaining constant the rammer drop



User defined video

33-T3512 View with open doors. The transparent right panel permit the visual control of the compaction and, at the end, the easy removal of the mould.

Proctor/CBR ASTM automatic compactors | T3600 series

The automatic compactor provides a fully automatic and uniform compaction of specified effort, thus ensuring repeatable test results and eliminating any operator fatigue during the tests.



main features

- > Automatic programmable compactor to Standards ASTM and AASHTO
- > Graphic display showing test progress in real time
- > Possibility to program up to 3 user defined compaction cycles and sequences
- > Rammer with both head and weights included
- > Unique rammer lifting device to guarantee correct and longlife drop height
- > All safety features as protection guards and emergency button included as standard
- > Lateral transparent panel ensures free view on the compaction evolution
- > Double doors for free access to wide test area
- > Noise reduction cabinet is available (see accessories)

Ordering information

33-T3612

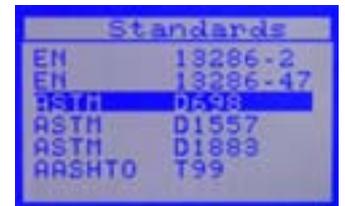
Automatic Proctor/CBR compactor for 4 and 6" dia. moulds, conforming to ASTM/AASHTO Standards. Rammer kit included. 230 V, 50 Hz, 1 ph

33-T3613

Same as above but 220 V, 60 Hz, 1 ph

33-T3614

Same as above but 110 V, 60 Hz, 1 ph



Standards

ASTM D698 | ASTM D1863 | ASTM D1557 | AASHTO T99 | AASHTO T180 | AASHTO T193

Conforming to ASTM and AASHTO Standards, this microprocessor-controlled soil compaction tester is designed for 4" and 6" moulds. The end of each layer compaction is indicated by a visual and acoustic signal. The machine is supplied complete with all relevant accessories as: 50.8 mm circular face for 4" diameter specimen and interchangeable sector face for 6" diameter specimens, and a rammer weights (2495/4353 g) that are easily interchangeable according to the reference standard.

The wide control display and panel are connected with a shock absorber system and can be tilted according to user comfort.

The software gives the possibility to program customized sequences allowing the user to set the rotation angle from 5° to 90° with 5° steps between two subsequent blows, granting a precise and uniform blows distribution.

The rotating base has screw clamping system for the moulds locking.

Two doors, one blind frontal and one transparent lateral, ensure comfortable access to a wide test area and gives free view during test running.

The soil automatic compactor can be supplied with noise reduction cabinet (see accessories).

See page 139.

Models	33-T3612, 33-T3613, 33-T3614
Standards	ASTM AASHTO
Mould/specimen dia.	4" and 6" (101.6 to 152.4 mm)
Rammer (s)	Included: circular 4" (50.8 mm) head and sector face for 6" specim.
Rammer weight	Adjustable: 2495/4353 g
Rammer drop (adjustable)	305 and 457 mm
Blow rate	25 blows/min approx.
CE protection	Included
Power rating	650 W approx.
Overall dimensions (wxdxh)	457 x 455 x 1390 mm
Weight approx.:	130 kg

NOTE ASTM/AASHTO compactor can be easily converted to compact 100 mm dia. specimens conforming to EN using a 50 mm dia. tamping face available on request and adjusting the weight and the drop height of the hammer.



33-T3612 ASTM/AASHTO automatic compactor. Detail of the rammer sector face with the interchangeable sector face to compact 6" dia. specimens.

33-T3000/CB

Noise reduction cabinet for CBR-Proctor automatic compactors

The cabinet is manufactured from sheet steel and lined internally with soundproofing material to considerably reduce the noise.

This cabinet is essential for use in laboratories that adhere to CE safety standards. The control panel of the automatic compactor can be easily removed from the machine and placed externally on the cabinet wall as shown.

The cabinet is designed to make the operator access very easy as the compactor front protection door can be completely opened for filling and moulds removal.

-Overall dimensions: (wxdxh). 850 x 672 x 1562 mm

-Weight (cabinet only): 90 kg approx



33-T3512 installed inside the Noise reduction cabinet 33-T3500/CB. Double access door and top door to make easy all load and unload operations.

main features

- > Large lateral space permitting the total opening of the compactor door and consequent easy filling and removal of moulds
- > The top of the cabinet can be opened for easy removal of the rammer in case of routine maintenance
- > Possibility to fit the control panel to the external wall without electrical disconnection

Vibrating compaction hammer

Standards

EN 12697-9 | EN 12697-10 |
EN 12697-32 | EN 13266-4 | BS 1377:4 |
BS 1924:2

Vibrating hammer.

230 V, 50 Hz, 1 ph.

Used for compacting asphalt in the percentage refusal density test and for the compaction of Proctor and CBR soil specimens (for more information see page 443). Using the appropriate tamping foot it can also be used for compacting concrete cube or beam specimens.

The hammer is supplied without support frame and tamper which have to be ordered separately



- Power: 950 W
- Length: 433 mm
- Weight approx.: 6.4 kg

Ordering information

- 33-T8702**
Vibrating hammer. 240 V, 50 Hz, 1 ph
- 33-T8703**
As above but. 220 V, 60 Hz, 1 ph
- 33-T8704**
As above but. 110 V, 60 Hz, 1 ph

33-T8702 with Supporting frame 33-T0087/B, Large tamping foot 33-T0087/7 and Shank 33-T0087/8A

Accessories

- 33-T0087/B**
Supporting frame for vibrating hammer, weight 70 kg (approx.).
- 33-T0087/6**
Small tamping foot, 102 mm diameter, head only.
- 33-T0087/7**
Large tamping foot, 146 mm diameter, head only.
- 33-T0087/8A**
Shank, 300 mm long.

Compaction penetrometers

Standards

ASTM D1558

33-T0165

Proctor penetrometer

Used for establishing the moisture content/penetration resistance relationship of fine-grained soils. It consists of a special spring dynamometer with a pressure-indicating scale on the stem of the handle. A sliding ring on the stem indicates the maximum pressure obtained in the test.

Supplied in a carrying case.

Specifications

- Load scale: 0 to 55 kg, 1 kg subdivisions with maximum load indicator
- Diameter of interchangeable needles: 28.55, 24.79, 20.22, 16.54, 12.83, 9.07, 6.40, 5.23 and 4.52 mm
- Weight: 3.5 kg (approx.)

33-T0166

Load ring penetrometer

Used for measuring the bearing strength and degree of compaction of soils. The apparatus consists of a T-shaped handle connected to a 1 kN (100 kgf) capacity load ring with a maximum load pointer, and an extension rod with five 100 mm graduations. The 30° end cone has an area of 645 mm² (1in²). Supplied complete with calibration chart.

Weight: 4 kg (approx.)



Compressive strength of Unbound and Hydraulically bound mixtures

Standards

EN 12390-4 | EN 13286-41

This Multipurpose compression tester can be suitable used for applying static compaction to CBR samples or for 10% Fines/ACV on aggregates.

For more information see page 366

Ordering information

50-C92C02

PILOT Automatic COMPACT-Line compression tester, 600 kN capacity, load measurement by pressure transducer. 230 V, 50-60 Hz, 1 ph.

50-C92C04

As above but 110 V, 60 Hz, 1 ph.



Determination of compactability

Moisture Condition Value (MCV) and Chalk Crushing Value (CCV)

Standards

EN 13286-46, BS 1377:4,
Manufactured under license from TRL-UK

33-T0064 Moisture condition apparatus

Used in the assessment of earthworks for construction by comparing compaction characteristics at various moisture contents in order to determine the "Moisture Condition Value" and "Chalk Crushing Value". This robust apparatus is designed for use in the construction laboratory and incorporates a rammer, scale, counter, and mould.

Weight: 55 kg (approx.)



Accessories

- 33-T0064/1**
Moisture condition mould
- 33-T0064/2**
Fibre discs, pack of 6.

Relative density of cohesionless soil

Standards

EN 13286-5 | ASTM D4253 |
ASTM D4254

This method, in the EN standard, covers the determination of the maximum dry density and water content of cohesionless materials when compacted using a vibrating table. Materials for which this method is applicable may contain up to 12% fines (<0.063 mm) by mass. The maximum particle size of the material to be tested is 80 mm. This method applies to mixtures to be used in road construction.

The ASTM also specifies that the method is used for the determination of the relative density of cohesionless soil for which impact compaction will not produce a well-defined moisture/density relationship curve and where the maximum density of the impact method will generally be less than by the vibratory method.

Two versions of test set are available: 33-T0063/A conforming to EN and 33-T0063 conforming to ASTM. They are practically identical except for the 0.1 ft³ mould which is included with 33-T0063.



Specifications

Both 33-T0063/A (EN) and 33-T0063 (ASTM) test sets include:

- **33-T0063/3:**
14200 cm³ (0.5 ft³) mould set
- **33-T0064/4:**
Relative density gauge set
- **33-T0063/1:** Vibrating table (33-T0063/1 Y for 220 V, 60 Hz or 33-T0063/1 Z for 110 V, 60 Hz) with the following specifications:
 - Vibration frequency: 3600 r.p.m.
 - Amplitude range: 0.05 to 0.64 mm
 - Vibrator type: electromagnetic
 - Separate amplitude control panel
 - Table dimensions: 762 x 762 mm
 - Table capacity: 250 kg

The 33-T0063 (ASTM) version also includes:

- **33-T0063/2:**
0.1 ft³ relative density mould set.
- Overall weight: 33-T0063/A, 289 kg; 33-T0063, 310 kg (approx.)

Note Each part can be ordered individually.

Ordering information

33-T0063/A
EN Relative density test set. 230 V, 50 Hz, 1 ph.

33-T0063
ASTM Relative density test set. 230 V, 50 Hz, 1 ph.
33-T0063/Y
As above but 220 V, 60 Hz, 1 ph.
33-T0063/Z
As above but 110 V, 60 Hz, 1 ph.

Accessories

33-T0063/7
12.5 and 25 mm diameter pouring devices.



33-T0063/7

CBR (California Bearing Ratio), IBI (Immediate Bearing Index)

This method is used for the laboratory evaluation of subgrade and subbase coarse materials in road construction. The apparatus comprises moulds with accessories, compaction rammers (the automatic models are the same as those used for the compaction of Proctor moulds - see pages 136-138), load testing machines with accessories, etc. Different models are available that conform to the various relevant specifications. Please note that very frequently, some of the items (e.g. Swell plate, Tripod etc.) are common to more than one standard test set.

ASTM, AASHTO, UNE, UNI CBR equipment

Standards ASTM D1883 | AASHTO T193 | UNE 103-502 | CNR UNI 10009

Ordering information and specifications

Code	Description	Specifications	Approx. weight, kg
34-T0090/A	CBR mould	With collar and perforated base plate - Plated steel. 6" (152.4 mm) diameter, - 7" (177.8 mm) body height	7.8
34-T0090/A1	Split CBR mould	Same as T0090/A, split longitudinally on one side	8.5
34-T0090/3	Filter screen	Stainless steel woven mesh, No.100 (150 µm), 144 mm diameter	0.05
33-T0076	Compaction rammer	2" (50.8 mm) diameter rammer face, 457.2 mm fall, 4.54 kg weight	5.3
33-T0096	Sliding weight rammer (as alternative to 33-T0076)	2" (50.8 mm) diameter rammer face, 457.2 mm fall, 4.54 kg weight	8
34-T0091	Spacer disc with "T" handle	5 ¹⁵ / ₁₆ " (150.8 mm) diameter x 2.416" (61.4 mm) high. Plated steel	7.5
34-T0091/1	UNE Spacer disc	Plated steel	7.5
34-T0094	Annular surcharge	Plated steel, 2.27 kg	2.27
34-T0095	Slotted surcharge	Plated steel, 2.27 kg	2.27
34-T0098	Cutting edge	Plated steel	0.5
34-T0099	Straight edge	3 x 30 x 300 mm	0.3
34-T0097/A	Solid CBR base	Plated steel	1.0
86-D1800	Filter paper	No. 1 x 150 mm diameter. Pack of 100	0.3
34-T0092	Swell plate	With adjustable stem	1.0
34-T0093	Gauge tripod	Non-corrodible alloy	0.3
82-D1255	Dial gauge	10 mm travel, 0.01 mm divisions	0.1
16-T0080	Universal extruder	For 100 to 152.4 mm diameter samples	25
34-T0100/B	Soaking tank	Plastic, 680 x 490 x 540 mm (internal dimensions)	9.1



ASTM, AASHTO, UNE, CNR test set (partial)



BS CBR equipment

Standards BS 1377:4 | BS 1924:2

Ordering information and specifications

Code	Description	Specifications	Approx. weight, kg
34-T0090/BS1	CBR mould body	Plated steel with both ends threaded to fit the base or collar. 152 mm internal diameter x 127 mm high	3.0
34-T0090/BS2	Extension collar	152 mm internal diameter x 50 mm high	1.0
34-T0090/BS3	Perforated base plate	Plated steel	1.8
34-T0090/BS4	Solid base/top plate	Plated steel	1.8
34-T0090/BS5	Cutting collar	Plated steel	1.0
34-T0090/B6	"C" spanner	To tighten / loosen the collar from the mould body. Two required	1.0
34-T0090/B7	Tool for base plate	To tighten / loosen the solid or perforated base plate from the mould	1.0
34-T0091/B	Compaction plug with handle	150 mm diameter x 50 mm high	7.2
33-T0076/B	Compaction rammer	50 mm diameter rammer face, 450 mm fall, 4.5 kg weight	5.3
34-T0094/B	Annular weight	Plated steel, 2 kg	2.0
34-T0095/B	Split weight	Plated steel, 2 kg	2.0
34-T0095/C	Tamping bar	12.7 mm dia. x 380 mm long	
34-T0099	Straight edge	3 x 30 x 300 mm	0.3
82-D1694	Steel rule	500 mm long	0.1
86-D1800	Filter paper	No.1 x 150 mm diameter. Pack of 100	0.3
34-T0092	Swell plate	With adjustable stem	1.0
34-T0093	Gauge tripod	Non-corrodible alloy	0.3
82-D1257	Dial gauge	25 mm travel, 0.01 mm divisions	0.1
16-T0080	Universal extruder	For 100 to 152.4 mm diameter samples	25
34-T0100/B	Soaking tank	Plastic, 680 x 490 x 540 mm (internal dimensions)	9.1



BS test set (partial)

NF CBR equipment

Standards NF P94-078 | NF P94-093 | NF P98-231-1

Ordering information and specifications

Code	Description	Specifications	Approx. weight, kg
34-T0089/NF	NF CBR mould	Complete with collar and perforated base plate. Plated steel. 152 mm diameter x 152 mm body height	9.0
34-T0089/NFS	Split NF CBR mould	Same as T0089/NF, split longitudinally on one side	9.0
34-T0076/F	Modified compaction hammer	51 mm diameter rammer face, 457.2 mm fall, 4.54 kg weight	5.3
86-D1800	Filter paper	No.1 x 150 mm diameter. Pack of 100	0.3
34-T0091/F	Spacer disc	Plated steel, 25.4 mm high	3.8
34-T0091/1	Spacer disc	Plated steel, 36 mm high	4.5
34-T0094/F	Annular surcharge weight	Plated steel, 2.3 kg	2.3
34-T0095/F	Split surcharge weight	Plated steel, 2.3 kg	2.3
34-T0098	Cutting edge	Plated steel	0.5
34-T0099	Straightedge	3 x 30 x 300 mm	0.3
34-T0092/F	Swell plate	Plastic with 3 mm diameter holes	0.3
82-D1257	Dial gauge	30 mm travel, 0.01 mm divisions	0.1
34-T0093	Gauge tripod	Non-corrodible alloy	0.3
34-T0100/B	Soaking tank	Plastic, 680 x 490 x 540 mm (internal dimensions)	9.1
16-T0080	Universal extruder	For 100 to 152.4 mm diameter samples	25



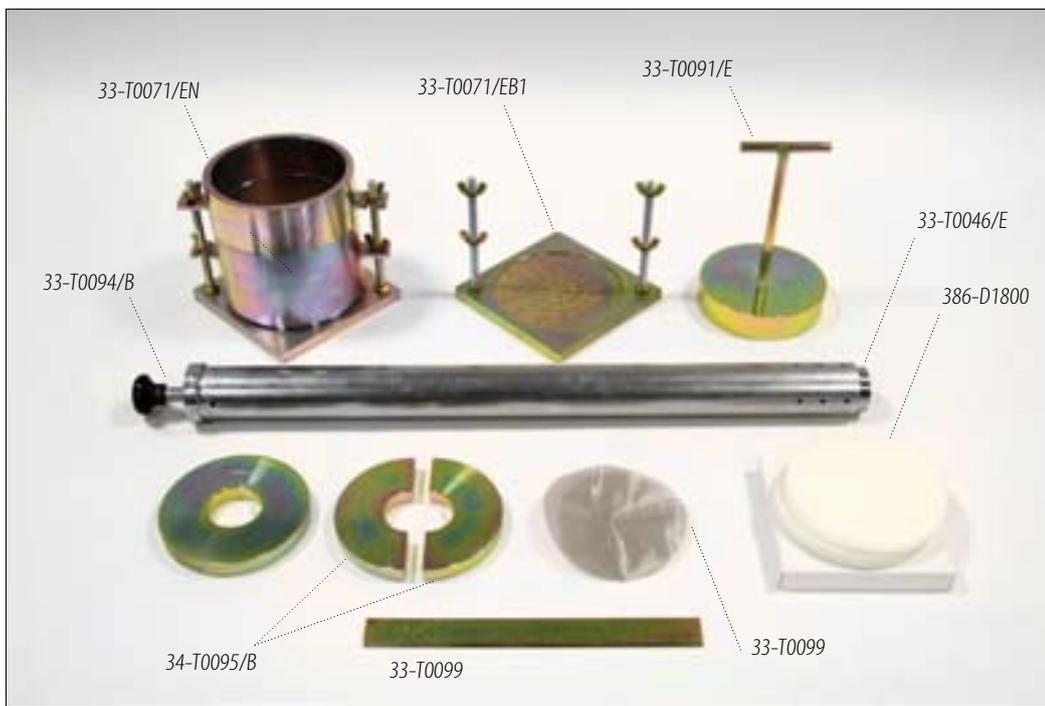
NF test set (partial)

EN CBR equipment

Standards EN 13286-47

Ordering information and specifications

Code	Description	Specifications	Approx.weight, kg
33-T0071/EN	Proctor/CBR mould	With collar and solid base plate. Plated steel. 150 mm diameter, 120 mm height	8.9
33-T0071/ENS	Proctor/CBR mould split version	With collar and solid base plate. Plated steel. 150 mm diameter, 120 mm height	8.9
33-T071/EB1	Perforated base plate	Plated steel	1.0
34-T0090/3	Filter screen	Stainless steel woven mesh, No.100 (150 µm), 144 mm diameter	0.05
33-T0076/E	Compaction rammer	50 mm diameter rammer face, 457 mm fall, 4.50 kg weight	5.3
34-T0091/E	Spacer disc with "T" handle	149.5 mm diameter, 36 mm high. Plated steel	5.0
34-T0094/B	Annular surcharge	Plated steel, 2 kg	2.0
34-T0095/B	Split surcharge	Plated steel, 2 kg	2.0
34-T0099	Straight edge	3 x 30 x 300 mm	0.3
86-D1800	Filter paper	No.1 x 150 mm diameter. Pack of 100	0.3
34-T0092/E	Swell plate	Aluminium perforated with adjustable stem	1.0
34-T0093	Gauge tripod	Non-corrodible alloy	0.3
82-D1257	Dial gauge	30 mm travel, 0.01 mm divisions	0.1
16-T0080	Universal extruder	For 100 to 152.4 mm diameter samples	25
34-T0100/B	Soaking tank	Plastic, 680 x 490 x 540 mm (internal dimensions)	9.1



Expansion (Swell) test apparatus

34-T0093

Dial gauge tripod

Used to support the dial gauge for monitoring the swelling of CBR samples. Made from a special non-corrodible alloy. Weight: 0.3 kg (approx.)

82-D1255

Dial gauge, 10 x 0.01 mm as alternative:

82-D1257

Dial gauge, 30 x 0.01 mm

34-T0092 (T0092/E) with Tripod 34-T0093 and Dial gauge 82-D1257



34-T0092

ASTM Perforated plate with adjustable stem (Swell plate). Plated steel.

-Weight: 1 kg approx.

34-T0092/F

NF Perforated plate with adjustable stem (Swell plate). Plastic.

-Weight: 0.3 kg approx.



34-T0092/F

34-T0092/E

EN Perforated plate with adjustable stem (Swell plate). Aluminium.

-Weight: 0.3 kg approx.

34-T0100/B

Large soaking tank

The CBR moulds are immersed in this plastic water tank during the swelling test. Supplied complete with supporting base, which allows free water circulation.

Capacity: 6 CBR moulds

Dimensions:

External: 800 x 600 x 550 mm;

Internal: 680 x 490 x 540mm;

Weight: 9.1 kg (approx.)



Extruder 16-T0080. Detailed information on page 31



34-T0100/B with CBR moulds

Field CBR apparatus

Standards

ASTM D4429 | BS 1377:7 | BS 1924:2 |

UNI 10009

34-T0115/A

Field CBR test set

Description

Used for the in-situ determination of the bearing capacity of soils used in road construction. The complete set is housed in a strong carrying case and includes:

34-T0112*

50 kN capacity mechanical jack.

Weight 8.5 kg.

34-T0112/1*

Ball seating for 34-T0112. Weight 1 kg.

82-T1008*

40 kN capacity load ring. Weight 4 kg.

34-T0103/1*

Adjustable CBR penetration piston.

Weight 2.2 kg.

34-T0104/7*

Adjustable dial gauge holder.

34-T0115/3

Set of 3 extension rods and adapters.

Weight 33 kg.

34-T0115/41

Datum bar assembly including two tripod stands and a 1220 mm long aluminium bar. Weight 7 kg.

82-D1257*

Penetration dial gauge, 30 mm travel, 0.01 mm divisions.

34-T0115/5

9 kg slotted surcharge weight.

34-T0115/6

4.5 kg slotted surcharge weight.



34-T0114 with items*

34-T0115/7

4.5 kg annular surcharge weight.

*Items for use with the 34-T0114 to create a hand operated CBR laboratory loading press.

Total weight: 70 kg (approx.)

Note: all above items can also be purchased individually.

Accessories

34-T0114

Conversion frame to convert the 34-T0115/A test set into a hand operated CBR loading press for laboratory use.

Total weight (including parts identified with the *in the 34-T0115/A set): 55 kg (approx.)



34-T0115/A

CBR (California Bearing Ratio), Penetration test

CBR Loading frames and presses

Standards EN 13286-47 | ASTM D1883 | AASHTO T193 | BS 1377:4 | NF P94-078 | UNI CNR 10009

The CBR penetration test can be performed with a number of loading presses, some of them specifically designed for CBR tests, and others with multiple applications (Universal models), at different levels of sophistication. A concise presentation is given below to expedite your selection.

34-T0106 and 34-T0102 series 50 kN capacity

main features

- > Adjustable penetration piston
- > Load ring fitted with 0.001 mm div. gauge to fulfill the Standard requirements

Ordering information

34-T0106/A

CBR motorized loading press, 50 kN capacity, complete with 50 kN load ring, adjustable penetration piston and dial gauge. 230 V, 50 Hz, 1 ph.

34-T0106/AY

As above but 220 V, 60 Hz, 1 ph.

34-T0106/AZ

As above but 110 V, 60 Hz, 1 ph.

34-T0102/A

CBR mechanical loading press, 50 kN capacity, manually/hand operated, complete with CBR accessories.

CBR Specific loading presses

34-T0106/A

Motor operated

This machine features a rigid two-column frame with an upper crossbeam which can be adjusted in height and locked in position with locknuts. The drive force is provided by a mechanical jack housed in the base cabinet which also houses the motor and the electric panel. The machine includes a precision 50kN capacity load ring, an adjustable penetration piston and a dial gauge.

A version without accessories is also available: model 34-T0106, which can be completed with other accessories (e.g. digital configuration). See Accessories.

Note: 82-T1009/C load ring 50 kN cap. fitted with gauge 0.01 mm resolution available on request.



34-T0106/A with mould



34-T0102/A

Hand operated

This machine features a rigid two-column frame with an upper crossbeam which can be adjusted in height and locked in position with locknuts. The drive force is provided by a mechanical jack housed in the base cabinet. The machine includes a precision 50kN capacity load ring, penetration piston and dial gauge.

Models	34-T0106/A	34-T0102/A
Maximum load	50 kN	50 kN
Test speed	1.27 mm/min	Manually Controlled
Maximum ram travel	120 mm	120 mm
Horizontal span	270 mm	270 mm
Load ring capacity	50 kN, 0,001 mm div. incl.	50 kN, 0,001 mm div. incl.
Dial gauge	30 x 0.01 mm, included	30 x 0.01 mm, included
Penetration piston	Adjustable, included	Included
Power rating	300W	-
Overall dimensions	392 x 495 x 1194 mm	300 x 410 x 1140 mm
Weight (approx.)	78 kg	75 kg

34-T0106

CBR motorized loading press. Frame only.
230 V, 50 Hz, 1 ph.

34-T0106/Y

As above but 220 V, 60 Hz, 1 ph.

34-T0106/Z

As above but 110 V, 60 Hz, 1 ph.

34-T0102

CBR Hand operated press. Frame only.

CBR parts for 34-T0106 and 34-T0102. Frames only

The above frame can be completed with the standard parts mounted in the 34-T0106/A version (34-T0103/3 and 82-T1009).

Accessories

34-T0103/3

Adjustable penetration piston complete with dial holder and dial gauge 30 x 0.01 mm div.

82-T1009

Load ring 50 kN cap., fitted with dial gauge 0.001 mm div.

Note: As alternative, with the 34-T0103/3C assembly and the 82-T1009/C load ring



34-T0106 with 34-V0107/CBR and 82-P60R02 with mould

CBR Accessories for performing the test in digital mode

The 34-T0106 frame can be equipped in digital mode, as shown, with the following accessories.

34-V0107/CBR

Test set to perform the CBR test in digital mode, including:

82-P0375

Load cell, 50 kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25 mm travel

34-T0104/81

Adjustable transducer holder

34-T0103/1

Adjustable CBR penetration piston

Also required:

82-P60R02

DIGIMAX TS, Touchscreen, 4-channel readout and processing unit for load and displacement sensors. Suitable for CBR, Marshall, Indirect tensile and general purpose tests.
110-240 V, 50-60 Hz, 1 ph.

82-SW/CMU

PC software for CBR, Marshall, Indirect tensile and general purpose tests.

Note: for more details and information on the DIGIMAX TS and Software, see page 154

Spare parts

34-T0103/1

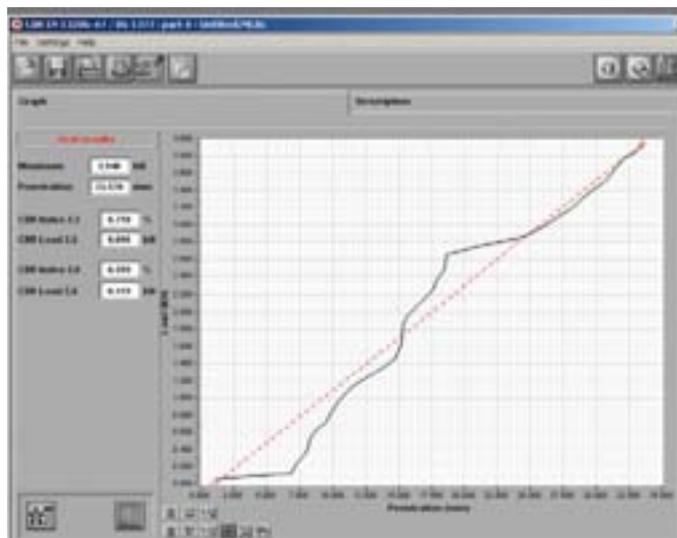
Adjustable penetration piston.

82-D1257

Dial gauge 30 mm travel, 0.01 mm divisions.

34-T0104/7

Dial gauge holder.

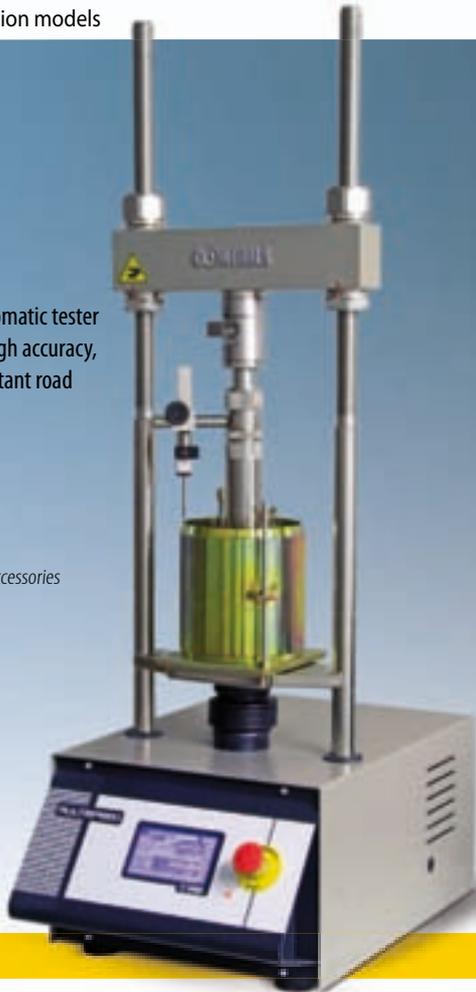


MULTISPEED

Multiple application models

A unique fully automatic tester to perform with high accuracy, all the most important road strength tests

34-V1172 with CBR accessories



main features

MULTISPEED Automatic 34-V1172

- > Closed-loop speed control
- > CBR and MARSHALL test speed can be selected by default
- > Other testing speeds (custom) between 0.05 and 51mm/min, can be easily set
- > Selection of maximum platen displacement with automatic stop
- > Rapid approach and return function, to reduce the testing time
- > Speed calibration function by firmware.
- > CE Emergency stop button
- > Stand-alone automatic digital load frame
- > Four channel on board data acquisition
- > Integrated transducer calibration facility
- > Infinitely variable speed from 0.05 to 51 mm/min
- > Large touchscreen display for viewing real-time graph and test data

Application of MULTISPEED and MULTISPEED Automatic testers

These models represent the ideal solution for major laboratories performing tests requiring displacement control, such as **CBR, Marshall, Indirect tensile, Unconfined compression, Quick triaxial** etc. The MULTISPEED standard version 34-V1072 (see page 150) is usually equipped with analogue measurement system but could also accept digital accessories, while MULTISPEED Automatic 34-V1172 is fitted with digital system only, as required by all EN Standards. The various test accessories and relevant Standards, are shown and listed on page 152,153.

34-V1172 with Marshall accessories



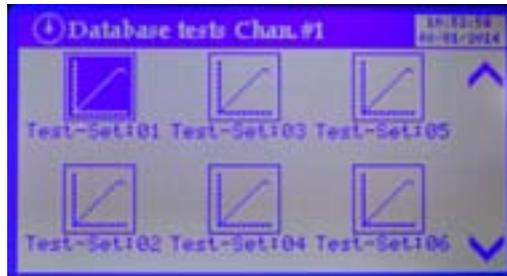
MULTISPEED 34-V1172 Automatic series

The MULTISPEED Automatic, features automatic control of the test speed/ travel by microprocessor. Prior to the test, the operator can set travel limits for automatically ending the test. No external transducer is required for displacement measurement. The firmware allows transducer calibrations and setting of up to 10 test profiles, saving data onboard. A real-time test graph and transducer data are displayed on the user interface touchscreen which is supplied complete with a stylus pen.

The machine has built-in data acquisition with four channels: two dedicated to strain gauge load cells and two for potentiometric linear transducers - one of each can be used during the test. An important feature is provided by the processing unit that manages the speed through closed-loop control, avoiding speed calibrations and voltage fluctuation effects. The front panel is fitted with an emergency button for prompt stopping of the machine. Test data can be stored on a USB pen drive or downloaded through a LAN communication port in Controls, txt or ASCII format. All the accessories have to be ordered separately.

Data acquisition and processing system

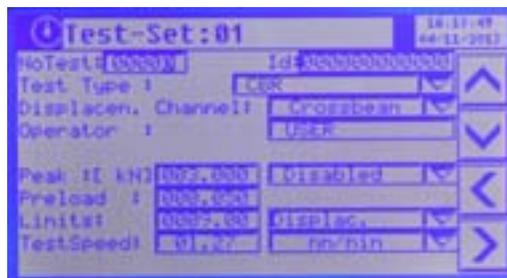
Example of screenshots



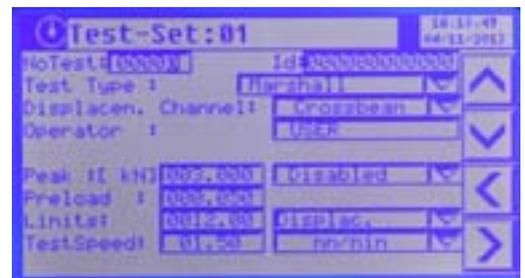
Main menu



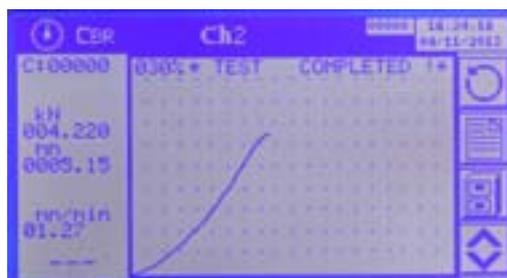
Saving data screenshot



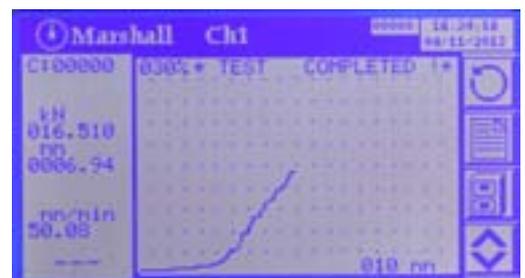
Test set parameters



Test set parameters



CBR graph



Marshall graph



34-V1172 Multispeed Automatic. Detail of the connection socket panel: Power, USB port, LAN port for PC connection and four connectors for Load cells and displacement transducers.

Technical specifications

Models	34-V1172 34-V1173 34-V1174
Maximum capacity	50 kN
Testing speed, adjustable from	0.05 to 51 mm/min
Power rating	DC motor 750 W
Data download	By LAN port, ASCII,
USB port	For USB memory stick data storage
Resolution	132000 divisions
Display	Touchscreen graphic 240 x128 pixel
Sampling frequency	50 Hz
Horizontal clearance	270 mm
Maximum vertical clearance (without accessories)	730 mm
Overall dimensions (lwxhxh)	392 x 495 x 1213 mm
Weight (approx.)	65 kg

Ordering information

MULTISPEED AUTOMATIC 34-V1172

34-V1172

MULTISPEED Automatic, automatic compression tester, 50 kN capacity, 4-channel built-in data acquisition and variable speed from 0.05 to 51 mm/min. 230 V, 50 Hz, 1 ph.

34-V1173

As above but 220 V, 60 Hz, 1 ph.

34-V1174

As above but 110 V, 60 Hz, 1 ph.

Test accessories

See pages 152, 153

MULTISPEED

Multiple application models



34-V1072 with CBR accessories (analogic)



34-V1072 with Marshall accessories (analogic)

General descriptions

MULTISPEED 34-V1072 series

The MULTISPEED tester features a rigid two-column structure with an upper cross beam which can be set at various heights. The load jack, DC motor and controls are housed in a specially designed base cabinet.

When fitted in digital mode, test data are acquired and processed by a Digimax or other similar device.

One of the main features of the new MULTISPEED is the control of test speed which is easily set and then shown on the display. Furthermore, the test stroke can be set at the beginning of the test with an automatic stop, avoiding overloading the machine and the specimen, thus assuring operator safety. This important feature also permits a calibration of machine speed to be performed, with micrometric manual adjustments made by the operator.

The display shows the travel direction of the lower platen and the front panel is fitted with an emergency button and two operating LEDs indicating machine on/off and travel direction.

This model is normally equipped in the analogical mode, but, using the Digimax TS Data acquisition system and relevant PC software (see page 154), can also be equipped in the digital mode (see accessories)

Ordering information

MULTISPEED 34-V1072

34-V1072

MULTISPEED, digital compression tester, 50 kN capacity, testing speed steplessly adjustable from 0.2 to 51 mm/min. 230 V, 50 Hz, 1 ph.

34-V1073

As above but 220 V, 60 Hz, 1 ph.

34-V1074

As above but 110 V, 60 Hz, 1 ph.

Accessories for performing CBR and Marshall tests in analogue mode

(For use with the Multispeed 34-V1072 series only)

CBR Accessories

Standards

EN 13286-47 | ASTM D1883 | AASHTO T193 | BS 1377:4 | NF P94-078 | UNI CNR 10009

34-T0103/3

Adjustable penetration piston complete with dial holder and dial gauge 30 x 0.01 mm div.

82-T1009

Load ring 50 kN cap., fitted with dial gauge 0.001 mm div.

Marshall accessories

Standards

EN 12697-34* | ASTM D1559 | ASTM D5581 | ASTM 6927-06 | AASHTO T245 | BS 598-107 | NF P98-0251-2 | DIN 1996 | CNR 30

Note: The EN Standard specifies that Marshall Testers must be used in digital mode with a recording unit.

82-T1009/F

Load ring, 50 kN capacity, with stembrake Or as alternative:

82-T1007/F

Load ring, 30 kN capacity, with stembrake

34-T0104/10

Compression device.

76-B0034

Flow meter.

76-B0033

Stability mould.



CBR accessories (analogic mode)



Marshall accessories (analogic mode)

Note: to perform the above tests in the digital mode see page 152

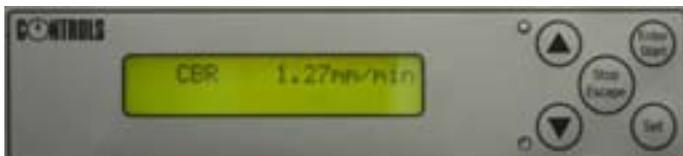
main features

MULTISPEED 34-V1072 series

- > Closed-loop speed control
- > CBR and MARSHALL test speed can be selected by default
- > Other testing speeds (custom) between 0.2 and 51mm/min, can be easily set
- > Selection of maximum platen displacement with automatic stop
- > Rapid approach and return function, to reduce the testing time
- > Speed calibration function by firmware.
- > CE Emergency stop button



34-V1072 with Marshall accessories to test 6" up to dia. samples in the digital mode and Digimax TS 82-P60R02 touch screen data acquisition system. See page 154



Technical specifications

Models	34-V1072 34-V1073 34-V1074
Maximum capacity	50 kN
Testing speed, adjustable from	0.2 to 51 mm/min
Power rating	DC motor 750 W
Display	Alphanumeric 2 x16 characters
Horizontal clearance	270 mm
Maximum vertical clearance (without accessories)	730 mm
Overall dimensions (lxwxh)	392 x 495 x 1213 mm
Weight (approx.)	65 kg

MULTISPEED

Multiple application models

Accessories for 34-V1072 and 34-V1172 models

All the above MULTISPEED and MULTISPEED Automatic testers, with the appropriate accessories, are frequently used for road testing (CBR, Marshall, and Indirect tensile etc.) which are illustrated on this page.

For all other applications, see page 153

*Accessories to perform the CBR and Marshall test in digital mode

CBR, conforming to:

Standards

EN 13286-47 | ASTM D1883 | AASHTO T193 | BS 1377:4 | NF P94-078 | UNI CNR 10009



34-V0107/CBR Test set with CBR mould

34-V0107/CBR

Test set for performing CBR tests in digital mode, including:

82-P0375

Load cell, 50 kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25 mm travel

34-T0104/81

Adjustable transducer holder

34-T0103/1

Adjustable CBR penetration piston

All above items can be ordered individually.

Note: The MULTISPEED 34-V1072 Series also require data acquisition system. See DIGIMAX TS 82-P60R02 on page 154

Marshall, conforming to:

Standards

EN 12697-34* | ASTM D1559 | ASTM D5581 | ASTM 6927-06 | AASHTO T245 | BS 598-107 | NF P98-0251-2 | DIN 1996 | CNR 30



34-V0107/MAR Test set

34-V0107/MAR

Test set for performing Marshall tests in digital mode, including:

82-P0375

Load cell, 50 kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25 mm travel

34-T0104/81

Adjustable transducer holder

34-T0104/13

Compression device extension

34-T0104/10, Compression device

76-B0033, Stability mould 4"

*The EN Standard specifies that Marshall Testers must be used in digital mode with a recording unit.

CBR and Marshall, conforming to the standards specified above

(To avoid duplications when both test have to be performed)

34-V0107/CM

Test set for performing CBR and Marshall tests in digital mode, including:

82-P0375

Load cell, 50 kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25 mm travel

34-T0104/81

Adjustable transducer holder

34-T0103/1

Adjustable CBR penetration piston

34-T0104/13

Compression device extension

34-T0104/10

Compression device

76-B0033

Stability mould 4"

Note: Stability mould for 6" specimen available on request-see 76-B0033/C

Other tests can be performed with the MULTISPEED and MULTISPEED AUTOMATIC testers, using the following accessories:

Indirect tensile on bituminous mixtures

Standards

EN 12697-12 | EN 12697-23 | ASTM D4123 | CNR 34



Machine fitted with accessories for IDT

Unconfined compression (soil)

Standards

EN 12697-12 | EN 12697-23 | ASTM D4123 | CNR 34



Machine fitted with accessories

Quick triaxial (soil)

Standards

ASTM D2850 | BS 1377:7

Accessories

82-P0375

Load cell, 50 kN capacity

82-P0375/C

Adapter to fit load cell (two pieces). For triaxial cells and related accessories see page 75, 79



Universal models

UNIFRAME

For performing tests under speed/displacement and load control, including all road tests (CBR, Marshall, Indirect tensile etc.), concrete, cement and natural building stone flexural testing under load control, triaxial testing etc. See page 388, 392

Accessories

82-P0375

Load cell, 50kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25mm travel

34-T0104/81

Adjustable transducer holder

34-T0104/13

Compression device extension

34-T0104/10

Compression device

76-B0078/B

Tensile splitting device or, alternatively,

76-B0078/C

82-P60R02*

DIGIMAX TS Data acquisition system

*For use with Multispeed 34-V1072 series only

Accessories

82-P0370

Load cell, 2.5kN capacity

82-P0375/C

Adapter to fit load cell (two pieces)

82-P0322

Displacement transducer, 25mm travel

34-T0104/81

Adjustable transducer holder

70-T0108/5

Load cell extension

34-T0104/4

Platens for unconfined compression

82-P60R02*

DIGIMAX TS Data acquisition system

*For use with Multispeed 34-V1072 series only

Punching test on clay block for flooring

(see page...)



UNIFRAME 70-T1082 with CBR accessories. Other versions also available: 70-T1182 with increased testing space and 70-T1092, 100 kN cap. For complete information see page 388

main features

- > Stand-alone automatic digital load frame
- > Automatic failure detection
- > Universal machine suitable for a wide range of tests
- > Closed-loop speed/load control
- > Four channel onboard data acquisition
- > CBR and Marshall test automatic control facility
- > Integrated transducer calibration facility
- > Infinitely variable speed from 0.05 to 51 mm/min
- > Large touchscreen display for viewing real-time graph and test data
- > Rapid approach and return functions ensure test time savings
- > CE emergency stop button

DIGIMAX TS, Touch Screen data acquisition system



main features

- > Large size touchscreen display
- > Very easy to use menus with intuitive selections, self-explanatory icons, optimized test procedures
- > PC connection via LAN port allowing faster communication, better stability and longer cable lengths compared to an RS232 serial connection
- > Advanced calibration menus with linearization functions, firmware-driven procedures, secure file storage
- > Unlimited data storage on USB pen drives

Note: For Multispeed 34-V1072 series only.

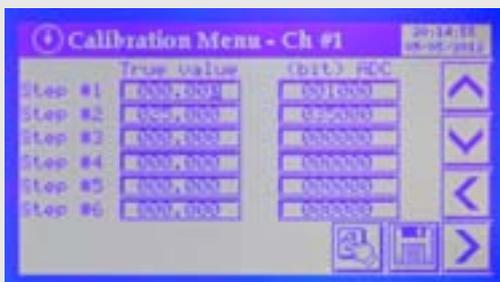
The Multispeed Automatic 34-V1172 Series incorporates a data acquisition system.

Based on the latest electronic technology, this modern readout unit offers advanced performance and outstanding electronic features, including excellent effective resolution, sampling rate, accuracy and stability of readings, superb calibration functions, touchscreen sensitivity and reaction times, and fast network communication.

Our long-standing experience and tradition in the production and design of testing systems, and in particular digital units, has enabled us to create an extraordinarily optimized user interface with efficient working procedures, resulting in a unit that is faster and easier to use, combined, as always, with Class 1 accuracy and total reliability.

82-P60R02

DIGIMAX TS, Touchscreen four-channel readout and processing unit for load and displacement sensors. Suitable for CBR, Marshall, Indirect tensile and general purpose tests. 110-240 V, 50-60 Hz, 1 ph.



DIGIMAX TS
82-P60R02.
Few examples of test
menu

Technical specifications

- 240 x 128 pixel touchscreen graphic display showing numerical and graphical data
- Total of four channels: two dedicated to load sensors and two for displacement transducers. A maximum of two channels (one load and one displacement, selected by the user) can be used simultaneously
- Effective sampling rate up to 50/sec
- Effective resolution 17 bit
- Data storage on USB pen drive (included)
- Connection to PC via LAN port (basic communication software is included)
- Multiple selection of language and units
- Real-time clock and date
- Overall dimensions (w x d x h): 290 x 220 x 130 mm
- Weight: 3.4 kg (approx.)

is designed specifically to be used with new Digimax 82-P60 R02 and with 76-B3812, 34-V1172, 70-T1082, 70-T1182 and 70-T1192 testing machines.

Minimum PC requirements

- Pentium 4® CPU 3 GHz
- 1 GB of free hard disk space
- Microsoft Windows® XP or higher operating system
- RAM memory:
 - for Windows XP or Vista: minimum 1 GB; recommended 2 GB
 - for Windows 7: minimum 2 GB; recommended 4 GB
- CD-ROM drive
- One free RJ45 network port
- Screen resolution of 1024 x 768 pixels with color quality set to 32 bit
- MS Excel 2003 or higher (optional)

Ordering information

82-SW/CMU

PC software for CBR, Marshall, Indirect tensile and universal tests.

PC software for CBR, Marshall, Indirect tensile and general purpose tests

Standards

EN 12697-34 | ASTM D1559 | ASTM D1883 | ASTM D5581 | ASTM D6927 | AASHTO T245 | EN 12697-12 | EN 12697-23 | BS 1377:4 | NF P94-078 | AASHTO T193 | EN 13286-47 | UNI 10009

This program is written to run in MS Windows® for data acquisition and processing of CBR, Marshall, Indirect tensile and general load/displacement tests. The software

82-SW/CMU test data screenshot



Impact soil tester

34-T0168/B

Used to obtain an indication of the degree of compaction of soil in road construction. Results can be directly correlated to the CBR test. The unique microprocessor system automatically checks all readings throughout the test and displays the fourth reading as the Impact Value. An essential trench control tool for all cable and pipe laying service contractors.

Specifications

Dimensions: 140 x 140 x 700 mm (approx.)

Weight: 6.5 kg (approx.)



34-T0168/B

main features

- > Results can be directly correlated to the CBR test
- > An essential trench control tool for all cable and pipe laying service contractors

Strength of stabilized soil

Standards

EN 13286-53 | BS 1924:2 | NF P 94-100 | NF P98-230-2

These tests are performed to determine the unconfined compressive strength of fine and medium grained soils.

Two versions with different sizes are available that conform to:

- EN 13286-53 and BS 1924:2
- NF P 94-100

EN 13286-53 and BS 1924:2 test sets

34-T0123/A

EN/BS stabilized soil set for fine and medium grained soils – specimen size Ø 50 x 50 mm (diameter x height) – EN 13286-53 and BS 1924:2

34-T0123/B

EN/BS stabilized soil set for fine and medium grained soils – specimen size Ø 50 x 100 mm (diameter x height) – EN 13286-53 and BS 1924:2

34-T0124/A

EN/BS stabilized soil set for fine and medium grained soils – specimen size Ø 100 x 100 mm (diameter x height) – EN 13286-53 and BS 1924:2

34-T0124/B

EN/BS stabilized soil set for fine and medium grained soils – specimen size Ø 100 x 200 mm (diameter x height) – EN 13286-53 and BS 1924:2

All above sets include a mould, set of 2 end plugs, set of 2 plug displacing collars with 3 different heights, one demoulding plunger and specimen collector.

All components can be purchased separately.

Approx. weight: 10 kg (34-T0123/A), 12 kg (34-T0123/B), 20 kg (34-T0124/A) and 53 kg (34-T0124/B)

NF P 94-100 test set

34-T0123/S

NF stabilized soil set for fine and medium grained soils – specimen size Ø 50 x 50 mm (diameter x height) – according to NF P94-100

This set includes a mould, 5 stainless steel casing, 2 compaction plugs, set of plug displacing collars, one demoulding plunger and a specimen collector.

Spares

34-T0123/S1

Set of 5 stainless steel casing for specimen size Ø 50 x 50 mm (diameter x height)



34-T0123/A



34-T0124/B

FIELD DENSITY

Sand replacement method

The verification of the degree of compaction can be determined on site with a simple procedure that essentially involves removing and weighing a section of compacted soil and then refilling the hole with sand. A simple apparatus is used to record the volume of sand, and then the density of the removed soil can be calculated.

ASTM/AASHTO/NF Sand density cone apparatus

Standards

ASTM D1556 | AASHTO T191 |
NF P94-061-3 | UNE 7371 | CNR N° 22

We produce three versions of this apparatus, each suitable for soils of different grain sizes. The sets all include a double cone, a metal base plate and two plastic sand jars, except the 35-T0133 model which is supplied with one acrylic sand container.

The 35-T0129 6.5" (165.1 mm) diameter model can be completed with a calibrating container. See Accessories.

Ordering information

35-T0128

4" (101.6 mm) diameter sand density cone apparatus.

35-T0129

6.5" (165.1 mm) diameter sand density cone apparatus.

35-T0133

12" (304.8 mm) diameter sand density cone apparatus.

Accessories

35-T0130/8

Calibrating container for 35-T0129
Weight: 5 kg (approx.)

35-T0127

Standard sand, 0.3 to 0.6 mm grain size, conforming to ASTM/AASHTO/BS. 50kg sack.

35-T0127/1

Standard sand, 0.4 to 2.0 mm grain size, conforming to CNR 22. 50 kg sack.

Sand replacement set parts (ASTM)

Part description*	35-T0128 4" diameter	35-T0129 6.5" diameter	35-T0133 12" diameter
Double cone	35-T0128/1	35-T0129/1	-
Plastic sand jar (2 pieces)	35-T0130/2	35-T0130/2	-
Metal base plate with flanged (rimmed) hole	35-T0128/2	35-T0129/2	-
Weight of complete set (approx.)	3 kg	3 kg	20 kg

*all parts can also be purchased individually



35-T0128, 35-T0129, 35-T0133

BS Sand replacement apparatus

Standards BS 1377:9 | BS 1924:2

The operating principle is identical to the ASTM/AASHTO method. Three sizes of apparatus are available, each comprising a pouring cylinder, calibration can and density tray made of plated sheet steel. The apparatus have a similar design to the ASTM/AASHTO models but the pouring cylinders and calibration can are made from precision-machined cast aluminium.

Ordering information

35-T0125

100 mm diameter sand replacement apparatus.

35-T0125/A

150 mm diameter sand replacement apparatus.

35-T0126

200 mm diameter sand replacement apparatus.

Accessories

35-T0127

Standard sand, 0.3 to 0.6 mm grain size, conforming to BS/ASTM/AASHTO. 50 kg sack.

Sand replacement set parts (BS)

Part description*	35-T0125 100 mm diameter	35-T0125/A 150 mm diameter	35-T0126 200 mm diameter
Sand pouring cylinder	35-T0125/1	35-T0125/A1	35-T0126/1
Calibration can	35-T0125/2	35-T0125/A2	35-T0126/2
Density tray	35-T0125/3	35-T0125/A3	35-T0126/3
Weight of complete set (approx.)	7.7 kg	13 kg	27.5 kg

*all parts can also be purchased individually

Field Density tools

Used to dig, level and remove soil during various field density tests.

35-T0140

Metal dibber, weight 300 g.

35-T0141

Scraper, weight 600 g.

35-T0142

Pointed steel rod, weight 100 g.

35-T0143

Density spoon, weight 150 g.

35-T0144

Rubber mallet, 50 mm diameter, weight 1 kg.

35-T0145

Hammer, weight 300 g.

35-T0145/G

Club hammer, weight 2 kg.

35-T0146

Density pick, weight 1 kg.

35-T0147

Chisel, 300mm long, weight 1 kg.

86-D1348

Tin lid lever, 5 litre capacity, weight 100 g.



35-T0126, 35-T0125/A, 35-T0125



Balloon method

The principle of operation is similar to the sand replacement method but the hole is filled with a rubber balloon into which water is pumped. The amount of water can be easily determined by reading the graduations marked on the cylinder or piston stress. Two versions are available: the ASTM/AASHTO/CNR model, with 1.6 litre capacity (35-T0131), and the NF version, with 3 or 6 litre capacity (35-T0134 and 35-T0134/A).

35-T0131

ASTM/AASHTO Balloon density apparatus

Standards

ASTM D2167 | AASHTO T205 | CNR N° 22

This test set consists of a graduated cylinder with 1596 ml capacity housed inside an aluminium guard, a reversible rubber aspirator pump, a 9" square density plate and 12 rubber balloons.

- Capacity: 1596 ml.
- Weight: 6 kg (approx.)

Accessories and spares

35-T0131/4

Rubber balloons, pack of 12.



35-T0131

NF Balloon apparatus

Standards

NF P94-061-2

This apparatus is used for determining the in-situ density of well-bonded soil according to NF specifications. A metal cylinder is filled with water which is then pumped into a rubber membrane mounted on the base of the cylinder, which fills a hole previously made in the soil. The water pressure is controlled by a pressure gauge and the volume of the balloon is measured on the graduated piston stem. Two versions are available: 3000 and 6000 ml capacity. The apparatus are supplied complete with base plate, 3 locking clamps and 6 reinforced balloons.

- Weight:
35-T0134, 9.5 kg (approx.)
35-T0134/A, 11.5 kg (approx.)



35-T0134/A



35-T0134

Ordering information

35-T0134

Balloon density apparatus, 3000 ml capacity.

35-T0134/A

Balloon density apparatus, 6000 ml capacity.

Accessories and spares

35-T0134/2

Spare reinforced 3000 ml membranes for 35-T0134. Pack of 6.

35-T0134/A2

Spare reinforced 6000 ml membranes for 35-T0134/A. Pack of 6.

Surface soil samplers

In this method a sampling tube is driven into the ground to take a standard core sample, which is then removed, trimmed, and weighed in order to establish the in-situ density of the soil. Two different versions are available, one conforming to ASTM/CNR and one to BS.

ASTM/CNR Surface soil sampler

Standards

ASTM D2937 | CNR N° 22

This apparatus is made from corrosion-resistant steel and consists of a 5 kg sliding-weight drop-hammer which falls freely onto the driving head situated above the sampling tube.

- Weight: 10 kg (approx.).
- Sampling tube: 73 mm internal diameter, 66 mm long.

Ordering information

35-T0135

ASTM/CNR Surface soil sampler.

Accessories and spares

35-T0135/1

Spare thin wall sampling tube, 73 mm internal diameter, 66 mm long.



BS Surface soil samplers (Core cutters)

Standards

BS 1377:9

This version of the soil sampler includes a core cutter, driving dolly and driving rammer. Two sizes are available: 100 and 150 mm internal diameter, both made of steel.

Ordering information

35-T0137

100 mm diameter core cutter set.

35-T0138

150 mm diameter core cutter set.



Field density of undisturbed soil

35-T0164

Piston volumeter, 30 cm³ capacity.

This is an easy to use pocket device; very useful for determining the in-situ density of undisturbed soil. A stainless steel tube is driven into the soil and the volume is read off the stem which is marked from 0 to 30cm³.

- Weight: 0.5kg (approx.).



Soil samplers parts

Description	35-T0137 100 mm diameter	35-T0138 150 mm diameter
Core cutter (weight)	35-T0137/1 (1 kg)	35-T0138/1 (4.5 kg)
Driving dolly (weight)	35-T0137/2 (1 kg)	35-T0138/2 (4 kg)
Driving rammer (weight)	35-T0137/3 (13.5 kg)	35-T0138/3 (16 kg)
Total weight (approx.)	15.5 kg	24.5 kg

Note: all parts can also be purchased individually

Bearing capacity

Plate bearing test apparatus 100, 200 and 500kN capacity

Standards

ASTM D1194 | ASTM D1195 | ASTM D1196 | BS 1377:9 | UNE 739 | UNE 7391 | DIN 18134 | CNR N° 92 | CNR N° 146

These test methods are used for estimating the bearing capacity of a soil under field loading conditions for a specific loading plate and depth of embedment (ASTM D1194). They also cover load tests on soil and flexible pavement components, for use in evaluation and design of airport and highway pavements (ASTM D1195, D1196 - BS 1377 - CNR No. 92 and No. 146 - DIN 18134).

Models available

Our new models have been designed primarily with the operator's site requirements in mind. These considerations are summarized in the following points:

- Light and easy to handle
- Easy load reading options, either by high-resolution digital manometer or with a pressure transducer and data logger
- We produce an extensive range of models which offer different levels of sophistication and load capacities and satisfy the requirements of all the relevant standards.

There are two basic versions:

- 100 / 200kN capacity, 300 mm plate diameter. 35-T1170 to 35-T1172/EL models.
- 200 kN capacity, 300, 450, 600 and 760 mm plate diameters. 35-T1173/D and 35-T1173/EL models

Each one of the above versions is available in the following configurations:

- Analogue measuring system with manometer and dial gauges
- Digital measuring system with digital manometer and analogue dial gauges
- Electronic measuring system with a pressure transducer for load measurement, three linear displacement transducers for deflection measurements and a datalogger for data acquisition, processing and display

Technical Specifications

All above versions are listed and detailed in the table on page 162 and in the ordering information

500 kN ASTM loading system

A 500 kN loading system, conforming to ASTM D1194 and ASTM D1195, is also available and can be completed with the suitable accessories (datum bar, load plates and dial gauges). See page 163.



35-T1171



35-T1171/D



Detail of the digital gauge fitted in the 35-T1170/D, 35-T1171/D, 35-T1172/D and 35-T1173/D models.

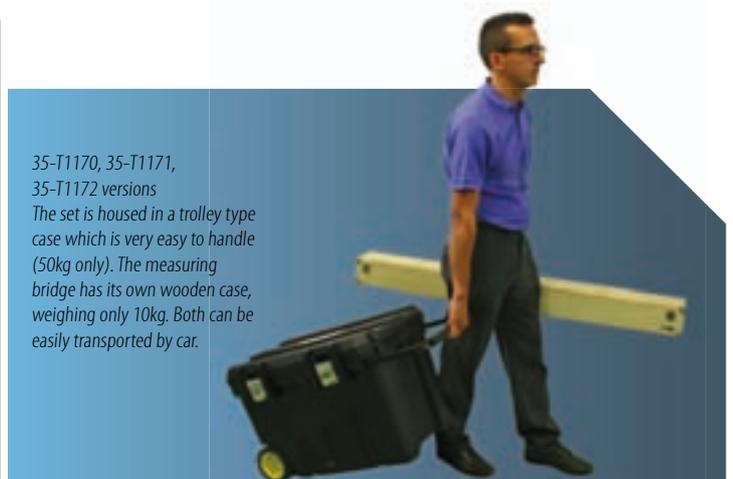
Very high resolution (65,000 divisions), 0-100 kN range, 10N minimum reading. LCD display, display height 16 mm with high visibility. Battery operated, 1 year battery life.



35-T1173/D

main features

- > 180/200mm piston travel, to meet easily the reaction loading system
- > Double-delivery hand pump for fast approach to the reaction loading system
- > Three measuring system options: Analogue, Digital with analogue dial gauges and Electronic with load and displacement transducers and a datalogger
- > Light and extremely rigid aluminium alloy measuring bridges
- > Load and measuring system housed in a practical, very easy to handle-trolley case.
- > Light and easily transportable: Analogue and Digital versions (35-T1170 to 35-T1172 series) weigh only 60kg in total, including cases
- > Supplied complete with calibration and conformity certificates



35-T1170, 35-T1171, 35-T1172 versions
The set is housed in a trolley type case which is very easy to handle (50kg only). The measuring bridge has its own wooden case, weighing only 10kg. Both can be easily transported by car.



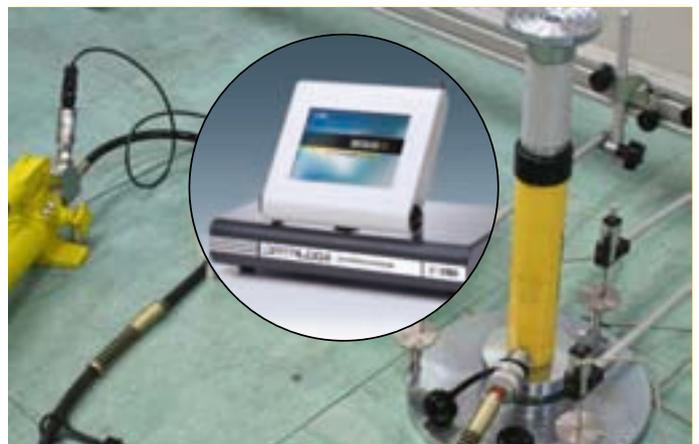
35-T1170, 35-T1170/D, Detail of dial gauge housing conforming to CNR N° 146 method A standard



35-T1173/D detail of plate set, hydraulic cylinder, dial gauges with supports, hand pump and high resolution digital gauge: 0-200kN range, 10N resolution.



Internal view of carrying cases



35-T1170/E/L Electronic version. Detail of platen assembly with pressure transducer connected to the pump, three displacement transducers and DATALOG8, data acquisition system.

Plate bearing test apparatus

Technical specifications

Models	35-T1170	T1170/D	T1170/EL	T1171	T1171/D	T1171/EL	T1172/D	T1172/EL	T1173/D	T1173/EL
Standards	CNR 146-A	CNR 146-A	CNR 146-A	BS 1377:9 CNR 146-B	ASTM D1194 ASTM D1195 ASTM D1196 BS 1377:9 CNR 146-B	ASTM D1194 ASTM D1195 ASTM D1196 BS 1377:9 CNR 146-B				
Capacity, kN	100	100	100	100	100	100	200	200	200	200
Plate diameter(s), mm	300	300	300	300	300	300	300	300	300 450 600 760	300 450 600 760
Deflection measurement method	30 x 0.01mm dial gauge	30 x 0.01mm dial gauge	One electronic transducer	Three 30 x 0.01mm dial gauges	Three 30 x 0.01mm dial gauges	Three electronic transducers	Three 30 x 0.01mm dial gauges	Three electronic transducers	Three 30 x 0.01mm dial gauges	Three electronic transducers
Load measurement method (scale and divisions/resolution)	Manometer 200mm diameter 0-50 kN scale 250 N div.	Digital pressure gauge 0-100 kN 10 N res.	Pressure transducer and data logger	Manometer 200mm diameter 0-50 kN scale 250 N div.	Digital pressure gauge 0-100 kN 10 N res.	Pressure transducer and data logger	Digital Pressure gauge 0-200 kN 10 N res.	Pressure transducer and data logger	Digital pressure gauge 0-200 kN 10 N res.	Pressure transducer and data logger
Data acquisition	-	-	Datalog8* with 82-P9008/1 Inverter and case	-	-	Datalog8* with 82-P9008/1 Inverter and case	-	Datalog8* with 82-P9008/1 Inverter and case	-	Datalog8* with 82-P9008/1 Inverter and case
Case dimensions, cm and approximate weights	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 137 x 15 x 12 10 kg	Trolley 80 x 48 x 50 50 kg Wooden case 162 x 31 x 12 27 kg Wooden pallet 96 x 95 x 20 200 kg	Trolley 80 x 48 x 50 50 kg Wooden case 162 x 31 x 12 27 kg Wooden pallet 96 x 95 x 20 200 kg
Total weight, kg (approx.) (including cases)	60	60	60	60	60	60	60	60	277	277

* Complete with plastic carrying case. For detailed information see page 552

Ordering information

Analogue models

35-T1170

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, pressure gauge 0-50 kN range, 250 N divisions, conforming to CNR No. 146 method "A", one dial gauge.

35-T1171

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, pressure gauge 0-50 kN range, 250 N divisions, conforming to BS 1377:9 and CNR No. 146 method "B", three dial gauges.

Digital models

35-T1170/D

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, digital

pressure gauge 0-100 kN range, 10 N resolution, conforming to CNR No. 146 method "A", one dial gauge.

35-T1171/D

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, pressure gauge 0-100 kN range, 10 N resolution, conforming to BS 1377:9 and CNR No. 146 method "B", three dial gauges.

35-T1172/D

Plate bearing test apparatus, 200 kN capacity, 300 mm diameter plate, pressure gauge 0-200 kN range, 10 N resolution, conforming to BS 1377:9 and CNR No. 146 method "B", three dial gauges.

35-T1173/D

Plate bearing test apparatus, 200 kN capacity, 300, 450, 600 and 760 mm diameter plates, pressure gauge 0-200 kN range,

10 N resolution, conforming to ASTM D1194-D1195-D1196, BS 1377:9 and CNR No. 146 method "B", three dial gauges.

Electronic models

35-T1170/EL

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, complete with pressure transducer, one displacement transducer and Datalog8 data acquisition and display unit. Battery operated with adaptor for 110-230 V. Conforming to CNR No. 146 method "A".

35-T1171/EL

Plate bearing test apparatus, 100 kN capacity, 300 mm diameter plate, complete with pressure transducer, three linear displacement transducers and Datalog8 data acquisition and display unit. Battery operated with adaptor for 110-230 V.

Conforming to BS 1377:9 and CNR No. 146 method "B".

35-T1172/EL

Plate bearing test apparatus, 200 kN capacity, 300 mm diameter plate, complete with pressure transducer, three linear displacement transducers and Datalog8 data acquisition and display unit. Battery operated with adaptor for 110-230 V. Conforming to BS 1377:9 and CNR No. 146 method "B".

35-T1173/EL

Plate bearing test apparatus, 200 kN capacity, 300, 450, 600 and 760 mm diameter plates, complete with pressure transducer, three linear displacement transducers and Datalog8 data acquisition and display unit. Battery operated with adaptor for 110-230 V. Conforming to ASTM D1194-D1195-D1196, BS 1377:9 and CNR No. 146 method "B".

Electronic components of the Plate bearing test apparatus, models 35-T1170/EL | 35-T1171/EL | 35-T1172/EL and 35-T1173/EL

The Electronic Plate bearing apparatus models listed above include a pressure transducer to be fitted to the hand pump, three linear displacement transducers to measure the deflection and a datalogger for data acquisition and display. These components can also be purchased individually to convert an analogue to an electronic model and to create a loading system using the other available accessories.

82-P0324

Linear displacement potentiometric transducer, 50 mm travel.

Specifications

- Input voltage: 10V DC
- Output: from 0 to 10V DC
- Repeatability: better than 0.002 mm
- Accuracy: better than 0.002 mm
- Weight: 100 g (approx.)

82-P0700

Pressure transducer, range 0-700 bar.

Specifications:

- Accuracy: $\pm 0.5\%$
- Resolution: infinite
- Weight: 150 g (approx.)



82-P0324



82-P0700

Datalog8 82-P9008, 8-channel multipurpose datalogger



82-P9008

35-T0116/33

500 kN capacity loading system

Standards

ASTM D1194 | ASTM D1195

This apparatus consists of a 500 kN capacity hydraulic jack, spherical seat, hand pump and pressure gauge and is supplied complete with a wooden carrying case. The set can be completed with a datum bar, dial gauges and load plates to make a complete Plate bearing test apparatus that suits your requirements. See Accessories.

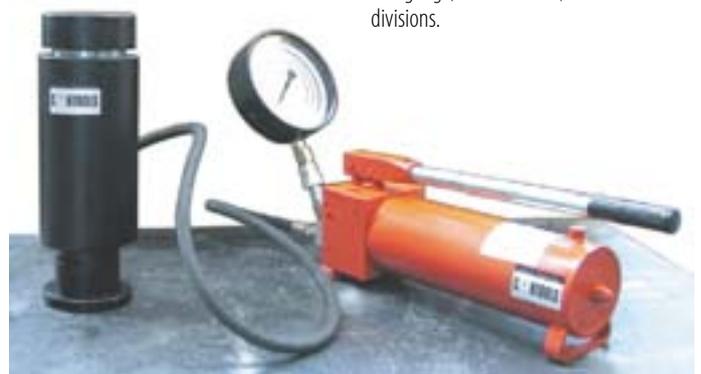
Weight: 40 kg (approx.)

Accessories

Datum bars (measuring bridges)

35-T1171/10

Datum bar, 2.5 m long, complete with three dial gauge supports.



35-T0116/33

35-T1173/10

As above but 5.5 m long.

Load plates

35-T0116/27

Load plate, 300 mm diameter. Weight 14 kg (approx.).

35-T0116/23

Load plate, 450 mm diameter. Weight 28 kg (approx.).

35-T0116/24

Load plate, 600 mm diameter. Weight 55 kg (approx.).

35-T0116/25

Load plate, 760 mm diameter. Weight 80 kg (approx.).

Dial gauges

82-D1259/B

Dial gauge, 50 mm travel, 0.01 mm divisions.

82-D1257

Dial gauge, 30 mm travel, 0.01 mm divisions.

82-D1255

Dial gauge, 10 mm travel, 0.01 mm divisions.



Set of load plates, dial gauges, dial gauge supports and datum bar (partial view).

Bearing capacity and deflection

Aluminium bearing plate 600mm diameter

Standards

NF P94-117-1

This bearing plate is normally used, together with a hydraulic jack, hand pump with manometer and the 80-B0180 Benkelman beam apparatus, for determining the bearing capacity and deflection of road pavements as fully described on page 472

It can also be conveniently used in plate load testing as an alternative to the standard 300 to 760 mm diameter steel plates. The aluminium bearing plate should be completed with the accessories specified below.

Ordering information

80-B0180/B1

Aluminium bearing plate, 600 mm diameter, with reinforcing ribs. Weight 30 kg (approx.).

Accessories

80-B0180/B2

Hydraulic jack, 200 kN capacity. Weight 10 kg (approx.).

80-B0180/B3

Three interchangeable extensions with spherical seated foot. Weight 12 kg (approx.).

80-B0180/B4

Hand pump with 200 mm diameter high-precision manometer. Calibrated in bar (0 to 3.5) and in daN (0 to 10000). Complete with connecting hose. Weight 11 kg (approx.).

80-B0180/B5

Carrying case for the above items except for the 80-B0180/B1. Weight 10 kg.

80-B0180*

Benkelman beam apparatus. Weight 10 kg

80-B0181*

Wooden carrying case for 80-B0180



80-B0180/B1

* For more informations see page 472



80-B0180/B1, 80-B0180/B2, 80-B0180/B3, 80-B0180/B4

Plate bearing test - Swiss method

Standards

SNV 70312

This method is used to estimate the bearing capacity of a soil under field loading conditions on flexible pavement components.

The relatively low weight (68 kg in total) and small dimensions of this apparatus make it very easy to use and to move from one place to another. The measuring bridge, made from aluminium alloy, is very light and has telescopic extensions so it can be positioned in a few minutes with minimum effort. The remote load control and gauge are mounted on the pump so it is not necessary to go near the plate for recording the load. The deformations are measured with three dial indicators.

Specifications

- Loading ram capacity: 100 kN
- Gauge range: 0 to 0.8 MN/m²
- Dial indicators: 3 no., 30 mm travel, 0.01 mm divisions
- Carrying case dimensions:
 - 1) 1080 x 360 x 200 mm
 - 2) 920 x 360 x 200 mm
- Total weight: 68 kg (approx.)

Ordering information

35-T0121

Plate bearing test apparatus, 100 kN capacity, 300 mm plate diameter.



35-T0121

Dynamic deformation modulus of soil

35-T0120

Lightweight deflectometer

Standards ASTM E2835-11* | TP-BF**-StB part 8.3/2012 | ZTV E-StB 09 | ZTV T-StB 95 | ZTV A- StB 97 | RVS 8 (Austrian regulations) | RIL 836

*Standard test method for measuring deflections using a portable impulse plate load test device

**German technical test standard for soil and rock in road construction

The dynamic plate load test performed with the Lightweight deflectometer is used to determine the soil bearing capacity and compaction quality of soils and non-cohesive subbases, as well as for soil improvement applications. Built-in soil layers can easily be tested without load abutment, facilitating quick assessments of test lots even under limited space conditions. The test method is suited to coarse-grain and mixed grain soils with a maximum grain size of 63mm and can be used to determine the dynamic modulus of deformation of soil in the range $E_{vd} = 15$ to 70 MN/m^2 .



35-T0120 during operation

Applications

- Road and railway construction, earth moving
- Quality assurance in canal construction
- Compaction monitoring in pipe trenches and cable ducts
- Testing of pavement bedding
- Testing of foundation backfill
- Quality inspection in boreholes
- Testing of modulus of deformation in line with soil exploration

Intra-company monitoring saves costs!

Being easy to handle and providing immediate measuring results, the Lightweight deflectometer is especially suited for monitoring intra-company operations. It facilitates quick decisions for continu-

ing construction at the site. The documentation can be printed directly at the site via the thermal printer or as a protocol printout after transferring and processing the data on a PC.

Advantages of the Dynamic Plate Load Testing.

- Fast and cost-saving
 - Time-saving (maximum 2 minutes per measuring point)
 - No vehicle required
 - Immediate on-site evaluation of test results
- Easy to handle
 - Low tester weight, few components, human-engineered
 - Easy for one person to operate and carry

- Testing can be achieved in difficult-to-reach locations
- Reliable and precise
 - Calibrated by an approved calibration institute
 - Complies with the latest state of the art technology
 - Field tested and used successfully throughout the world
 - Calibrated according to ASTM E2835-11 by authorization of the Federal Highway Research Institute

Specifications

Loading mechanism

Total weight: 15 kg
 Drop weight: 10 kg
 Maximum impact force: 7.07 kN
 Duration of impact: 17 ms
 Material: zinc coated/hard-chrome plated steel

Load plate

Diameter: 300 x 20 mm
 Total weight: 15 kg
 Material: zinc coated steel

Electronic settlement measuring instrument

Interfaces: USB, Thermal-Printer, GPS
 Power supply: 4 x R6 batteries
 Dimensions: 210 x 100 x 45 mm
 Settlement measuring range: 0.1 to 2.0 mm \pm 0.02 mm
 Measuring range: $E_{vd} < 225 \text{ MN/m}^2$
 Temperature range: 0 to 40°C
 Storage capacity of measured data: 500 series

Accessories

35-T0120/1

Transport cart for easier on-site transport of the Lightweight deflectometer between the measuring points.

35-T0120/2

Magnetic base plate for proper positioning of loading unit.

35-T0120/3

Thermal printer, small and quick, with light resistant paper, for documenting the test results within seconds at any time and any place.

35-T0120/4

Protocol software for user-friendly evaluation and processing of measurement series.

35-T0120/5

Transport box for secure transport of the Lightweight deflectometer to the site and between measuring points.



35-T0120/2



35-T0120/5



35-T0120/1



SOIL PERMEABILITY

Constant and Falling head apparatus

The permeability of soil is a very important factor in the study of the natural behaviour of soil with respect to water flow.

Two different methods of testing are proposed:

Constant head apparatus (models 38-T0184/A1 to 38-T0184/A11). Particularly suitable for relatively coarse-grained soil such as sands and gravel.

Falling head apparatus (models 38-T0185/1 to 38-T0185/4). More appropriate for fine-grained soils such as clay-like or silty soils.

Constant head apparatus

Standards

ASTM D2434 | AASHTO T215 | BS 1377:5

This test set includes a transparent plastic permeability cell (available in two sizes: 75 and 114 mm diameter), a stand with 3 manometer tubes (38-T0184/A2) and a constant level tank (38-T0184/A3).

Ordering information

38-T0184/A1

Constant head permeability cell, 75mm internal diameter, 3 take-off points.

38-T0184/B1

Constant head permeability cell, 114mm internal diameter, 6+6 (blanked) take-off points.

38-T0184/A2

Manometer stand with 3 manometer tubes.

The metal stand comprises 3 constant bore tubes, a metre scale, nipples and connecting tubing.

Dimensions: 1150 x 200 x 50 mm.

Weight: 3 kg (approx.)

38-T0184/A3

Constant level tank. Manufactured from acrylic glass. Complete with inlet, outlet, overflow, connecting tubing for the cell and attachment for wall mounting.

Dimensions: 250 x 155 x 160 mm.

Weight: 2.6 kg (approx.)

38-T0184/A11

Tamping rod, 8 mm diameter x 300 mm height.

Falling head apparatus

This apparatus is particularly suitable for fine-grained soils such as clay-like or silty soils with a permeability in the range of 1×10^{-2} to 1×10^{-6} cm/s. The test is performed with a permeability cell (38-T0185/1), which has to be connected to a manometer stand (38-T0185/2). During the test the cell is placed in a soaking tank fitted with an overflow tube (38-T0185/3). A vacuum pump can be connected to the cell to saturate the sample before testing. See Accessories.

As an option, the apparatus can be used with a suitable de-airing system such as the De-airing apparatus (28-WF4202) with De-airing tank (28-WF4220/A or 28-WF4221/A), Vacuum pump (86-D2001), Air drying unit (86-D2005) and Vacuum control panel (38-T085/4). See Accessories and general layout next page.

Ordering information

38-T0185/1

Falling head permeability cell, 100 mm internal diameter.

Complete with 75 micron gauze and 2 m of tubing

38-T0185/2

Manometer stand, with 4 glass manometer tubes, 1500 mm long, of 21, 12, 5 and 3.5 mm internal diameter.

Back panel dimensions: 1680 x 280 mm.

Weight: 3.6 kg (approx.)

38-T0185/3

Soaking reservoir, made from plated steel, complete with overflow tube.

Dimensions: 230 mm diameter x 230 mm height.

Weight: 2.3 kg (approx.)



38-T0184/A3,
38-T0184/A2,
38-T0184/A1



38-T0185/1
with 38-T0185/3 and
38-T0185/2

Permeability cell specifications

Cell model	38-T0184/A1	38-T0184/B1
Nominal internal diameter	75 mm	114 mm
Cell body	Transparent plastic	Transparent plastic
Take-off points	3	12 (6 blanked off)
Upper and lower plates	Anodised aluminium	Anodised aluminium
Weight (approx.)	2.7 kg	6.5 kg

Note: to use the 38-T0184/B1 cell, two manometer stands (38-T0184/A2) are required.

Accessories for falling head apparatus

De-airing and vacuum system

De-airing tanks

Used in conjunction with a vacuum source and related accessories, this item provides a very efficient and therefore quick means of removing the air from water. The de-airing tank consists of a transparent plastic cylinder fitted with a water spray inlet, an air outlet and a water outlet. A suitable vacuum supply is connected to the air outlet and water is sucked into the cylinder in a fine spray via the water inlet.

The tanks are supplied complete with a metal stand and have to be mounted at a high level so that the tank can fill the testing system by gravity.

Two models are available:

28-WF4220/A

7 litre capacity de-airing tank.
Overall dimensions: 579 x 200 x 209 mm.
Weight: 6.4 kg (approx.).

28-WF4221/A

23 litre capacity de-airing tank.
Overall dimensions: 619 x 320 x 311 mm.
Weight: 12 kg (approx.).



28-WF4220/A

Vacuum pump

86-D2001

Portable vacuum pump.
Free air displacement: 75 l/min.
Ultimate vacuum: 0.1 mbar.
230 V, 50-60 Hz, 1 ph.

86-D2001/Z

As above but 110 V, 60 Hz, 1 ph.

86-D2064

Rubber tube for vacuum pump.
ID 6.5 mm, OD 16.5 mm.



86-D2001

Air drying unit

86-D2005

Air drying unit

This item is installed between the vacuum pump and the de-airing tank to prevent / limit water vapour mixing with the oil of the vacuum pump, which, in significant quantities, may cause serious damage to the pump. It has to be filled with a suitable desiccant (e.g. Silica gel desiccant 86-D0819). For more details about complete de-airing systems see page 570

Specifications

Plastic frame with acrylic cylinder.

Desiccant capacity:
500 g (approx.).

Overall dimensions:
185 x 300 mm (d x h) (approx.).

Weight when empty:
1 kg (approx.)

86-D0819

Silica gel desiccant with indicator,
1000 g bottle.

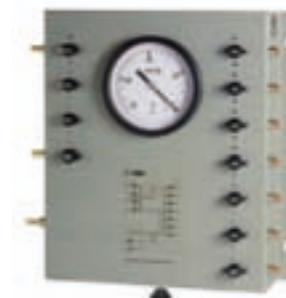


86-D0819, 86-D2005

Vacuum control panel

38-T0185/4

Vacuum control panel.
Used for saturating samples. Includes adjustable vacuum valve and vacuum gauge.
Two manifolds of 3 and 6 lines.
Weight: 3 kg (approx.).



38-T0185/4

Hydraulic conductivity by compaction mould permeameters

Standards

ASTM D5856

This test method covers laboratory measurement of the hydraulic conductivity (also referred to as the coefficient of permeability) of laboratory-compacted materials in compaction-mould permeameters conforming to ASTM D5856: Constant head method A and Falling head method B-C-D. The testing system includes a compaction-mould permeameter (available in two sizes: 4" and 6" diameter) and a permeability stand (38-T0179/B) which is suitable for either constant or falling head permeability determination.

Compaction-mould permeameters

The 4" (101.6 mm) diameter model (38-T0180) is based on a standard Proctor mould and the 6" (152.4 mm) diameter (38-T0181) on a CBR mould. Both comprise mould and collar, valve, water inlet or outlet, perforated base plates and filter screens. The moulds are designed to prevent swelling of the test specimen.

Weight:

38-T0180: 8 kg (approx.)

38-T0181: 16 kg (approx.).

Ordering information

38-T0180

Compaction-mould permeameter, 4" (101.6 mm) diameter.

38-T0181

Compaction-mould permeameter, 6" (152.4 mm) diameter.

38-T0179/B

Constant and Falling head permeameter stand four cell capacity

This apparatus is used to control the water supply in the constant or falling head permeability tests on compacted soils.

The stand consists of two wall-mounted aluminium panels. The larger one is for falling head permeability tests, with four transparent plastic tubes and graduated scales, the other is for constant head permeability tests and has a height-adjustable water reservoir and comes complete with tubing and valves.

Specifications

- Max adjustable height of constant head tank: 3850 mm
- Cell capacity: four cells
- Overall dimensions of panels:
 - Falling head panel: 800 x 1100 x 130 mm (with four transparent tubes)
 - Constant head panel: 240 x 1920 x 300 mm (with water reservoir)
- Weight: 70 kg (approx.)



38-T0180, 38-T0181



38-T0179/B. The wall mounted panels can be conveniently positioned at an appropriate height. The water reservoir can be easily adjusted in height up to the maximum height of 3850 mm for the selected constant head value.

Determination of dispersibility

38-T0186

Combined constant or falling head apparatus

Standards

ASTM D2434

This apparatus can be used for either the constant or falling head method, to determine the soil permeability. It consists of a two-section plastic chamber, a plated steel top with gaskets, a plastic funnel reservoir (with a maximum head of 550 mm with the reservoir upright) and a 100 cc pipette. Also included are two porous stones, 63.5 mm diameter by 12.7 mm thick, with an average pore size of 300 microns.

Weight: 4.5 kg (approx.)

Spare parts

38-T0186/1

Spare porous stone 63.5 mm dia x 12.7 mm thick. Pack of 5.



38-T0186

38-T0189/A

Pinhole test apparatus

Standards

ASTM D4647 | BS 1377:5

Certain fine-grained soils with a high sodium content are highly susceptible to erosion by the water flowing through them. During the dispersibility test the flow of water through a cavity in the soil under a high hydraulic gradient is reproduced. The test apparatus consists of a cylindrical metal container fitted with a water inlet at one end and an outlet connection at the other, a standpipe tube with scale, and a stand to support the pinhole apparatus.

Weight: 3.5 kg (approx.)

Accessories

38-T0184/A3

Constant level tank.

38-T0184/A5

PVC tubing, 10 mm OD, 8 mm ID, 10 m coil.



38-T0189/A

Rocks

45 | Rock mechanics

According to the “Committee on Rock Mechanics, National Academy of Sciences”, rock mechanics is a theoretical and applied science concerning the physical behaviour of rocks subjected to stress conditions of different origin. In general terms, rock mechanics involves the study of underground works such as tunnels and surface construction such as open quarries or dam foundations.

When a rock sample is subjected to defined stress conditions in the laboratory, the stress-strain diagram can show behaviours of non linearity also for very small strains, hysteresis, anisotropy, fluage conditions, etc. All these phenomena can be mathematically described.

This section proposes a complete range of testing equipment including Automatic test systems for the determination of Elastic Modulus and strength characteristics of rock specimens in uniaxial and triaxial conditions.

45 Rock mechanics

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Behaviour of joints

The behaviour of joints is of particular interest: joints originate from geological failures; a break in the rock mass continuity along which no visible displacement has occurred.

From a rock mechanics point of view, the discontinuities are characterized by a mechanical strength lower than the original rock matrix and require detailed test investigations summarized as follows:

Tilt test Performed with the Tilt test apparatus, 45-B0096.

Surface roughness of the joint Performed with the Profilometer (Barton comb), 45-D0566 or 45-D0566/A.

Shear strength of the joint Performed with the Rock shear box apparatus, 45-D0548 or 45-D0548/D.

45-B0096

Tilt test. apparatus

This device is used to calculate the JRC (Joint Roughness coefficient) of a rock joint. It consists of an adjustable inclined plate, on which the rock sample (maximum 100 mm diameter) is placed, separated along the surface where the roughness is to be measured. The plate is then slowly tilted until the upper part of the sample starts

to slide over the lower one. From the measured inclination angle it is possible to evaluate the roughness index.

Inclination angle: 0 to 50°
Overall dimensions: 265 x 170 x 260 mm
Weight: 4 kg (approx.)

Profilometers (Barton comb)



Used for measuring the roughness profile of rock samples.

45-D0566

Profilometer (Barton comb), 300 mm length. Weight 1 kg (approx.).

45-D0566/A

Profilometer (Barton comb), 150 mm length. Weight 0.5 kg (approx.).

Rock shear box apparatus

Standards

ASTM D5607 | ISRM Suggested method

The test method offers a simple and practical way of determining the strength and slope stability of rock, both in the field and in the laboratory. The apparatus consists of a shear box designed to accept samples measuring no larger than 115 x 125 mm, or alternatively, cores up to 102 mm diameter. The shear box is in two halves, the

upper being connected to two rams for reversible shearing action and the lower connected to a ram for normal load application. The loads are recorded by Bourdon tube load gauges.

The normal loading system comes with an adjustable low-friction pressure maintainer to absorb any changes in the specimen volume during the shearing process and to ensure a constant vertical stress is maintained.

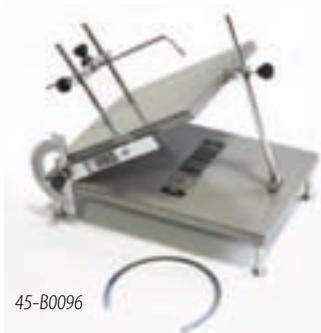
Two versions are available:

- **45-D0548/A**, supplied complete with two 50 kN pumps and manometers, five digital gauges (25 x 0.01 mm), and two mould forms used to ensure correct alignment of the sample before the test with cementation.
- **45-D0548/D (digital version)** comprises: 5 potentiometric transducers with 25 mm travel (4 vertical and 1 horizontal), 2 hand-operated pumps fitted with Bourdon gauges for applying lateral and vertical load, 2 pressure transducers for the direct acquisition of the load values on the external datalogger model 82-P9008 (see page 552)

Note: High alumina cement for cementation of the sample is not included and has to be ordered separately - see Accessories.

Specifications

Gauge range: 50 kN x 1 kN
Overall dimensions (loading frame only):
460 x 250 x 600 mm
Weight: 45 kg (approx.)



45-B0096



48-D0548/A

Classification tests



45-D0548/D: Detail of the shear box apparatus fitted with 5 displacement transducers

Ordering information

45-D0548/A

Rock shear box apparatus conforming to ASTM and ISRM suggested method.

45-D0548/D

Digital rock shear apparatus to ASTM and ISRM suggested method.

Accessories and spares

45-D0548/9

High alumina cement for the cementation of the sample in the shear box. 50 kg bag.

82-P9008

Datalog, 8 channel general purpose data acquisition device.
110-240 V, 50-60 Hz, 1 ph.

45-D0548/8

Spare shear box

45-P0070/6

Excel® template for data processing according to ASTM D5607.

45-D0561

Rock classification hammer

Standards

ASTM D5873 | ISRM Suggested method

Used to measure the rebound index on rock cores and samples. It is similar to the one used for testing concrete, but has a different level of impact energy: 0.74 Nm. Rock cores are positioned horizontally and the rebound index is obtained from the average of several measurements performed perpendicularly to the longitudinal axis, using the ASTM Rock cradle (45-D0562/A - see Accessories) as shown in the picture.

Weight: 1.5 kg (approx.)



45-D0561 with 45-D0562/A

Accessories

45-D0562/A

ASTM rock cradle

This universal cradle can hold rock core samples with diameters from EX (21.46 mm) to NX (54.74 mm) size and greater. The cradle comprises a vertical hammer guide fitted to a steel plate of minimum mass conforming to ASTM D5873.

Dimensions: 220 mm diameter x 420 mm height (approx.)

Weight: 27 kg (approx.)

58-C0184

Calibration anvil

Standards

EN 12504-2 | ASTM C805 | ASTM D5873

Made from special alloy steel and supplied complete with a traceable hardness certificate, the anvil is essential for the periodical laboratory verification of the rock classification hammer.

Dimensions: dia. 150 mm x 230 mm

Weight: 16 kg (approx.)



58-C0184

Rock picks

Used for preliminary rock identification.

45-D1710

Rock pick with pointed tip.
Weight: 650 g (approx.).

45-D1711

Rock pick with chisel edge.
Weight: 550 g (approx.).



45-D1710, 45-D1711

Mohs hardness scale set

45-D0529

Mohs hardness scale. Set of 9 mineral specimens.



45-D0529

Rock strength index apparatus

Standards ASTM D5731 | ISRM Suggested method

45-D0550/E

Digital rock strength index apparatus (Franklin press).

This apparatus consists of a 60 kN capacity load frame with a hydraulic loading ram worked with a hand pump. The frame is adjustable, for testing samples measuring up to 102 mm diameter. A ruler mounted on the frame allows for direct measurement of the distance D between the conical platens before and after the test. The compression load is measured by a pressure transducer with an advanced digital display unit, assuring the best accuracy and resistance to failure shocks. The machine, when fitted with the accessory 45-D0550/D5, can also be used for compression tests on small cores or cylindrical specimens. The apparatus is contained in an easily transportable metal case and is supplied complete with clear safety goggles.

Specifications

- Load range: 0 to 60 kN
- Digital display: 2 x 16 characters
- Resolution: 32,000 divisions
- Load pacer: included
- Load units: kN and MPa
- PC connection: serial port
- Accuracy: ±1%
- Case dimensions: 800 x 500 x 280 mm
- Weight: 15 kg (approx.)
- Battery charger: 110-240V, 50-60 Hz, 1 ph



45-D0550/E during operation



45-D0550/E fitted with set 45-D0550/D5 for compression test

main features

- > Light and portable unit
- > Sample sizes up to 102mm diameter
- > Accepts irregularly shaped samples
- > High resolution digital display, battery operated
- > Resistant to failure shocks
- > Serial port for PC connection included
- > Compression platens option for compression test on small cores and cylinder
- > Safety goggles included



45-D0550/E

Accessories and spare parts

45-D0550/D5

Set of lower and upper platens, 52 mm diameter, with spherical seat.

45-D0550/A7

Set of hardened conical points.

45-D0550/A8

Set of gaskets for cylinder and pump.



45-D0550/D5

Specimen preparation

Laboratory coring machine and bits

This machine is specifically used in the laboratory for cutting core samples from hard materials such as rock and concrete. A clamp is provided to firmly secure the material during the cutting cycle. The coring area is protected with a transparent cylinder. A special clamping device for preparing rock samples from core pieces is also available - see Accessories.

Note: drill bits are not included.

Technical specifications

- Power unit: 1800 W
- Coring speed: 1485/2720 rpm
- Coring range: from 8 to 60 mm diameter
- Dimensions of the base tray assembly: 600 x 500 x 200 mm
- Weight: 80 kg (approx.)

Ordering information

45-C0330

Laboratory coring machine, 2-speed, complete with water inlet. 230 V, 50-60 Hz, 1 ph.

45-C0330/Z

As above but 110 V, 60 Hz, 1 ph.

Accessories

Drill bits with spigot adaptors

Code	Description	Specimen diameter		Effective length	D.C.D.M.A. reference
		mm	inches	mm	
45-C0342	Diamond core bit for	21.46	0.850	110	EX
45-C0343	Diamond core bit for	30.10	1.185	110	AX
45-C0344	Diamond core bit for	38.10	1.500	110	1.5 in.
45-C0345	Diamond core bit for	42.04	1.655	120	BX
45-C0346	Diamond core bit for	54.74	2.155	140	NX
45-C0347	Diamond core bit for	63.5	2.5	150	HQ

Clamping device

45-C0331

Clamping device for cores with a maximum diameter of 100 mm, complete with transparent guard.



45-C0331



45-C0330 with core bit, taking sample from a large rock core



45-C0330 with core bit and clamping device 45-C0331



45-D0343, 45-D0344, 45-D0345

Cutting saw

Description

This universal saw, when completed with suitable accessories, can be used to cut concrete and rock cores and irregular rock samples in order to obtain geometrically defined samples. It can be fitted with 300 to 450 mm diameter blades.

The head is adjustable in height and the tilting motor head permits cutting at an inclination of up to 45°. The tank and the trolley are zinc-plated to avoid corrosion. A water pump with double-filtering system for cooling the blade is included.

Note: cutting blade and accessories to cut cores, rock and other building materials are not included – see Accessories.

Specifications

Maximum cutting height: 115 mm with the 350 mm diameter blade and 165 mm with the 450 mm diameter blade
 Maximum blade diameter: 450 mm
 Power: 3 kW
 Overall dimensions: 1300 x 700 x 700 mm (w x d x h)
 Weight: 92 kg (approx.)

Ordering information

55-C0210/D

Rock, concrete and masonry saw. 380 V, 50 Hz, 3 ph.

55-C0210/DZ

As above but 220 V, 60 Hz, 3 ph.

Accessories

45-C0211/4

Diamond blade, 350 mm diameter, for hard rock.

55-C0211/1

Diamond blade, 350 mm diameter, for concrete.

55-C0210/1

Diamond blade, 450 mm diameter, for concrete.

55-C0210/5

V-shaped support for cylinders and cores up to 160 mm diameter.
 Weight: 4 kg (approx.).

45-C0210/6

Locking clamp device for irregular pieces.

Note: for more information about using the machine for cutting concrete core specimens, see page 297



55-C0210/D with 55-C0210/1 blade and 55-C0210/5 V-shaped support for cylinders and cores.



55-C0210/D with 45-C0210/6 and 55-C0210/4

Core trimmer and cut-off machine

Standards ASTM D4543

This machine is used to obtain perfectly machined rock samples (cubes, prisms, etc.) from irregular rock or core pieces. It is supplied complete with a standard vice to hold irregular pieces (up to approx. 70 x 140mm) firmly in place, and a "V" device for cores up to 75mm diameter x 140 mm height. Longer cores can be machined by turning the sample upside down in the device. The machine also includes a cooling water inlet and transparent cover, conforming to CE requirements, with a switch that automatically stops the machine when it's opened.

The machine can be fitted with either a cutting blade or a double-faced cup wheel for surfacing the ends of cylindrical specimens.

Note: blade, cup wheel and water pump are not included and have to be ordered separately - see Accessories.

Specifications

Power: 1 100 W
Blade speed: 3000 rpm
Dimensions: 730 x 1050 x 590 mm (approx.)
Weight: 100 kg (approx.)

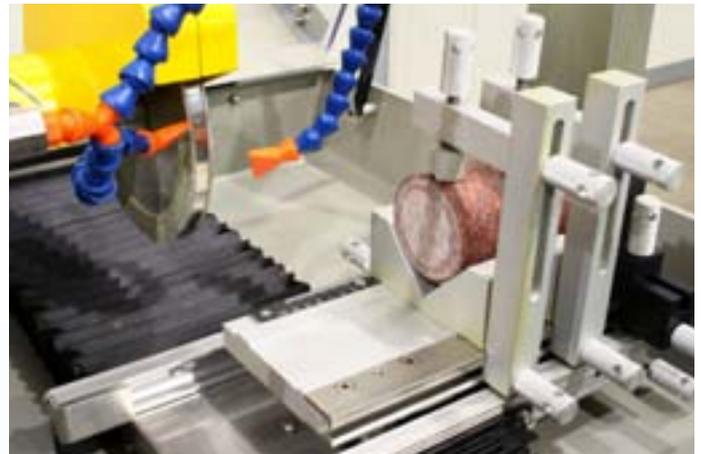
Ordering information

45-D0536/A

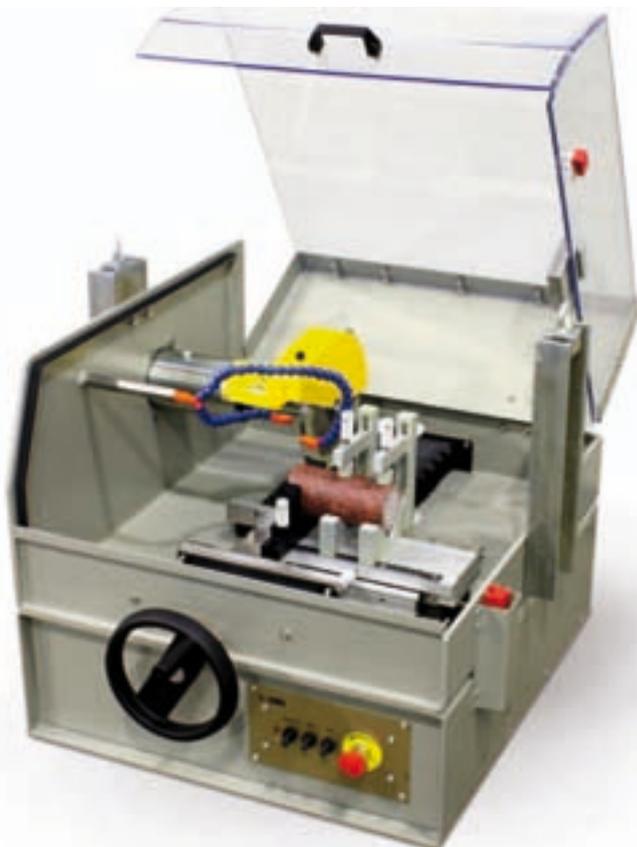
Laboratory core trimmer and cut-off machine complete with water inlet.
230 V, 50 Hz, 1 ph.
45-D0536/AY
As above but 220 V, 60 Hz, 1 ph.
45-D0536/AZ
As above but 110 V, 60 Hz, 1 ph.



45-D0536/A, detail of spindle with clamping mechanism and cutting blade 45-D0536/2



45-D0536/A, detail of spindle with clamping mechanism and double-faced cup wheel 45-D0536/A3 during surface grinding of cylindrical specimen ends



45-D0536/A with cutting blade 45-D0536/2

Accessories

Cooling recirculating pump

45-D0536/1

Cooling recirculating pump complete with reservoir.
230 V, 50 Hz, 1 ph.

45-D0536/1Y

As above but 220 V, 60 Hz, 1 ph.

45-D0536/1Z

As above but 110 V, 60 Hz, 1 ph.

Cutting blade and cup wheel

45-D0536/2

Diamond cutting blade, 230 mm diameter x 2.8 mm thick. Maximum cutting area 110 x 70 mm.

45-D0536/A3

Double-faced diamond cup wheel, 230 mm diameter x 16 mm thick. Used for finishing/grinding sample ends parallel and at right angles to the axis.



45-D0536/A3, 45-D0536/2

Specimen grinding machine 55-C0201 series

Standards

EN 12390-2 | ASTM D4543

This machine is used to grind and polish rock and concrete specimens, natural stones, ceramic materials, etc.

Two versions are produced:

- 55-C0201/B Standard: in this version the radial displacement of the grinding head is motor operated and activated with a push button.
- 55-C0201/C Automatic: in this version the radial displacement is fully automatic and controlled by travel limit switches.

All the other characteristics are identical.

The machine is supplied complete with a safety chip-guard (which, when removed, automatically stops the machine), a coolant tank, motor pump, and one set of abrasive sectors. Diamond grinding sectors are available on request (see Accessories).

The 45-D0534/B Core face preparation jig can be easily fitted using the clamping element supplied with the machine.

Note: for more details and information about using these machines for grinding concrete specimens, see page 296



55-C0201/B

Ordering information

55-C0201/B

Specimen grinding machine.
220-380 V, 50 Hz, 3 ph.

55-C0201/BZ

As above but 220 V, 60 Hz, 3 ph.

55-C0201/C

Specimen grinding machine with automatic radial displacement of the grinding head. 230-380 V, 50 Hz, 3 ph.

55-C0201/CZ

As above but 220 V, 60 Hz, 3 ph.

Accessories and spares

55-C0201/B2

Set of 10 diamond impregnated sectors.
Weight: 4,6 kg (approx.).

55-C0201/B1

Spare set of 10 abrasive sectors.
Weight: 2 kg (approx.).

45-D0534/B

Core face preparation jig, for preparation of parallel and flat core faces using horizontal surface grinders (e.g. 55-C0201/B). Consisting of a 4-place locking device capable of clamping core samples from 20

to 55 mm diameter, it can be mounted on most grinding machines with or without a magnetic chuck.
Weight: 6 kg (approx.).

45-D0534/C

As 45-D0534/B but consisting of a 2 place docking device capable of clamping core samples from 50 to 100 mm diameter.



45-D0534/C



45-D0534/B

Strength and deformability tests

UNIAXIAL AND TRIAXIAL TESTS

Most of the information obtained from laboratory tests on rock are substantially related to the stress and strain characteristics of the tested materials. The tests most generally performed on cylindrical rock samples are the following:

- Evaluation of the compressive strength and strain under uniaxial conditions
- Evaluation of the compressive strength and strain under triaxial conditions

Uniaxial test

Standards

ASTM D2938 | ASTM D3148

Recommended by ISRM: Suggested methods for determining the uniaxial compressive strength and deformability of rock materials

The uniaxial test is performed by applying increasing vertical stress at a constant rate of between 0.5 and 1.0 MPa/s. Axial and radial strains are measured with high precision (about 5×10^{-6}). Subsequent load-unload cycles are also carried out to obtain an accurate evaluation of the compressibility properties.

Triaxial test

Standards

ASTM D2664 | ASTM D5407

Recommended by ISRM: Suggested methods for determining the strength of rock materials in triaxial compression

The triaxial test is performed on prepared rock specimens which are contained in a rubber sealing membrane and placed within a triaxial chamber. They are then subjected to a constant isotropic confining pressure (generally between 5 and 60 MPa). A vertical stress is subsequently applied; tests and measurements are carried out in the same way as for uniaxial tests.

From the measurements recorded during the tests the following information is obtained:

- Rate of stress versus axial and radial strain
- Maximum stress / failure stress
- Tangent and secant Young's modulus measured from the stress-axial strain curve
- Poisson's ratio, obtained from the change in radial and axial strain
- Maximum stress versus applied cell pressure (in the triaxial tests) to define the failure envelope and the corresponding properties (cohesion and friction).

Other significant parameters investigated in the triaxial test are the permeability characteristics of rocks, and rock behaviour, when subjected to high water pressure, especially important for the study of dam foundations, and generally for underground tunnels and cavities.

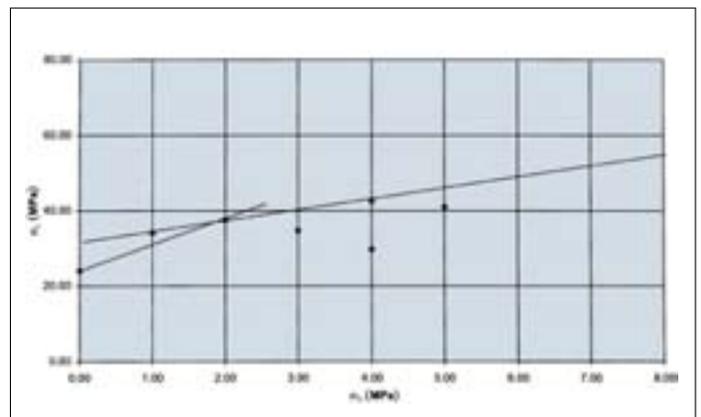
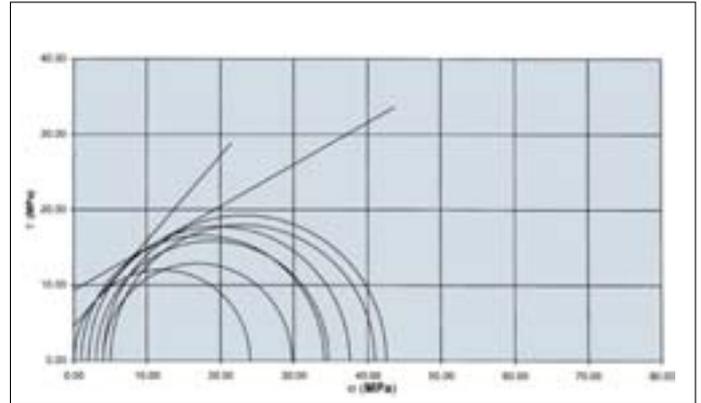
Testing systems

We produce three systems which differ for sophistication and automation:

ADVANCED Automatic system for Uniaxial and Triaxial tests on rock specimens (see page 180)

Triaxial test is carried out automatically at a multiple failure stages, the strength envelope is obtained with a single test by a stepwise procedure, from a single specimen it is possible to plot the complete failure path.

The system is based on ADVANTEST ROCK and SERCOMP 7



Triaxial test on rock material. Typical failure envelopes, diagrams σ vs τ and σ_1 vs σ_3 .

ROCK Servo-hydraulic units and it features the full automation of triaxial testing including stress path (multi - stage) and post-peak softening analysis.

Automatic system for Uniaxial and Triaxial tests on rock specimens (see page 187)

Based on the AUTOMAX E MODULUS for axial load and SERCOMP 7 for confining pressure. The whole system performs either uniaxial or triaxial automatic tests under load/stress control.

The 2 consoles are operated independently and the failure envelope is obtained by few individual tests (single - stage) with automatic application of axial load and confining pressure at different levels.

Semi-automatic system for Uniaxial and Triaxial tests on rock specimens (see dedicated web page for details and ordering information).

Based on a standard compression machine for axial loading and a manually-operated pump for confining pressure. It performs either uniaxial or triaxial tests under load/stress control. Failure envelope is obtained by few individual tests (single - stage) with manual application of axial load confining pressure at different levels.

Advanced automatic uniaxial and triaxial test system

Standards

ASTM D2664 | ASTM D3148 | ASTM D5407 | EN 14580 | EN 1926

ADVANTEST

ADVANTEST ROCK

- > For determining elastic and Poisson modulae and strength characteristics of rock specimens under uniaxial and triaxial conditions.
- > Automatic performance of triaxial tests with individual but combined control of axial load and confining pressure including stress-path procedure.
- > Fully customizable test procedure including axial and later pressure combining laws.
- > Fully integrated data acquisition and results elaboration including strength envelope diagramming.

ADVANTEST ROCK: an advanced testing system specifically designed for rock testing



Our Automatic Rock Mechanics test systems are designed for testing various materials, from soft sandstone to high-strength basaltic samples. Triaxial tests with multiple failure stages are carried out automatically, making it possible to plot the entire failure path from a single specimen. The complete test system includes:

ADVANTEST Rock Servo-hydraulic control console

For Uniaxial and Triaxial tests

For application of load in conformance with the relevant standards.

The ADVANTEST Rock (45-C9842/RCK) manages strain-controlled load-unload ramps automatically and includes a dedicated software module for testing rock under triaxial conditions, applying confining pressures at definable values. When the specimen approaches failure, the system automatically and instantaneously increases the confining pressure to the next defined value to increase the specimen's strength.

It is therefore possible to build the complete failure path using a single specimen (multi-stage triaxial tests).

The ADVANTEST Rock can also be used for load, stress, displacement

and strain-controlled testing of concrete, fibre-reinforced concrete and Shotcrete etc.

Sercomp 7 Rock Servo-hydraulic control console

For Triaxial tests

For control of confining pressure. The Sercomp unit (45-C7022/RCK) has been specifically designed for triaxial rock testing and works as a remotely-controlled pressure unit, managed by the ADVANTEST Rock control console.

With the tests carried out under displacement controller conditions the cell pressure is maintained constant and axial stress is increased. When the sample approaches peak strength, the cell pressure is automatically increased up to a defined level.

Cell pressure is again maintained constant and axial stress is increased. When the sample again

approaches peak strength, the cell pressure is further increased. The above procedure is automatically repeated several times.

When maximum peak strength is reached, the test is continued.

Cell pressure is reduced in steps and, for each step, the residual strength is measured.

All the peak strengths are plotted against the corresponding values of cell pressure, thus building the complete failure path.

High-stiffness compression testing frame

For Uniaxial and Triaxial tests

Several different frames are available - the appropriate one should be selected according to the size and expected strength of the test specimens. Due to the typical high strength and fragility of rocks we recommend using the higher capacity frames (4000 kN

or 5000 kN).

For more information see page 216 EN 12390-4 compression frames.

Accessories

Hoek cells (for triaxial tests), see page 184

Strain gauges and accessories (for uniaxial and triaxial tests), see page 185

Sample extruders, see page 185

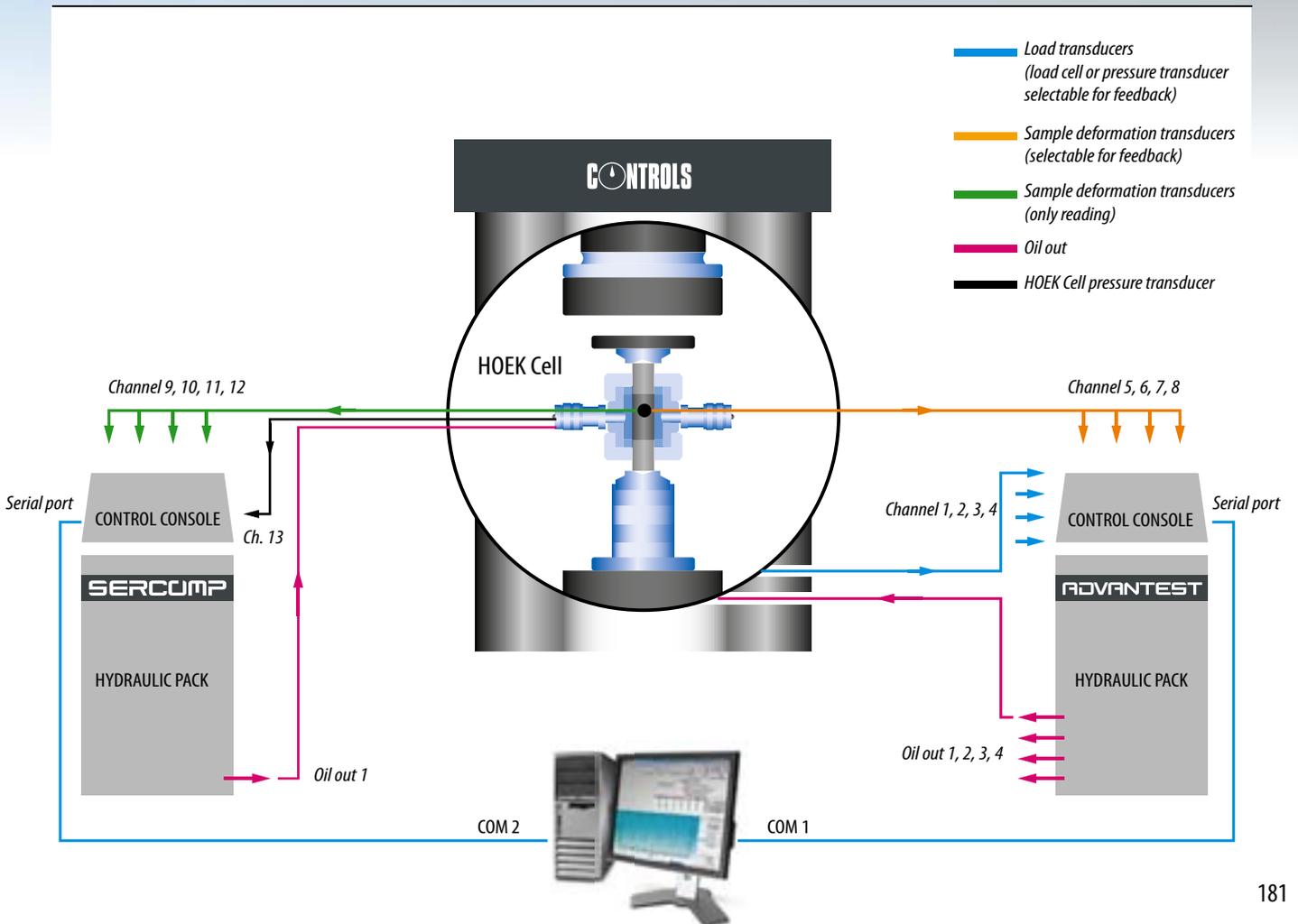
Compression device (for Uniaxial tests) see page 186

For a typical configuration of an Automatic triaxial test system, see page 186,187



3000 kN compression frame 50-C86Z00 with Hoek cell, 45-C9842/RCK ADVANTEST Rock, 45-C7022/RCK Sercomp Rock and 82-D2999 PC cabinet

ADVANTEST Rock Triaxial tests. Layout of the system



ADVANTEST

ADVANTEST Rock

Technical specifications

Hydraulics

- Maximum working pressure: 700 bar
- Maximum oil delivery: 2 litres/min at low pressure, 0.7 litres/min at high pressure
- Hydraulic ports for connection of test frames: 4
- Flow control: via servo-controlled proportional valve
- Cooling system: oil, with forced ventilation
- ON/OFF valves: 4, with electronic control

Hardware and onboard software

- Maximum resolution: 1/524,000 divisions
- 8 input channels:
 - 4 for load sensors (load cells or pressure transducers)
 - 4 for displacement transducers (potentiometric, LVDT amplified or analogue) and deformation transducers (clip gauge, strain gauge)
- Electrical characteristics of the conditioners:
 - Input signal from -2.5 to +2.5 V DC
 - Single/dual-ended input selected by jumper
 - Output signal from 1 to 10 V DC, calibrated by trimmer
- Zero and gain adjustable via software
- Data acquisition synchronized on all channels
- 8 analogue outputs corresponding to each channel for possible use of an external data acquisition system
- Test execution with control of:
 - Load/specific load
 - Displacement
 - Strain
- Diagnostic system to detect possible system malfunctions including oil level and oil filter
- 320 x 240 pixel display
- Storage of multiple calibration curves for immediate connection of different sensors
- Low frequency dynamic tests: maximum frequency 0.1 Hz (depending on the wave amplitude)

PC and software

PC and printer of latest generation
Software modules:

- Performs the remote control of the system. Manages the graphical and numerical display of the data including the overlay of various curves on the same axis (e.g. 3 different deformation curves with respect to a single time axis)
- Performs tests and sequences of steps/cycles programmable by the user
- Print out of test reports
- Real time variation of all test parameters during the test, including active control channel
- Language selection: English, French, Spanish, Italian, plus another language which can be input by the user overwriting messages of the desired language.

Physical specifications

- Power rating 750 W
- Voltage: 230V, 50Hz, 1ph (other voltages are available - see below)
- Dimensions: 470 x 410 x 1000 mm (d x w x h)
- Weight: 120 kg (approx.) excluding PC and printer

Ordering information

45-C9842/RCK

ADVANTEST Rock Servo-hydraulic unit for controlling up to four test frames for compression, flexure and indirect tensile tests with load, displacement and deformation control. Complete with PC, printer and software, including dedicated software module for rock testing under triaxial conditions (requires also the Sercomp7 Rock unit). 230 V, 50 Hz, 1 ph.

45-C9843/RCK

As above but 220 V, 60 Hz, 1 ph.

45-C9844/RCK

As above but 110 V, 60 Hz, 1 ph.

Sercomp 7 Rock



The Sercomp 7 Rock is a hydraulic unit remotely managed by the ADVANTEST Rock to provide and control lateral pressure inside the Hoek cell for triaxial testing. A cooling device is incorporated into the unit, for better control and uniformity of pressure throughout the test.

The control console includes 4 additional channels for sample strain / displacement transducers (acquisition only).

Specifications

- Maximum working pressure: 700 bar
- Maximum oil delivery: 0.7 litres/min
- Flow control: by servo-valve system
- Hydraulic ports: 2
- Power: 750 W
- Voltage: 230 V, 50 Hz, 1 ph (other voltages are available - see below)
- Dimensions: 470 x 410 x 1000 mm (d x w x h)
- Weight: 120 kg (approx.)

Ordering information

45-C7022/RCK

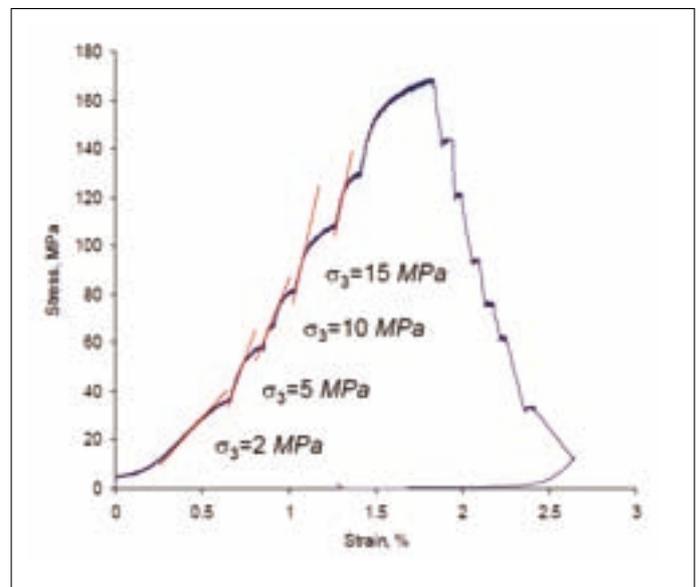
Sercomp 7 Rock Servo-hydraulic control unit for lateral pressure control. Can be used as a remotely controlled pressure unit, managed by the ADVANTEST Rock. 230 V, 50 Hz, 1 ph.

45-C7023/RCK

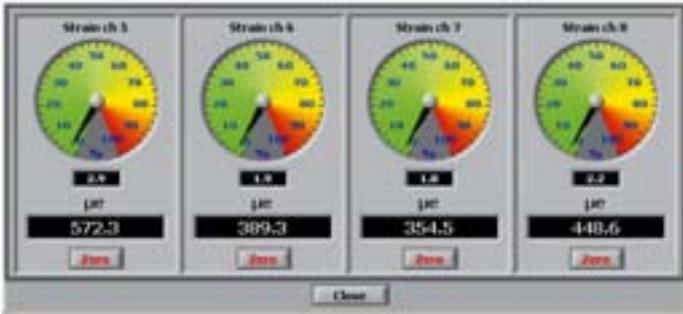
As above but 220 V, 60 Hz, 1 ph.

45-C7024/RCK

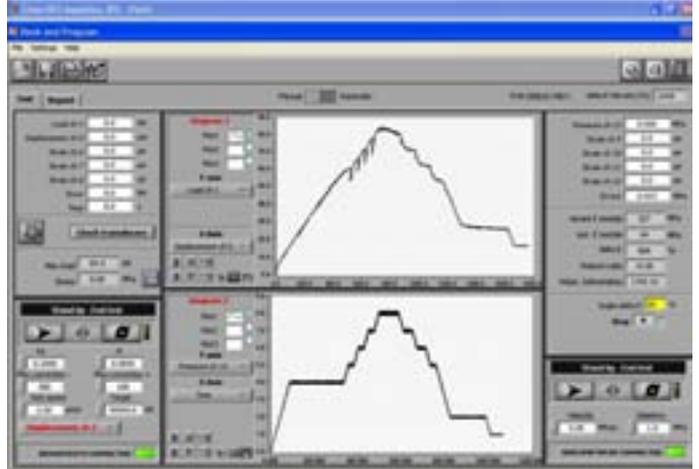
As above but 110 V, 60 Hz, 1 ph.



Stress-path triaxial test on rock performed under strain control for post peak evaluation.

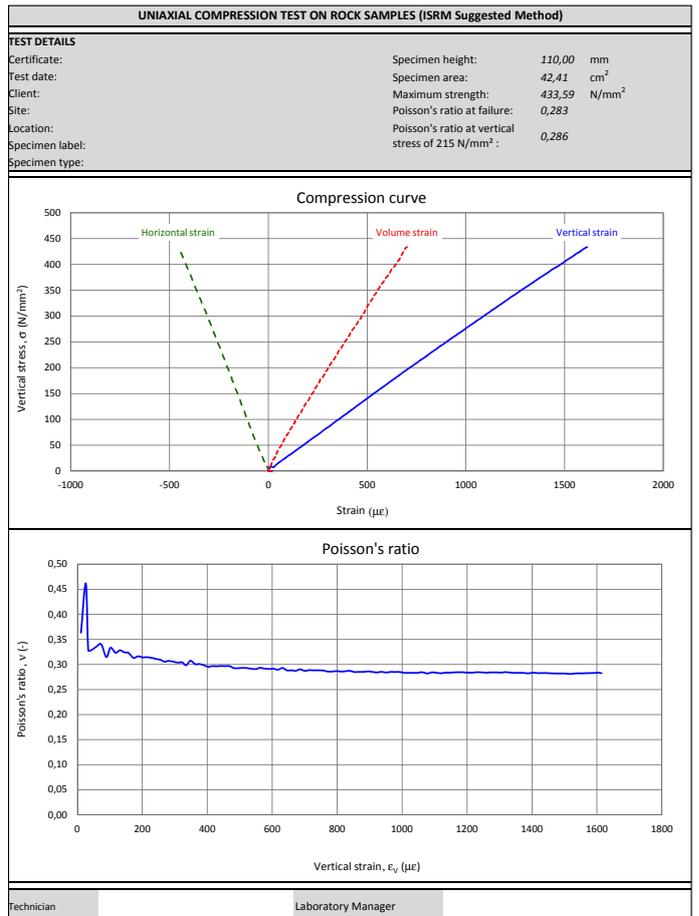
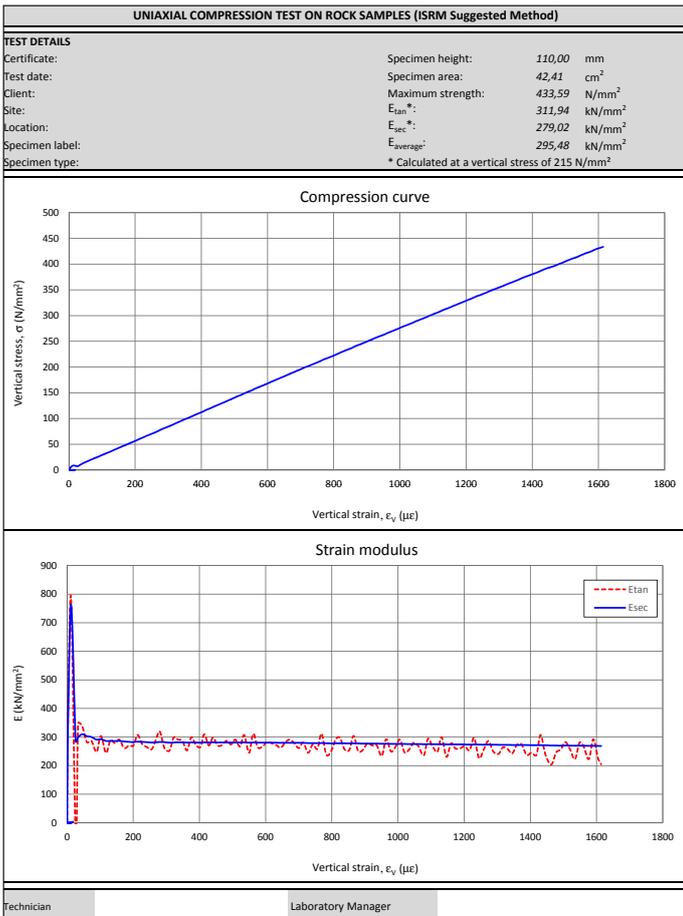


ADVANTEST, virtual gauges indicating the real-time readings of the sensors both in engineering units and as a percentage of the full scale. An excellent tool for transducer positioning.



ADVANTEST, main screenshot of software showing a stress-path triaxial test.

Examples of Excel® data sheets for uniaxial tests



Hoek cells for triaxial tests

Four different sizes of Hoek triaxial cells are produced; each one consisting of the following: (please refer to the drawing below)

- A cell body (1), complete with two quick-release self-sealing couplings: one for the introduction of hydraulic oil and cell pressure, and one for air out
- Two end caps (2)
- An upper (3) and a lower loading cap (4) with spherical coupling
- Two female spherical seats (5) for correct transmission of the axial load
- A rubber sealing sleeve (6)

Measurements of axial and radial strain are taken using electric strain gauges (7) glued directly onto the cylindrical surface of the specimen in both vertical and horizontal directions. Each strain gauge must be connected through a proper interface device (see 82-P0398) to complete and balance the Wheatstone bridge. The strain gauge measurements



Hoek cells for triaxial tests

Hoek cells. Specifications and ordering information

Code	D.C.D.M.A. reference	Specimen size (dia. x h) (mm)	Total height (mm)	Total height ⁽¹⁾ (mm)	Weight (kg)
45-D0553	AX	30.10 x 60	193	248	2.5
45-D0554	1.5 in.	38.10 x 75	247	302	4.0
45-D0555	BX	42.04 x 85	246	301	6.5
45-D0556	NX	54.74 x 108	271	326	13.0
45-D0557	HQ	63.5 x 130	300	355	15.0

(1) Including also 45-D0556/A and 45-D0556/B

Note: other Hoek cell dimensions, example H type, dia. 63.5 mm, available on request

can be acquired by automatic testing systems such as the ADVANTEST Rock control system or by the Semi-automatic systems.

The cells can also be used for permeability tests. See the Rock permeability equipment on page 188. It is recommended that a specimen extruder is used to extrude the rock sample from its sleeve.

Accessories

45-D0556/A

Pair of load spreaders for uniform load distribution. Thickness 15 mm (each).

45-D0556/B

Distance pad to reduce the vertical clearance of the compression machine. Thickness 25 mm.

45-D0556/H

Hoek cell holder

Spare rubber sleeves

45-D0553/1

Spare rubber sleeve, AX, for specimens 30.10 mm diameter x 60 mm height.

45-D0554/1

Spare rubber sleeve, 1.5 in., for specimens 38.10 mm diameter x 75 mm height.

45-D0555/1

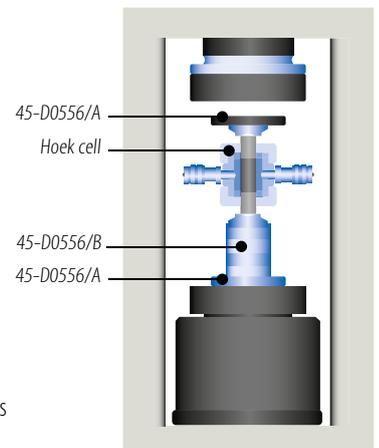
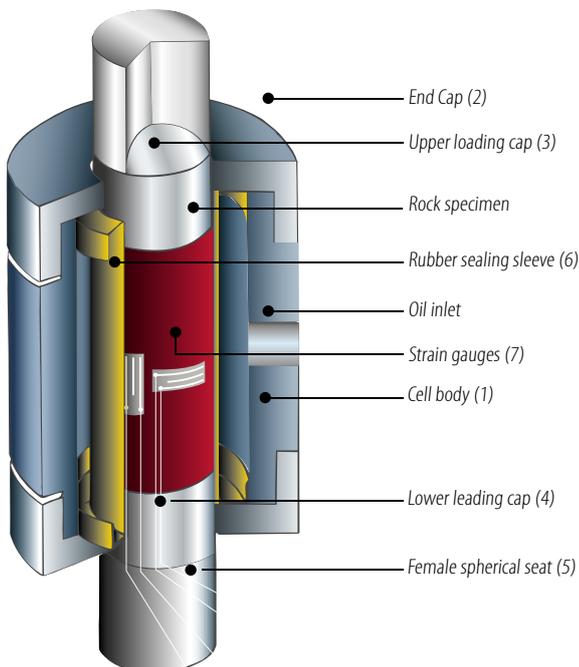
Spare rubber sleeve, BX, for specimens 42.04 mm diameter x 85 mm height.

45-D0556/1

Spare rubber sleeve, NX, for specimens 54.74 mm diameter x 100 mm height.

45-D0557/1

Spare rubber sleeve, HQ, for specimens 63.5 mm diameter x 130 mm height.



Schematic view of the Hoek cell with load spreaders and distance pads within the testing chamber of the compression frame



45-D0556/A, 45-D0556/B

Hoek cell 45-D0556 supported by cell holder model 45-D0556/H

45-D0577/A

Rock sample extruder

The extruder is used to extrude the rock sample from its sleeve thus avoiding having to empty the confining fluid. It consists of a steel frame with a rack and pinion mechanism and has to be used with an adapter set suitable for the cell size. See the following table. Weight: 11 kg (approx.)



45-D0577/A with adapter

Extruder adapter sets, comprising adapter plate, support cell body and shaft head.

Code	D.C.D.M.A. reference	For use with cell	Weight (kg)
<u>45-D0577/1</u>	AX	45-D0553	1.7
<u>45-D0577/2</u>	1.5 in.	45-D0554	1.7
<u>45-D0577/3</u>	BX	45-D0555	1.5
<u>45-D0577/4</u>	NX	45-D0556	1.5
<u>45-D0577/5</u>	HQ	45-D0557	1.5

Strain gauges for uniaxial and triaxial tests

Strain gauges provide a very accurate electrical signal which is directly proportional to deformation. When attached to the surface of a specimen submitted to an application of load, the measurements can be used to determine the elastic modulus and strength characteristics of the specimen. The gauges can be applied to the specimen surface using a special adhesive-catalyst agent and other accessories, which are all included in the Strain gauge application kit (82-P0399/B).

Up to four ¼ bridge strain gauges and eight ½ bridge gauges can be connected, via interface 82-P0398, to the ADVANTEST Rock control console. In the same way other additional strain gauges can be connected to the Sercomp 7 Rock (for triaxial tests).

In the Semi-automatic systems, the gauges can be connected, via one or two interfaces (82-P0398), to a suitable data logger. See page 552

Specifications

Code	82-P0390	82-P0391	82-P0392	82-P0393
Gauge width, mm	0.9	1.2	2.3	1
Gauge length, mm	10	20	30	60
Resistance, ohm	120	120	120	120
Bridge	¼	¼	¼	¼
No. of gauges per pack	10	10	10	10

Ordering information

82-P0390

Strain gauge, 10 mm gauge length. Pack of 10.

82-P0391

Strain gauge, 20 mm gauge length. Pack of 10.

82-P0392

Strain gauge, 30 mm gauge length. Pack of 10.

82-P0393

Strain gauge, 60 mm gauge length. Pack of 10.

82-P0399/1

Connecting terminals, 50-pair sheet.

82-P0399/B

Strain gauge application kit comprising: conditioner, neutralizer, acetone, two tweezers, adhesive and catalyst agent, 100 m of bipolar cable, solder, electric welder and carrying case.

82-P0398

Compensation device for up to 4 Wheatstone bridge gauges with ¼ or ½ bridge setup.

Spare parts

82-P0399/P22

Adhesive and catalyst agent for gluing strain gauges to the specimen.



Detail of rock sample fitted with 3 strain gauges



82-P0399/B Application kit



82-P0398

Compression device for uniaxial tests

Standards

ASTM D2938

The apparatus consists of a two-column frame fitted with an upper platen with a spherical seat that moves vertically, sustained by a spring. The lower platen is fitted to the base. It is suitable for use with a compression frame, as part of the Automatic or Semi-automatic testing systems for rock uniaxial tests.



45-D9035

45-D9035

Compression device for rock core specimens with dia. 50 to 55 mm and with height 100 to 110 mm.

Specifications

- Maximum load capacity: 800 kN
- Platen dimensions: 55 mm diameter x 28 mm thick
- Platen minimum hardness: 58 HRC
- Vertical clearance: 112 mm
- Overall dimensions: 145 mm diameter x 280 mm height
- Weight: 15 kg (approx.)



82-D1260 with 82-P0331/C



82-P0331/2

Typical configuration of the advanced automatic stress path system for uniaxial and triaxial tests on rock specimens

Code	Description	Q.ty Uniaxial	Q.ty Triaxial
Axial load system			
45-C9842/RCK	ADVANTEST Rock servo-hydraulic control console	1	1
86-D2999	PC cabinet (optional)	1	1
50-C68Z00	Compression frame, 4000 kN capacity	1	1
50-C0050/CAL	Special calibration of digital load unit assuring Class 1 from 1% of full scale	1	1
50-Q0050/P8	Upgrading of the 50-C68xxx series compression frame with bottom platen anti-fall safety system	1	1
50-C9086/P	Distance piece, 200 x 100 mm (dia. x h with threaded centering pin)	2	1
50-C9083/P	As above but 200 x 68 mm	3	2
50-C9082/P	As above but 200 x 50 mm	1	1
Confining pressure system			
45-C7022/RCK	Sercomp 7 Rock control unit	-	1
Triaxial components			
45-D0556 ⁽¹⁾	Hoek cell, NX, 54.7 mm diameter	-	1
45-D0556/A	Pair of load spreaders	-	1
45-D0556/B	Distance pad	-	1
45-D0556/1 ⁽¹⁾	Spare rubber sleeve	-	5
45-D0577/A	Rock sample extruder	-	1
45-D0577/4 ⁽¹⁾	Extruder adapter set for NX samples	-	1
45-D0556/H	Holding device for Hoek cells	-	1
Uniaxial components			
45-D9035	Compression device for samples up to 55 mm diameter x 110 mm height	1	-
Strain measurement (Select suitable strain gauges from the models listed below)			
82-P0398	Electrical compensation device	1	1
82-P0399/B	Strain gauge application kit	1	1
82-P0399/1	Connecting terminals, 50 pairs	1	1
82-P0390	10 mm strain gauge, 10 pieces	1	1
82-P0391	20 mm strain gauge, 10 pieces	1	1
82-P0392	30 mm strain gauge, 10 pieces	1	1
82-P0393	60 mm strain gauge, 10 pieces	1	1
82-P0070/3	Excel template for uniaxial tests, with stress-strain analysis, elastic modulus and Poisson's ratio processing	1	1
82-P0070/4	Excel template for triaxial tests, with stress-strain analysis and failure envelope processing	-	1
Post-peak evaluation (The following items are required, in displacement-controlled testing under triaxial conditions, to perform automatic failure path test (multi-stage) and to evaluate the post-peak behavior of the specimen)			
82-P0331/C1	High-precision LVDT transducer, 10 mm travel	-	3
82-P0331/2	Electrical averaging device for 2 or 3 transducers	-	1
82-D1260	Magnetic transducer holder	-	3

(1) Other models are available. See Hoek cells and Rock sample extruder on page 184, 185

Automatic uniaxial and triaxial test system

For determining the elastic modulus and strength characteristics of rock specimens under uniaxial and triaxial conditions.

Standards

ASTM D2664 | ASTM D3148 | ASTM D5407 | EN 14580 | EN 1926

The Automatic configuration including AUTOMAX E MODULUS and SERCOMP 7 performs stress path test by few individual tests (single - stage) with automatic application of axial load and confining pressure at different levels.

The confining pressure into the Hoek cell, applied by SERCOMP 7 is also measured by AUTOMAX E for simultaneous plot of all test quantities, e.g. stress, strain and cell pressure.

AUTOMAX E MODULUS

The AUTOMAX E-Modulus, fully described on page 252, consists of an ergonomic control console which houses the power unit and the PC.

Specifications

Hydraulics

See page 252

Hardware

See page 252 except:

- 4 channels for load sensors (pressure transducers/load cells)
- 1 channel for confining pressure (acquisition only)

- 6 channels for strain/displacement transducers (potentiometers, magnetostrictive, LVDTs)
- 3 channels for strain gauges

Ordering information

50-C20E82

AUTOMAX E-Modulus stand alone power and control console. 230 V, 50-60 Hz, 1 ph
50-C20E84
Same as above but 110 V, 60 Hz, 1 ph

SERCOMP 7

The hydraulic unit SERCOMP 7 controls the lateral pressure in the Hoek cell in case of triaxial testing. A cooling device is incorporated, for superior control and uniformity of pressure throughout the test. The control console includes a large graphic display with a membrane keyboard allowing easy setting and test monitoring.

Specifications

See pag 182

Ordering information

45-C7022/S

SERCOMP 7 Servo-hydraulic control console for lateral pressure to perform triaxial rock testing. 230V, 50 Hz, 1ph.

45-C7023/S

As above but 220 V, 60 Hz, 1 ph.

45-C7024/S

As above but 110 V, 60 Hz, 1 ph.

Typical configuration of an automatic system for uniaxial and triaxial tests on rock specimens

Code	Description	Q.ty Uniaxial	Q.ty Triaxial
Axial load system			
50-C20E82	Automax E modulus control console	1	1
50-C56Z00	Compression frame, 3000 kN capacity	1	1
50-Q0050/HRD	Upgrading of the 50-C46xxx and C56xxx Series compression frames with upper and bottom platens dia. 300 mm, min. hardness 58 HRC	1	1
50-C0050/CAL	Special calibration of digital load unit assuring Class 1% from 1% of full scale	1	1
50-Q0050/P6	Upgrading of the 50-C46xx and 50-C56xx series compression frames with bottom platen anti-fall safety system	1	1
50-C9086/P	Distance piece, 200 x 100 mm (dia. x h) with threaded centering pin	1	-
50-C9083/P	As above but 200 x 68 mm	2	1
Confining pressure system			
45-C7022/5	Sercomp 7 servo hydraulic control console	-	1
45-R0023	Three way connector	-	1
82-P0700	Pressure transducer, 700 bar capacity	-	2
82-P0349/ELT	Connection cable	-	2
Triaxial components			
45-D0556 ⁽¹⁾	Hoek cell, NX, 54.7 mm diameter	-	1
45-D0556/A	Pair of load spreaders	-	1
45-D0556/B	Distance pad	-	1
45-D0556/1 ⁽¹⁾	Spare rubber sleeve	-	5
45-D0557/A	Rock sample extruder	-	1
45-D0577/4 ⁽¹⁾	Extruder adapter set for NX samples	-	1
45-D0556/H	Holding device for Hoek cell	-	1
Uniaxial components			
45-D9035	Compression device for samples up to 55mm diameter x 110 mm height	1	-
Strain measurement (Select suitable strain gauges from the models listed below)			
82-P0398	Electrical compensation device	1	1
82-P0399/B	Strain gauge application kit	1	1
82-P0399/1	Connecting terminals, 50 pairs	1	1
82-P0390	10 mm strain gauge, 10 pieces	1	1
82-P0391	20 mm strain gauge, 10 pieces	1	1
82-P0392	30 mm strain gauge, 10 pieces	1	1
82-P0393	60 mm strain gauge, 10 pieces	1	1
82-P0070/3	Excel template for uniaxial tests, with stress-strain analysis, elastic modulus and Poisson's ratio processing	1	1
82-P0070/4	Excel template for triaxial tests, with stress-strain analysis and failure envelope processing	-	1

(1) Other models are available. See Hoek cells and Rock sample extruder on page 184, 185



3000 kN compression frame 50-C56Z00 with Hoek cell, 50-C20E82 AUTOMAX E-Modulus and 45-C7022/S SERCOMP 7

Rock permeability

This test is performed to measure the water flow through a rock specimen contained in a Hoek cell and subjected to a high confining pressure. The hydraulic gradient within the rock sample is supplied by a constant pressure apparatus and the water permeating the sample is collected in a burette. A couple of end caps are also necessary to fit the Hoek cell.

Constant pressure apparatus

This apparatus, originally designed for soil mechanics test applications, provides an infinitely variable constant pressure and can be used, in conjunction with the Hoek cells and permeability end caps, to test the permeability of rock at high confining pressures in the laboratory. The apparatus comprises: a motorized hydraulic pump, honed piston/spring assembly, precision test gauge 0-3500 kPa range, cylindrical oil/water interchange vessel, valves, and 2 kg of high viscosity oil.

Alternatively, lateral pressure can be applied with the 45-D0558 Low friction pressure maintainer or with the 45-C7022/RCK Sercomp 7 Rock Servo-hydraulic control console which is part of the Automatic Triaxial test system (see page 187)

A typical configuration for a rock permeability test set is shown in the table.

Specifications

Pressure range: 0 to 3500 kPa
Overall dimensions: 310 x 300 x 390 mm
Weight: 16 kg (approx.)

Ordering information

28-WF4312

Oil and water constant pressure apparatus for pressures up to 3500 kPa.
230 V, 50-60 Hz, 1 ph.

28-WF4314

As above but 110 V, 60 Hz, 1 ph.

Accessories

(Hoek cell accessories for permeability testing see page 184)

Permeability end caps

45-D0553/3

Permeability end cap, AX size, 30.10 mm diameter x 60 mm height.

45-D0554/3

Permeability end cap, 1.5 in. size, 38.10 mm diameter x 75 mm height.

45-D0555/3

Permeability end cap, BX size, 42.04 mm diameter x 85 mm height.

45-D0556/3

Permeability end cap, NX size, 54.74 mm diameter x 100 mm height.

Connecting hose

28-WF4191

Connecting hose for the Hoek cell.

Typical configuration of a semi-automatic system for permeability tests on rock specimens

Code	Description	Q.ty
28-WF4312	Oil and water constant pressure apparatus	1
28-WF0490	Nylon tubing, 6 mm ODx 4 mm ID, 20 m coil	1
45-D0556 ⁽¹⁾	Hoek cell NX size, 54.74 mm diameter x 100 mm height	1
45-D0556/3 ⁽¹⁾	Permeability end caps for NX Hoek cell, set of two.	1
28-WF4191	Connecting hose for the Hoek cell	1
86-D1160	Graduated glass burette, 25 ml capacity, 0,1 ml divisions	1
86-D1445	Support base, 200 x 130 mm, complete with rod, 10 mm diameter x 500 mm length	1
86-D1451	Double sleeve metal/glass	1
45-D0558	Low-friction pressure maintainer	1
45-C7022/RCK	Sercomp Rock control console ⁽²⁾	1

(1) Other models are available. See Hoek cells on page 184

(2) An alternative to the manual model 45-D0558. See Sercomp 7 Rock on page 187



28-WF4312 with Hoek cell, Permeability end caps, burette, support base and metal/glass sleeve

Manual lateral pressure system

45-D0558

Low friction manual pressure maintainer for lateral pressure in the Hoek triaxial cells, including pump and precision pressure gauge.

- Max. working pressure: 70 MPa
- Weight approx.: 15 kg



Splitting tensile test device

Standards

ASTM D3967

This apparatus, originally developed for testing cement specimens in compression, can be used for splitting tensile tests on rock disks with dimensions from dia. 54 mm to 64 mm.

It can be used as an accessory with a suitable universal tester such as one of the UNIFRAME universal testers.

See page 388

- Platens diameter 75 mm
- Hardness platens: 60 HRC
- Vertical daylight: 65 mm
- Total height: 234 mm
- Weight: 13 kg (approx.)

45-D9032/H

Compression device for indirect tensile test on rock specimens. Supplied with distance piece for specimen dia. 54 mm to 64 mm.



45-D9032/H

Slake durability index apparatus

Standards

ASTM D4644

The slake durability test has been developed to assess the deterioration of rocks over a period of time when subjected to water immersion. The test apparatus consists of a motorized drive unit which is mounted on a baseplate and can rotate two drums at a speed of 20 rpm. The tank assemblies are filled with water to a level 20 mm below the drum axis. The test drums are manufactured from 2 mm mesh, and measure 140 mm diameter x 100 mm ong. Two drums are already included, while two additional ones can be ordered separately - see Accessories.

- Overall dimensions: 1400 x 400 x 380 mm (w x d x h)
- Weight: 30 kg (approx.)

45-D0546/A

Slake durability apparatus. 230 V, 50 Hz, 1 ph.

45-D0546/AY

As above but 220 V, 60 Hz, 1 ph.

45-D0546/AZ

As above but 110 V, 60 Hz, 1 ph.

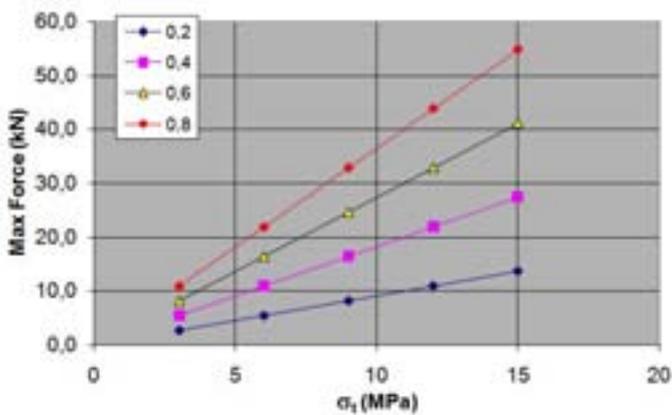
Accessories

45-D0546/2

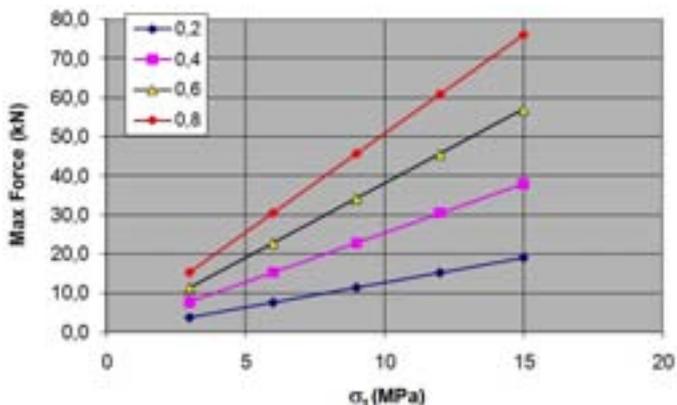
Mesh drum, complete with tank, base and coupling.

The typical failure loads of rock disks dia. 54 mm and 63.5 mm are plotted below in relation to the corresponding indirect tensile strength:

Rock core dia. 54 mm



Rock core dia. 63,5 mm



σ_t = Range of splitting tensile strength of rock samples (from ASTM D3967)



Aggregates

47 | Geometrical properties

48 | Mechanical and physical properties

Mineral aggregates are used in all fields of the construction industry to produce bituminous mixtures, concrete, mortars to be used in structures, fill materials, railway ballast, etc. For this reason we have given particular attention to all testing methods. The new EN standards, which in the majority of cases correspond to ASTM and old National standards, have grouped all tests on aggregates in five main subjects: Tests for general properties of aggregates / Tests for geometrical properties of aggregates / Tests for mechanical and physical properties of aggregates / Tests for thermal and weathering properties of aggregates / Tests for chemical properties of aggregate.

Sections 47 and 48 include all testing equipments required by the above specifications.

47 Geometrical properties

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Sampling

Riffle boxes (Sample splitters)

Standards

EN 932-1 | 932-2 | ASTM C136 | ASTM C702 | AASHTO T27

Note: for complete details and information see pages 21



15-D0438 to 15-D0438/H delivered with 3 pans.

Ordering information

15-D0438

EN riffle box, 7 mm slot width.

15-D0438/A

EN riffle box, 15 mm slot width.

15-D0438/B

EN riffle box, 30 mm slot width.

15-D0438/C

EN riffle box, 50 mm slot width.

15-D0438/D

EN riffle box, 19 mm slot width.

15-D0438/F

EN riffle box, 38 mm slot width.

15-D0438/G

EN riffle box, 64 mm slot width.

15-D0438/H

EN riffle box, 45 mm slot width

Mini stainless steel sample splitter

15-D0431

Stainless steel sample splitter, sixteen 5 mm slots



15-D0431, delivered with 3 pans.



86-D1180/1, 16-D1179/A

Large capacity sample splitter

15-D0430

Large capacity sample splitter.



15-D0430

Accessories

86-D1601

Round aluminium scoop, 325 ml capacity.

86-D1602

Round aluminium scoop, 1000 ml capacity.

86-D1603

Round aluminium scoop, 2600 ml capacity.



86-D1601 to 86-D1603

86-D1645

Shovel.

86-D1180/1

Soil mortar.

16-D1179/A

Rubber-headed pestle.

15-D0439

Quartering canvas to ASTM C702. 2x2 m.

EN Test sieves

Standards

EN 933-2 | ISO 3310-1 | ISO 3310-2 | ISO 565

200 to 450 mm diameter woven cloth and perforated metal plate sieves.

Note: for complete details and information see pages 12, 13



ASTM test sieves

Standards

ASTM E11

8" (203.2 mm) and 12" (304.8 mm) diameter woven wire and woven cloth sieves.

Note: for complete details and information see pages 14



Determination of particle shape: flakiness index

Bar sieves (Grids)

Standards

EN 933-3 | NF P18-561 | UNI 8520 | NLT 354

Used to determine the flakiness index of aggregates. Aluminium frame and steel bars.

Weight: 3 kg per unit, 42 kg complete set (approx.)



Bar sieves

Ordering information

Individual sieves

47-D0418/01

Bar sieve (Aggregate grid), 2.50 mm opening.

47-D0418/02

Bar sieve (Aggregate grid), 3.15 mm opening.

47-D0418/03

Bar sieve (Aggregate grid), 4.00 mm opening.

47-D0418/04

Bar sieve (Aggregate grid), 5.00 mm opening.

47-D0418/05

Bar sieve (Aggregate grid), 6.30 mm opening.

47-D0418/06

Bar sieve (Aggregate grid), 8.00 mm opening.

47-D0418/07

Bar sieve (Aggregate grid), 10.00 mm opening.

47-D0418/08

Bar sieve (Aggregate grid), 12.50 mm opening.

47-D0418/09

Bar sieve (Aggregate grid), 16.00 mm

opening.

47-D0418/10

Bar sieve (Aggregate grid), 20.00 mm opening.

47-D0418/11

Bar sieve (Aggregate grid), 25.00 mm opening.

47-D0418/12

Bar sieve (Aggregate grid), 31.50 mm opening.

47-D0418/13

Bar sieve (Aggregate grid), 40.00 mm opening.

47-D0418/14

Bar sieve (Aggregate grid), 50.00 mm opening.

Complete set

47-D0418/B

Complete set of 14 Bar sieves (Aggregate grids) with 2.50, 3.15, 4.00, 5.00, 6.30, 8.00, 10.00, 12.50, 16.00, 20.0, 25.00, 31.50, 40.0, and 50mm openings.

Flakiness and elongation index: BS method

Flakiness sieves

Standards

BS 812:105.1

Used to determine if aggregate particles are to be considered flaky, i.e. their thickness is less than 0.6 of their nominal size. Each sieve is made from heavy gauge steel. Sieves can also be purchased individually - see ordering information.

Weight: 2.4 kg per unit, 15 kg complete set (approx.)

Ordering information

Individual sieves

47-D0415/1

Flakiness sieve, 4.9 x 30 mm slot.

47-D0415/2

Flakiness sieve, 7.2 x 40 mm slot.

47-D0415/3

Flakiness sieve, 10.2 x 50 mm slot.



47-D0415

47-D0415/4

Flakiness sieve, 14.4 x 60 mm slot.

47-D0415/5

Flakiness sieve, 19.7 x 80 mm slot.

47-D0415/6

Flakiness sieve, 26.3 x 90 mm slot.

47-D0415/7

Flakiness sieve, 33.9 x 100 mm slot.

Complete set

47-D0415

Set of 7 Flakiness sieves with 4.9 x 30, 7.2 x 40, 10.2 x 50, 14.4 x 60, 19.7 x 80, 26.3 x 90, and 33.9 x 100 mm slots.

Link to other products

Thickness gauge

Used to determine if aggregate particles are to be considered flaky, i.e. their thickness is less than 0.6 of their nominal size. Alternatively, for large sample analysis, the 47-D0415 set may be preferred.

Dimensions: 383 x 150 x 6 mm
Weight: 600 g (approx.)

Ordering information

47-D0540

Thickness gauge.

Length gauge

Used for determining the elongation index of aggregates. Aggregate particles are considered elongated when their length is more than 1.8 of their nominal size. Made of a wooden base with brass plate and steel pins.

Dimensions: 360x75x71 mm
Weight: 1 kg (approx.)

Ordering information

47-D0541

Length gauge.



47-D0541 & 47-D0540

Shape index

Standards

EN 933-4 | 933-5 | 933-7 | DIN 4226 | CNR N° 95 | NLT 354

Used to determine the shape factor of aggregates. Supplied complete with carrying case.

Dimensions (case): 470 x 170 x 50 mm

Net weight: 500 g

Ordering information

47-D0542

Shape index gauge.

47-D0542/A

Shape index gauge with traceable certificate.



47-D0542

Flat and elongated particles in coarse aggregates

Standards

ASTM D4791

47-D1656

Proportional caliper conforming to ASTM D4791.

Used for the rapid and easy determination of percentage of flat particles, elongated particles, or both in coarse aggregate fractions of 9.5 mm (3/8") or larger.

It consists of a 6" x 16" (152.4 x 406.4 mm) base plate with four rubber feet, two fixed posts and a 13" (330 mm) pivoting arm. The positioning of the pivoting arm allows ratios of 1:2, 1:3, 1:4, or 1:5 to be obtained.

Weight: 3.2 kg (approx.)



47-D1656

Determination of the efflux index

Standards

EN 933-6 | ASTM C1252 | CNR 113

47-D0516/A

Efflux index apparatus.

Used to obtain information about the shape and angularity of grains in the 0.063-4 mm fraction of aggregates. It consists essentially of a container which ends in a 12 mm diameter funnel with a 60° opening. Supplied complete with both sizes of funnel, control shutter and cylindrical feed hopper.

Dimensions: 200 x 200 x 420 mm

Weight: 9 kg (approx.)



47-D0516/A

Assessment of fines: sand equivalent test

Standards

EN 933-8 | ASTM D2419 | AASHTO T176
 NF P18-898 | UNE 83131
 UNI 8520-15 | CNR N° 27

Sand equivalent test sets

These test sets are proposed in two versions: EN and ASTM. Both comprise the following:

- Measuring cylinders - qty 4
- Rubber stopper - qty 2
- Measuring can
- Irrigator tube
- Siphon assembly with bottle
- Weighted foot
- Funnel
- Graduated rule
- Stock solution (1 litre)

All items are housed in a carrying case (except the siphon assembly with bottle and the stock solution, that are packed separately).

The two sets are identical except for the four measuring cylinders which are totally graduated in the ASTM/AASHTO version, and the weighted foot which has slight differences between versions.

All components can be purchased individually-see Spare parts.

For reliable test results we recommend the use of a mechanical shaker.

Dimensions: 500 x 400 x 130 mm
 Total weight: 7 kg (approx.)



47-T0050/B with 47-T0050/7. The 47-T0050/C version is identical except for the graduation of the cylinders and some small differences in the weighted foot.

Ordering information

47-T0050/B

Sand equivalent test set conforming to EN 933-8 and NF, UNE, UNI and CNR standards.

47-T0050/C

Sand equivalent test set conforming to ASTM D2419 and AASHTO T176.

Accessories

47-T0050/7C

Sand equivalent stock solution, 125 cc bottle. Pack of 20.

47-T0050/8

Clamp stand set. Holds siphon assembly in place during the test.

15-D2185/J

Stainless steel test sieve, 200 mm diameter, 2 mm opening (for UNI 8522-15).

Spare parts

47-T0050/1A

Measuring cylinder conforming to EN.

47-T0050/1C

Measuring cylinder conforming to ASTM/AASHTO.

47-T0050/2

Rubber stopper.

47-T0050/3

Measuring can.

47-T0050/4

Irrigator tube.

47-T0050/5

Siphon assembly with bottle.

47-T0050/6

Weighted foot conforming to ASTM/AASHTO.

47-T0050/61

Weighted foot conforming to EN.

47-T0050/7

Sand equivalent stock solution, 1 L bottle.

86-D1546

Funnel.

82-D1694

Graduated rule, 500 mm.

Specifications

Stroke: adjustable 200 ± 10 mm
 Rate: 175 strokes/min
 Dimensions: 720 x 420 x 450 mm
 Weight: 20 kg (approx.)
 Complete with timer

Ordering information

47-T0056/B

Motorized sand equivalent shaker. 230 V, 50 Hz, 1 ph.

47-T0056/BY

As above but 220 V, 60 Hz, 1 ph.

47-T0056/BZ

As above but 110 V, 60 Hz, 1 ph.

47-T0056/C

Motorized sand equivalent shaker with safety cover, conforming to CE directives. 230 V, 50 Hz, 1ph.

47-T0056/CY

As above but 220 V, 60 Hz, 1 ph.

47-T0056/CZ

As above but 110 V, 60 Hz, 1 ph.

Sand equivalent shakers

The shakers provide a completely uniform shaking action at a specified rate and eliminate operator fatigue. In the 47-T056/C version the machine stops automatically when the safety cover is opened, in conformance with CE directives.



47-T0056/B



47-T0056/C

Assessment of fines: methylene blue test

Standards

EN 933-9 | NF P94-068 | UNE 83 180 | UNI 8520-15

This test is performed to determine the clay content in the fines fraction of aggregates.

Weight: 10 kg (approx.)

The test set includes:

47-D0439/C1

50 cc burette with stopcock.

47-D0439/C2

Support base with clamp.

47-D0439/C3

Filter paper. Pack of 100 discs.

47-D0439/C4

Glass rod, 300 x 8 mm diameter.

86-D1075

1000 ml capacity beaker.

47-D0439/C9

Methylene blue, 250 g.

47-D0439/C10

Kaolinite, 1000 g.

47-D0439/C11

Electric agitator, 400 to 700 rpm, 75 mm diameter impeller. Complete with support base and double sleeve. 230 V, 50 Hz, 1 ph.

All the above mentioned items can be purchased individually.

Ordering information

47-D0439/C

Methylene blue test set. 230 V, 50 Hz, 1 ph.

Accessories

47-D0439/C9S

Methylene blue, 6x10 g

47-D0439/C13

Automatic bottle top dispenser 0 - 10 ml, 0.1 mm graduations.

Note: this item replaces the 47-D0439/C1 and 47-D0439/C2 burette with support base.

47-D0439/C15

Plastic pan.

Spare parts

47-D0439/C3

Filter paper. Pack of 100 discs.

47-D0439/C4

Glass rod, 300 x 8 mm diameter.

86-D1075

1000 ml capacity beaker.

47-D0439/C9

Methylene blue, 250 g.

47-D0439/C10

Kaolinite, 1000 g.

47-D0439/C11

Electric agitator, 400 to 700 rpm, 75 mm diameter impeller. Complete with support base and double sleeve. 230 V, 50 Hz, 1 ph.

Determination of clay, silt and dust in fine and coarse aggregates: BS method

Standards

BS 812

Bottle roller

Used for rotating a glass bottle containing samples as described in BS 812, at a speed of 80 ± 20 rpm.

Power: 90 W

Dimensions: 424 x 195 x 275 mm (w x d x h)

Weight: 8.5 kg (approx.)

Ordering information

47-D0439/A

Bottle roller. 230 V, 50 Hz, 1 ph.

47-D0439/1

Airtight glass container, 1 litre capacity.

22-T0062/2A

Pipette stand.

The pipette stand is used to precisely raise or lower the Andreasen pipette to its required level without disturbing the suspension.

Weight: 4.6 kg (approx.)



47-D0439/B with 22-T0062/2A

Assessment of fines: grading of fillers (air jet sieving)

Standards

EN 933-10

15-D0413

Digital Air Jet sieve shaker.

230 V, 50-60 Hz, 1 ph.

Note: for complete information see page 15



15-D0413



47-D0439/C



47-D0439/A with 47-D0439/1

Andreasen pipette with stand

47-D0439/B

Andreasen pipette, 25 ml capacity.

The 25 ml capacity Andreasen pipette is used to extract precise quantities of suspension ready for analysis. Made from glass.

Weight: 700 g (approx.)

Determination of resistance to fragmentation

Standards

EN 1097-2 | EN 12697-17 | ASTM C131 | AASHTO T96 | NF P18-573 | CNR N° 34

Los Angeles machine

This test procedure is for determining the resistance of coarse aggregates to abrasion.

The machine consists of a rolled steel drum with an inner diameter of 711 mm and inner length of 508 mm. The drum is rotated by a speed reducer driven by an electric motor at a speed of between 31 and 33 rpm. The machine is equipped with an automatic counter which can be used to set the required number of revolutions of the drum. The unit is supplied without the abrasive charge, which has to be ordered separately depending on which standard is being followed - see Accessories.

The machine can be fitted inside a noise reduction and safety cabinet or simple safety cabinet, both conforming to CE directives. These versions come complete with a switch that stops the machine when the door is opened and have the control panel mounted externally. See accessories

Specifications

Power: 740 W
Dimensions: 975 x 785 x 937 mm (approx.)
Weight: 350 kg (approx.)

Ordering information

Standard models

48-D0500/D

Los Angeles abrasion machine, 230 V, 50 Hz, 1 ph.

48-D0500/DY

As above but 220 V, 60 Hz, 1 ph.

48-D0500/DZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

48-D0505

Set of 12 abrasive charges conforming to ASTM/AASHTO standards.

48-D0505/A

Set of 12 abrasive charges conforming to EN standards.

Noise reduction and safety cabinets, 48-D0500/CB1 and 48-D0500/CB2

The Los Angeles machines can be fitted inside the protection cabinets, conforming to CE requirements. The cabinets are manufactured from sheet steel and fitted with electric safety device which stops the rotation of the drum when opening the door. The 48-D0500/CB2 version is also lined internally with soundproofing material to reduce the noise.

- Dimensions (wxdxh):
975 x 785 x 937 mm
- Weight approx.: 150-180 kg

Ordering information

48-D0500/CB1

CE compliant safety cabinet with door opening switch for Los Angeles machine.

48-D0500/CB2

Noise reduction and CE compliant safety cabinet with door opening switch for Los Angeles machine.



48-D0500/D with 48-D0505



48-D0500/D fitted inside the CE cabinet 48-D0500/CB2. Double access doors and top door to make easy all load and unload operations.

Determination of the resistance to wear

Standards

EN 1097-1 | EN 13450 | NF P18-572 | NF P18-576 | UNE 83115 | CNR N° 109

Micro-Deval testing machine

This machine is used to determine the resistance to wear of aggregates. The frame is constructed from steel and can hold four cylinders 200 mm diameter x 154 mm long (EN 1097-1) or two cylinders 200 mm diameter x 400 mm long (EN 13450). The top section of the machine is enclosed in a soundproof safety cabinet that conforms to CE requirements and automatically stops the machine when it is opened. The machine comes complete with a counter for setting the number of revolutions and includes the four standard cylinders 200 mm diameter x 154 mm length.

The 400 mm long cylinders and steel spheres are not included and have to be ordered separately - see Accessories.

Specifications

Power: 1100 W
Dimensions: 1070 x 470 x 1025 mm
(w x d x h)
Weight: 135 kg (approx.)

Ordering information

48-D5242

Micro-Deval testing machine with soundproof safety cover conforming to CE

requirements. Complete with four stainless steel cylinders 200 mm diameter x 154 mm long. Steel spheres not included - see Accessories. 230 V, 50 Hz, 1 ph.

48-D5243

As above but 220 V, 60 Hz, 1 ph.

48-D5244

As above but 110 V, 60 Hz, 1 ph.

Accessories

Conforming to EN 1097-1

48-D0524/7

Stainless steel spheres, 10 mm diameter. 20 kg pack.

Conforming to EN 13450

48-D0524/8

Stainless steel cylinder, 200 mm diameter x 400 mm length.

Note: abrasive charge (steel spheres) not required.

Conforming to NF P 18-576

48-D0524/1

Steel spheres, 30 mm diameter. Pack of 10.

48-D0524/2

Steel spheres, 18 mm diameter. Pack of 50.

Spare parts

48-D0524/4

Stainless steel cylinder 200 mm diameter x 154 mm length.

main features

- > Complete with four stainless steel cylinders 200 mm diameter x 154 mm long
- > Suitable for rolling two 200 mm diameter x 400 mm long cylinders
- > Revolutions setting counter included
- > Enclosed in soundproof safety protection conforming to CE requirements



48-D5242. Internal view of the soundproof safety cover conforming to CE requirements



48-D5242 with two 48-D0524/8 cylinders, 200 mm diameter, 400 mm long



48-D5242

Abrasion resistance: Deval method

Standards NF P18-577

48-D0523

Deval abrasion test machine.

Used for testing the abrasion resistance of aggregates, this machine has a rotating frame that holds two steel cylinders and comes complete with covers and locking device. The rotating frame is driven by a motor/speed reducer. An automatic counter is included for setting the required number of revolutions.

Specifications

- 230 V, 50 Hz, 1 ph.
- Rotation speed: 33 rpm
- Power rating: 736 W
- Dimensions: 1500 x 500 x 700 mm
- Weight: 190 kg (approx.)



48-D0523

Determination of aggregate abrasion value (AAV)

Standards EN 1097-8 | BS 812

48-D0522

AAV Abrasion machine

This test provides a measure of the resistance of an aggregate to surface wear by abrasion. The machine, formerly known as the "Dorry abrasion machine", consists of a 600 mm diameter cast iron grinding disc which rotates on a horizontal plane at a speed of 28/30 rpm. Abrasive sand is fed across the surface of the specimen through a special funnel. The machine is supplied complete with two specimen moulds, two trays, two flat plates, weights and clamps.

Specifications

- 230 V, 50 Hz, 1 ph.
- Overall dimensions: 800 x 700 x 1100 mm
- Weight: 200 kg (approx.)



Accessories

86-D1672

Soft hair brush, 3 mm diameter.

48-D0522/2

Graded sand, 50 kg sack.

Determination of the polished stone value (PSV)

Standards

EN 1341 | EN 1342 | EN 1097-8 | EN 1343

Accelerated polishing machine

This machine is used to measure the resistance of road stone to the polishing action of vehicle tyres on a road surface, simulating actual road conditions, and is used in conjunction with the Skid Resistance Tester to determine the Polished Stone Value (PSV). The machine is electronically controlled by a digital unit with a 4-row x 20-character LCD display and is fitted with an emergency stop button.

It is supplied complete with road wheel, side plate, rubber rings, two tyred wheels, drive belt, abrasive feed mechanism, corn emery, flour emery, tool kit, set of two specimen moulds and two mouldplates.

main features

- > Fully conforms with EN 1097-8
- > Advanced digital interface for programming test steps and pauses
- > Independent control of the two feeders
- > Digital control of speed rotation
- > Full protection of all the moving part areas with safety switch
- > Removable water tank, easy to refill

Technical specifications

- Electronic control of rotation speed and feed mechanism
- Digital 4-row x 20-character display
- Aluminium wheel, 406 mm diameter
- Clamping device for specimen
- Rotation speed adjustable from 315 to 325 rpm
- Two rubber-tyred wheels, 200 ±3 mm diameter
- Lever arm and weight loading the tyred wheel on the aluminium wheel to 725 ±10N
- Microprocessor-controlled feed mechanism for corn emery and flour emery
- Electric motor: 750 W
- Rated power: 850 W
- Overall dimensions: 1800 x 980 x 510 mm (h x w x d)
- Weight: 200 kg (approx.)

Ordering information

48-PV5262

Accelerated polishing machine. 230 V, 50 Hz, 1 ph.

48-PV5263

As above but 220 V, 60 Hz, 1 ph.

48-PV5264

As above but 110 V, 60 Hz, 1 ph.

Accessories

48-PV0525/12

Corn emery, 5 kg pack.

48-PV0525/13

Flour emery, 5 kg pack.

48-PV0525/14

Control stone (ungraded), 50 kg bag.

48-PV0525/15

Friction tester reference stone (Criggion stone-ungraded), 25 kg bag.



48-PV5262

Skid resistance and friction tester (Skid Tester)

Standards ASTM E303 | EN 1097-8 | EN 1338 | EN 1341 | EN 1342

Used for the measurement of surface friction properties, this apparatus is suitable for both site and laboratory applications. It can be used for determining the Polished Stone Value (PSV) using curved specimens obtained from accelerated polishing tests performed by the Accelerated polishing machine (conforming to EN 1097-8), and also for testing Paving Stones (EN 1341, EN 1342) and Paving Blocks (EN 1338).

The apparatus, originally developed at the Transport and Research Laboratory U.K., consists of an adjustable pendulum arm and a spring loaded rubber slider (see Accessories) mounted on the end of the arm. During operation the pendulum is raised and then released to swing freely, allowing the edge of the rubber slider to skid across the surface of the road or sample.

Two versions are available:

48-B0190/A conforming to ASTM E303 standard;

48-B0190/E conforming to EN 1097-8 and all other mentioned EN standards.

The pendulum is supplied complete with:

- Additional scale for tests on Polished Stone Value specimens
- Thermometer with range 0 to 220°C for surface temperature measurement
- Washing bottle, 1 L capacity for surface wetting
- Tool set with case for machine assembly
- Rule for sliding length verification
- Carrying case
- Traceable certificate of conformity to EN 1097-8 or ASTM E303
- Three rubber sliders for site use

Case dimensions: 790 x 760 x 320 mm
Weight, including case: 34 kg (approx.)

Ordering information

48-PV0190/A

Skid resistance and friction test set (Skid tester) conforming to ASTM E303 standard, comprising additional scale for PSV, 3 rubber sliders for site use, thermometer, washing bottle, tool set with case for machine assembly, rule, carrying case and traceable certificate of conformity to ASTM E303.

48-PV0190/E

Skid resistance and friction test set (Skid tester) conforming to EN 1097/8 standard, comprising additional scale for PSV, 3 rubber sliders for site use, thermometer, washing bottle, tool set with case for machine assembly, rule, carrying case and traceable certificate of conformity to EN 1097-8.

Accessories

Rubber sliders

48-PV0190/1

Mounted rubber slider, TRL rubber, 32 mm width.

48-PV0190/2

Mounted rubber slider, TRL rubber, 76 mm width.

48-PV0190/6

Mounted rubber slider, 4S rubber, 32 mm width.

48-PV0190/7

Mounted rubber slider, 4S rubber, 76 mm width

Base plates

48-PV0190/4

Metal base plate to clamp the Polished Stone Value specimen.

48-PV0190/5

Metal base plate for testing surface friction properties of Natural stones (EN 1341, EN 1342) and Paving blocks (EN 1338).



48-PV0190/E Skid resistance tester

main features

- > New low friction release mechanism of the pendulum arm for better accuracy
- > Extremely light pointer, for high-precision results.
- > Slider lifting system integrated into the pendulum foot that guarantees reliable adjustment operations
- > Strong and sturdy twin column structure
- > Easy and reliable height adjusting system
- > Integrated additional scale for tests on PSV specimens
- > Complete with calibration certificate to EN 1097-8 or ASTM E303



48-PV0190/A – 48-PV0190/E complete set



Rubber sliders



48-PV0190/5

Abrasion resistance of natural stones and concrete tiles for external paving

Standards

EN 1341 | EN 1342 | EN 1338 | EN 1339 | EN 1340 | EN 14157 | EN 12808-2

48-D0471

Abrasion testing machine for natural stones and concrete tiles

This machine has been developed for determining the resistance to abrasion/wear of natural stones and concrete products. It is easy to use, with electronic control of the disc speed and auto shut-off of the machine at the selected number of revolutions. It comes complete with an aspirator to collect powders. The abrasion disc wheel is 70 mm thick. 5 kg of white corundum FEPA grit size 80 and a calibration sample (Boulonnais marble) are included.

The machine can also be converted, using the conversion kit 48-D0471/K, for abrasion tests conforming to EN 1344, 10545-6, 14617-4, 12808-2 and UNE 127024 - see Accessories.

The standard version conforms to EN 1338, 1339, 1342, 14157, 1340 and 1341.

Technical specifications

230 V, 50-60 Hz, 1 ph.

Power: 500 W

Overall dimensions: 620 x 670 x 850 mm

Weight: 85 kg (approx.)

Accessories

48-D0471/K

Conversion kit to perform the abrasion test conforming to EN 1344, 10545-6, 14617-4, 12808-2 and UNE 127024. Comprising counterweight, hopper, abrasion disc (200 mm diameter x 10 mm thick) and silica calibration plate.

Spare parts

48-D0471/1

Abrasive white corundum sand 80 grade. 25 kg pack.

Abrasion resistance of natural stones used for flooring in buildings

(Method Böhme)

Standards

EN 1338 | EN 1339 | EN 1340 | EN 13748 | EN 13892-3 | EN 14157 | DIN 52108

Abrasion tester acc. to Böhme

This machine is used to determine the abrasion resistance of natural stones and concrete products used for internal and external paving. The machine has a rotating grinding wheel of 750 mm diameter. The specimen is positioned in a suitable holder and submitted to a test force of 294 ± 3 N.

An abrasive material is continuously poured onto the disc and the abrasion effect is measured after a number of rotating cycles.

The abrasive powder is not included and has to be ordered separately - see Accessories.

Technical specifications

- 230 V, 50 Hz, 1 ph.

- Disc diameter: 750 mm

- Rotation speed: 30 rpm

- Power rating: 800 W

- Overall dimensions:

1200 x 760 x 1054 (h) mm

- Weight: 220 kg (approx.)

Ordering information

48-D5272

Boehme Abrasion Tester for testing concrete paving stones, concrete slabs, concrete kerb stones, natural stone, paving stones and natural stone Slabs. 230 V, 50 Hz, 1 ph.

48-D5273

Same as above but 220 V, 60 Hz, 1 ph

48-D5274

Same as above but 110 V, 60 Hz, 1 ph

Accessories

48-D0471/1

Abrasive white corundum sand 80 grade, 25 kg pack.



48-D0471



48-D5272



Detail of 48-D5272

Aggregate impact value: BS and NF method

Standards

BS 812 | NF P18-574

48-D0515/A

Impact testing machine



48-D0515/A

This machine is used to determine the aggregate impact value (AIV) which provides a relative measure of the resistance of an aggregate to sudden shock or impact. The machine is robustly designed and made from corrosion-resistant steel. It is fitted with a counter to check the number of blows delivered to the sample and comes complete with two cylindrical measures (BS and NF) and a tamping rod.

Overall dimensions: 444 x 300 x 879 mm
Weight: 58 kg (approx.)

Determination of the aggregate crushing value: BS method

Standards

BS 812:110

Aggregate crushing value apparatus

Two versions of this apparatus are available: 150 (standard) and 75 mm diameter; both sets comprise a cylinder, plunger, base plate, tamping rod and measure. The cylinder, plunger and base plate are made from special alloy steel, hardened to 650 HV (57.8 HRC), and protected against corrosion.

Ordering information

48-D0510

Aggregate crushing value apparatus, 150 mm diameter. Weights (approx.) 16.5 kg

48-D0511

Aggregate crushing value apparatus, 75 mm diameter. Weights (approx.) 3.5 kg



48-D0510, 48-D0511. Strictly conforming to BS: Hardened to 650 HV (57.8 HRC)

Crushing resistance of lightweight aggregates

Standards

EN 13055-1

Crushing resistance apparatus for lightweight aggregates

Two versions are available:

Method 1: 48-D0512, apparatus with cylinder with inner diameter 113 mm;

Method 2: 48-D0512/A, apparatus with cylinder inner diameter 76 mm.

Ordering information

48-D0512

Apparatus for the determination of the crushing resistance of lightweight aggregates. 113 mm inner diameter, conforming to Method 1. Weights (approx.): 15 kg

48-D0512/A

Apparatus for the determination of the crushing resistance of lightweight aggregates. 76 mm inner diameter, conforming to Method 2. Weights (approx.): 7 kg



48-D0512

Glass measuring cylinder and steel plunger for lightweight aggregates

86-D1006

Graduated glass cylinder, 1000 ml capacity.
Weight approx.: 0,6 kg

22-T0060/8

Steel plunger with perforated plate.
Weight: 0.4 kg (approx.)



Scratch hardness: ASTM method

Standards

ASTM C235

48-D0518

Scratch hardness apparatus

This apparatus is used in the field to determine the quantity of soft particles in coarse aggregate. It consists of a metal rod with a rounded point of 1.6 mm diameter, which is mounted in a device so that a load of 8.9 ± 4 N is applied to the test specimen.

Dimensions: 150 x 200 x 320 mm
Weight: 8 kg (approx.)



48-D0518

Determination of loose bulk density and voids

Standards

EN 1097-3

In terms of operating principles, also comparable with: ASTM C29, ISO 6872, BS 812, UNI 8520-6, CNR N° 62, CNR N° 63 and CNR N° 64

Bulk density measures

Stainless steel construction with handles. The top rim is smooth and plane and parallel to the bottom in accordance with the standards.

Ordering information

48-D0446/1

Bulk density measure, 1 litre capacity. Weight: 1.4 kg (approx.)

48-D0446/5

Bulk density measure, 5 litre capacity. Weight: 4.9 kg (approx.)

48-D0446/10

Bulk density measure, 10 litre capacity. Weight: 7.4 kg (approx.)

48-D0446/20

Bulk density measure, 20 litre capacity. Weight: 11.9 kg (approx.)

Accessories

34-T0099

Straight edge.

22-T0040/1

Glass plate 300 x 300 mm.



48-D0446/1, 48-D0446/5, 48-D0446/10. Stainless steel construction.

Determination of the voids of dry compacted filler

Standards

EN 1097-4 | BS 812 | NLT 177 | CNR N°23

48-D0447

Filler compaction apparatus

This apparatus is used for the determination of the voids content of dry compacted filler. It consists essentially of three components:

- A metal base sized 100x150 mm;
- A cylinder 25 mm inner diameter;
- A plunger of a diameter that allows it to slide freely in the cylinder without lateral play.

It can be fitted with a Blow counter kit - see Accessories. Weight: 3.5 kg (approx.)

Accessories

48-D0447/1

Blow counter kit.

48-D0447/2

Filter paper, 25 mm diameter. Pack of 100.



48-D0447

Determination of particle density and water absorption

Standards

EN 1097-6 | EN 12390-7 | BS 812 | BS 1881:14 | UNI 6394-2

Only the apparatus produced specifically for the test are described here. Many other items of laboratory equipment such as balances, ovens, sieves and containers are required for this group of tests, especially since the introduction of the new EN 1097-6 Standard, which encompasses more methods than those specified by the national Standards. For more information ask for our Buyer's Guide which details each individual Standard.

Specific gravity frame and Density baskets

This apparatus is used, together with a suitable electronic balance, for determining the specific gravity of aggregates. A purpose built robust frame supports the electronic balance, while the lower part of the frame incorporates a moving platform which holds the water container, allowing test specimens to be weighed in both air and water.

The balance is not included and should be selected according to the weighing range required. Any type of electronic balance fitted with an under-bench weighing facility can be used. All our balances have this feature - our model 11-D0630/30, 30 kg capacity, 0.5 g resolution is ideal for this and other applications. See Accessories or, for other capacities, see page 9

The frame has to be completed with the Density basket 11-D0612/1.

Overall dimensions: 400 x 650 x 1000 mm
Weight: 25.5 kg (approx.)

Ordering information

11-D0612/B

Specific gravity frame.

11-D0612

Density basket, stainless steel, 200 mm diameter x 200 mm height, 3.36 mm mesh size (No. 6 ASTM).

11-D0612/1

Density basket, stainless steel, 250 mm diameter x 250 mm height, 3.36 mm mesh size. Suitable for up to 15 kg of aggregates.

11-D0630/30

Electronic top loading balance, 30 kg capacity, 0.5 g resolution.



11-D0612/B with 11-D0612/1 Density basket and 11-D0630/30 electronic balance



11-D0612/1, 11-D0612

Pyknometers

We produce two series of pyknometers:

86-D1040 to 86-D1042 series suitable for aggregate particles passing the 4 mm test sieve and retained on the 0.063 mm test sieve;

86-D1037 to 86-D1038 wide-necked series suitable for aggregate particles passing the 31.5 mm test sieve and retained on the 4 mm test sieve.

Weights: from 0.5 to 1 kg each (approx.)

Ordering information

Wide-necked pyknometers for 4 to 31.5 mm particle sizes

86-D1037

Wide-necked pyknometer, 500 ml capacity, complete with stopper, capillary tube and funnel.

86-D1038

Wide-necked pyknometer, 1000 ml capacity, complete with stopper, capillary tube and funnel.



86-D1037, 86-D1038, 48-D0440

Standard pyknometers for 0.063 to 4 mm particle sizes

86-D1040

Pyknometer, 500 ml capacity, complete with stopper.

86-D1041

Pyknometer, 1000 ml capacity, complete with stopper.

86-D1042

Pyknometer, 2000 ml capacity, complete with stopper.



86-D1040, 86-D1041

48-D0441

Glass jar supplied complete with cone and rubber seal.

Capacity: 1 kg
Weight approx.: 500 g



48-D0441

48-D0440

Sand absorption cone and tamper

Sand absorption cone, 40 mm top diameter, 90 mm bottom diameter, 75 mm high, plus tamper.

Weight: 0.6 kg (approx.)

Aggregate density by water displacement: BS method

Standards

BS 812

48-D0442

Volumeter for coarse aggregates

Used to determine the density of coarse aggregates, this apparatus consists of a cylindrical metal container 163 mm diameter and 370 mm high, fitted with a siphon tube 250 mm from the base.

Weight: 2.5 kg (approx.)

Accessories

86-D1004

Graduated glass cylinder 250 ml capacity.



48-D0442



48-D0440

Surface moisture of fine aggregates: ASTM method

Standards

ASTM C70, AASHTO T142

48-D0460

Chapman flask

Used for determining the amount of surface moisture in fine aggregates. The flask is graduated to 200 ml between the two bulbs and from 375 to 450 ml above the second bulb.

Weight: 500 g (approx.)



48-D0460

Moisture measurement of sand, aggregates, building materials and mixes

48-D0462

Microlance instant moisture and temperature tester

This instrument measures the moisture and temperature of building materials at depths up to 1 m approx., simply by insertion. The digital readings are shown instantly. The Microlance has a built-in computer, which gives it the flexibility to handle a wide range of materials and water contents. The meter comes with standard calibration for sands and aggregates, but is easily recalibrated in the field for virtually any material or mixture using the built-in "Autocal" facility.

Complete with calibration certificate.

Technical specifications

- Battery: 4x1.5V AA cells
- Typical range: Moisture 0-35%; Temperature -20 to 60°C
- Resolution: Moisture 0.1%; Temperature 0.1°C
- Accuracy: Moisture: better than 0.5% over a given range; Temperature: better than 0.5°C
- Measurement principles:
 - Moisture: temperature compensated electric field
 - Temperature: BS 1904 – DIN 751
- Platinum resistance detector
- Total length: 1.2 m (approx.)
- Weight: 2 kg (approx.)

main features

- > Suitable for sands, aggregates, building materials and mixes
- > Provides quick on-site moisture measurement from small batches to hundreds of tons
- > Ideal in the processes of concrete manufacture, brick making, ceramics etc.



48-D0462 in different working positions



48-D0462 Detail

Determination of resistance to freezing and thawing

Standards

EN 1367-1

Also comparable to: ASTM C671, ASTM C682, BS 812:124, UNI 8520-20 and CNR N° 80

Two versions of this advanced climatic chamber are offered:

- 10-D1429 - temperature controlled from -25 to +60°C, for testing aggregates in conformance with EN 1367-1 as well as other similar tests on concrete and other construction materials, and
- 10-D1429/A- temperature and humidity controlled from -25 to +60°C and 10 to 95% respectively, for aggregates and various other applications such as concrete and cement specimen curing (EN 12390-2, EN 196-1).

Both models can be upgraded with an internal data recording facility, data output port and dedicated PC software. See accessory 10-D1429/REC.

For the determination of resistance to freezing and thawing of aggregates, the accessory 48-D0457 should be used - see Accessories.

For a complete description and full product information see page 7

Ordering information

main features

- > Advanced controller with cycle programmer for 50 programs and 1000 segments
- > Temperature sensor can be positioned anywhere inside the cabinet or inside the sample, in conformance with requirements of the standards
- > High accuracy: $\pm 1^\circ\text{C}$, $\pm 5\% \text{RH}$ (RH with 10-D1429/A model only)
- > A multipurpose climatic chamber suitable for testing applications in aggregates, cement, concrete, bricks, blocks, asphalt and other construction materials
- > Optional internal data recording facility, data output port and dedicated PC software.

10-D1429

Temperature controlled cabinet, 520 litre capacity, temperature range -25 to +60°C. 230V, 50-60Hz, 1ph.

10-D1429/Z

As above but 110V, 60Hz, 1ph.

10-D1429/A

Temperature and humidity controlled cabinet, 520 litre capacity, temperature range -25 to +60°C, humidity range from 10 to 95%. 230V, 50-60Hz, 1ph.

10-D1429/AZ

As above but 110V, 60Hz, 1ph.

Accessories

10-D1429/REC

Upgrade of the cabinet controller with internal data recording facility, data output port and dedicated PC software. Note: This upgrade must be factory installed.

48-D0457

Metal can, 2000 ml capacity with removable lid and 1kg ballast. Conforming to EN 1367-1. Used, in conjunction with the 10-D1429 Temperature controlled cabinet, for determining the resistance to freezing and thawing of aggregates including lightweight types. Weight: 2.5 kg (approx.)

Magnesium sulphate test

Standards

EN 1367-2

Also comparable to: ASTM C88, UNE 7136 and UNI 8520-10

Only the apparatus produced specifically for the test are described here. Many other items of laboratory equipment such as balances, ovens and sieves are also required. For more information ask for our Buyer's Guide.

Stainless steel basket, Container and Hydrometer

Ordering information

48-D0612/11

Stainless steel mesh basket, 120 mm diameter x 160 mm high, 3.35 mm openings. Weight: 0.3 kg (approx.)

86-D1348

Lever lid container, 180 x 240 mm diameter. Weight: 0.2 kg (approx.)

48-D0452

Hydrometer range 1200 to 1300 g/ml, accuracy 0.001 g/ml. Weight: 0.1 kg (approx.)



10-D1429, 10-D1429/A



48-D0457



48-D0612/11



86-D1348

Soundness of aggregates by use of sodium sulphate or magnesium sulphate

Standards

ASTM C88

Only the apparatus produced specifically for this test are described here. Many other items of laboratory equipment such as balances, ovens and sieves are also required. For more information ask for our Buyer's Guide.

Stainless steel baskets

Ordering information

48-D0612/A1

Stainless steel mesh basket, 600 µm opening (No. 30 ASTM), 120 mm diameter, 160 mm high.

Weight: 0.3 kg (approx.)

48-D0612/A2

Stainless steel mesh basket, 1.7 mm opening (No. 12 ASTM), 120 mm diameter, 160 mm high.

Weight: 0.3 kg (approx.)

48-D0612/A3

Stainless steel mesh basket, 9.5 mm opening (3/8"), 200 mm diameter, 200 mm high.

Weight: 1 kg (approx.)



48-D0612/A3, 48-D0612/A2

Determination of drying shrinkage

Standards

EN 1367-4

48-D0453

Drying shrinkage prism mould

Used for determining the effect of aggregates on the drying shrinkage of concrete. The test is based on the testing of concretes of fixed mix proportions and aggregates of 20 mm maximum size. To complete the test, the Length comparator with the 62-L0034/3 should also be used - see Accessories.

Three gang, 50 x 50 x 200 mm, complete with steel inserts

Made from steel.

Weight: 8 kg (approx.)

Accessories

62-L0035/A

Digital length comparator 12.5 x 0.001 mm, with output for PC connection (serial cable required). For more information see page 341

82-D1261/LINK

Serial cable for PC connection.

62-L0034/3

Reference rod, 205 mm length.



48-D0453

Determination of resistance to thermal shock

Standards

EN 1367-5

This test involves heating soaked aggregates to 700°C for 3 minutes and comparing the loss in fines and the strength loss, determined in accordance with EN 1097-2, before and after the heat, using the appropriate accessories (see Accessories).

High capacity muffle furnace

Floor-mounted muffle furnace, fitted with an electronic thermoregulator and 24 hour timer. The internal dimensions of the furnace are suitable to receive the 48-D0454/1 test plate.

Technical specifications

- 1100 °C maximum temperature.
- 220-380 V, 50-60 Hz, 3 ph.
- Maximum temperature: 1100°C
- Furnace inner dimensions: 300 x 220 x 500 mm (wxhxd)
- Power: 9000 W
- Overall dimensions: 750 x 1650 x 1100 mm (wxhxd)
- Weight: 400 kg (approx.)

Ordering information

10-D1419

High capacity muffle furnace, 220-380 V, 50-60 Hz, 3 ph.

Accessories

48-D0454/1

Metal test plate, 440 x 240 x 4 mm thick with 12 mm high turned lip.

48-D0454/2

Metal support frame for metal test plate.

48-D0454/3

Fireproof plate 450 x 250 x 10 mm thick.

48-D0454/4

Stainless steel sieve fabric, 2 mm aperture, 250 x 445 mm size.



10-D1419

Potential alkali-silica reactivity of aggregates

Standards

ASTM C289 | NF P94-048 | UNI 85209-22

This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in Portland-cement concrete. Only the specific Reaction container required for performing the test is described here but other apparatus are also needed, for example, grinding equipment (see 48-D0544 page...), constant temperature water bath (see 76-B0066/A page 453), scales, balances, glassware, etc. For more information ask for our Buyer's guide. The UNI 8520-22 standard also requires Three-gang prism moulds 25 x 25 x 280 mm, for determining the dimensional variations caused by alkalis.

48-D0545

Reaction container

Made from stainless steel and fitted with an airtight cover.

Capacity: 59 cm³ approx.

Inner diameter: 38.1 mm

Weight: 2 kg (approx.)



48-D0545

62-L0009/A

Three-gang prism mould
25x25x280 mm conforming to UNI 8520-22.

Used for determining the dimensional variations of mortar specimens caused by alkalis and hydroxides. Made of steel with minimum surface hardness of HV 200, gauge length 294 mm.

Weight: 4.5 kg (approx.)

Accessories

62-L0035/A

Length comparator, digital gauge 12.5x0.001 mm, with output for PC connection (special cable required, see 82-D1261/LINK). For more information see page 341

82-D1261/LINK

Serial cable for PC connection.

62-L0034/11

Reference rod. Gauge length 294 mm.

Spare parts

62-L0009/1

Spare plugs for 62-L0009/A. Pack of 20 pieces.

48-D0850/A Color standard glass scale

Standards

ASTM C40

Used for determining the organic impurities in fine aggregates by the colorimetric method together with the organic impurities test bottles. 5 colored glass mounted in plastic holder.

Weight: 150 g approx.



48-D0850/A

Carbonate content of aggregates

48-D0570

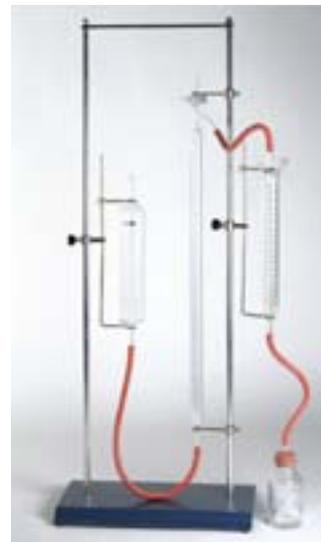
Dietrich-Frühling Gasometer

This apparatus is used for the determination of CaCO₃, especially in limestone and lime marl. It consists of a glass container in which the reaction between the calcium carbonate contained in the product and a solution of hydrochloric acid takes place. The gas given off is collected within the container. By measuring the volume of gas (CO₂) given off, the quantity of CaCO₃ contained in the sample can be calculated.

Dimensions of gasometer (assembled):

400 x 200 x 1100 mm (approx.)

Weight: 12 kg (approx.)



48-D0570

Organic impurities in fine aggregates

Standards

ASTM C40 | AASHTO T21 | UNI 8020-14

Test bottles

Ordering information

48-D1090

Graduated impurities test bottles, 500 ml, conforming to ASTM C40.

Weight: 0.2 kg (approx.)

48-D1091

Graduated impurities test bottle, 1000 ml.

Weight: 0.3 kg (approx.)



48-D1090, 48D1091

Chloride content of fine aggregates

Standards

BS 812:117 | BS 1377:3

Quantab titrators: rapid method

Quantab chloride titrators can be used for estimating the chloride content of aqueous solutions. Two models are available:

48-D0543

Quantab chloride titrator, type 1175 (711195), range 0.005% to 0.1% NaCl. Pack of 40 strips.

48-D0543/A

Quantab chloride titrator, type 1176 (711196), range 0.05% to 1% NaCl. Pack of 40 strips.



48-D0543, 48-D0543/A

Sample reduction

Standards

ASTM C289

The standard states that crushing and grinding equipment must be capable of reducing samples to particles that pass through a 300 µm sieve. All the models of mill and crusher proposed here meet and exceed these requirements.

48-D0530/A

Jaw laboratory crusher

Used to crush samples when a reduction in particle size is necessary, for example crushing core samples and similar materials and

crushing aggregates down to 5 mm particle size. The crusher is supplied with a separate control console and safety devices conforming to CE requirements.

Technical specifications

- 230 V, 50-60 Hz, 1 ph.
- Jaw opening: 90 x 60 mm
- Jaw crushing adjustment: 5 to 15 mm
- Feed capacity: 100 to 400 kg per hour
- Power rating: 736 W
- Overall dimensions: 885 x 390 x 1169 mm (w x d x h)
- Weight: 135 kg (approx.)



48-D0530/A

48-D0535/A

Hammer mill

The hammer mill is used to further reduce the particle size of samples previously crushed to 5 mm with the Laboratory crusher 48-D0530/A, in order to perform various tests such as the chemical properties of aggregates. The grinding operation is achieved through the combination of three actions: impact, shear and rebound. After entering the grinding chamber through the hopper, the material is ground to the required fineness, down to 1 mm particle size, and is then delivered to the collector through the filtering hoses. The machine is sup-

plied complete with screens of 3, 2 and 1 mm opening. The material retained on the 1 mm screen can be further reduced to pass the 300 µm sieve using the Jar mill 48-D0544.

Technical specifications

- 380V, 50 Hz, 3 ph.
- Grinding chamber 180 mm diameter
- 3-4 interchangeable fixed hammers
- Output grain size "rise" type (4-5 mm)
- Possibility to mount screens with the desired opening size
- Maximum hardness of the material to grind: 6-7 Mohs
- Maximum capacity: 50 kg/h
- Power: 500 W
- Dimensions: 500 x 60 x 900 mm
- Weight: 64 kg (approx.)

48-D0544

Jar mills

Designed for milling aggregate samples to reduce particle sizes down from 1-5 mm (depending on hardness) to pass through a 300 µm sieve. The machine is fitted within a noise reduction cabinet with a safety switch for safe operation conforming to CE directives. Fitted with a 0-99 minute electronic timer, the mill can drive jars of 300 cm³ for 150 g of dry product and 1000 cm³ for 500 g of dry product. The jar has been ordered separately (see Accessories).

Technical specifications

- 230 V, 50 Hz, 1 ph.
- Power rating: 370 W
- Overall dimensions: 730 x 350 x 445 mm
- Weight: 55 kg (approx.)

Accessories

48-D0544/1

Alumina jar, 300 cm³ capacity, for 150 g of dry product, complete with grinding load.

48-D0544/2

Alumina jar, 1000 cm³ capacity, for 500 g of dry product, complete with grinding load.



48-D0535/A



48-D0544



48-D0544/1, 48-D0544/2

Concrete Testing

50 | Compression testing machines, Machine parts, Flexural frames and accessories, Advanced Testing Systems

54	Fresh Concrete Testing	255
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Concrete structures are a great deal more than sand, gravel, cement and water stirred up and left to harden into usefully shaped lumps. Considerable care and knowledge are required to produce quality concrete. We propose a complete range of testing equipment to satisfy all the EN and other National Standards. This section includes the widest range available today of Advanced Automatic, Semi-automatic compression testers and Automatic Testing Systems which satisfy all requirements.

50 Compression Testing Machines, Flexural frames and accessories

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Testing systems for determining the mechanical properties of concrete

This vast and complete range includes:

COMPRESSION and FLEXURAL TESTING MACHINES (from page 216 to 249)

ADVANCED SYSTEMS, (from page 250 to 267)

Relating to power and control consoles connectable to up to four frames, performing more sophisticated determinations such as the modulus of elasticity and deformability/ductility tests under load, displacement and strain control.

The pages which follow should guide you in the identification of your ideal machine or system, and at the same time, present a summary of our products which, we believe, are the most complete, modern and advanced available in the world market today.

ICONS Legend



Numbers of frames
(including the
basic frame)
that
can be controlled
by the PCS



Other voltages option



Additional information
available

(PCS) Power Control System

WIZARD2  Semi-automatic, 2 channels
digital readout display

DIGIMAX3  Semi-automatic, 3 channels,
data acquisition and processing

PILOT  Automatic, with closed
loop control

AUTOMAX  Super-automatic, with
closed loop control

COMPRESSION TESTING MACHINES

SELECTION CRITERIA

Basic components: Frame and Power Control System (PCS)

The compression testers are primarily characterized by the current testing Standards (e.g. ASTM/AASHTO or EN) which prescribe the shape and dimensions of specimens (e.g. cylinders, cubes or blocks). This requirement determines the type of frame (capacity, spherical seat, compression platen dimensions).

The other important component is the Power and Control System (PCS for short) which also refers to the Standards in terms, mainly, of load application, strength measurement and accuracy.

We propose four versions, WIZARD 2 Semi-automatic, DIGIMAX3 Semi-automatic, PILOT and AUTOMAX Automatic testing systems. The following table summarize the most common configurations.

	Description	kN Capacity	Power Control System (PCS)	Standards	Page
Standards					
EN	Compression testers For Cubes and Cylinders		DIGIMAX 3 PILOT AUTOMAX	EN 12390-4	216
EN	Compression testers For Cubes, Cylinders, Blocks		DIGIMAX 3 PILOT AUTOMAX	EN 12390-4 EN 772-1	218
EN	Heavy Duty Compression frames for Cubes, Cylinders, Blocks			EN 12390-4 EN 772-1	220
ASTM	Compression testers For Cylinders		WIZARD 2 PILOT	ASTM C39 AASHTO T22	222
ASTM	Compression testers For Blocks and Cylinders		PILOT	ASTM C39 AASHTO T22 ASTM C140 ASTM C1314	224
General Utility*	Compression testers For Cubes and Cylinders		WIZARD 2 PILOT	--	226
General Utility*	Compression testers For Blocks, Cubes, Cylinders		WIZARD 2 PILOT	--	228

COMPACTline

The integrated COMPACT-Line design

Combining a single testing frame with a PCS results in the integrated COMPACT-Line version of compression machine where the PCS is attached to the side of the frame.

Modular system: user selection of testing frame and control system

The comprehensive range of testing frames and PCS, and the modularity of the system, permit to achieve, with the help of our specialists, the configuration you need even if it is outside of the standard models we propose in this catalogue.

SMARTline

DIGIMAX3, PILOT and AUTOMAX PCS are also available housed in a stand-alone console (SMART-Line version), for connection and control of up to 3 different frames (up to 2 frames for DIGIMAX3 PCS), including flexural and cement compression frames. See page 237

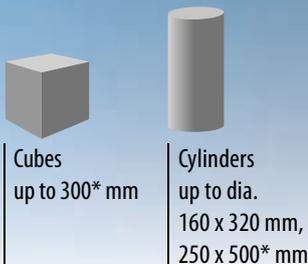
Machine class

All models are supplied in Class 1 to EN 12390-4 (corresponding to ASTM E74 Class A) starting from the 10% of the full range as standard, but with a special calibration procedure identified by the code 50-C0050/CAL, we can grant Class 1 starting from 1% of the full range.

EN Compression testers 2000 | 3000 | 4000 | 5000 kN

Standards EN 12390-4 - Accuracy Cl.1

COMPACTline



*With the 4000 and 5000 kN versions only



Pilot 50-C46C02

Automax 50-C56D02

This serie is proposed with different power and control systems (PCS):

AUTOMAX
Super-automatic system with closed loop control

PILOT
Automatic system with closed loop control

DIGIMAX3
Semi-automatic power and control system

Note Also available, as alternative, the configuration with WIZARD 2, Semi-automatic power and control system. See page 232

Common specifications

Frame

Four column rigid welded steel construction. EN heavy duty spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front door and rear fragment guard.

Machine Accessories

- Distance pieces to reduce the vertical daylight.
- Frame pedestal.

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full

data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Fragment guard lock switch

Prevents test execution with the safety guard open

50-C50/P

For 4000kN and 5000kN testers with AUTOMAX PCS and for testers with PILOT PCS.

50-C50/P1

For 2000kN and 3000kN testers with AUTOMAX PCS.

50-C50/P2

For testers with DIGIMAX and WIZARD PCS.

Special calibration procedure

See page 240

Certified platen hardness

See page 240

Explosion proof test kit

Upgrading kit comprehending: safety cables securing the upper platen to the frame, metallic perforated fragment guard and bottom platen anti-fall safety system.

50-C59/EK

Explosion proof test kit for C56xxx series

50-C69/EK

Explosion proof test kit for C68xxx

50-C79/EK

Explosion proof test kit for C78xxx

Note: for testing high strength / explosive failure specimens we strongly recommend the use of distance pieces complete with threaded centering pin. See page 242

Frame physical specifications

model 50-	C46xxx	C56xxx	C68xxx	C78xxx
Cap. kN	2000	3000	4000	5000
Max. vertical daylight mm	350	350	525	525
Horizontal daylight mm	350	370	425	390
Platen dimensions, mm	dia. 300		305 x 305	
Surface hardness	53 HRC (550HV)			
Flatness tolerance	0.03 mm			



AUTOMAX 50-C68D02

AUTOMAX

kN	kN	kN	kN	3
2000	3000	4000	5000	3

50-C46D02

AUTOMAX Compact-Line, 2000 kN cap. super-automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. Complete with steel base. 230 V, 50-60 Hz, 1 ph.

50-C56D02

AUTOMAX Compact-Line, 3000 kN cap. super-automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. Complete with steel base. 230 V, 50-60 Hz, 1 ph.

50-C68D02

AUTOMAX Compact-Line, 4000 kN cap. super-automatic EN compression tester for cylinders up to dia. 250 x 500 mm and cubes up to 300 mm. 230 V, 50-60 Hz, 1 ph.

50-C78D02

AUTOMAX Compact-Line 5000 kN cap. super-automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 300 mm. 230V, 50-60Hz, 1 ph

PILOT

kN	kN	kN	kN	3
2000	3000	4000	5000	3

50-C46C02

PILOT Compact-Line, 2000 kN cap. automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230 V, 50-60 Hz, 1 ph.

50-C56C02

PILOT Compact-Line, 3000 kN cap. automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230 V, 50-60 Hz, 1 ph.

50-C68C02

PILOT Compact-Line, 4000 kN cap. automatic EN compression tester for cylinders up to dia. 250 x 500 mm and cubes up to 300 mm. 230 V, 50-60 Hz, 1 ph.

50-C78C02

PILOT Compact-Line 5000 kN cap. automatic EN compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 300 mm. 230V, 50-60Hz, 1 ph

main features

- > High-stiffness 4-column welded frame with EN heavy duty spherical seat in oil bath, supplied with traceable test certificate for load transfer verification (stability test) to EN 12390-4
- > Class 1 accuracy to EN 12390-4 starting from 10% of full scale. Special calibration procedure to obtain Class 1 from 1% available as option. Traceable calibration certificate supplied with the machine
- > Optional explosion proof test kit specifically designed to cope with the explosive energy release resulting from high strength concrete specimen failure

PILOT and AUTOMAX

- > Automatic test execution with closed-loop digital feedback
- > 3 channels (for load sensors) with 132'000 div. resolution (better than 0.01% of full scale)
- > sampling rate 50/sec
- > ES Energy Saving technology reducing the power consumption and ensuring silent operations
- > Control of additional testing frames
- > Unlimited storing capacity on USB pen drive of test data downloadable to PC via LAN port
- > Double-stage hydraulic pump with rapid approach (40 mm/min) and precise oil flow control. Soft platen-to-specimen contact and smooth load rate control from the very beginning of the ramp
- > Dual user-interface via console display and PC

DIGIMAX 3

kN	kN
2000	3000

50-C46B02

DIGIMAX 3, 2000 kN cap. semi-automatic compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230 V, 50 Hz, 1 ph.

50-C56B02

DIGIMAX 3, 3000 kN cap. semi-automatic compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230 V, 50 Hz, 1 ph.

Frames only

All frames are supplied complete with pressure transducer, connection kit for separate control console and steel base (except 50-C68Z00 and 50-C78Z00 models)

kN	kN	kN	kN
2000	3000	4000	5000

50-C46Z00

EN compression testing frame, 2000 kN cap.

50-C56Z00

EN compression testing frame, 3000 kN cap.

50-C68Z00

EN compression testing frame, 4000 kN cap.

50-C78Z00

EN compression testing frame, 5000 kN cap.

+ info

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 DIGIMAX 3 p. 233
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 Test accessories p. 263
 DATAMANAGER Software p. 238
 Special calibration p. 240

⚡ For 110V, 60 Hz versions change last code number from 2 to 4.
 Example: 50-C46B04, C56C04, C68D04
 For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

EN Compression testers 2000 | 3000 kN

Standards EN 12390-4 | EN 772-1 - Accuracy Cl.1

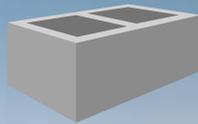
COMPACTline



Cubes
up to 200 mm



Cylinders
up to dia.
160x320 mm



Blocks



Automax 50-C57D02

This serie is proposed with different power and control systems (PCS):

AUTOMAX

Super-automatic system with closed loop control

PILOT

Automatic system with closed loop control

DIGIMAX3

Semi-automatic power and control system

Note Also available, as alternative, the configuration with WIZARD 2, Semi-automatic power and control system. See page 232

Common specifications

Frame

Four column rigid welded steel construction. EN heavy duty spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front door and rear fragment guard.

Machine Accessories

- Distance pieces to reduce the vertical daylight.
- Frame pedestal.
- Lifting device for bottom platen

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS.

See page 232, 233

For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS.

See page 232, 233

For PILOT and AUTOMAX PCS.

See page 236

Fragment guard lock switch

Prevents test execution with the safety guard open.

50-C50/P

For testers with AUTOMAX and PILOT PCS.

50-C50/P2

For testers with DIGIMAX PCS and WIZARD PCS.

Special calibration procedure

See page 240

Certified platen hardness

See page 240

Note: for testing high strength / explosive failure specimens we strongly recommend the use of distance pieces complete with threaded centering pin. See page 242

Frame physical specifications

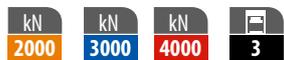
model 50-	C47xxx	C57xxx
Cap. kN	2000	3000
Max. vertical daylight mm	350	350
Horizontal daylight mm	350	370
Platen dimensions, mm	310 x 510 x 50*	
Surface hardness	55.5 HRC (600 HV)	
Flatness tolerance	0.05 mm	

*Models fitted with platens 310x510x90mm also available on request



Pilot 50-C57C02 with steel base 50-C59/B

AUTOMAX



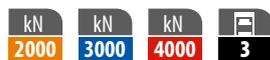
50-C47D02

AUTOMAX Compact-Line, 2000 kN cap., super-automatic EN compression tester for blocks, cylinders and cubes. Complete with steel base. 230 V, 50-60 Hz, 1 ph.

50-C57D02

AUTOMAX Compact-Line, 3000 kN cap., super-automatic EN compression tester for blocks, cylinders and cubes. Complete with steel base. 230 V, 50-60 Hz, 1 ph.

PILOT



50-C47C02

PILOT Compact-Line, 2000 kN cap., automatic EN compression tester for blocks, cylinders and cubes. 230 V, 50-60 Hz, 1 ph

50-C57C02

PILOT Compact-Line, 3000 kN cap., automatic EN compression tester for blocks, cylinders and cubes. 230 V, 50-60 Hz, 1 ph



50-C57B02 with steel base 50-C59/B

main features

- > Models matching all requirements of both EN 12390-4 and EN 772-1 Standards
- > High-stiffness 4-column welded frame with EN heavy duty spherical seat in oil bath, supplied with traceable test certificate for load transfer verification (stability test) to EN 12390-4
- > Class 1 accuracy to EN 12390-4 starting from 10% of full scale. Special calibration procedure to obtain Class 1 from 1% available as option. Traceable calibration certificate supplied with the machine

PILOT and AUTOMAX

- > Automatic test execution with closed-loop digital feedback
- > 3 channels (for load sensors) with 132'000 div. resolution (better than 0.01% of full scale)
- > Sampling rate 50/sec
- > ES Energy Saving technology reducing the power consumption and ensuring silent operations
- > Control of additional testing frames
- > Unlimited storing capacity on USB pen drive of test data downloadable to PC via LAN port
- > Double-stage hydraulic pump with rapid approach (40 mm/min) and precise oil flow control. Soft platen-to-specimen contact and smooth load rate control from the very beginning of the ramp
- > Dual user-interface via console display and PC

DIGIMAX 3



50-C47B02

DIGIMAX 3, Compact-Line 2000 kN cap, semi-automatic EN compression tester for blocks, cylinders and cubes. 230 V, 50 Hz, 1 ph.

50-C57B02

DIGIMAX 3, Compact-Line 3000 kN cap, semi-automatic EN compression tester for blocks, cylinders and cubes. 230 V, 50 Hz, 1 ph.

Frames only

All frames are supplied complete with pressure transducer, connection kit for separate control console and steel base



50-C47Z00

EN compression frame 2000 kN cap.

50-C57Z00

EN compression frame 3000 kN cap.

+ info

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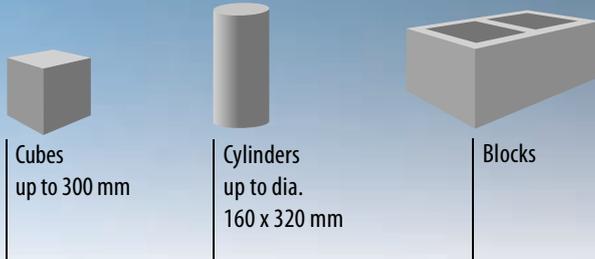
⚡ For 110V, 60 Hz versions change last code number from 2 to 4.
 Example: 50-C47B04, C57C04

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

EN Heavy duty compression frames 4000 | 5000 kN

Standards

EN 772-1 | EN 12390-4



Cubes
up to 300 mm

Cylinders
up to dia.
160 x 320 mm

Blocks



This model featuring four column rigid welded steel construction, is fitted with block platens 310x510x90 mm thickness and Heavy duty premium spherical seat. Satisfy either the EN 772-1 concerning block testing, or the EN 12390-4 concerning standard cubes and cylinders. The frame is provided with all safety features relating to the explosive energy release resulting from high strength concrete specimen failure.

It can be fitted with a special block platen lifting assembly which is essential to make easy the placement of distance pieces, to adjust the vertical daylight, between the piston and the lower platen. See accessories.

50-C79Z00 with 50-C10D02 Automax Smart-Line. The frame is fitted with front and rear fragment guard protections. Upper compression platen is secured to the frame by steel cords. Bottom compression platen is secured to the distance pieces. See safety features

Common specifications

Frame

Four column rigid welded steel construction. EN Premium heavy duty spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

These models are fitted with a specifically designed explosion proof test kit comprehending: safety cables securing the upper platen to the frame, metallic perforated fragment guard and bottom platen anti-fall safety system.

Note: for testing high strength / explosive failure specimens we strongly recommend the use of distance pieces complete with threaded centering pin. See page 242



Detail of the compression frame fitted with lifting device 50-C9060/B.

Machine Accessories

- Distance pieces to reduce the vertical daylight.
- Heavy duty lifting device for bottom platen

main features

- > A unique compression frame conforming to EN 772-1 and EN 12390-4, certified for stability (verification of force transfer). Traceable test certificate provided with the machine
- > Specifically designed to cope with the explosive energy release resulting from high strength concrete specimen failure. Fitted with a specifically designed explosion proof test kit

EN Frame only

All compression frames are complete with pressure transducer and connection kit for separate control console.



50-C69Z00

EN Compression testing frame, 4000 kN cap

50-C79Z00

EN Compression testing frame, 5000 kN cap.

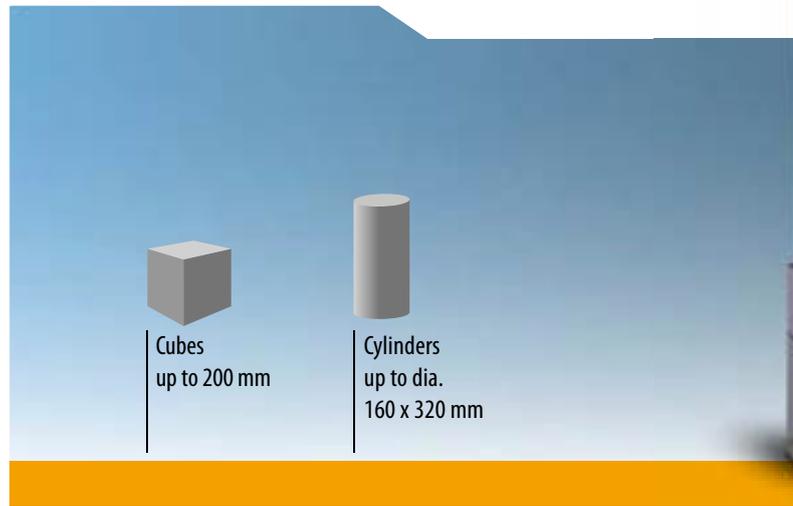
Frame physical specifications

Model 50-	C69Z00	C79Z00
Cap., kN	4000	5000
Max. vertical daylight, mm	310	310
Horizontal daylight, mm	425	425
Platen dimensions, mm	310 x 510 x 90	
Surface hardness	55.5 HRC (600 HV)	
Flatness tolerance	0.05 mm	

EN High stiffness pre-stressed frames 3000 kN

Standards

EN 12390-4



50-C86Z00

These high stiffness frames are particularly suitable for research purposes. The four column structure is pre-tensioned as shown below. The two proposed versions are identical except for the load cell incorporated in the piston of the 50-C86Z10 version providing very high accuracy starting from the very beginning of load scale. 50-C86Z00 version is fitted with pressure transducer. Both versions include pedestal and connection kit for control console.

Common specifications

Frame

Four pre-tensioned steel columns construction. EN heavy duty spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.



50-C86Z10 Detail of load cell housed in the ram

Compression Platens

See physical specifications table.

Safety Features

Piston travel limit switch, front rigid door and rear fragment guard. anti-fall safety system.

Machine Accessories

- Distance pieces to reduce the vertical daylight

Test Accessories

These frames can be equipped with accessories to perform:

- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

+ info

Smart-Line Console DIGIMAX 3.... p. 237
 Smart-Line Console PILOT..... p. 237
 Smart-Line Console AUTOMAX.... p. 237
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Balanced pre-tensioning system

The columns consist of two elements, one contained within the other. The internal part is the column and works in tension, whilst the external part is a tube and works in compression. This configuration guarantees tensional uniformity at all load levels. The other specifications concerning compression platens, spherical seat and safety features are identical to those of the EN Four column welded structures

Schematic balanced pre-tensioning system

EN Frame only

All high stiffness compression frames are complete with pressure transducer or load cell, connection kit for separate control console and pedestal.

kN
3000

50-C86Z00

EN compression frame 3000 kN cap. Load measurement system with pressure transducer

50-C86Z10

EN compression frame 3000 kN cap. Load measurement system with load cell

Frame physical specifications

Model 50-	C86Z00	C86Z10
Cap., kN	3000	3000
Load measurement system	Pressure transducer	Load cell
Max. vertical daylight, mm	345	345
Horizontal daylight, mm	330	330
Platen dimensions, mm	dia. 300	
Surface hardness	53 HRC (550 HV)	

ASTM Compression testers 1500 | 2000 | 3000 kN and 335 | 460 | 660 k lbf

Standards ASTM C39 | AASHTO T22
Accuracy Cl.1/ Cl. A

COMPACTline



Cylinders
up to dia.
160x320 mm
(6"x12")



50-A12A02 with pedestal
50-C99/B and front door 50-C19/FG



50-A22C02 with pedestal
50-C29/B and front door 50-C29/FG

WIZARD2

Semi-automatic power and control system

Note Also available, as alternative, the configuration with DIGIMAX 3, Semi-automatic power and control system. See page 233 and ask for our technical support.

PILOT

Automatic system with closed loop control

Note Also available, as alternative, the configuration with AUTOMAX, super automatic power and control system. See page 234 and ask us for technical support.

Common specifications

Frame

Rigid welded steel construction. ASTM spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

test data download to PC. Full data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Compression Platens

See physical specifications table.

Test Accessories

These machines can be equipped with accessories to perform:

- Capping pads and retainers
- Sulphur capping equipment
- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front and rear flexible fragment guards.

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Special calibration procedure

See page 240

Calibration in lbf units

These machines can be calibrated in lbf unit. For the codes change second last code number from 0 to 1

Machine Accessories

- Distance pieces to reduce the vertical daylight
- Frame pedestal
- Rigid front door

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred

Fragment guard lock switch

Prevents test execution with the front door (optional) open.

50-C50/P1

For testers with PILOT PCS.

50-C50/P3

For testers with DIGIMAX 3 PCS and WIZARD 2 PCS.

Certified platen hardness

See page 240

Frame physical specifications

model 50-	A12xxx	A22xxx	A32xxx
Cap., kN (lbf)	1500 (335,000)	2000 (450,000)	3000 (660,000)
Max. vertical daylight, mm (inches)	370 (14.6")	380 (15")	380 (15")
Horizontal daylight, mm (inches)	265 (10.4")	340 (13.4")	370 (14.6")
Platen dimensions, mm (inches)	dia. 165 (6.5")		
Surface hardness	55 HRC		
Flatness tolerance	0.02 mm		



50-A12C02 with pedestal
50-C99/B and front door 50-C19/FG

main features

- > Rigid welded steel construction
- > Spherical seat assembly fully compliant to ASTM C39 for testing 4"x8" and 6"x12" cylinders
- > Class A accuracy to ASTM E74 starting from 10% of full scale. Special calibration procedure to obtain Class A from 1% available as option. Traceable calibration certificate for load measurement accuracy supplied with the machine

PILOT

- > Automatic test execution with closed-loop digital feedback
- > 3 channels (for load sensors) with 132'000 div. resolution (better than 0.01% of full scale)
- > Sampling rate 50/sec
- > ES Energy Saving technology reducing the power consumption and ensuring silent operations
- > Control of additional testing frames
- > Unlimited storing capacity on USB pen drive of test data downloadable to PC via LAN port
- > Double-stage hydraulic pump with rapid approach (40 mm/min) and precise oil flow control. Soft platen-to-specimen contact and smooth load rate control from the very beginning of the ramp
- > Dual user-interface via console display and PC

WIZARD 2

kN 1500	kN 2000	kN 3000	2
K lbf 335	K lbf 450	K lbf 660	

50-A12A02

WIZARD 2 Compact-line 1500 kN cap. semi-automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50Hz, 1 ph
50-A12A12
as above but calibrated in lbf (cap. 335,000 lbf)

50-A22A02

WIZARD 2 Compact-line 2000 kN cap. semi-automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50Hz, 1 ph
50-A22A12
as above but calibrated in lbf (cap. 450,000 lbf)

50-A32A02

WIZARD 2 Compact-line 3000 kN cap. semi-automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50Hz, 1 ph
50-A32A12
as above but calibrated in lbf (cap. 660,000 lbf)

PILOT

kN 1500	kN 2000	kN 3000	3
K lbf 335	K lbf 450	K lbf 660	

50-A12C02

PILOT Compact-line 1500 kN cap. automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50-60Hz, 1 ph
50-A12C12
as above but calibrated in lbf (cap. 335,000 lbf)

50-A22C02

PILOT Compact-line 2000 kN cap. automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50-60Hz, 1 ph
50-A22C12
above but calibrated in lbf (cap. 450,000 lbf)

50-A32C02

PILOT Compact-line 3000 kN cap. automatic ASTM compression tester for cylinders up to dia. 6"x12" (160 x 320 mm). 230V, 50-60Hz, 1 ph
50-A32C12
as above but calibrated in lbf (cap. 660,000 lbf)

Frames only

All frames are supplied complete with pressure transducer and connection kit for separate control console

kN 1500	kN 2000	kN 3000
K lbf 335	K lbf 450	K lbf 660

50-A12Z00

ASTM compression frame 1500 kN cap.
50-A12Z10
as above but calibrated in lbf (cap. 335,000 lbf), when connected to any PCS.

50-A22Z00

ASTM compression frame 2000 kN cap.
50-A22Z10
as above but calibrated in lbf (cap. 450,000 lbf), when connected to any PCS.

50-A32Z00

ASTM compression frame 3000 kN cap.
50-A32Z10
as above but calibrated in lbf (cap. 660,000 lbf), when connected to any PCS.

+ info

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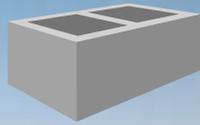
⚡ For 110V, 60 Hz versions change last code number from 2 to 4.
Ex. 50-A12A04

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

ASTM Compression testers 3000 kN | 660 klbf

Standards ASTM C39 | ASTM C140 | ASTM C1314 | ASTM E4 | AASHTO T22
Accuracy Cl.1/Cl.A

COMPACTline



Blocks



Cylinders*
up to dia. 6"x12"
(150/160 x 300/320 mm)

*Using the upgrading option 50-A39/CYL.



PILOT 50-A39C02 with printer 50-C10B/PR and pedestal 50-C39/B1

PILOT

Automatic system with closed loop control

Note Also available, as alternative, the configuration with semi automatic power and control system WIZARD 2, DIGIMAX 3. See page 232, 233 Ask us for technical support.

Common specifications

Frame

Four column rigid welded steel construction. ASTM spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front door and rear fragment guard.

Machine Accessories

- Slotted distance pieces to reduce the vertical daylight
- Frame pedestal
- Rigid front door

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional software DATA-

MANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Capping pads and retainers
- Sulphur capping equipment
- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Fragment guard lock switch

Prevents test execution with the front door open

50-C50/P

For testers with PILOT PCS.

50-C50/P2

For testers with DIGIMAX 3 and WIZARD 2 PCS.

Special calibration procedure

See page 240

Calibration in lbf units

These machines can be calibrated in lbf unit. For the codes change second last code number from 0 to 1

Certified platen hardness

See page 240

Conversion system to test cylinder

This innovative upgrade is achieved by fitting the conversion apparatus, which consists of a rail sliding system and a 165 mm (6.5") diameter compression platen with a spherical seat, to the rear part of the frame. Once installed, the testing configuration can be changed with minimum effort: all that's required is to loosen the central screw using the upper hand wheel, slide off the upper block platen with spherical seat and fit the cylinder spherical seat assembly.

50-A39/CYL

Conversion set to test cylinders up to 6" x 12" to ASTM C39, comprehending:

- spherical seat and upper compression platen dia. 165 mm (6.5")
- system for easy removal and repositioning of the upper block spherical assembly

Frame physical specifications

Model 50-	A39xxx	A39xxx + A39/CYL
Cap., kN (lbf)	3000 (660,000)	
Max. vertical daylight, mm (inches)	260 (10.2")	370 (14.6")
Horizontal daylight, mm (inches)	370 (14.6")	
Platen dimensions, mm (inches)	310 x 410 x 90 (12.2"x16.1"x3.5")	dia. 165 (6.5")
Surface hardness	55 HRC	
Flatness tolerance	0.02 mm	

main features

- > Rigid welded steel construction
- > Premium Heavy Duty spherical seat and rectangular platens 310x410x90 mm (12.2"x16.1"x3.5") for testing blocks according to ASTM C140 and ASTM C1314
- > Innovative upgrading kit for easily switch of the spherical seat assembly for testing cylinders to ASTM C39
- > Compression machine completely reversible. This model is fitted with Premium Heavy Duty spherical seat and rectangular platens 310x410x90 mm (12.2"x16.1"x3.5") for testing blocks according to ASTM C140, C1314. Upper platen and spherical seat are mounted on a axial screw assembly allowing easy adjustment of vertical clearance using slotted distance pieces. Using the innovative upgrading kit the spherical seat-upper platen assembly for blocks can be easily switched with the other one for testing cylinders conforming to ASTM C39, resulting a multi-testing unit!
- > Class A accuracy to ASTM E74 starting from 10% of full scale. Special calibration procedure to obtain Class A from 1% available as option. Traceable calibration certificate for load measurement accuracy supplied with the machine



Detail of axial screw assembly allowing easy adjustment of vertical clearance



Detail of upper platen and spherical seat strictly conforming to ASTM C39 and AASHTO T22

PILOT

kN	K lbf	Platens
3000	660	3

50-A39C02

PILOT Compact-line 3000 kN cap. automatic ASTM compression tester for blocks.
230V, 50-60Hz, 1 ph

50-A39C12

as above but calibrated in lbf (cap. 660,000 lbf), when connected to any PCS.

Frame only

kN	K lbf
3000	660

All frames are supplied complete with pressure transducer and connection kit for separate control console

50-A39Z00

ASTM compression frame 3000 kN cap.

50-A39Z10

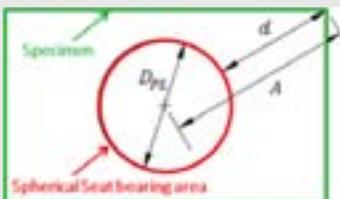
as above but calibrated in lbf (cap. 660,000 lbf), when connected to any PCS.



Detail of the sliding off operation of the upper block platen and spherical seat, to be replaced by the platen assembly for testing cylinders.



Detail of the upper block platen and spherical seat sliden off on the solid rail system, to fit the platen assembly for testing cylinders



This model fully complies with the ASTM C140 Standard which specifies the minimum platens thickness related to the spherical seat bearing area and the specimen dimensions as shown in the sketch.

Min. platens thickness = $d = A - D_{pl} / 2$

- A: distance from spherical seat centre to specimen corner
- D_{pl} : diameter of spherical seat bearing surface (see Annex A8)

Slotted distance pieces

Specifically designed for reducing the vertical clearance, to suite the size of specimens. Made of steel.



Slotted distance pieces

+ info

AUTOMAX p. 234
 PILOT p. 234
 DIGIMAX 3 p. 233
 WIZARD 2 p. 232
 Dimensions and weights p. 230
 Certificate of platen surface hardness p. 240
 Machine accessories p. 241
 Test accessories p. 263
 DATAMANAGER Software p. 238
 Special calibration p. 240



For 110V, 60 Hz versions change last code number from 2 to 4.
Example: 50-A39C04

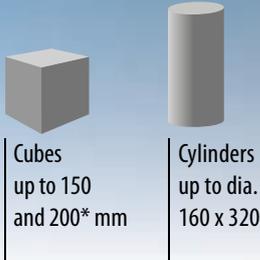
For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

Code 65-	Dimensions dia. x h	Weight approx.
L 1000/100B	7.7"x 4" (195 x 100 mm)	44.1 lbs (20 kg)
L 1000/68B	7.7"x 2.7" (195 x 68 mm)	29.8 lbs (13.5 kg)
L 1000/50B	7.7"x 2" (195 x 50 mm)	21.6 lbs (9.8 kg)
L 1000/40B	7.7"x 1.6" (195 x 40 mm)	17.2 lbs (7.8 kg)

General Utility Compression testers 1500 | 2000 | 3000 kN

Standards These series generally relate to previous European national standards Accuracy Cl.1

COMPACTline



*With the 3000 kN models only



50-C13A02 with pedestal 50-C99/B and front door 50-C19/FG

50-C23C02 with pedestal 50-C29/B and front door 50-C29/FG

WIZARD2

Semi-automatic power and control system

Note Also available, as alternative, the configuration with DIGIMAX 3, Semi-automatic power and control system. See page 233 and ask for our technical support.

PILOT

Automatic system with closed loop control and control system

Common specifications

Frame

Rigid welded steel construction. Spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front and rear flexible fragment guards.

Machine Accessories

- Distance pieces to reduce the vertical daylight
- Frame pedestal
- Rigid front door

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Splitting tensile test
- Compression on cement samples

50-C50/CYL

Lower compression platen dia. 165 x 30 mm for testing capped cylinders dia. 150 x 300 mm (6"x12"). Resulting compression machine vertical clearance is increased by 20 mm.

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Fragment guard lock switch

Prevents test execution with the front door (optional) open

50-C50/P1

For testers with PILOT PCS.

50-C50/P3

For testers with DIGIMAX PCS and WIZARD PCS.

Special calibration procedure

See page 240

Certified platen hardness

See page 240

Frame physical specifications

model 50-	C13xxx	C23xxx	C34xxx
Cap. kN	1500	2000	3000
Max. vertical daylight mm	340*	350*	350*
Horizontal daylight mm	265	340	370
Platen dimensions, mm	dia. 216		dia. 300
Surface hardness	55 HRC		
Flatness tolerance	0.03 mm		

*Note: with accessory 50-C50/CYL vertical clearance is increased by 20 mm. See Test Accessories.

main features

- > Rigid welded steel construction
- > Spherical seat assembly suitable to test both cubes and cylinders
- > Class 1 accuracy to EN 12390-4 (Class A to ASTM E74) starting from 10% of full scale. Special calibration procedure to obtain Class 1 / A from 1% available as option. Traceable calibration certificate for load measurement accuracy supplied with the machine

WIZARD 2

- > 2 channels (for load sensors) with 65'000 div. resolution (better than 0.01% of full scale)
- > Sampling rate 50/sec
- > Second frame option available
- > Unlimited storing capacity on USB pen drive of test data downloadable to PC via LAN port
- > Digital readout unit with wide high-contrast display 4x20 characters and 6 keys membrane keyboard
- > Real time display of load / stress and applied load rate by symbols for easy adjustment
- > Dual stage pump: low pressure/high delivery for fast piston approach (40 mm/min) and high pressure/low volume for loading
- > Special hand operated pressure-compensated proportional valve for the manual preset of load rate requiring just occasional operator's intervention



50-C13C02 with pedestal
50-C99/B and front door 50-C19/FG

WIZARD 2



50-C13A02

WIZARD 2, 1500 kN cap. semi-automatic compact-line compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 150 mm. 230V, 50 Hz, 1 ph

50-C23A02

WIZARD 2, 2000 kN cap. semi-automatic compact-line compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 150 mm. 230V, 50 Hz, 1 ph

50-C34A02

WIZARD 2, 3000 kN cap. Compact-Line semi-automatic compact-line compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230V, 50 Hz, 1 ph

PILOT



50-C13C02

PILOT Compact-Line, 1500 kN cap. automatic compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 150 mm. 230V, 50-60 Hz, 1 ph

50-C23C02

PILOT Compact-Line, 2000 kN cap. automatic compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 150 mm. 230V, 50-60 Hz, 1 ph

50-C34C02

PILOT Compact-Line, 3000 kN cap. automatic compression tester for cylinders up to dia. 160 x 320 mm and cubes up to 200 mm. 230V, 50-60 Hz, 1 ph

Frames only

All frames are supplied complete with pressure transducer and connection kit for separate control console



50-C13Z00

General utility compression frame 1500 kN cap.

50-C23Z00

General utility compression frame 2000 kN cap.

50-C34Z00

General utility compression frame 3000 kN cap.

+ info

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DIGIMAX 3	p. 233
WIZARD 2	p. 232
Dimensions and weights	p. 230
Certificate of platen surface hardness	p. 240
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Test accessories	p. 263
DATAMANAGER Software	p. 238
Special calibration	p. 240

⚡ For 110V, 60 Hz versions change last code number from 2 to 4. Example: 50-C13C04.

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

General Utility Compression testers 2000 | 3000 kN

Standards These series generally relate to previous European national standards Accuracy Cl.1

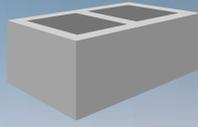
COMPACTline



Cubes
up to 200 mm



Cylinders
up to dia.
160 x 320 mm



Blocks



50-C25A02 with pedestal
50-C29/B and front door 50-C29/
FG

WIZARD2

Semi-automatic power and control system

Note Also available, as alternative, the configuration with DIGIMAX 3, Semi-automatic power and control system. See page 233 and ask for our technical support.

PILOT

Automatic system with closed loop control and control system

Note Also available, as alternative, the configuration with AUTOMAX, Super Automatic system with closed loop control. See page 234 and ask us for technical support.

Common specifications

Frame

Rigid welded steel construction. Spherical seat allows free alignment at the initial contact with the specimen. Ram travel 50 mm.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front and rear flexible fragment guards.

Machine Accessories

- Distance pieces to reduce the vertical daylight
- Frame pedestal
- Rigid front door

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Splitting tensile test
- Compression on cement samples
- Flexural test on concrete beams

Upgrading Options

Additional testing frame connection

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Fragment guard lock switch

Prevents test execution with the front door (Optional) open

50-C50/P1

For testers with PILOT PCS.

50-C50/P3

For testers with DIGIMAX 3 PCS and WIZARD 2 PCS.

Special calibration procedure

See page 240

Certified platen hardness

See page 240

Note: for testing high strength / explosive failure specimens we strongly recommend the use of distance pieces complete with threaded centering pin. See page 242

Frame physical specifications

Model 50-	C25xxx	C35xxx
Cap., kN	2000	3000
Max. vertical daylight, mm	350	350
Horizontal daylight, mm	340	370
Platen dimensions, mm	310 x 510 x 50	
Surface hardness	55.5 HRC (600 HV)	
Flatness tolerance	0.05 mm	

main features

- > Rigid welded steel construction
- > Spherical seat assembly suitable to test both cubes, cylinders and blocks
- > Class 1 accuracy to EN 12390-4 (Class A to ASTM E74) starting from 10% of full scale. Special calibration procedure to obtain Class 1 / A from 1% available as option. Traceable calibration certificate for load measurement accuracy supplied with the machine

WIZARD 2

- > 2 channels (for load sensors) with 65'000 div. resolution (better than 0.01% of full scale)
- > Sampling rate 50/sec
- > Second frame option available
- > Unlimited storing capacity on USB pen drive of test data downloadable to PC via LAN port
- > Digital readout unit with wide high-contrast display 4x20 characters and 6 keys membrane keyboard
- > Real time display of load / stress and applied load rate by symbols for easy adjustment
- > Dual stage pump: low pressure/high delivery for fast piston approach (40 mm/min) and high pressure/low volume for loading
- > Special hand operated pressure-compensated proportional valve for the manual preset of load rate requiring just occasional operator's intervention



50-C25C02 with pedestal 50-C29/B and front door 50-C29/FG

WIZARD 2



50-C25A02

WIZARD 2, 2000 kN cap. semi-automatic compact-line compression tester for testing blocks, cylinders and cubes. 230V, 50 Hz, 1 ph

50-C35A02

WIZARD 2, 3000 kN cap. semi-automatic compact-line compression tester for testing blocks, cylinders and cubes. 230V, 50 Hz, 1 ph

PILOT



50-C25C02

PILOT Compact-Line, 2000 kN cap. automatic compression tester for testing blocks, cylinders and cubes. 230V, 50-60 Hz, 1 ph

50-C35C02

PILOT Compact-Line, 3000 kN cap. automatic compression tester for testing blocks, cylinders and cubes. 230V, 50-60 Hz, 1 ph

Frames only

All frames are supplied complete with pressure transducer and connection kit for separate control console



50-C25Z00

General utility compression frame 2000 kN cap.

50-C35Z00

General utility compression frame 3000 kN cap.



Upgrading of the power pump by a two way valve to connect a second frame

+ info

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 PILOT p. 234
 DIGIMAX 3 p. 233
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 Dimensions and weights p. 230
 Certificate of platen surface hardness p. 240
 Machine accessories p. 241
 Test accessories p. 263
 DATAMANAGER Software p. 238
 Special calibration p. 240

⚡ For 110V, 60 Hz versions change last code number from 2 to 4.
 Example: 50-C35C04

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

Dimensions and weights of compression testing machines

	CODE	DIMENSIONS LxDxH (mm)	WEIGHT (Kg)
EN 12390-4	50-C46B02	955 x 450 x 1115	670
	50-C46C02	895 x 450 x 1115	680
	50-C46D02	930 x 420 x 1530	740
	50-C56B02	1035 x 505 x 1190	1040
	50-C56C02	985 x 505 x 1190	1045
	50-C56D02	1020 x 475 x 1550	1105
	50-C68C02	1090 x 570 x 1555	2000
	50-C68D02	1125 x 570 x 1555	2010
EN 12390-4 / EN 772-1	50-C47B02	955 x 605 x 1115	730
	50-C47C02	895 x 605 x 1115	740
	50-C47D02	930 x 605 x 1530	790
	50-C57B02	1035 x 640 x 1190	1095
	50-C57C02	985 x 640 x 1190	1105
	50-C57D02	1020 x 640 x 1550	1160
ASTM C39 AASHTO T22	50-A12A02 50-A12A12	810 x 425 x 1085	285
	50-A12C02 50-A12C12	760 x 370 x 1085	290
	50-A22A02 50-A22A12	835 x 440 x 1090	500
	50-A32A02 50-A32A12	805 x 450 x 1160	710
	50-A32C02 50-A32C12	765 x 450 x 1160	710
ASTM C140 ASTM C1314 ASTM C39	50-A39C02 50-A39C12	925 x 510 x 1670	980
	50-A39C02 50-A39C12 + 50-A39/CYL	925 x 830 x 1670	1031 (+51)
GENERAL UTILITY	50-C13A02	810 x 425 x 1085	305
	50-C13C02	760 x 370 x 1085	315
	50-C23A02	835 x 440 x 1090	525
	50-C23C02	785 x 420 x 1090	530
	50-C34A02	805 x 450 x 1160	755
	50-C34C02	755 x 450 x 1160	760
	50-C25A02	835 x 555 x 1090	610
	50-C25C02	785 x 555 x 1090	620
	50-C35A02	805 x 600 x 1160	815
	50-C35C02	765 x 600 x 1160	820
	50-C46Z00	650 x 450 x 1530	665
	50-C56Z00	740 x 505 x 1550	1035
	50-C68Z00 50-C78Z00	845 x 570 x 155	1960

Dimensions and weights of compression frames

	CODE	DIMENSIONS LxDxH (mm)	WEIGHTS (Kg)
EN-12390-4	50-C46Z00	650 x 450 x 1530	665
	50-C56Z00	740 x 505 x 1550	1035
	50-C68Z00 50-C78Z00	845 x 570 x 155	1960
EN 12390-4 Pre-stressed columns	50-C86Z00	700 x 450 x 1470	1050
	50-C86Z10	700 x 450 x 1580	1110
EN 12390-4 EN 772-1	50-C47Z00	650 x 610 x 1530	725
	50-C57Z00	740 x 640 x 1550	1100
	50-C69Z00 50-C79Z00	845 x 570 x 155	1960
ASTM C140 ASTM C1314	50-A12Z00 50-A12Z10	450 x 365 x 1090	250
	50-A22Z00 50-A22Z10	540 x 440 x 1090	465
	50-A32Z00 50-A32Z10	440 x 450 x 1160	665
ASTM C140 ASTM C1314 ASTM C39	50-A39Z00 50-A39Z10	610 x 510 x 1670	935
	50-A39Z00 50-A39Z10 + 50-A39/CYL	610 x 830 x 1670	986 (+51)
General Utility	50-C13Z00	445 x 365 x 1090	270
	50-C23Z00	540 x 400 x 1090	490
	50-C34Z00	440 x 450 x 1160	715
	50-C25Z00	540 x 555 x 1090	575
	50-C35Z00	440 x 600 x 1160	775

Dimensions and weights of multipurpose machines and frames

	CODE	DIMENSIONS LxDxH (mm)	WEIGHTS (Kg)
Multipurpose machines	50-C92A02 50-C92A12	810 x 425 x 1085	285
	50-C92C02 50-C92C12	760 x 370 x 1085	290
	50-C92Z00 50-C92Z10	450 x 365 x 1090	250
	50-C92A22	1060 x 410 x 1090	325
	50-C92C22	1010 x 390 x 1090	330
	50-C92Z20	695 x 390 x 1090	280

Semi-Automatic Power and Control Systems

These systems include a power pump with a proportional valve and a load measuring and display system which is produced in two versions:

WIZARD 2

Readout/Digital Interface

DIGIMAX 3

Data Acquisition and Processing Unit

Power pump and proportional valve

The power system consists of a dual-stage pump: low pressure/high delivery (max. 7 bar) for fast piston approach (up to 40mm/min) and high pressure/low volume (up to 650 bar, 0.50 litres/min) for loading. It is optimised to prevent any overheating effects even under intensive use and severe working conditions.

The pump is fitted with a special manually-controlled proportional valve (pacemeter system) to maintain the preset load rate during the test, requiring only occasional adjustments by the operator.

The power pump with proportional valve can be used to fit existing frames, including other brands. It is identified with the following code and description:

Ordering information

50-Q30B12

Hydraulic power system for compression testing machines.

230V, 50Hz, 1ph.

50-Q30B13

As above but 220V, 60Hz, 1ph.

50-Q30B14

As above but 110V, 60Hz, 1ph.

Technical specifications

- Complete with self-compensated proportional valve for the manual preset of load rate
- Maximum pressure: 650 bar, oil delivery 0.5 litres/min
- Maximum usable oil volume: 3.5 litres
- Power: 750W
- Weight: 55kg (approx.)

Upgrading options

50-C10B/2F

Two-way valve for WIZARD 2 and DIGIMAX 3 PCS for the connection of a second testing frame.



Semi-automatic power system (50-Q30B12)



Detail of proportional valve and dial knob



50-Q60A02 with printer 50-C10A/PR

WIZARD 2

Digital readout unit

HARDWARE

- 2 analogue channels
- 4 x 20 characters alphanumeric display
- 65'000 points high resolution/stability analogue channels
- Sampling rate 50/sec
- Large storage capacity for test data on USB memory stick
- Ethernet port to download data to PC using the SW/TRM software
- Optional integrated printer (see Accessories)

FIRMWARE

- Simultaneous display of load, specific load and actual load rate
- LAN connection to PC for data transmission in real time
- Easy firmware update through Ethernet port
- Memory management with options to display tests stored on USB memory stick, download data to internal printer or PC, delete single tests or reset the entire memory
- Multi-coefficient calibration procedure with automatic storage of data without manual editing (using a suitable load cell and readout unit)
- Language and units selection (kN, ton, lbf)

The WIZARD 2 unit can also be ordered separately to upgrade existing frames (including other makes). A suitable pressure transducer (see Accessories) and connection cable would also be required. For more information get in touch with our Service department.

Ordering information

50-Q60A02

WIZARD 2, two-channel readout/digital interface for compression and flexural machines. Support bracket not included. 110-240V, 50-60Hz, 1ph.

Accessories

50-Q60A02/ARM

Arm for lateral-wall mounting of WIZARD 2 digital readout unit.

Serial printer

(must be factory installed)

50-C10A/PR

Upgrade of the WIZARD 2 unit to incorporate a serial printer in the front panel, allowing results to be printed at the end of a test.

Specifications:

- Very quiet printing
- High speed: 50 mm/sec
- High resolution: 203 dpi= 8 dots/mm
- Supports text printing
- Easy maintenance with self-diagnostics
- Paper width: 57.5 mm

Pressure transducer

82-P0700

Pressure transducer, 0-700 bar.

82-P0349/ELT

Pressure transducer connecting cable



50-Q60B02 with printer 50-C10B/PR

main features

DIGIMAX 3

- > Three channels (for load sensors) with 132'000 divs resolution (better than 0.01% of full scale)
- > Large advanced touchscreen with 240x128 pixel graphic display, icon-driven with figures and diagrams
- > Compatible with the DataManager software 82-SW/DM. See pages...
- > Can be connected to any make of hydraulically operated testing frame
- > Recording facility of up to 10 test profiles for each channel allowing quick and easy test start

DIGIMAX 3
Data Acquisition and Processing Unit

HARDWARE

- 3 analogue channels
- Touch screen graphic display 240 x 128 pixel .Icons driven showing figures and diagrams
- 132'000 point high resolution/stability analogue channels
- Sampling rate 50/sec
- Large storage capacity for test data on USB memory stick
- Ethernet port to download data to PC using the SW/TRM or the DATAMANAGER software
- Optional integrated printer (see Accessories)

FIRMWARE

- Simultaneous display of load, specific load, actual load rate and load/time graph
- LAN connection to PC for transmission of load and time data in real time during loading
- Easy firmware update through Ethernet port

- Memory management with options to display tests stored on USB memory stick, download data to internal printer or PC, delete single tests or reset the entire memory
- Multi-coefficient calibration procedure with automatic storage of data without manual editing (using a suitable load cell and readout unit)
- Recording facility for up to 10 test profiles for each channel including: type of test (e.g. compression, flexural, indirect tensile), specimen size and shape, load rate, test standard and other general information. Each one of the recorded test profiles can be recalled automatically to save time.
- Compatible with the newly-released DataManager Software (82-SW/DM, see page 238), tailored to the requirements of construction material testing laboratories, for real-time data acquisition, display and management
- 9 language
- Unit selection (kN, ton, lbf)

The DIGIMAX 3 unit can also be ordered separately to upgrade existing frames (including other makes). A suitable pressure transducer (see accessories) and connection cable would also be required. For more information get in touch with our Service department.

Ordering information

50-Q60B02

DIGIMAX 3, three-channel digital readout unit for compression and flexural machines. Support bracket included. 110-240V, 50-60Hz, 1ph.

Accessories

Graphic printer

(must be factory installed)

50-C10B/PR

Upgrade of the DIGIMAX 3 unit to incorporate a serial graphic printer in the front panel, allowing results (including a load/time plot) to be printed at the end of a test.

Specifications:

- Very quiet printing
- High speed: 50 mm/sec
- High resolution: 203 dpi=8 dots/mm
- Supports text and graphic printing
- Easy maintenance with self-diagnostics
- Paper width: 57.5 mm

Pressure transducer

82-P0700

Pressure transducer 0-700 bar for use with compression and flexural testers.

82-P0349/ELT

Pressure transducer connecting cable



DIGIMAX 3 SEMI-AUTOMATIC POWER AND CONTROL SYSTEMS

The systems include a power pump with a proportional valve, code 50-Q30B12 and a load measuring and display system, code 50-Q60B02.

Automatic Power and Control Systems

PILOT and AUTOMAX have the same technical features in common except for the enhanced hydraulic control and firmware of the AUTOMAX Super Automatic System, which are described in the additional features below.

Technical specifications

(PILOT and AUTOMAX systems)

HYDRAULICS

- Dual-stage pump: centrifugal low pressure for fast approach automatically switches to radial multi-piston high pressure for loading
- DC motor, 720W, 50-60Hz
- Maximum working pressure 700 bar
- Second and third frame optional facility using valve selector (PILOT PCS)
- Second (included) and third (optional) frame facility with active frame selection using display or PC software (AUTOMAX PCS).
- ES Energy Saving technology to reduce the power consumption and enable silent operation

HARDWARE

- 132,000 points high-resolution/stability analogue channels
- 240 x 128 pixel, icon-driven touchscreen graphic display, showing data and plots
- Large storage capacity for test data on a USB memory stick
- Ethernet port for communication with PC
- Optional integrated graphic printer

FIRMWARE

- Simultaneous display of load, specific load, actual load rate and load/time graph
- Memory management with options to display tests stored on USB memory stick, download data to internal printer (optional) or PC, delete single tests or reset the entire memory
- Multi-coefficient calibration curve
- Automatic force verification procedure
- Recording facility for up to 10 test profiles for each channel including: type of test (e.g. compression, flexural, indirect tensile), specimen size and shape, load rate, test standard and other general information. Each one of the recorded test profiles can be recalled automatically to save time
- Compatible with the newly-released DataManager software, tailored to the requirements of construction material testing laboratories, for real-time data acquisition, display and management
- 9 languages and unit selection (kN, ton, lbf)
- Real-time clock/date
- Execution of compression, flexure or indirect tensile tests in automatic mode. The load rate is controlled by a closed-loop P.I.D. system
- Link to PC via LAN port
- Display of load rate (e.g. N/s) or stress rate (e.g. MPa/s), data and plot

main features

Common to PILOT and AUTOMAX systems

- > Automatic test execution with closed-loop digital feedback
- > Adopts the latest ES Energy Saving technology for reduction of power consumption
- > Silent operation
- > Double-stage hydraulic pump with rapid approach and precise oil flow control allowing high throughput of accurate tests (up to 40 per hour)
- > Soft platen-to-specimen contact and smooth load rate control from the very beginning of the ramp
- > Control of a second frame (optional for PILOT) and third testing frame (optional for PILOT and AUTOMAX PCS)
- > Optional internal graphic printer including load/time plot
- > Connects to laboratory network via LAN port/DataManager
- > Connectable to PC via DataManager software (see page 238)
- > Dual user-interface via console display and PC

Additional features of the AUTOMAX systems

- > Automatic performance of the complete test cycle with closed-loop digital feedback by pressing the start button. Automatic loading and unloading by electronic on/off valve
- > Fully computerized system. Connectable to PC via DataManager software (see page 238). The software includes a remote control function for full computerization of the system
- > Double frame control as standard with optional control of an additional third frame: active frame selection via console display or software



PILOT Automatic Power and Control system, connected directly to a compression frame. The display unit is upgraded with the serial graphic printer 50-C10B/PR



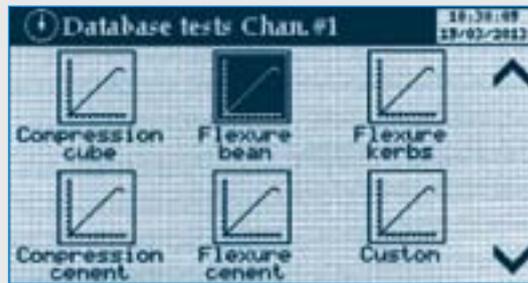
AUTOMAX, Super-automatic Power and Control System, connected directly to a compression frame

PILOT | AUTOMAX

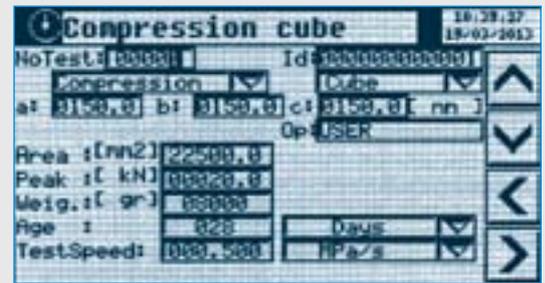
Automatic test procedure

Once the specimen has been positioned and centered, the test procedure is:

1. The user sets the test parameters, including load rate, on the touchscreen (or PC with DataManager software). This operation can be avoided by using a pre-saved test profile for repetitive tests.
2. The user presses the start button on the touchscreen (or PC). For PILOT System the loading/unloading valve has to be switched to the loading position.
3. The machine automatically starts the rapid platen approach, softly contacts the specimen, switches to the test speed and applies load to the specimen with a smooth load-rate control and, finally, releases the pressure upon specimen failure. For PILOT System the loading/unloading valve has to be switched to the unloading position.
4. The machine automatically saves the test including data results and load/time graph. Conformance of the test execution to standards can be easily proven.



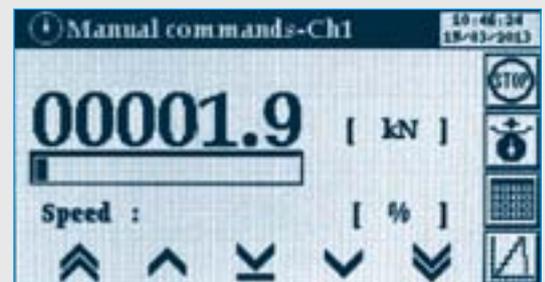
Selection of the test profile (specimen type, load rate, ref. standards, etc.)



Test profile data



Test results



Manual commands for calibration purpose



Date and time



Language selection menu

Automatic Power and Control Systems

Upgrading options

Graphic printer
(must be factory installed)

50-C10B/PR

Upgrade of a PILOT or AUTOMAX system to incorporate a serial graphic printer in the front panel, allowing results (including a load/time plot) to be printed at the end of a test.

Specifications:

- Very quiet printing
- High speed: 50mm/sec
- High resolution: 203 dpi= 8 dots/mm
- Supports text and graphic printing
- Easy maintenance with self-diagnostics
- Paper width: 57.5mm



Detail of display unit with 50-C10/PR graphic printer

Second frame connection Second and third frame connection (PILOT System)

The PILOT System can be upgraded with a two or three way valve for controlling (not simultaneously) a second or a third frame.

50-C10C/2F

Two-way valve for PILOT System to control a second frame. This item must be factory installed.



Detail of the two way valve selector (left) and loading/unloading valve (right).

50-C10C/3F

Three-way valve for PILOT System to control a second and a third frame. This item must be factory installed.



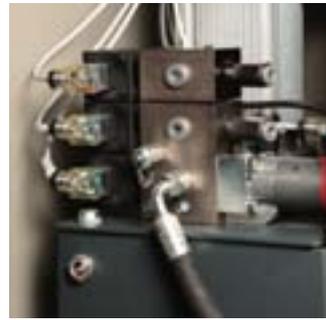
Automatic compression tester with PILOT Power and Control unit, controlling a second Flexural frame with the two-valve selector 50-C10C/2F

Third frame connection (AUTOMAX System)

The AUTOMAX System, which can control two frames as standard, can be upgraded with a hydraulic valve for controlling (not simultaneously) a third frame.

50-C10D/3F

Hydraulic valve for AUTOMAX System to control a third frame. This item must be factory installed.



Super-automatic compression tester with AUTOMAX Power and Control unit, controlling Flexural on concrete and Compression cement frames, with the hydraulic valve 50-C10D/3F

DIGIMAX3 | PILOT | AUTOMAX Smart-Line stand-alone consoles



DIGIMAX 3, PILOT and AUTOMAX PCS are also available in a stand-alone configuration that can be connected to all our compression and flexural frames. In this configuration, they can be profitably used to update any make of existing machine. Technical specifications are identical to those listed on pages 233 for DIGIMAX 3 PCS and on page 234 for PILOT and AUTOMAX PCS.

- Overall dimensions: 1292 x 350 x 450 mm
- Weight: 80 kg (approx.)

DIGIMAX SMART-Line

50-C10B02

DIGIMAX 3 SMART-Line, semi-automatic stand-alone Power and Control Console, for the control of one testing frame. Second frame facility available on request. 230V, 50Hz, 1ph

50-C10B03

As above but 220V, 60Hz, 1ph.

50-C10B04

As above but 110V, 60Hz, 1ph.



DIGIMAX 3 SMART-Line, stand-alone control console 50-C10B02 with 50-C56Z00 frame and distribution block 50-C10B/2F for the control of 50-C0910/FR flexure frame

Accessories



50-C20Z00

PC cabinet
Dimensions:
500 x 650 x 1350 mm (l x p x h)
Weight approx.: 46 kg
PC and printer not included

PILOT SMART-Line

50-C10C02

PILOT SMART-Line, automatic stand-alone Power and Control Console, for the control of one testing frame. Second and third frame facility available on request. 230V, 50-60Hz, 1ph)

50-C10C04

As above but 110V, 60Hz, 1ph.



PILOT SMART-Line, stand-alone console, 50-C10C02, controlling three frames: Compression and Flexure on cement and compression on concrete, with the two way valve 50-C10C/3F

AUTOMAX SMART-Line

50-C10D02

AUTOMAX SMART-Line, super-automatic stand-alone Power and Control Console, for the control of two testing frames. Third frame facility available on request. 230V, 50-60Hz, 1ph.

50-C10D04

As above but 110V, 60Hz, 1ph.



AUTOMAX SMART-Line, stand-alone console, 50-C10D02, controlling three frames: Compression concrete, Flexure concrete and Compression cement, with the hydraulic valve 50-C10D/3F

Universal Testing Software

DataManager 82-SW/DM

The DataManager software, running within the RTM (Real Time Management) environment, is compatible with DIGIMAX 3, PILOT and AUTOMAX Power and Control Systems and also with the more sophisticated AUTOMAX E-Modulus consoles. It is specially designed for data acquisition and reporting of compression, flexure and indirect tensile tests performed on different types of specimens and materials.

The Control System of the testing machine is connected to the PC via the RTM software using a high-speed Ethernet link, passing data and commands to the software in real-time and allowing live readings of load, strength and elapsed time, and a load/time graph to be displayed on the screen.

When connected to the AUTOMAX Control System, tests can be fully performed remotely, using the software.

Test data is stored using a database system, allowing previous tests to be quickly and easily recalled for reviewing or creating reports. MS Excel® test reports can be generated singly, or as batch files containing all the required test results for a single client or project or other criteria.

Test types and descriptive sample and test information are fully customisable, meaning that test reports can be tailored to the client's specific requirements, and ensuring that results can be reported in accordance with the relevant testing standards.



A screenshot of the DataManager software interface displaying a data table. The table has multiple columns and rows of data, likely representing test results. The interface includes a title bar and control buttons at the bottom.

intuitive + smart software



Automatic force verification procedure

In addition, by connecting the PC to our digital readout unit (82-P0801/E or 82-P0804/E) and suitable load cells, it is possible to perform an automatic load measurement verification procedure, including data acquisition and printing of traceable calibration certificates, using the software. see page 268



Control console directly connected via software to our digital readout unit and load cell to perform automatic force verification procedure.

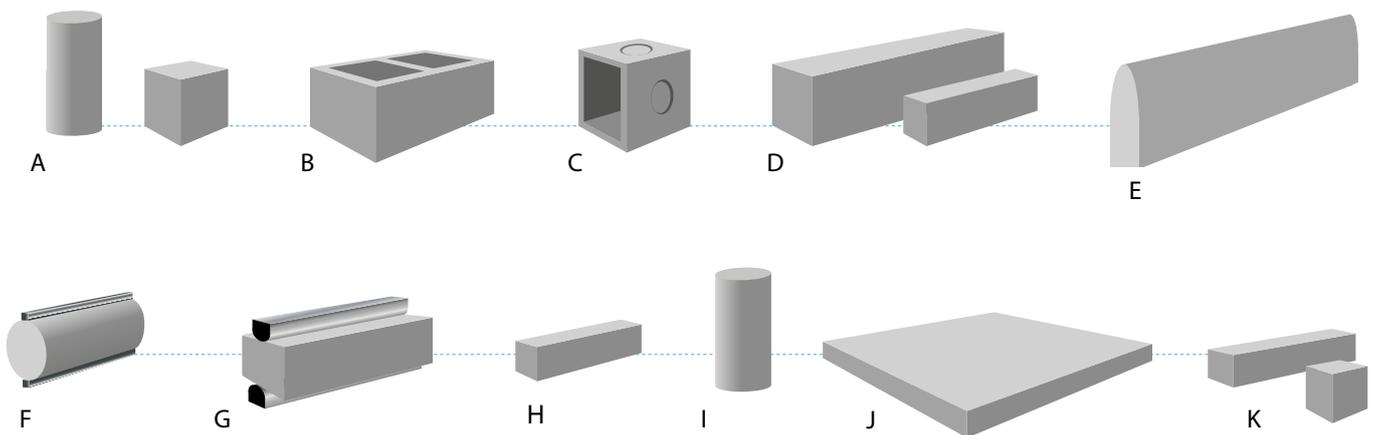


DataManager 82-SW/DM

For Compression, Flexural, Indirect tensile Testing on Concrete, Cement and similar



Standard	Test	Specimen
EN 12390-3	Compressive strength of Concrete test specimens	A
EN 772-1 ASTM C140, C1314	Compressive strength of masonry units	B
EN 1917	Concrete unreinforced, manholes and inspection chambers, compressive strength	C
EN 12390-5	Flexural strength of concrete test specimens	D
EN 1340	Flexural test on Concrete kerb units	E
EN 12390-6	Tensile splitting test on concrete test specimens	F
EN 1338	Indirect tensile test on concrete paving blocks	G
EN 196-1	Compression and flexural strength of cement specimens	H
ASTM C39 AASHTO T22	Compressive strength of cylindrical concrete specimens	I
ASTM C78	Flexural strength of concrete using third-point loading	D
ASTM C293	Flexural strength of concrete using center-point loading	D
ASTM C496	Splitting tensile strength of cylindrical concrete specimens	F
EN 1339	Flexural test on concrete flagstones	J
ASTM C109 C348	Compression and flexural strength of cement specimens	K



Upgrading options

Platen surface hardness certificates

Standards

EN 12390-4 | ASTM C39 | ASTM C109 | ASTM C140 | EN 196-1 |
ASTM D2664 | ASTM D2938

The standards prescribe a minimum surface hardness depending on the type of test to be performed. When required, the hardness verification is performed with certified instruments. This option is identified by the Certificate code shown on the following table.

Platen surface

Machine/frame/ accessory Series	Platen dimensions (mm)	Certificate code	Certified minimum hardness HRC
50-A12xxx 50-A22xxx 50-A32xxx 50-A39xxx + accessory 50-A39/CYL 50-C92xxx	165 (circular)	<u>50-C0050/HRD2</u>	55
50-G13xxx 50-G23xxx	216 (circular)	<u>50-C0050/HRD3</u>	55
50-C34xxx 50-C46xxx 50-C56xxx 50-C86xxx	300 (circular)	<u>50-C0050/HRD4</u>	53
50-C25xxx 50-C35xxx 50-C47xxx 50-C57xxx 50-C67xxx 50-C77xxx	310 x 510 x 50 (rectangular)	<u>50-C0050/HRD7</u>	55.5
50-C69xxx 50-C79xxx	310 x 510 x 90 (rectangular)	<u>50-C0050/HRD10</u>	55.5
50-C68xxx 50-C78xxx	305 x 305 (square)	<u>50-C0050/HRD6</u>	53
65-L17xxx 65-L27xxx 50-C9030 50-C9030/H	40 x 40 (square)	<u>50-C0050/HRD5</u>	60
65-L18xxx 65-L28xxx 65-L38xxx 65-L58xxx 50-C92x2x	165 (circular)	<u>65-L0050/HRD</u>	55.5
50-Q0050/HRD*	300 (circular)	<u>50-C0050/HRD9</u>	58

* For rock testing to ASTM D2938, D3148

Special calibration procedures

Standards

EN 12390-4 | ASTM E74

These procedures can be applied to Concrete, Cement and Flexural testing machines fitted with WIZARD 2, DIGIMAX 3, PILOT and AUTOMAX systems and testing systems AUTOMAX E, MCC and ADVANTEST.

The calibrations are obtained by selecting suitable load sensors and using the calibration facilities of the Control Systems' software.

To be specified at the time of ordering

Machine/Frame Series	Calibration in Class 1 (A)	Identification code
All compression testing frames from 1500 to 5000kN capacity	From 1% to 100% of full scale	<u>50-C0050/CAL</u>
All cement compression testing frames, 300 and 600kN testing chambers only	From 1% to 100% of full scale	<u>50-C0050/CAL</u>
Cement compression Testing frame 500 kN capacity (model fitted with load cell)	From 0,1 % to 100 % of full scale	<u>50-C0050/1 CAL</u>
All cement double-chamber testing frames, for the 15kN chamber	From 5% to 100% of full scale	<u>50-C0050/CAL5</u>
Flexure testing frames fitted with load cells: 50-C1201/BFR 50-C1401/BFR 50-C1601/BFR	From 1% to 100% of full scale	<u>50-C0050/CAL</u>
Flexure testing frames fitted with pressure transducers: 50-C0910/FR 50-C1200/BFR 50-C1400/BFR	From 5% to 100% of full scale	<u>50-C0050/CAL5</u>

Machine accessories

Frame pedestals

All the pedestals in the range are made of steel and are designed to make use of the compression machine straightforward, providing easy specimen loading and machine control.

Technical specifications and ordering information

Code 50-	Pedestal dimensions (wxdxh) mm	For machines/ frame	Approx. weight (kg)
C29/B	620 x 420 x 400	50-C23xxx 50-C25xxx 50-A22xxx	29
C39/B	670 x 400 x 400	50-C34xxx 50-C35xxx 50-A32xxx	40
C49/B	650 x 310 x 425	50-C42xxx 50-C46xxx 50-C47xxx	35
C59/B	740 x 370 x 375	50-C52xxx 50-C56xxx 50-C57xxx	36
C99/B	660 x 370 x 400	50-C92xxx 50-A12xxx 50-C13xxx	26
C39/B1	670 x 630 x 200	50-A39xxx	35



50-C49/B, 50-C59/B



50-C99/B, 50-C29/B, 50-C39/B

Rigid front door

All our EN compression frames/machines series are already fitted with front rigid door and rear flexible fragment guard. General utility and ASTM frames/machines series are standard mounted with front and rear flexible fragment guard. As accessory it is possible to upgrade them with a front rigid door.

Ordering information

Code 50-	For machine/frame
C19/FG	50-C13xxx / 50-A12xxx
C29/FG	50-C23xxx / 50-A22xxx
C25/FG	50-C25xxx
C39/FG	50-C34xxx / 50-A32xxx
C35/FG	50-C35xxx

Lifting assembly for block testing platens

This accessory is used for easier placement of distance pieces which can be used, when necessary, to reduce the vertical clearance of the machines/frames.

Two models are available:

50-C9060/A

Lifting device for bottom block platen for easier placement pieces compatible platen size 310 x 510 x 50 mm thickness. Weight: 19 kg (approx.)

50-C9060/B

Lifting device for bottom block platen for easier placement of distance pieces compatible platen size 310 x 510 x 90 mm thickness. Weight: 18 kg (approx.)



50-C9060/A



50-C9060/B

Centering device for cylinders and cubes

This is a useful accessory for accurately centering cylindrical and cubical specimens on the compression platens, made of corrosion-resistant steel.

50-C0050/CTR2

Centering device for specimen with 100, 150, 160 and 200 mm diameter/side. Suitable for machines fitted with 300 mm dia. platens.

50-C0050/CTR3

Same as above, but suitable for machines fitted with 216 mm square platens.

50-C0050/CTR4

Same as above, but suitable for machines fitted with 305 x 305 mm square platens.



50-C0050/CTR 2



50-C0050/CTR2

Machine accessories

Distance pieces

For adjusting the vertical clearance

Made of steel, these pieces are used to reduce the vertical clearance of the compression machine to a height that is appropriate for the size of the specimen and considering that, in general, the maximum piston travel is 50mm. The following information is provided to help you select the correct combination of distance pieces.

How to select distance pieces

When selecting distance pieces, all possible combinations of tests and specimen sizes should be considered.

The total vertical space that needs to be filled by distance pieces can be calculated using: $(v - h) - 10$ mm

Where:

v = Maximum vertical clearance of the machine (mm)

h = Specimen height (mm)

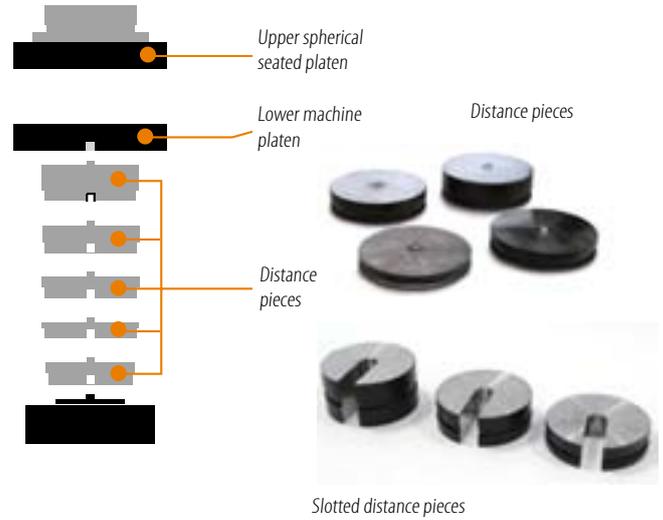
10 mm = typical free vertical space to be left after specimen positioning

For example:

$v = 350$ mm

$h = 150$ mm

Vertical space to be filled = $(v - h) - 10$ mm = $(350 - 150) - 10 = 190$ mm (approx.)



Test accessories

Splitting tensile test devices

Standards EN 1338 | EN 12390-6 | ASTM C496

This device is a two-column steel frame with a self-centering specimen holder at the base and an upper load beam suspended with springs for easy adjustment of the specimen. It can be easily placed on the lower platen of the compression tester, with suitable distance pieces used to adjust the vertical clearance.

The devices have to be completed with packing strips which are inserted between the specimen and the load beam.

Model 50-C9000/B is used for splitting tensile tests on cylindrical specimens up to 160 x 320 mm (diameter x height)

Model 50-C9000/A is used for cylinders up to 250 x 500 mm (diameter x height).

Model 50-C9070/B is used for splitting tensile tests on concrete block pavers and concrete cubes.

Technical specifications

Model	50-C9000/B	50-C9070/B	50-C9000/A
Maximum height*, mm	370	370	388
Max vertical daylight, mm	210 (total height: 370)		
Min vertical daylight, mm	90 (total height: 250)		
Max horizontal daylight, mm	160		
Max travel, mm	45		
Bearers length, mm	345		
Overall dimensions, width/length, mm	255/345	255/345	346/525
Usable with	All compression testers	All compression testers	With 4000/5000kN compression testers only
Approx. weight, kg	28	28	50

*When testing 150 mm and 160 mm diameter specimens, the vertical height required is 325 mm. When testing 100 mm diameter specimens, the vertical height required is 275 mm. Suitable distance pieces must be selected to adjust the remaining vertical clearance. For models 50-C9000/B and C9070/B max total height is 370 mm. The 370 mm vertical daylight can easily be obtained removing the lower platen of the compression tester.

Technical specifications and ordering information

Code	Dimensions (diameter x height, mm)	Approx. weight (kg)
50-C9080*	200 x 30	7.3
50-C9082*	200 x 50	12.3
50-C9083*	200 x 68	16.7
50-C9084	96 x 158	9
50-C9086*	200 x 100	25
50-C9087	96 x 130	7
65-L1000/20	165 x 20	3.5
65-L1000/30	165 x 30	5.5
65-L1000/40	165 x 40	7
65-L1000/68	165 x 68	10.5
Slotted type (for 50-A39xxx only)		
50-L1000/40B	195 x 40	7.8
50-L1000/50B	195 x 50	9.8
50-L1000/68B	195 x 68	13.5
50-L1000/100B	195 x 100	20

*These codes by adding the suffix /P identify the distance pieces complete with threaded centering pin suitable for testing high strength / explosive failure specimens. Dimensions are the same as standard models.



50-C9070/B



50-C9000/B

Ordering information

50-C9000/B

Splitting tensile test device for cylinders up to 160 mm diameter x 320 mm height. Conforms to EN 12390-6 and ASTM C496.

50-C9000/A

Splitting tensile test device for cylinders 250mm diameter x 500 mm height. Conforms to EN 12390-6.

50-C9070/B

Splitting tensile test device for concrete block pavers and concrete cubes. Conforms to EN 1338 and EN 12390-6.

Accessories

50-C9002

Hardboard packing strips 4 x 15 x 345 mm, to EN 1338 and 12390-6. Pack of 50.

50-C9001/A

Hardboard packing strips 4 x 15 x 550 mm, for 50-C9000/A device. Pack of 50.

50-C9002/A

Plywood packing strips 3 x 25 x 345 mm, to ASTM C496. Pack of 50.



50-C9000/B fitted in the compression machine



50-C9010/B fitted in the compression machine

Flexural test device for concrete beams

Standards

EN 12390-5 | ASTM C78 | ASTM C293 | AASHTO T97



This device has a double upper bearer for two-point and centre-point tests. The total height of the device is 370 mm when adjusted for 150 mm beams and 320 mm for 100 mm beams. When the device is adjusted to 370mm height, the required vertical clearance in the chamber of the compression tester can easily be obtained by removing the lower platen.

50-C9010/B

Flexural device for concrete beams 100 x 100 x 400/500 mm and 150 x 150 x 600/700 mm.

- Maximum vertical clearance: 160 mm (total height: 370 mm)
- Minimum vertical clearance: 110 mm (total height: 320 mm)
- Maximum travel: 45 mm
- Distance between upper rollers: 100 mm or 150 mm
- Distance between lower rollers: 300 mm or 450 mm
- Total width: 260 mm
- Weight: 33 kg (approx.)

Compression devices for cement and mortars

Standards

ASTM C109 | EN 196

This apparatus can be placed and centered directly on the lower machine platen and consists of a robust frame fitted with an upper platen with a spring-mounted spherical seat. The 50-C9030/H model conforms to EN 196-1 and is designed to test portions of 40 x 40 x 160 mm prisms broken in flexure, while the 50-C9032/H model, conforming to ASTM C109, is fitted with 75 mm diameter compression platens, has a vertical clearance of 53 mm, and is used to test 50 mm/2" cubes and other small samples such as microcores. The total height of both models is 222 mm.

Vertical clearance of the compression machine has to be adjusted accordingly using suitable distance pieces. See accessories.

50-C9030/H can be supplied, on request, with a platen hardness certificate. See page 240

Weight: 8 kg (approx.)



50-C9030/H



50-C9032/H

Ordering information

50-C9030/H

Compression device to test portions of 40 x 40 x 160mm prisms broken in flexure to EN 196-1. High stiffness model.

50-C9032/H

Compression device to test 50mm (2") cubes to ASTM C109. High stiffness model.

Distance pieces (dimensions and weight on page 242) required for specimen size:

Machine and frames Series 50-	Vertical daylight approx. mm	*Cylinders 4"x 8" and Ø 100 x 200 mm		*Cylinders 6"x12", Ø 150 x 300 and 160 x 320 mm		Cube 100 mm		Cube 150 mm		Cube 200 mm		Cube 300 mm		Blocks up to 300 x 500 x 200 mm (W x D x H)	
		Q.ty	code	Q.ty	code	Q.ty	code	Q.ty	code	Q.ty	code	Q.ty	code	Q.ty	code
A12xxx	370	1x	C9084	1x	L1000/40	1x	C9084	2x	L1000/40	-	-	-	-	-	-
				1x	L1000/20	1x	L1000/20	1x	L1000/20						
C13xxx	340	2x	C9083	1x	C9080	2x	C9082	1x	C9082	-	-	-	-	-	-
						2x	C9083	2x	C9083						
A22xxx	380	1x	C9084	1x	L1000/40	1x	C9084	2x	L1000/40	-	-	-	-	-	-
		1x	L1000/20	1x	L1000/30	1x	L1000/30	1x	L1000/30						
C23xxx	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	-	-	-	-	-	-
						2x	C9083	2x	C9083						
C25xxx (block platens)	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	1x	C9080	2x	C9083
						2x	C9083	2x	C9083						
A32xxx	380	1x	C9084	1x	L1000/40	1x	C9084	2x	L1000/40	-	-	-	-	-	-
		1x	L1000/20	1x	L1000/30	1x	L1000/30	1x	L1000/30						
C34xxx	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	1x	C9082	-	-	-	-
						2x	C9083	2x	C9083	1x	C9083				
C35xxx (block platens)	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	1x	C9080	2x	C9083
						2x	C9083	2x	C9083						
C46xxx	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	-	-	-	-
						2x	C9083	2x	C9083						
C47xxx (block platens)	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	1x	C9080	2x	C9083
						2x	C9083	2x	C9083						
C56xxx	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	-	-	-	-
						2x	C9083	2x	C9083						
C57xxx (block platens)	350	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	1x	C9080	2x	C9083
						2x	C9083	2x	C9083						
C69xxx (block platens)	330	1x	C9082	-	-	1x	C9082	-	-	1x	C9082	-	-	1x	C9082
		1x	C9083			1x	C9083	1x	C9083	1x	C9083			1x	C9083
						1x	C9086	1x	C9086						
C68xxx	525	1x	C9083	1x	C9083	1x	C9083	1x	C9083	1x	C9083	1x	C9083	-	-
		2x	C9086	1x	C9086	3x	C9086	3x	C9086	2x	C9086	1x	C9086		
		1x	C9082	1x	C9082	1x	C9082			1x	C9082	1x	C9082		
C79xxx (block platens)	330	1x	C9082	-	-	1x	C9082	-	-	1x	C9082	-	-	1x	C9082
		1x	C9083			1x	C9083	1x	C9083	1x	C9083			1x	C9083
						1x	C9086	1x	C9086						
C78xxx	525	1x	C9083	1x	C9083	1x	C9083	1x	C9083	1x	C9083	1x	C9083	-	-
		2x	C9086	1x	C9086	3x	C9086	3x	C9086	2x	C9086	1x	C9086		
		1x	C9082	1x	C9082	1x	C9082			1x	C9082	1x	C9082		
C86xxx	345	2x	C9083	1x	C9080	2x	C9082	1x	C9082	2x	C9083	-	-	-	-
						2x	C9083	2x	C9083						

*The distance pieces here above listed refer to cylinders tested without capping devices.

Concrete pipe tester

Concrete pipe testing machines 750 kN capacity

Designed to test concrete sewer and drain pipes used in drainage works, water supply systems, irrigation systems etc. The machine is available in two versions:

50-C9602 conforming to ASTM C497

50-C9612 conforming to EN 1916

This EN version is suitable for testing round shaped pipes, cylindrical barrel shape over the full length without sockets conforming to EN 1916 Annex C, fig. C.2a. Compression tests can also be performed on cylindrical pipes with sockets, provided that you specify, at time of request, the shape and dimensions of above sockets to verify the compatibility with the loading bearers.

The difference between the two models concerns, mainly, the lower supports and the upper bearing beam. The machines do not include the elastomeric bearing strips or similar which have to be provided on site.

Other machine versions are available on request.



FRAME

The frame is made of structural steel and is bolted together with high strength bolts so it can be easily assembled and disassembled either for delivery or for movement from one site to another. The two upper crossbeams are raised and lowered by a motor operated winch. The upper cross-beam is then locked in position by locking pins inserted through the columns.

HYDRAULIC RAM ASSEMBLY

Consists of an alloy steel cylinder, of a piston tempered and ground, and hydraulic hoses and spherical seat.

CONTROL CONSOLE

DIGIMAX 3 Smart Line control console see page 237

For technical specifications about hydraulic pump and digital processing unit see page 233

Specifications (both models)

- Max. load: 750 kN
- Max vertical daylight: 3900 mm
- Distance between columns: 3250 mm
- Max. pipe dimensions: dia. 3700x2900 mm long
- Frame dimensions: 6460 x 4150 x 3000 mm (hxlxd)
- Power rating: 1300 W
- Net weight approx.: 4300 kg
- Shipping weight approx.: 5200 kg
- Shipping cubage approx.. 11 m³

Important note:

The machine is delivered disassembled and have to be mounted on site following the instructions.



Large concrete pipe tested with the 50-C9602 machine

Ordering information

50-C9602

Concrete pipe tester, 750 kN capacity, conforming to ASTM C497. 230 V, 50 Hz, 1 ph.

50-C9603

As above but 220 V, 60 Hz, 1 ph

50-C9604

As above but 110 V, 60 Hz, 1 ph

50-C9612

Concrete pipe tester, 750 kN capacity, conforming to BS/EN 1916.. 230 V, 50 Hz, 1 ph.

50-C9613

As above but 220 V, 60 Hz, 1 ph

50-C9614

As above but 110 V, 60 Hz, 1 ph

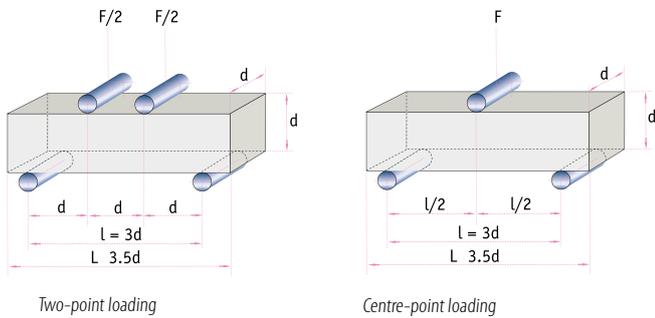
Flexural and transverse testing frames

These frames can be connected to our Power and Control Systems: WIZARD 2, DIGIMAX 3, PILOT, AUTOMAX, MCC and ADVANTEST, for testing standard concrete beams / flagstones / kerbs / tiles / fibre-reinforced and sprayed concrete etc. in conformance with the relevant EN, ASTM and AASHTO standards.

Testing standard concrete beams in flexure

EN and ASTM standards prescribe either the two-point or the centre-point methods which are illustrated in the sketch below. The two-point loading method (three-point for ASTM) however, has been taken as the reference method by the EN 12390-5.

All our frames are fitted or can be fitted with accessories to perform either the two-point or the centre-point loading.



Ordering information

50-C0910/FR

Flexure frame, 100kN capacity, complete with loading rollers for testing standard concrete beams conforming to EN 12390-5, ASTM C78 and ASTM C293. Includes pressure transducer and connection kit for separate control console and pedestal.

50-C1201/BFR

Flexural frame, 100kN capacity, complete with load cell and connection kit for separate control console. Rollers not included.

50-C1200/BFR

Flexural frame, 150kN capacity, complete with pressure transducer and connection kit for separate control console. Rollers not included.

50-C1401/FR

Flexural frame, 150kN capacity, with adjustable vertical clearance, complete with load cell and connection kit for separate control console. Rollers not included.

50-C1400/FR

Flexural frame, 150kN capacity, with adjustable vertical clearance, complete with pressure transducer and connection kit for separate control console. Rollers not included.

50-C1501/FR

High stiffness flexural frame, 200kN capacity, complete with load cell and connection kit for separate control console. Rollers not included.

Note:
All our Flexural frames are fitted or can be fitted with accessories to perform either the two-point or the centre-point loading.

Models available

We produce various versions which mainly differ from one another in the size and shape of the testing space, the type of load sensor (pressure transducer or load cell), and the maximum capacity. Models fitted with a load cell give high accuracy when testing low strength specimens. The 300kN capacity 50-C1601/FR frame features a "C"-shaped open structure which facilitates the positioning of large and bulky specimens. This model is particularly suitable for tests under displacement control (e.g. FRC-FRP concrete and Shotcrete), using MCC and ADVANTEST control consoles. See page 256, 260



50-C1200/7



50-C0910/FR

50-C1400/FR with 50-C1400/8

50-C1201/BFR with 50-C1200/8

50-C1200/BFR with 50-C1200/3 (with loading pad)

Technical specifications

Model 50-****	C0910/FR	C1200/BFR	C1201/BFR	C1400/FR	C1401/FR	C1501/FR
Maximum load capacity, kN	100	150	100	150	150	200
For testing	100 x 100 x 400/500 mm 150 x 150 x 600/700 mm concrete beams	Beams, flagstones, kerbs etc. (with the suitable accessory)	Beams, flagstones, kerbs etc. (with the suitable accessory)	Beams, flagstones, kerbs and large specimens in general (with the suitable accessory)	Beams, flagstones, kerbs and large specimens in general (with the suitable accessory)	Beams, flagstones, kerbs etc. (with the suitable accessory)
Load sensor	Pressure transducer	Pressure transducer	High-precision load cell	Pressure transducer	High precision load cell	High-precision load cell
Horizontal clearance, mm	180	720	720	660	660	650
Maximum vertical clearance with rollers or accessories, mm	160	-	-	-	-	-
50-C1x00/8	-	207	182	483	443	160
50-C1x00/3 (LP)*	-	273	248	405	365	226
50-C1x00/3 (LR)*	-	232	207	510	470	185
50-C1x00/3 + 50-C1200/4	-	181	156	458	418	134
50-C1x00/7	235	383	358	600	560	336
Distance between upper rollers, mm	150, 100 or single roller	100, 150, 200 or single roller	100, 150, 200 or single roller	100, 150, 200 or single roller	100, 150, 200 or single roller	100, 150, 200 or single roller
Distance between lower rollers, mm	450 or 300	100 to 900	100 to 900	100 to 1200	100 to 1200	100 to 900
Piston travel, mm	75	130	130	110	110	130
Piston travel limit switch	-	Included	Included	Included	Included	Included
Piston return by	Counterweight	Counterweight	Counterweight	Springs	Springs	Counterweight
Overall dimensions, mm (l x w x h)	350 x 530 x 1343 (including pedestal)	950 x 1000 x 981	950 x 1000 x 981	860 x 1400 x 1453	860 x 14090 x 1453	900 x 1000 x 950
Approx. weight, kg	165 (including pedestal)	130	130	216	224	150

* Note: The accessories 50-C1200/3 and 50-C1400/3 include lower rollers and either a top loading pad for testing kerbs, or an upper central loading roller for testing flagstones. The two different vertical clearances refer to the use of the loading pad (LP) or the use of the loading roller (LR). See accessories descriptions.

Accessories

Standard	Description	Codes for testing frames 50-C1200/BFR 50-C1201/BFR 50-C1501/FR	Codes for testing frames 50-C1400/FR 50-C1401/FR
EN 12390-5 ASTM C78, ASTM C293 Flexural tests on standard concrete beams	Roller bearing assembly for centre and two-point loading. Bearer dimensions: 40 x 300mm (diameter x length) Weight: 37kg (approx.)	50-C1200/8	50-C1400/8
EN 1339, EN 1340 Flexural tests on flagstones and kerbs	Set of two loading supports and central loading roller 620mm long, 40mm diameter, and top loading swivel jointed pad, 40mm diameter. Weight: 45kg (approx.) <i>Note: The 50-C1200/3 and 50-C1400/3 sets can be easily expanded to also perform flexural tests on standard concrete beams in conformance with EN 12390-5, by adding the following accessory:</i> 50-C1200/4 Set of two upper rollers 40 x 300mm (diameter x length) with support plate and cylindrical seat. Weight: 23kg (approx.)	50-C1200/3	50-C1400/3
Compression test on small/low strength specimens	Set of lower and upper platens, spherically seated, 165mm diameter, for compression tests. Weight: 23kg (approx.)	50-C1200/7**	50-C1400/7

**Suitable also for flexure frame model 50-C0910/FR

Flexural and transverse testing frames

50-C1601/FR

Universal, open structure flexural frame , 300 kN capacity

The 50-C1601/FR flexural frame has been designed to satisfy the stringent requirements prescribed by the Standards relating to determination of deformability and ductility index of sprayed concrete and fibre-reinforced concrete. The 'C-shaped' open structure of the frame allows easy and practical front-loading but, once the specimen is in position, the structure is closed with hydraulically-clamped rod assuring high rigidity.

Fitted with a high-precision strain gauge load cell for accurate and

reliable test results, the frame must be connected to a suitable control console and used with appropriate testing accessories, depending on type of test.

Main features

- > Universal flexural frame, 300 kN capacity
- > C-shaped open structure for easy specimen loading; closed for testing with hydraulically-clamped vertical rod
- > Load measurement by high-precision load cell
- > Large testing space houses a wide range of accessories for conventional tests and tests under displacement and strain control.

Technical specifications

- Maximum capacity: 300 kN
- Load sensor: load cell
- Maximum vertical clearance without accessories: 546 mm
- Horizontal clearance (between uprights): 900 mm
- Minimum/maximum distance between lower bearers: 80 to 1500 mm
- Minimum/maximum distance between upper bearers: 80 to 500 mm
- Overall dimensions (l x w x h): 1700 x 1266 x 1512 mm
- Weight approx.: 605 kg

50-C1601/FR with accessory.

The vertical rod, hydraulically clamped in testing position, provides high rigidity and stability.



Flexural tests on standard concrete beams

Standards EN 12390-5, ASTM C78, ASTM C293

50-C1601/1B

Upper and lower assembly for centre and two-point loading tests on concrete beams.

- Bearers 30 mm diameter, 300 mm long
- Weight approx.: 52 kg

50-C1601/KIT

Set of four distance pieces and two base plates for adjusting the vertical clearance.

Note: the remaining vertical clearance of the frame with the above accessory can be adjusted from 263 to 132 mm.

Flexural strength of paving slabs

Standards EN 1339

50-C1601/2

Set of one upper and two lower roller assemblies for testing paving flags.

- Bearers 40 mm diameter, 620 mm long
- Weight approx.: 66 kg

50-C1601/KIT

Set of four distance pieces and two base plates for adjusting the vertical clearance.

Note: the remaining vertical clearance of the frame with the above accessory can be adjusted from 263 to 132 mm.



50-C1601/FR frame fitted with 50-C1601/1B assembly and 50-C1601/KIT



50-C1601/FR frame fitted with 50-C1601/2 assembly and 50-C1601/KIT

Compression tests on small/ low strength specimens

The 50-C1601/FR Universal frame, 300 kN capacity, can also be profitably used, when equipped with the accessories described below, for compression tests on small/low strength specimens by placing the specimen directly on the 165 mm dia. platens, for splitting tests on concrete in conjunction with the accessory 50-C9070 or for cement testing with the suitable compression device (see page 243).

50-C1601/4

Set of spherically seated upper platen and lower platen, 165 mm diameter, for compression tests.
-Weight approx.: 19 kg

50-C1601/KIT

Set of four distance pieces and two base plates for adjusting the vertical clearance.

Note: the remaining vertical clearance of the frame with the above accessories can be adjusted from 352 mm to 100 mm.



50-C9030/H



50-C9032/H



50-C1601/FR frame fitted with 50-C1601/4 assembly and 50-C1601/KIT



50-C9070/B



50-C9000/B

Flexural strength of kerbs

Standards EN 1340

50-C1601/3

Swivel-jointed loading pad for testing kerbs. To be used with the 50-C1601/2 assembly and 50-C1601/KIT described above, removing the upper bearer and replacing it with the loading pad.

-Weight approx.: 5 kg

Note: the remaining vertical clearance of the frame with the above accessories can be adjusted from 221 to 90 mm.



Frame opening for easy and practical front loading

50-C1601/FR frame fitted with 50-C1601/2 assembly and 50-C1601/KIT



Specimen positioning

Advanced testing systems

The wide range of Control Systems that we propose, may cause, sometimes, doubts in the selection of the appropriate model. For this reason, in order to steer our client into the best solution for the requested application, we summarize, hereunder, the main tests on building materials.



Compression and flexural tests

One of the most important test parameter is the loading rate which, is common knowledge, shall be smooth and precisely controlled conforming to Standard requirement, independently on oil pressure or non-linear response of the specimen.

This performance is assured, at different level of sophistication, by all our ADVANCED TESTING SYSTEMS: AUTOMAX E-Modulus, MCC Multitest, ADVANTEST



Determination of Modulus of Elasticity

An important test determination is the elastic deformability of concrete and mortar under loading before first cracking, known as ELASTIC MODULUS: longitudinal (Young's modulus) and transverse (Poisson's modulus).

International Standards prescribe the specimen to be submitted to a sequence of loading and unloading cycles under controlled load rate. The testing system shall control the oil flow with precise increments and decrements and measure longitudinal and transverse deformation.

This test can be performed, at different level of sophistication, by AUTOMAX E-Modulus, MCC Multitest and ADVANTEST.



Tests under displacement and strain control (e.g. FRC/Shotcrete applications)

The above tests are mainly performed to determine the ductility of special construction materials which are used for their superior capacity of deformation after first cracking. This applies, in particular, to the following materials:

- > FRC, Fiber Reinforced Concrete > SHOTCRETE for tunneling
- > Structural specimens reinforced with membranes or similar

The above tests are performed in two phases (or steps):

Hardening:

Load applied to the specimen is gradually increased in order to produce a constant rate of deformation (for example the deflection rate of a beam) up to the peak load value and first cracking.

Softening:

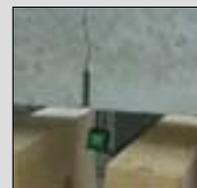
Load applied to the specimen is gradually decreased in order to maintain the same rate of deformation of the hardening phase. The test is completed when the load bearing capacity of the specimen becomes zero.

The typical test result is the area below the Stress-Strain diagram. The higher is the value of this area, the higher is the deformation capacity of the tested material.

The testing system must have very fast reaction time and extremely accurate oil flow regulation, if not, at the end of the hardening phase, facing the typical instability of the following stages, it is possible to loose the control of the test producing an early specimen failure and loosing the result (Stress-Strain diagram is partially lost and substandard area is not measurable).

The above tests can be performed by MCC Multitest and ADVANTEST.

The capacity of the above systems to perfectly fulfill the stringent requirements requested for deformation/strain controlled tests has been obtained after years of research and cooperation with the academic world and are outlined by the vast international references.



Selection guide Advanced testing systems



AUTOMAX E-MODULUS represents the ideal solution to automatically perform with the required accuracy and superior productivity, both the standard failure tests and the determination of Modulus of Elasticity.

AUTOMAX E-MODULUS

The oil flow, and consequently the load rate, is controlled by a double stage hydraulic pump, specifically designed and optimized for construction material testing, powered by a variable speed DC motor with closed loop digital feedback and customized PID algorithm.

The oil flow control is furthermore integrated by a Flow-Sharing device to allow loading and unloading cycles. Compatible with both small capacity frames (for cement and mortar specimens) and high capacity frames for concrete, high strength concrete, blocks and cores.

This technology, already in use in our machines by more than 10 years and continuously improved, combines high performances with the Energy Saving efficiency.



MCC Multitest represents the ideal solution to perform, with high accuracy, compression and flexural tests, determination of modulus of elasticity and deformation/strain controlled tests.

MCC MULTITEST

Oil flow control is obtained by a double stage hydraulic pump powered by an AC motor combined with a Servo-controlled Proportional valve with closed loop digital feedback and customized PID algorithm.

This sophisticated technology permits:

- Extremely accurate oil flow regulation controlling precisely even minor flow variation (positive and negative).
- Very fast reaction time, fundamental for those tests in which the behaviour of the specimen is fragile and requires immediate system feedback.
- Wide oil flow range making the system compatible with different tests, materials and testing frames



ADVANTEST covers all the application of MCC Multitest and also represents the ideal solution for central laboratories and research centers, to perform all tests and non standard determinations.

ADVANTEST

The advanced technology based on the Servo-controlled Proportional valve, featured by MCC Multitest, in this system is further extended: oil flow control and reaction time are nearly doubled and the total flexibility permits the system to perform ramp sequences, low frequency dynamic tests and user defined displacement/strain tests.

AUTOMAX E-Modulus



50-C20E82

- Compression and flexural tests
- Determination of modulus of elasticity

main features

- > Test cycle with closed-loop digital feedback is automatically performed by pressing the start button
- > Double-stage hydraulic pump with rapid approach and precise oil flow control allows high throughput of accurate tests (up to 40 per hour)
- > Flow-Sharing technology for automatic execution of loading and unloading cycles
- > Adopts the latest ES Energy Saving technology for reduction of power consumption and silent operation
- > Soft platen-to-specimen contact and smooth load rate control from the very beginning of the ramp
- > Double frame control expandable to up to four, with active frame selection via software
- > Complete with PC and DATAMANAGER testing software for EN and ASTM Standards relating to compression, flexural, splitting tests, etc.
- > Software for determination of Modulus of Elasticity and Poisson's ratio
- > Ready to perform automatic tensile test on steel specimens once upgraded with tensile test kit including a suitable testing frame and accessories listed in section 70. Ask our technical department for more details.



The AUTOMAX E-Modulus is concerned essentially with the automatic compression, flexural and splitting tests on concrete and cement (when connected to suitable testing frames and determinations of Elastic Modulus and Poisson's ratio). Essentially the system consists of an ergonomic power and control console which houses the power unit and the PC.

Specifications

Hydraulics

- Dual-stage pump: centrifugal low pressure for fast approach and automatic switching to radial multi-piston high pressure for loading
- DC motor, 720 W, 50-60 Hz
- Maximum working pressure 700 bar
- Third and fourth frame option, active frame selection by software
- Flow-Sharing technology to perform loading and unloading cycles
- ES Energy Saving technology to reduce power consumption
- Silent operation

Hardware

- 132,000 points effective resolution
- Closed-loop P.I.D. control
- 4 channels for load sensors (pressure transducers/load cells)
- 6 channels for strain/displacement transducers (potentiometers, magnetostrictive, LVDTs)
- 4 channels for strain gauges
- Memorization of the calibration curves enables sensors to be connected and used immediately
- Digital linearization of the calibration curve (multi-coefficient)

User-interface

- the System is fully controlled by the PC



50-C20E82
AUTOMAX E-Modulus
controlling a EN
Compression frame
with three electronic
Compressometer-
Extensometers fitted to
a cylindrical specimen.

Determination of modulus of elasticity

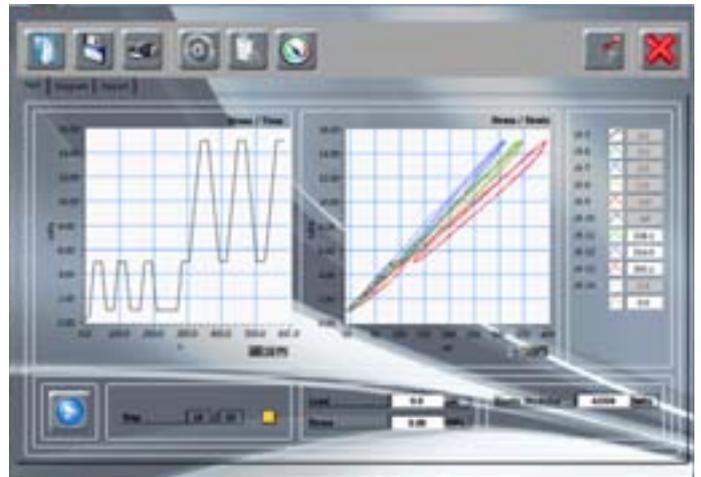
(Longitudinal: Young's Modulus-Transverse: Poisson's Modulus)

The specimen has to be submitted to a sequence of loading and unloading cycles under controlled load rate. The testing system shall control the oil flow with precise increments and decrements and measure longitudinal and transverse deformation.

For the AUTOMAX E-Modulus version, the oil flow control is integrated by a Flow-Sharing device to allow loading and unloading cycles. Compatible with both small capacity frames (for cement and mortar specimens) and high capacity frames for concrete, high strength concrete, blocks and cores.



This technology, already in use in our machines by more than 10 years and continuously improved, combines high performances with the latest Energy Saving efficiency.



E-MODULE software: Elastic Modulus test performed according to EN 12390-13 (Procedure A)

PC and Software

- > Remote control of the complete system (Console and Frame) for automatic test execution: rapid platen approach, zeroing, application of user-defined cycles of load/unload ramps, identification of the failure load, verification of conformity to the selected Standard, calculation of results, graphical and numerical management of results
- > DATAMANAGER software for compression, flexural, splitting tests to EN and ASTM standards (see page 238)
- > E-MODULE software for determination of young Modulus and Poisson's ratio allowing:
 - User-defined test cycles and step-programmable sequences
 - Real-time display of stress/time, stress/axial strain and stress/lateral strain diagrams
 - Automatic verification of sample centering and sensor functioning, as per standards requirements
 - Real- and/or deferred-time management of test results, either in graphical or table format
 - Remote selection of test frame
 - Memorization of single or batch test results
 - Printing and backing-up in MS Excel® format of user-defined test reports for single or batch tests
- > Multi-language software, customizable with local languages

- > Automatic load measurement verification procedure via software by connecting our digital tester (model 82-P0801/E or 82-P0804/E) with a strain gauged calibration cell to the PC allowing automatic data acquisition and print-out of traceable calibration certificates
- > Remote technical assistance/diagnostics via internet
- > UTSsoftware for tensile test on steel specimens available on request

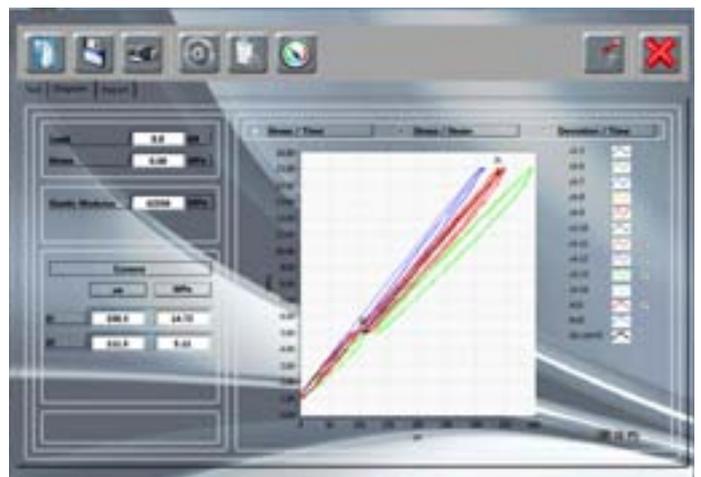
Ordering information

50-C20E82

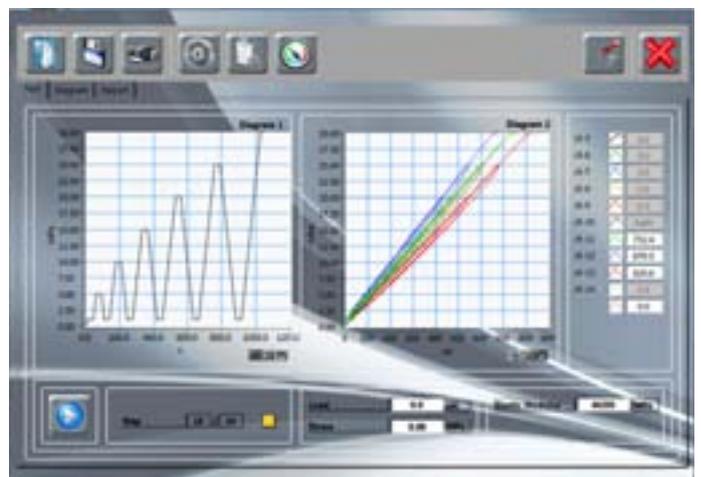
AUTOMAX E-Modulus stand alone power and control console, for the (non simultaneous) control of up to two testing frames (expandable to four).
 230 V, 50-60 Hz, 1 ph
 Overall dimensions (w x d x h): 500 x 650 x 1354 mm.
 Weight approx.: Kg. 102

50-C20E84

Same as above but 110 V, 60 Hz, 1 ph



E-MODULE software: detail of stress/strain graph showing measurements of each transducer and average readings (dashed red line)



E-MODULE software: Elastic Modulus test performed according to customized sequence of steps to fulfill any test procedure

AUTOMAX E-Modulus

Upgrading Options

Third and fourth frame connection

The AUTOMAX E-Modulus which can control two different frames can be upgraded for controlling, not simultaneously a third and a fourth frame, adding, respectively the following valve system:

50-C10D/3F

Hydraulic valve for AUTOMAX System for connection and control of a third frame.

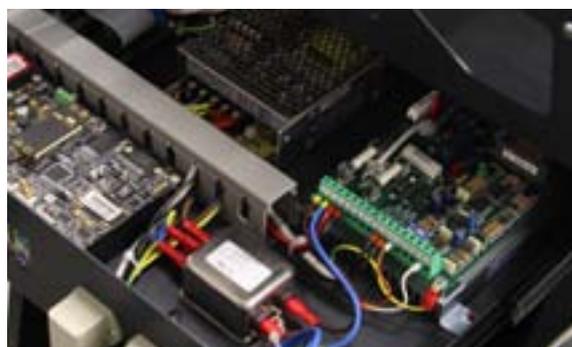
50-C20E/4F

Hydraulic valve for AUTOMAX System for connection and control of a fourth frame

These options shall be installed in factory or by authorized engineers technicians.



50-C20E82 fitted with 50-C10D/3F and 50-C20E/4F hydraulic valves for connection and control of a third and fourth frame



Detail of electronics positioned in the sliding drawer of Automax E-Modulus Console

Expandability of performance

The AUTOMAX Smart-Line control console (see page 237) is also available in an expandable version (code 50-C10D52) to fulfill multi-step investment programs. This version, designed for standard failure tests, when upgraded with upgrading kit 50-C10D52/EM becomes also suitable for Elastic Modulus and Poisson's ratio determination.

With this expandability option, all our clients can select a system that will cover their possible future testing requirements without the risk of having to purchase a complete new system.

For more information contact us or visit our website

Accessories for the determination of the Modulus of Elasticity and Poisson's Ratio

Standards

EN 12390-13, EN 13412, EN 13286-43, ASTM C469, ISO 6784, DIN 1048, BS 1888:121, UNI 6556

Elastic Modulus can be measured on different types of specimens and materials: concrete cores, cylinders and prisms, cement prisms, etc.

Accessories for Elastic Modulus determination are fully described on page 264, 265



Concrete cylinder fitted with three Compressometer-extensometers 50-C0222/F



Concrete specimen fitted with Strain Gauges



Cement prism fitted with three compressometer-extensometers 50-C0222/F



+ info

EN Compression frames	p. 85
ASTM Compression frames	p. 96
General Utility compression frames	p. 105
Flexural frames	p. 88
Accessories for the determination of the Modulus of Elasticity	p. 88

AUTOMAX E-Modulus



50-C20E82 AUTOMAX E-Modulus controlling a 2000 kN EN compression frame 50-C46Z00



50-C20E82 AUTOMAX E-Modulus controlling a 2000 kN ASTM compression frame 50-C4Z200 and a 100 kN flexure frame 50-C1201/BFR with accessory.

50-C20E82 AUTOMAX E-Modulus controlling a 2000 kN EN compression frame 50-C46Z00, a 100 kN flexure frame 50-C1201/BFR with accessory and a 600/15 kN frame 50-C9Z2Z0



MCC Multitest



50-C8422/MP with 82-D2999 PC cabinet. Printer not included

- Compression and flexural tests
 Determination of modulus of elasticity
 Tests under displacement and strain control

main features

- > Unique technology based on servo-controlled proportional valve optimized for construction materials for load, stress and displacement controlled tests, with superior performances: fast reaction time, excellent sensitivity to minor variations, extremely wide oil flow range
- > All above features extended onto up to 4 different frames ranging from 15 kN to 5000 kN
- > Completely automatic execution of:
 - Compression, flexure and indirect tensile tests.
 - Determination of Secant Elastic Modulus
 - Tests on Fibre-Reinforced Concrete (FRC-FRP) and Shotcrete (MCC Multitest only)
- > Accuracy and reliability thanks to advanced electronics, efficient closed-loop control, high effective resolution, optimized P.I.D. algorithms

MCC Multites connected to the appropriate testing frame and fitted with the relevant accessories can perform:

- Compression, flexure and splitting tests on concrete, cement, mortar, etc.
- Cyclic tests for determination of Secant Elastic Modulus (Young) and Poisson's ratio
- Ductility and fracture energy test on Fibre-Reinforced Concrete (FRC) and concrete lined with polymers (FRP)
- Toughness test on sprayed concrete (Shotcrete) under concentrated load

Specifications

Hydraulics

- Max working pressure: 720 bar.
- Hydraulic motorized power pump with automatic double stage mode: low pressure/high flow rate (2l/min) for the fast approach (min. 40mm/min) and high pressure/low flow rate (0.7 l/min) for test execution.
- Wide flow rate range allowing the control of several frames with different capacities from 15kN up to 5000kN.
- Forced ventilation oil cooling system.
- High efficiency oil filtering system with anomalies warnings (e.g. low oil level and dirty oil filter).
- Oil flow regulated by servo controlled proportional valve with high frequency driving signal.
- 2 (extendable to 4, see upgrading options) electronic ON/OFF valves for remote automatic selection via PC of the active frame.

Hardware and Firmware

- 8 active channels (each one can be used by the machine as feedback variable to control test execution):
 - 4 for load sensors (load cells or pressure transducers)
 - 4 for displacement transducers (potentiometric, LVDT amplified, magnetostrictive) and deformation transducers (strain gauge)
- Effective resolution 132.000 divisions, Closed loop control with high frequency PID.
- Electrical characteristics of the channel conditioners:
 - Feed from 0.5 to 10V DC (digital selection)
 - Single-/dual-ended input with automatic detection
 - Input signal from -2.5 to +2.5V DC
 - Zero and gain digitally adjustable
- Data acquisition synchronized on all channels
- Calibration of the 8 channels in engineering units, via linearization function (up to 10 steps) which allows optimisation of readings accuracy over the whole test range.

- Storage of multiple calibration curves enables various sensors to be connected and used immediately
- Alphanumeric keyboard with 320x240 pixels display

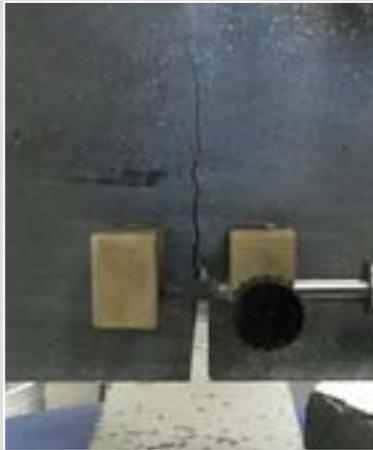
User-interface

The System is fully controlled by the PC

PC and Software

- Remote control of the complete system for automatic test execution including remote selection of test frame
- DATAMANAGER software for compression, flexural, splitting tests to EN and ASTM standards
- E-MODULE software for determination of Young Modulus allowing:
 - User-defined test cycles and step-programmable sequences
 - Real-time display of stress/ time and stress/axial strain diagrams
 - Automatic verification of sample centering, as per standards requirements
 - Real- and/or deferred-time management of test results, either in graphical or table format

Applications



The various main applications are summarized on pages 263 to 267

- MCC MULTITEST software for displacement/strain controlled tests for the determination of the:
 - Toughness of fiber reinforced concrete (FRC): ASTM C1550
 - Energy absorption of sprayed concrete: EN 14488-5, UNI 10834
 - Flexural strength of Shotcrete: EN 14488-3
 - Flexural strength of fiber reinforced concrete (FRC): EN 14641, ASTM C1609, C1018
- Graphical and numerical management of data, including the overlaying of various curves on the same axis (e.g. three different deformation curves on a single time axis)
- Possibility to display different curves in the same graph (for instance it's possible to display 3 different strain curves acquired by 3 different transducers in one graph with the same time axis)
- Real time display and monitoring of all test data
- During the test all the test parameter can be changed/modified including: active channel (used by the console as feedback to control the test execution), load/displacement rate, axes of diagrams, target value, etc.
- Constant load/displacement/strain function with closed loop feedback assuring precise holding of the target value

- Printing and backing-up in MS Excel® format of user-defined test reports for single or batch tests
- Language selection: English, French, Spanish and Italian, plus another language which can be added by the user (Latin alphabet only)
- Printer not included

Ordering information

50-C8422/MP

MCC Multitest, stand-alone closed-loop Control Console for up to two test frames expandable to four. Includes software for compression, flexure and indirect tensile tests, Elastic Modulus determination and displacement control testing facility. PC included. Power rating: 750 W Dimensions (lxwxh): 470 x 410 x 1000 mm Weight approx.: 120 kg, excluding PC 220V, 50 Hz, 1 ph.

50-C8423/MP

Same as above but 220 V, 60 Hz, 1 ph

50-C8424/MP

Same as above but 110 V, 60 Hz, 1 ph

Tests under displacement and strain control

As explained on page 250, to perform the above tests with the relevant stringent requirements related to the two testing phases (Hardening and Softening), the testing system must have very fast reaction time and extremely accurate oil flow regulation, if not, at the end of the Hardening phase, facing the typical instability of the following stages, it is possible to loose the control of the test and correct results (Stress-Strain diagram is partially lost and substandard area is not measurable).

The capacity of MCC Multitest and ADVANTEST to fulfill perfectly the stringent requirements requested for displacement/strain controlled tests has been obtained after years of research and cooperation with the academic world and are outlined by the vast international references.

Complete testing system controlled by the MCC Multitest, consisting of 4 frames: compression on concrete, compression and flexure on cement and flexure on concrete.

This configuration requires the upgrading of the system with two additional hydraulic ports 50-C7022/UP2. Printer and PC cabinet not included



MCC Multitest

Upgrading options

Third and fourth frame connection

50-C7022/UP1

Upgrading the MCC Classic and Multitest Control Consoles to control a third frame.

50-C7022/UP2

Upgrading the MCC Classic and Multitest Control Consoles to control a third and fourth frame.

Accessories

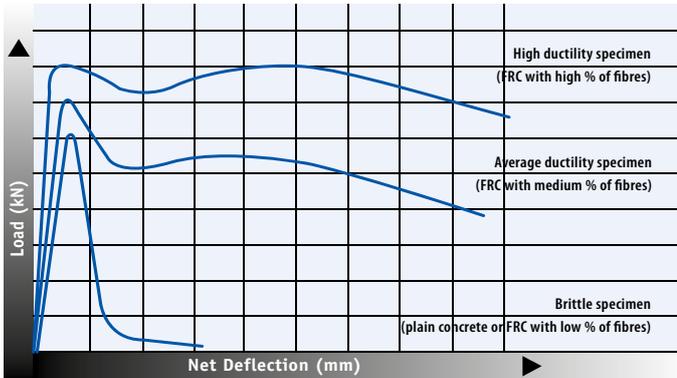
86-D2999

Cabinet for PC and printer with three extractable shelves to hold keyboard, printer and mouse. Complete with dust prevention system with two vented filters in the cabinet housing the PC.

230V, 50 Hz, 1 ph
Overall dimensions (w x d x h):
500 x 550 x 915 mm
Weight approx.: 55 kg

86-D2999/Z

Same as above but 110V, 60 Hz, 1Ph

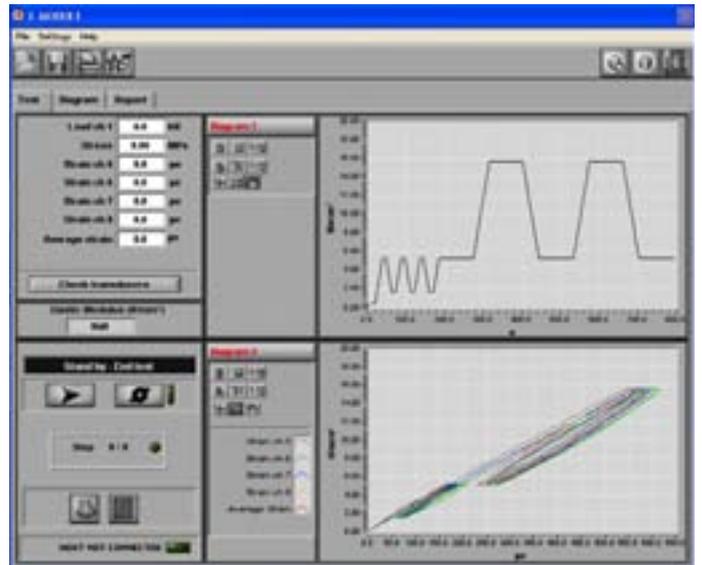


Detail of rear panel of MCC series

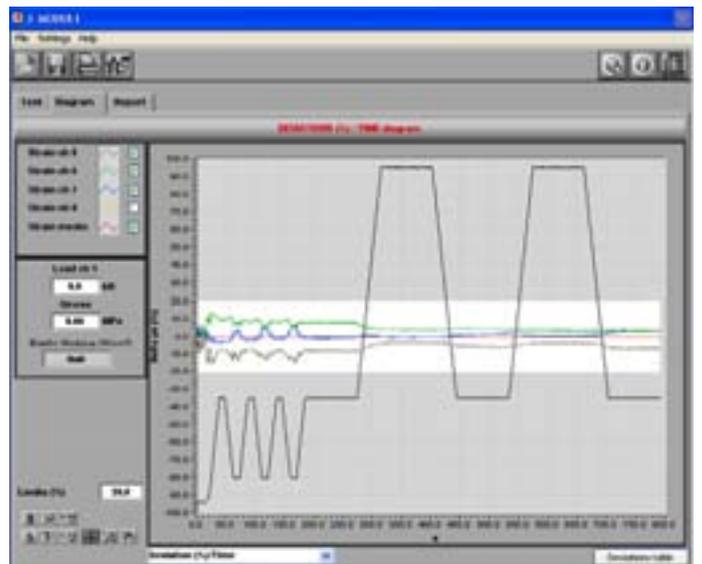


Calibration menu

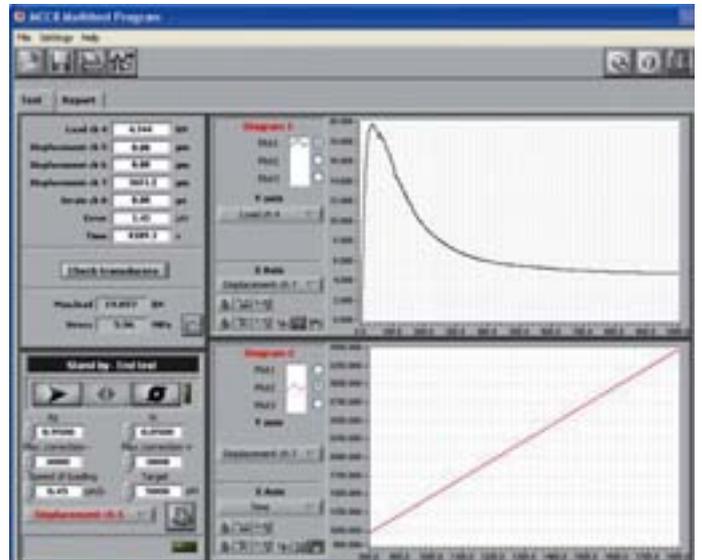
Detail of MCC display used basically for calibration purpose



Main screen of the software dedicated to Elastic Modulus determination



Deviation of the strain values measured by each transducer compared to the average reading (red line) useful to check specimen positioning



Results of flexure test on a fiber reinforced concrete beam performed under deflection rate control



MCC console upgraded with 50-C7022/UP2 distribution block for connection to up to 4 frames



86-D2999 PC cabinet,
PC and printer not included

Optimization and simplification

MCC and ADVANTEST are the outcome of more than 10 years of research, resulting in high performance and high-flexibility system suitable for many applications, together with optimization and simplification of major components

The power system can easily be lifted out of the console for ordinary maintenance and verification



Rear view of the MCC Power and Control Consoles. The four hydraulic ports for connection of test frames are visible (the MCC has two ports, extendable to four)

+ info

- EN Compression frames p. 216
- ASTM Compression frames p. 222
- General Utility compression frames p. 226
- Flexural frames p. 246
- Accessories for the determination of the Modulus of Elasticity p. 264
- Accessories for testing FRC/Shotcrete concrete p. 266

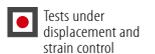
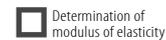
ADVANTEST



main features

- > Unique advanced technology controlling load, displacement and strain rate
- > Performs user defined displacement/deformation tests for research purposes:
 - Unlimited combinations of load/stress, displacement/strain cycles, load/stress ramp sequences and test procedures
 - Low frequency dynamic tests with a maximum of 0.1 Hz (depending on the wave amplitude)
 - Real time variation of settings, including the control method (load, displacement or strain), active channel used as feedback variable, load/displacement/strain rate, target valve
- > Completely automatic execution of:
 - Compression, flexural and indirect tensile tests
 - Determination of Secant Elastic Modulus
 - Tests on Fibre-Reinforced Concrete (FRC-FRP) and Shotcrete
- > Ready to perform automatic Uniaxial and Triaxial tests on rock specimens, including stress-path procedure, once completed with the computerized lateral pressure controller SERCOMP ROCK, the Hoek cells and all the other relevant accessories listed in section 45.

50-C9842 with 82-D2999 PC cabinet



The advanced technology based on the double stage hydraulic pump powered by AC motor combined with the servo-controlled proportional valve with closed loop digital feedback, featured by MCC, in this system is further extended resulting in an increased test control capacity, above all in terms of reaction time which is particularly important to detect sudden variations of the specimen behaviour in case of brittle cracking, dropping of the bearing capacity, local failures. In addition the channels resolution is higher such to measure very small changes of the quantities under investigation and the total flexibility permits the system to perform fully customizable ramp sequences, low frequency test cycles and displacement/deformation tests.

For these reasons ADVANTEST is the ideal choice for research laboratories whose main activity is focused on non-standard tests on new construction materials, where the higher performance of the machine makes the difference.

Specifications

Hydraulics

- Max working pressure: 720 bar.
- Hydraulic motorized power pump with automatic double stage mode: low pressure/high flow rate (2l/min) for the fast approach (min. 40mm/min) and high pressure/low flow rate (0.7 l/min) for test execution.
- Wide flow rate range allowing the control of several frames with different capacities from 15kN up to 5000kN.
- Forced ventilation oil cooling system.
- High efficiency oil filtering system with anomalies warnings (e.g. low oil level and dirty oil filter).
- Oil flow regulated by servo controlled proportional valve with high frequency driving signal.
- 4 electronic ON/OFF valves for remote automatic selection via PC of the active frame.

Hardware e Firmware

- 8 active channels (each one can be used by the machine as feedback variable to control test execution):
 - 4 for load sensors (load cells or pressure transducers)
 - 4 for displacement transducers (potentiometric, LVDT amplified, magnetostrictive) and deformation transducers (strain gauge)
- Effective resolution 19-bit, 524.288 divisions allowing to measure negligible variations of the quantities under investigation. For each hydraulic channel the 524.288 divisions can be displayed in calibration menu/manual mode from zero up to the full scale remaining stable and without electric drift.
- 8 analogical outputs corresponding to each channel for possible use of external data acquisition system

- Electrical characteristics of the channel conditioners:
 - Feed from 0.5 to 10V DC (digital selection)
 - Single-/dual-ended input with automatic detection
 - Input signal from -2.5 to +2.5V DC
 - Zero and gain digitally adjustable
- Data acquisition synchronized on all channels
- Closed loop control with PID parameters adjustable in real time during test execution by the user
- Adjustable control frequency up to 120 HZ allowing to detect sudden variations of the specimen behaviour (for example brittle cracking, dropping of the bearing capacity, local failures, etc.)
- Calibration of the 8 channels in engineering units, via linearization function (up to 10 steps) which allows optimisation of readings accuracy over the whole test range.
- Storage of multiple calibration curves for immediate connection of various sensors.
- Alphanumeric keyboard with 320x240 pixels display

User-interface

The System is fully controlled by the PC

PC and Software

- Remote control of the complete system for automatic test execution, including selection of test frame
- The PC allows remote control of the whole system and the automatic execution of test including: fast approaching, zeroing, test stage, automatic test interruption after specimen failure, automatic unloading phase, numerical and graphical management of test results, etc.
- DATAMANAGER software for compression, flexural, splitting tests to EN and ASTM standards
- E-MODULE software for determination of Young Modulus allowing:
 - User-defined test cycles and step-programmable sequences
 - Real-time display of stress/ time and stress/axial strain diagrams
 - Automatic verification of sample centering, as per standards requirements
 - Real- and/or deferred-time management of test results, either in graphical or table format

- ADVANTEST software for displacement/strain controlled tests for the determination of the:
 - Toughness of fiber reinforced concrete (FRC): ASTM C1550
 - Energy absorption of sprayed concrete: EN 14488-5, UNI 10834
 - Flexural strength of Shotcrete: EN 14488-3
 - Flexural strength of fiber reinforced concrete (FRC): EN 14641, ASTM C1609, C1018
 - Free unlimited programmable load/stress/displacement/strain cycles to fulfill any kind of test procedure
 - Possibility to perform low frequency dynamic tests featuring square wave, triangular wave, trapezoidal wave, approximate sine wave for examining materials characteristics. The maximum work frequency is dependant on the size of the wave and on the deformability of the sample.
- Graphical and numerical management of data, including the overlaying of various curves on the same axis (e.g. three different deformation curves on a single time axis)
- Possibility to display different curves in the same graph (for instance it's possible to display 3 different strain curves acquired by 3 different transducers in one graph with the same time axis)
- Real time display and monitoring of all test data
- During the test all the test parameter can be changed/modified including: active channel (used by the console as feedback to control the test execution), load/displacement rate, axes of diagrams, target value, etc.
- Constant load/displacement/strain function with closed loop feedback assuring precise holding of the target value
- Printing and backing-up in MS Excel® format of user-defined test reports for single or batch tests
- Language selection: English, French, Spanish and Italian, plus another language which can be added by the user (Latin alphabet only)

Ordering information

50-C9842

Advantest, stand alone closed loop automatic control console for up to 4 test frames for compression, flexure, indirect tensile tests under load/specific load control, for Elastic Modulus determination and for advanced tests under displacement/strain control. PC, printer and software included. 230V, 50Hz, 1ph.

Power rating: 750 W

Dimensions (l x w x h): 470 x 410 x 1000 mm

Weight approx.: 120 kg, excluding PC and printer

50-C9843

Same as above but 220V, 60 Hz, 1 ph.

50-C9844

Same as above but 110V, 60 Hz, 1 ph.



ADVANTEST,
Configuration for Uniaxial and
Triaxial tests on rock cores.

ADVANTEST

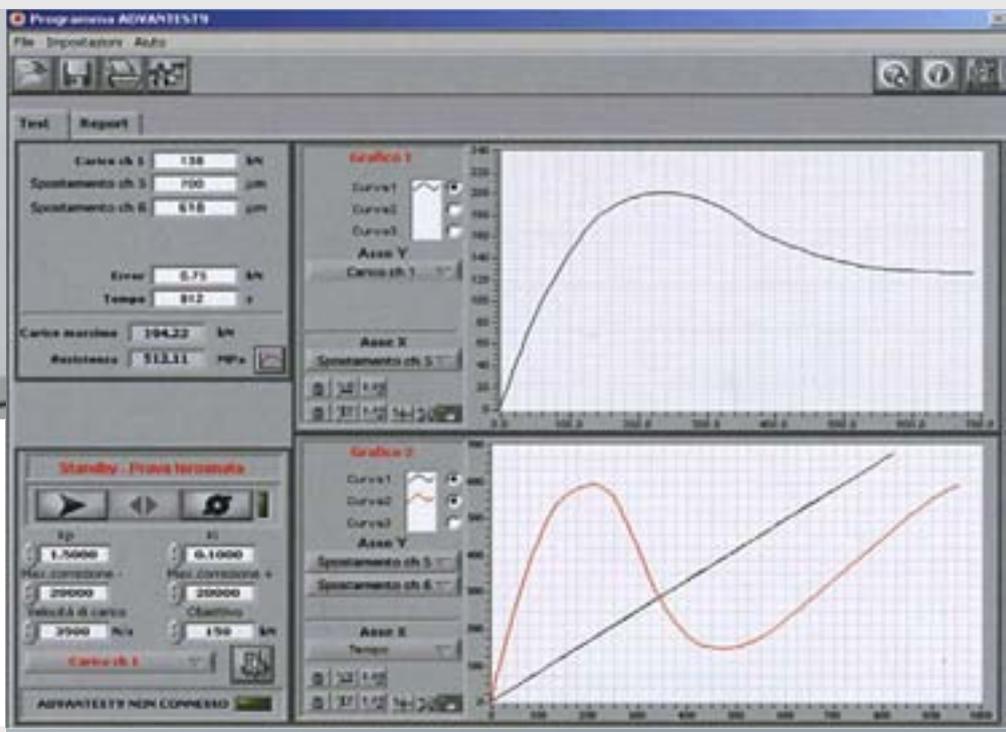
represents the ideal solution for central laboratories and research centers to perform all tests and non standard determinations.

Main applications and Test accessories



All above Systems, connected to the appropriate frame and accessory, can perform the following tests:

- Compression and flexural tests
- Determination of modulus of elasticity
- Tests under displacement and strain control



Main applications and Test accessories

AUTOMAX E-Modulus | **MCC** Multitest | **ADVANTEST**

Compression and Flexural tests

Standards EN 12390-4, EN 196, ASTM C39, ASTM C109, ASTM C348, AASHTO T22

Compression tests on concrete and cement



Our automatic testing systems can be connected to all our concrete and cement testing frames. See pages 234

Compression and flexure devices for cement testing. See page 46



50-C9030/H



65-L0019/B, 65-L0019/C



50-C9032/H

Standards

EN 1338, EN 12390-6, ASTM C496
Splitting tensile tests on concrete

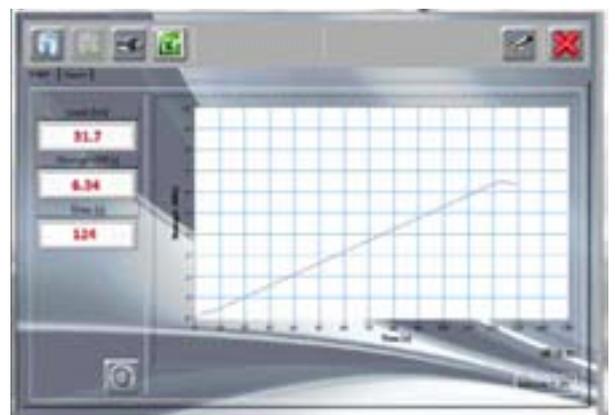
The accessory fits all our compression frames. Two versions are available: one for prism and paving blocks and one for cylinders. See page 242



Standards

EN 1339, EN 1340, EN 12390-5,
ASTM C78, ASTM C293,
AASHTO T97
**Flexural tests on concrete beams,
kerbs and flagstone.**

See our flexural frames. See page 246, 249



Flexure test on a concrete beam

Main applications and Test accessories

Determinations of Modulus fo Elasticity

Standards EN 12390-13, EN 13412, EN 13286-43, ASTM C469, ISO 6784, DIN 1048, BS 1888:121, UNI 6556

Electronic universal compressometer/ extensometer

Aluminium and steel structure incorporating high-precision inductive transducer. Three units are generally recommended for precise axial deformation measurement.

Inductive transducer:

- Sensitivity: 0.02 micron
- Feed: up to 10 V
- Travel: ± 1.5 mm
- Gauge length: adjustable from 50 to 160 mm
- Minimum axial dimension: 150 mm
- Full-travel mechanical stop to prevent damage



Three compressometer-extensometers (55-C0222/F) fitted to a cement prism 40 x 40 x 160 mm



Three compressometer-extensometers (55-C0222/F) fitted to a cylindrical specimen during compression stage.



Three compressometer-extensometers (55-C0222/F) fitted to a cylindrical specimen (150 mm diameter x 300 mm high) ready for elastic modulus test.

Ordering information

55-C0222/F

Electronic universal compressometer-extensometer for cylinders and prisms. Supplied with adapter for small specimens, template for correct mounting and elastic bands holding the devices onto the specimen.



Three compressometer-extensometers 55-C0222/F fitted to a concrete beam

Concrete cylinder compressometer/ extensometer

Used for determining the axial deformation and diametrical extension of dia. 150 x 300 mm, dia. 160 x 320 mm or dia. 6"x12" concrete cylinder specimens during the compression test.



55-C0221/E

Ordering information

55-C0221/E

Concrete cylinder compressometer/ extensometer complete with two high precision LDT displacement transducers 10 mm travel. Weight: 9 kg approx.

55-C0221/D

Axial-circumferential compression device complete with two digital gauges 12.5 x 0.001 mm with output for PC connection (special cable required)

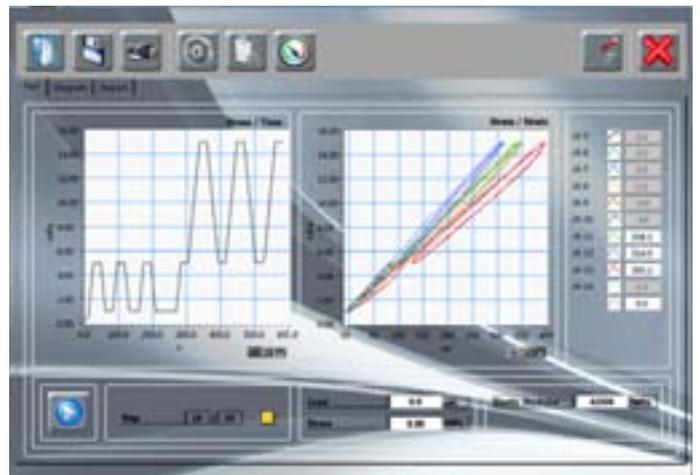


55-C0221/D

82-D1261/LINK

Serial cable for PC connection

Note: the dial gauge fitted on the 55-C0221/D device can be connected to the PC by using D1261/LINK cable in order to download displacement readings. By pushing a button on the cable, the current reading will be automatically stored in an excel cell or notepad row. Readings will be not acquired continuously, but just when pushing the button.



E-MODULE software: Elastic Modulus test performed according to EN 12390-13 (Procedure A)

Determinations of Modulus fo Elasticity

Standards EN 12390-13, EN 13412, EN 13286-43, ASTM C469, ISO 6784, DIN 1048, BS 1888:121, UNI 6556

Strain gauges

Strain gauges provide a very accurate electrical signal, directly proportional to the strain of a loaded specimen.

They can be applied to the specimen surface using a special adhesive-catalyst agent and other accessories, which are included with 82-P0399/B Strain gauge application kit.

Up to four 1/4 bridge strain gauges, can be directly connected to AUTOMAX E-Modulus, MCC Multitest and ADVANTEST Consoles using the interface 82-P0398.



82-P0399/B



82-P0398



Determination of Elastic Modulus using surface-mounted Strain gauges

Code 82-	P0390	P0391	P0392	P0393	P0396
Gauge width, mm	0.9	1.2	2.3	1	1
Gauge length, mm	10	20	30	60	120
Resistance, ohm	120	120	120	120	120
Bridge	1/4	1/4	1/4	1/4	1/4
N° of gauges per package	10	10	10	10	10

Ordering information

82-P0390

Strain gauge, 10 mm gauge length (1/4 bridge). Pack of 10

82-P0391

Strain gauge, 20 mm gauge length (1/4 bridge). Pack of 10

82-P0392

Strain gauge, 30 mm gauge length (1/4 bridge). Pack of 10

82-P0393

Strain gauge, 60 mm gauge length (1/4 bridge). Pack of 10

82-P0396

Strain gauge, 120 mm gauge length (1/4 bridge). Pack of 10

Accessories

82-P0399/1

Connecting terminals, 50-pair sheet

82-P0398

Compensation device for up to 4 Wheatstone bridges with 1/4 or 1/2 bridge setup

82-P0399/B

Strain gauge application kit including: conditioner, neutralizer, acetone, two tweezers, adhesive with catalyst agent, 100 m of bipolar cable, solder, soldering iron and carrying case.

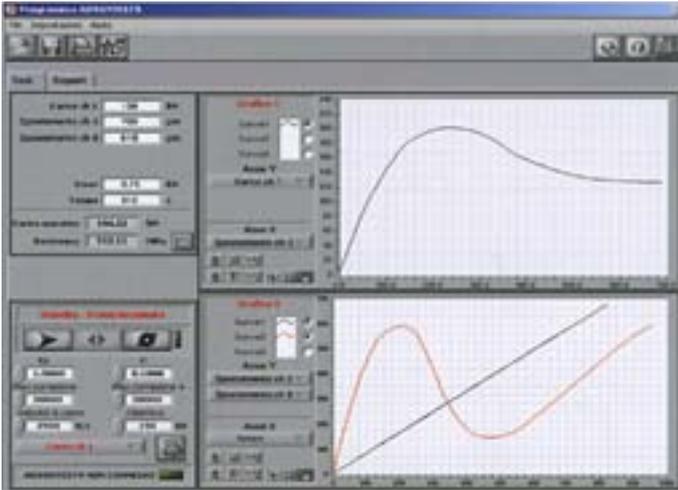


Strain gauges mounted on a 40 x 40 x 160 mm mortar prism

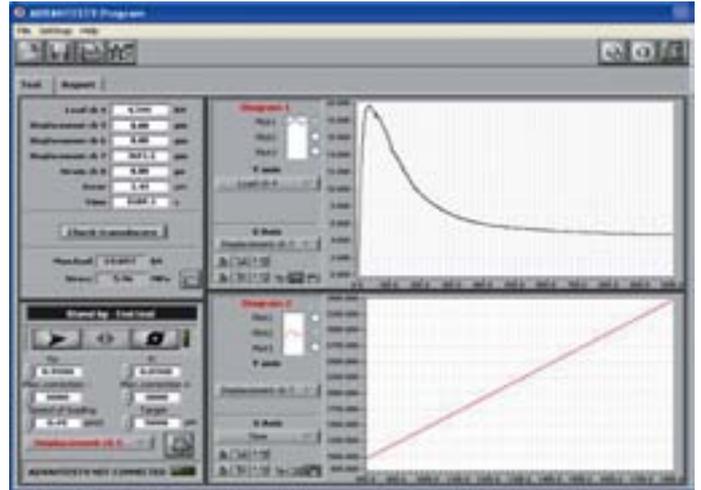
Main applications and Test accessories

Tests under displacement and strain control

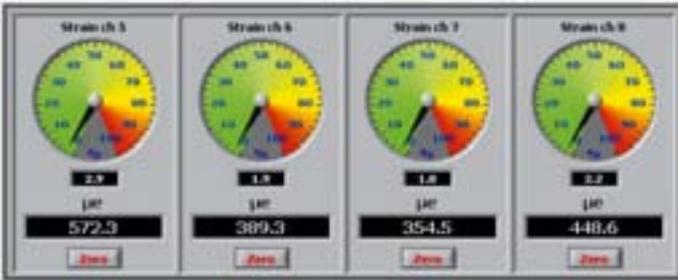
As specified, these tests are performed particularly on Fibre-Reinforced Concrete (FRC-FRP) and Shotcrete. MCC Multitest or ADVANTEST Power and Control Consoles are required to perform this type of test, controlling a suitable flexural frame. To perform tests on FRC/Shotcrete specimens, we suggest the use of flexure frame model 50-C1601/FR, which features high-rigidity and superior performance. However, the same tests can be performed with our frame 50-C1201/BFR. For more info see pages 246 and 248



Main screen shot of software used for strain/displacement controlled tests.



Results of flexure test on a fiber reinforced concrete beam performed under deflection rate control



Virtual gauges indicating the actual reading of the sensor in percentage respect the full scale. It's an excellent tool for transducers positioning.

Flexural toughness of FRC concrete

Standards ASTM C1550

50-C1601/7

Lower support frame and upper loading element for slabs 800 mm diameter, 75 mm thick.

Weight approx.: 59 kg



50-C1601/9

Linear transducer, 100 mm travel, for measuring the piston displacement.

50-C1601/8

Displacement transducer, 50 mm travel, for measuring the deformation of the slab centre under concentrated load.



Slab 800 mm dia.

50-C1601/FR Flexural frame fitted with the accessories to perform the test.

Tests under displacement and strain control

Energy absorption of sprayed concrete

Standards

EN 14488-5 and UNI 10834

Test accessories for the 50-C1601/FR frame:

50-C1601/6B

Supportive square base and upper loading element for testing 600 x 600 x 100 mm sprayed concrete slabs to EN Standard. Weight approx.: 78 kg

50-C1601/6

Same as above but complying to UNI standard

50-C1601/8

Displacement transducer, 50 mm travel, for measuring the deformation of the slab centre under concentrated load.



50-C1601/FR Flexural frame fitted with the accessories to perform the test.

50-C1601/9

Linear transducer, 100 mm travel, for measuring the piston displacement.

Test accessories for the 50-C1201/BFR frame:

50-C1200/6B

Supportive square base and upper loading element for testing 600 x 600 x 100 mm sprayed concrete slabs to EN Standard. Weight approx.: 78 kg

50-C1200/6

Same as above but complying to UNI standard

82-P0331/D1

High-precision displacement transducer, 50 mm travel



Typical failure under concentrated load

82-D1260

Magnetic transducer holder

Measurement of crack opening (CTOD-CMOD)

Standards EN 14651

Test accessories for the 50-C1601/FR frame:

50-C1601/1B

Upper and lower roller assembly for centre and two-point tests on concrete beams. Bearers 30 mm diameter x 300 mm long. Weight approx 52 Kg.

50-C1601/KIT

Set of four distance pieces and two base plates for adjusting the vertical clearance. Weight approx.: 10 Kg.



High precision transducer, 82-P0331/E

50-C1601/9

Linear transducer, 100 mm travel, for measuring the piston displacement.

Test accessory for the 50-C1201/BFR frame:

50-C1200/8B

Upper and lower roller assembly for centre- and two-point tests on concrete beams. Bearers 30 mm diameter x 300 mm long. Weight approx.45 Kg.



First Crack CMOD test

Common accessory:

82-P0331/E

High-precision displacement transducer for measuring Crack Tip Opening Displacement (CTOD) and Crack Mouth Opening Displacement (CMOD).

- Measuring capacity: 5 (3 to 8) mm
- Sensitivity: 1000 x 10⁻⁶ strain/mm

Beam deflection and toughness of FRC/Shotcrete

Standards EN 14488-3, ASTM C1609, ASTM C1018

Test accessories for the 50-C1601/FR frame:

50-C1601/1B

Set of two supports and two loading rollers, 30 mm diameter x 300 mm long.

50-C1601/KIT

Set of four distance pieces and two base plates to adjust the vertical clearance.

50-C1601/9

Linear transducer, 100 mm travel, for measuring the piston displacement.

Test accessories for the 50-C1201/BFR frame:

50-C1200/8B

Set of 2 supports and 2 loading rollers dia. 30 x 300 mm.



Common accessories:

50-C1200/5

Auxiliary testing frame for measuring the deflection of beams 100 x 100 x 400/500 and 150 x 150 x 500/600 mm.

82-P0331/C1

High-accuracy displacement transducer, 10 mm travel (n.2 pieces req.)

82-P0331/2

Electric mean device for displacement transducer 82-P0331/C.



82-P0331/2

50-C1601/FR fitted with the accessories to perform the test



Detail of the auxiliary frame and specimen

Verification of force transfer

Standards EN 12390-4

The EN 12390-4 concerning specifications for compression testing machines, describes procedures for Verification of force transfer, including:

- Accuracy of force indication
- Self-alignment of upper machine plate
- Restraint of movement of the upper plate

These verifications can be performed using the 82-E0105/1 strain gauged cell connected to the 82-P0804/E tester. The data can be processed automatically on a PC with the testing software. The verification of load measurement accuracy may be limited to the Accuracy of force indication using the appropriate load cell (82-E0100/L5 to 82-E0100/500) with a suitable tester such as our model 82-P0804/E. A detailed description of these items follows.

Can be performed with the following equipment:

Strain gauge load cell

The device consists of a 3000 kN capacity strain gauged column, 100mm diameter x 200 mm high, with hardness and tolerances conforming to Standard. The column is gauged with temperature-compensated electrical resistance strain gauges. Four complete bridges are applied, each centered at one of the ends of a pair of orthogonal diameters half-way up the cylinder.

Each bridge consists of two elements measuring axial strain and two measuring circumferential strain.

The column is supplied complete with auxiliary platen and spacers for easy and precise placing of the column either centrally or 6 mm displaced from the centre.

It must be used with a dedicated strain measuring apparatus such as, for example, our model 82-P0804/E.

The column can also be used as a standard load cell to test the accuracy of force indication.

Specifications

- Non linearity and hysteresis: $\pm 0.1\%$ FS
- Repeatability: 0.03%
- Uncertainty: 0.05%
- Dimensions: 100 mm diameter x 200 mm height
- Weight approx.: 17.5 kg

Ordering information

82-E0105/1

Strain gauged column/load cell, 3000 kN capacity



82-P0804/E with 82-E0105/1 Strain gauged column and 82-P0172/M 24 column printer. The strain gauged column is supplied complete with auxiliary platen and spacers for an easy and precise placing of the column either centrally or 6 mm displaced from the centre. It can also be used as a 3000 kN load cell for force verification.



82-E0105/1. Strain gauged column. Carrying case included.

Digital tester for Force Transfer verification

This tester, when connected to the 82-E0105/1 column and to a PC and printer using the specific software 82-P0804/E1 and 82-

Force Transfer verification certificate. The complete document includes another 3 certificates for upper plate self-alignment, alignment and restraint of movement.



P0804/E2, provides completely automatic data acquisition, processing and printing of the verification test certificates concerning either the accuracy of force indication or the force transfer verifications. Whilst operating, acquired data are displayed on the graphic screen and then downloaded via the serial port to the PC and printer. The system can also connected a 24-column serial printer (e.g. our model 82-P0172/M) or download the test results for further processing using programs developed by the user.

Supplied complete with carrying case that can also contain the 82-P0172/M printer.

Specifications

- Four channels
- Effective resolution:
 - 1/128,000 used with 82-E0105/1 strain gauged column or 1/256,000 used with load cells
- Large permanent memory to store data and test results
- Graphic display 240 x 128 pixel
- Bridge impedance: 350 ohm
- Dimensions: 250 x 220 x 150 mm
- Weight approx.: 2 kg

Ordering information

- 82-P0804/E**
Force transfer digital tester. 230 V, 50-60 Hz, 1 ph.
- 82-P0804/EZ**
Same as above but 110 V, 60 Hz, 1 ph.

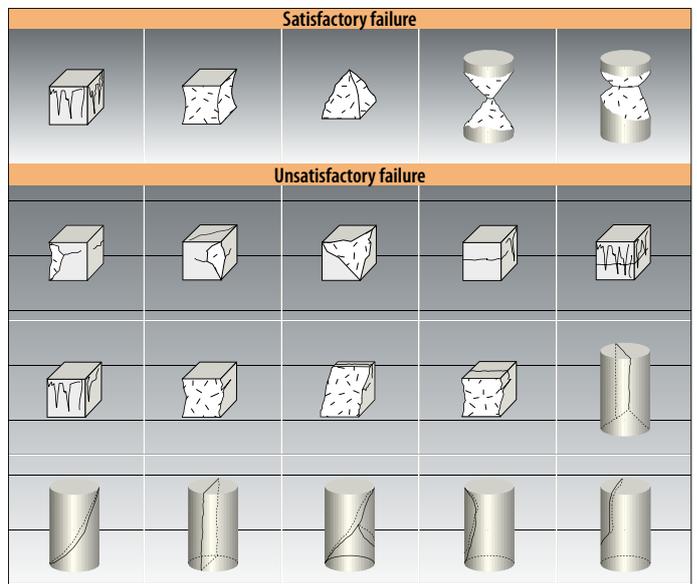
Accessories

- 82-P0804/E1**
Testing software for the automatic data acquisition and processing of the plate self-alignment and restraint of movement verification (stability) of compression testers.
- 82-P0804/E2**
Testing software for the automatic data acquisition and processing of force measurements for calibration of compression testers.
- 82-P0804/E3**
Force transfer verification MS Excel spreadsheet
- 82-P0804/E4**
Force calibration verification MS Excel spreadsheet
- 82-P0172/M**
24-column serial printer. 110-230 V, 50-60 Hz, 1 ph.
- 82-P0172/1**
Serial cable for connection of 82-P0172/M printer
- 82-Q0800/3**
RS 232 serial cable and RS 232 to USB adapter

Importance of the verification of force transfer

The result of a compression test on a cube or cylinder specimen is affected to a considerable extent by a non-uniform application of load on the surface of the sample – this results in an exceptional force being applied to the material causing premature failure. For this reason the calibration certificate for the force measurement instrument mounted on the machine does not guarantee the accuracy of the strength result.

Usually a non-uniform application of load leads to unsatisfactory failures, as shown below, which cannot be related to a known loss of strength. EN 12390-4 includes a testing procedure which verifies the self-alignment of machine components and the restraint on movement of the upper platen using a special strain gauged column (e.g. 82-E0105/1) connected to a suitable data acquisition and processing system (e.g. 82-P0804/E).



Force verification and calibration apparatus

Standards EN 12390-4 | EN ISO 376 | ASTM C39 | ASTM E4

The procedures detailed in these Standards can be performed with the following equipment:

- Load cell, to be selected according to the maximum capacity of the compression and/or flexural tester. See models 82-E0100/L5 to 82-E0100/500.
- Digital tester for force verification. See model 82-P0801/E with optional accessories.

Load cells

These high performance cells have been specially designed to meet the stringent requirements of EN, ISO and ASTM standards for calibration of compression testing machines. The cells must be connected to a suitable Digital tester such as the Digimax Plus (82-P0801/E).

Load cells connected to the Digi-

tal tester can be supplied complete with an official or traceable calibration certificate.

Specifications

- Accuracy: Class 1 EN ISO 376
- Linearity: $\leq \pm 0.05\%$ F.S.
- Hysteresis: $\leq \pm 0.05\%$ F.S.
- Repeatability:
0°, 120°, 240°: $\leq \pm 0.145\%$ F.S.
- Reversibility: $\leq \pm 0.240\%$ F.S.
- Zero: $\leq \pm 0.030\%$ F.S.
- Zero balance: $\leq \pm 1\%$ F.S.
- Supply voltage: 10 V
- Material: stainless steel
- Connector type: MIL-C-5015 7 poles male

Ordering information

82-E0100/L5

Load cell, 5 kN capacity, complete with spherical loading head and carrying case.

82-E0100/L30

Load cell, 30 kN cap., complete with spherical loading head and carrying case.

82-E0100/5

Load cell, 50 kN capacity, complete with spherical loading head and carrying case.

82-E0100/10

Load cell, 100 kN capacity, complete with spherical loading head and carrying case.

82-E0100/30

Load cell, 300 kN capacity, complete with carrying case.

82-E0100/50

Load cell, 500 kN capacity, complete with carrying case

82-E0100/100

Load cell, 1000 kN capacity, complete with carrying case.

82-E0100/200

Load cell, 2000 kN capacity, complete with carrying case.

82-E0100/300

Load cell, 3000 kN capacity, complete with carrying case.

82-E0100/500

Load cell, 5000 kN capacity, complete with carrying case.

82-E0100/SIT1

Official ACCREDIA (ex SIT) calibration certificate for load cell 30 to 1000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT2

Official ACCREDIA (ex SIT) calibration certificate for load cell 2000 to 5000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT3

Official ACCREDIA (ex SIT) calibration certificate for load cell 5 kN capacity, connected to the relevant Digital tester.

82-E0100/TRC

Traceable calibration certificate for load cells from 5 kN to 5000 kN capacity, connected to the relevant Digital tester.

Note: Load cells of other capacities are available on request.

Model	Capacity kN	Dimensions, mm (dia. x height)	Weight approx., kg
82-E0100/L5	5	57 x 117*	1.5
82-E0100/L30	30	82 x 149*	4.2
82-E0100/5	50	82 x 149*	4.2
82-E0100/10	100	82 x 149*	4.2
82-E0100/30	300	129 x 200	10
82-E0100/50	500	129 x 200	12
82-E0100/100	1000	129 x 200	14
82-E0100/200	2000	129 x 200	16
82-E0100/300	3000	129 x 200	18
82-E0100/500	5000	168 x 200	35

*Including spherical loading head



Load cells from 5 kN to 100 kN complete with spherical loading head



Load cells from 300 kN to 5000 kN



Digital tester for force verification

This system, when connected to any strain gauge load cell, provides data for the force verification of the testing machine. Data can be printed by a standard serial printer such as our model 82-P0172/M, using a serial cable (82-P0172/1, see accessories). Alternatively, data can be downloaded to the PC for processing and, using the relevant MS Excel template (82-P0804/E4, see accessories), for producing a test certificate conforming to the relevant Standard; for example the EN 12390-4 or ASTM C39 for concrete compression testers.

The tester, connected to one of our load cells 82-E0100/L5 to 82-E0100/500 (see Load cells), can be supplied complete with an official or traceable calibration certificate. See ordering information. Each cell must be calibrated separately and the certificate refers to one cell only.

Main features

- High effective resolution: 256,000 points (less than 0.05% of full scale)
- Large graphic display: 240 x 128 pixels
- Language selection
- Large permanent memory
- Two RS 232 serial ports for PC and printer
- Remote control
- MS EXCEL Template available for producing calibration certificates
- Clock calendar chip
- Dimensions: 250 x 220 x 150 mm
- Weight approx.: 2 kg

Load cell (from 300 kN up to 5000 kN), digital tester 82-P0801/E and printer 82-P0172/M

Ordering information

82-P0801/E

Digimax Plus, calibration tester, for use with load cells or transducers, 256,000-point effective resolution. 230 V, 50-60 Hz, 1 ph.

82-P0801/EZ

Same as above, but 110 V, 60 Hz, 1 ph.

Accessories

82-P0172/M

24-column serial printer. 110-230 V, 50-60 Hz, 1 ph.

82-P0800/C

Carring case for DIGIMAX Plus and printer

82-P0172/1

Serial cable for connection of 82-P0172/M printer

82-Q0800/3

RS 232 serial cable and RS 232 to USB adapter

82-P0804/E4

Force calibration verification MS Excel spreadsheet



Automatic calibration and force verification procedure

In order to perform automatic calibration of our compression machines, our external digital readout units (P0801/E or 82-P0804/E) can be directly connected on one side to the serial port of the PC controlling the machine via DATAMANAGER software and on the other side to a suitable reference load cell. The software displays the true force both in divisions (bits) and in engineering units (kN). The operator may enter a sequence of load levels and, once the true force levels are reached by reading on the dedicated software window, the corresponding electronic value in divisions will be saved, thus filling automatically the calibration table and creating the calibration curve.

In addition, once the calibration is performed, it's also possible to carried out the calibration verification. For the Automax E-Modulus control console, by editing a table of load target values, the machine will reach them automatically and will store all the corresponding values in divisions calculating the errors in comparison with true force. This operation can be repeated for up to three cycles so that a complete calibration certificate will be ready to be print out being saved in Controls excel format.



Reliability of strength test results

Full traceability of concrete, starting with a batch fresh from the ready-mix plant and ending with the hardened specimens tested in a compression machine, is a growing demand from contractors, consultants and inspectors. Their aim is to maintain continuous control of the whole process and gain evidence that the initial construction material designed with the ready-mix supplier is exactly the same as the one cast on-site.

Traceability of concrete, through production, transportation, sample picking, identification and testing, is a difficult task; a long process involving several participants working in different locations and at different times.

Control of the phases from the ready-mix plant through to the on-site sample picking is typically achieved using systems, software and technologies developed by specialized companies such as ELETTRONDATA SRL (www.elettrondata.it).

Traceability through the subsequent phases, from sample picking through to laboratory testing, requires full integration of the testing machines into the system; therefore CONTROLS is fully involved. In partnership with ELETTRONDATA S.R.L. we are developing an integrated system, based on ED-CUBE technologies, designed for this purpose.



Layout of a complete system for concrete traceability

ED-CUBE system

(it is a CONSYSTECH patent, developed and distributed by ELETTRONDATA)

The system is based on a tiny micro-chip (LF technology) which is cast into the fresh concrete specimen during the preparation phase, which means that it can't be removed later when specimen is hardened.



Micro-chip (LF technology) cast into the fresh concrete



Micro-chip (LF technology) is permanently locked inside the hardened concrete specimen

This chip is detected from the outside with a special RfId antenna and provides unique identification numbers. ED-CUBE software manages all the phases of the process, such as the association of the specimen with corresponding ID numbers (in the picking phase) and, after the strength test is performed, it creates a permanent link between the specimen ID and the compressive strength result.

Compression machine software and firmware (embedded software) provide complimentary functions, communicating with the ED-CUBE software, giving notification when a new test is started, ensuring that the speci-

men can't be removed after a test has started, transmitting full test results with encrypted protocol, etc...

Contact us for detailed information about the ED-CUBE System and to evaluate compatibility of your CONTROLS compression machine with the ED-CUBE systems.

Concrete Testing

54 | Fresh Concrete Testing

55 | Hardened Concrete Testing

50	Compression and Flexural Testing Machines, Advanced Testing Systems	212
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The Section 54, Fresh Concrete Testing Apparatus, includes items for determining the workability and consistency of concrete, the air content of concrete and for testing SCC Self Compacting Concrete.

The Section 55, Hardened Concrete Testing Apparatus, includes items for the preparation and curing of concrete specimens and other equipment for determining, as example, the water absorption and permeability, etc.

54 Fresh concrete testing

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55 Hardened concrete testing

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Sampling tools

Standards EN 12350-1

54-C0100

Stainless steel scoop.
125 mm diameter x 250 mm long,
5 kg capacity, ideal for taking samples
of concrete.
Weight: 1.1 kg (approx.)



54-C0100

Ordering information

54-C0149/B

Portable slump cone test set comprising
steel cone, metal base with clamps, mea-
suring bridge and graduated tamping rod.

54-C0150/C

Portable slump cone test set comprising
stainless steel cone, metal base with
clamps, measuring bridge and graduated
tamping rod.

54-C0149/E

Slump cone test set comprising steel cone,
metal base plate, tamping rod, steel rule
and scoop.

54-C0150

Slump cone test set comprising stainless
steel cone, metal base with clamps,
tamping rod, measuring column, cone
funnel and scoop.



54-C0150

Slump cone test sets

Standards

EN 12350-2 | ASTM C143 | AASHTO
T119 | BS 1881:102 | NF P18-305

The slump cone is also known as
Abrams cone, after the inventor.
We produce various cone sets, in-
cluding models 54-C0149/B and
54-C0150/C which are particu-
larly suitable for site inspection,
being handy, easily transportable
and supplied with housing for all
parts.

All cones are seamless and robust.
Cones and components can also
be purchased separately - see Ac-
cessories and spares.

Weight: of each set: 8 kg approx.



54-C0149/B, 54-C0150/C carrying position



54-C0149/E



54-C0149/B, 54-C0150/C during use. The
handle raises up over specimen and slump
is measured using the tamping rod which is
engraved with 1 cm graduations.

54-C0149/B
54-C0150/C



Accessories and spares

54-C0149/A

Slump cone, corrosion-resistant sheet steel, 100 mm top diameter, 200 mm base diameter x 300 mm height. Weight: 2 kg approx.

54-C0150/A

Slump cone, stainless steel. Dimensions as above.

54-C0149/P

Plastic slump cone. Weight: 0.7 kg.

54-C0140

Tamping rod, 16 mm diameter x 600 mm length.

54-C0140/A

Graduated tamping rod, 16 mm diameter x 600 mm length.

54-C0149/5

Steel rule, 300 mm length.

54-C0149/3

Metal base plate, 400 x 400 mm.

54-C0149/B1

Base plate with clamps and measuring bridge for 54-C0149/B and 54-C0150/C sets.



54-C0151/A

Flow table test

Standards EN 12350-5

54-C0151/A

Concrete flow table

This apparatus consists of a double wooden table, steel cone and wooden tamping rod. The table, measuring 700 x 700 mm, is hinged at one side and the upper part is covered with an engraved metal plate 2 mm thick. The steel cone has a top diameter of 130 mm, a base diameter of 200 mm and is 200 mm high. All metal parts are protected against corrosion.

Spare parts

54-C0151/1

Flow cone, 130/200 mm diameter x 200 mm high.

54-C0151/2

Wooden tamping rod.



54-C0149/A, 54-C0149/P, 54-C0150/A



54-C0140, 54-C0140/A, 54-C0149/B1, 54-C0149/3, 54-C149/5

Vebe test

Standards

EN 12350-3 | ASTM C1170 |
ASTM C1176

Vebe consistometers

The Vebe test is used to measure the consistency of stiff to extremely dry concrete. Consistency is determined by measuring the time required for a given mass of concrete to consolidate when subjected to vibration in a cylindrical mould. The small vibrating table of the test apparatus operates at a fixed amplitude and frequency.

Three versions are available:

- **54-C0195** conforming to EN 12350-3
- **54-C0195/A** conforming to ASTM C1170 and ASTM C1176 (using the accessory 54-C0195/A1)
- **54-C0195/B** conforming to ASTM C1176

The operating principle is identical in all versions; the units only differ from one another in the shape of the container and the swivel arm with surcharge weight. The 50 lb (22.7 kg) surcharge weight, which is part of the 54-C0195/A unit (conforming to ASTM C1170), can be replaced with the 20 lb (9 kg) sliding weight in order to conform to ASTM C1176 (see Accessories). The apparatus is also available supplied with the 20 lb (9kg) surcharge weight to conform directly to ASTM C1176.

Ordering information

54-C0195

Vebe consistometer, conforming to EN 12350-3. 230 V, 50-60 Hz, 1 ph.
Overall dim.: 260 x 380 x 700 (h) mm
Weight: 90 kg (approx.)

54-C0195/Z

As above but 110 V, 60 Hz, 1 ph.

54-C0195/A

Vebe consistometer, conforming to ASTM C1170. 230 V, 50 Hz, 1 ph.
Overall dim.: 531 x 431 x 970 (h) mm.
Weight: 135 kg (approx.)

54-C0195/AY

As above but 220 V, 60 Hz, 1 ph.

54-C0195/AZ

As above but 110 V, 60 Hz, 1 ph.

54-C0195/B

Vebe consistometer, conforming to ASTM C1176. 230 V, 50 Hz, 1ph.
Overall dim.: 531 x 431 x 940 (h) mm
Weight: 145 kg (approx.)

54-C0195/BY

As above but 220 V, 60 Hz, 1 ph.

54-C0195/BZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

54-C0195/A1

20lb (9kg) sliding weight and mould fixing plate to make 54-C0195/A compliant with ASTM C1176.

Degree of compactibility

Standards EN 12350-4

54-C0146

Waltz container

Waltz container, consisting of a metal box 200 x 200 x 400 mm.
Weight: 5 kg (approx.)

86-D1619

Trowel 90 x 115 x 165 mm to EN 12350-4



54-C0146



54-C0195



54-C0195/B



54-C0195/A

Compacting factor

Standards BS 1881:103

54-C0155

Compacting factor apparatus



54-C0155

This apparatus consists of two conical hoppers with a hinged trap door attached to the lower end of each one, allowing the concrete sample to flow freely into the cylindrical mould beneath them. The hoppers and mould are mounted on a rigid steel frame and can be easily removed for cleaning.

The whole apparatus is protected against corrosion.

Weight: 50 kg (approx.)

Accessories

54-C0140

Tamping rod, 16 mm diameter x 600 mm length.

Workability of concrete: NF method

Standards NF P18-452

54-C0152

Concrete workability meter

This test method has particular application for concretes containing chemical admixtures and is used to verify the homogeneity of concrete in relation to its workability or plasticity.

The apparatus consists of a metal box divided into two parts and fitted with an electrical vibrator system. During operation the concrete is poured into the first section of the box and then the dividing plate is removed. The vibrator is immediately switched on and the time taken for the concrete to spread uniformly across the whole box is recorded.

Overall dimensions: 800 x 400 x 400 mm
Weight: 30 kg (approx.)
230V, 50 Hz, 1 ph.



54-C0152

Flow of concrete: k-slump method

Standards ASTM D1362

54-C0144

K-Slump tester



54-C0152

This device is used to determine the workability and degree of compaction of fresh concrete after being placed in the forms. It can be used for in-situ measurements or inside test moulds and forms. Results can be correlated against the slump test.

The operation is very simple: the tester is inserted into the concrete up to the level of the disc; after 60 seconds, a measuring rod is lowered onto the surface of the concrete and the K-slump value is read directly from a scale.

The calibrated hollow tube has a diameter of 20 mm.

Total length: 300 mm

Weight: 500 g (approx.)

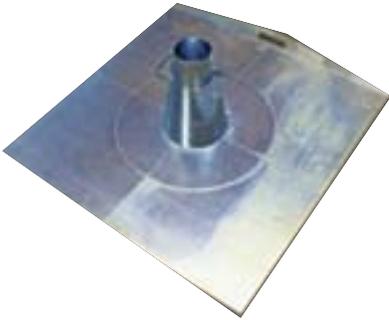
SCC (Self-Compacting Concrete) apparatus

Standards

EN 12350-8 | EN 12350-9 | EN 12350-10
| EN 12350-11 | EN 12350-12

Slump-Flow test

Standards EN 12350-8



54-C0149/D with 54-C0149/20

This test is performed to determine the slump flow and t_{500} time for self-compacting concrete. The test is performed with the slump cone and a steel plate and is only suitable for aggregates with a maximum particle size of less than 40 mm.

The SCC slump cone, made from corrosion-resistant sheet steel, has a top diameter of 100 mm, a base diameter of 200 mm and is 300 mm high.

Weight: 2 kg (approx.)

The steel plate, 900 x 900 mm, has circles of 210 and 500 mm diameter engraved on its surface.

Weight: 10 kg (approx.)

54-C0149/D

Slump cone.

54-C0149/20

Steel plate, 900 x 900 mm, with engraved circles.

V-Funnel test

Standards EN 12350-9

This test is for determining the V-funnel flow time. It is not suitable for aggregates with particle sizes exceeding 20 mm.

The apparatus consists of a stainless steel V-shaped funnel fitted with a watertight sliding gate and supported by a frame to assure the top funnel is kept horizontal.

54-C0147

V-Funnel apparatus.

Overall dimensions: 570 x 300 x 920 (h) mm

Weight: 6 kg (approx.)



54-C0147

L-Box test

Standards

EN 12350-10

The test is for determining the passing ratio of self-compacting concrete.

The apparatus consists of an L-shaped stainless steel box and is supplied complete with filling hopper.

54-C0147/B

L-Box apparatus

Overall dimensions: 700 x 200 x 600 mm

Weight: 18 kg (approx.)



54-C0147/B

Sieve segregation test

Standards EN 12350-11



54-C0147/F

This test is performed to determine the sieve segregation resistance of self-compacting concrete. The method is not applicable for concrete containing fibres or light weight aggregates.

The test set includes a 300 mm diameter perforated plate test sieve with 5 mm apertures, a receiver and an 11 L capacity plastic bucket.

54-C0147/F

Sieve segregation test set.

Weight: 3 kg (approx.)

J-Ring test

Standards EN 12350-12

This test is performed to determine the passing ability (measured by the blocking step), flow spread and t_{500} flow time of self-compacting concrete. The parameters are measured as the concrete flows through the J-Ring, which consists of a stainless steel crown with sixteen (54-C0147/C) or twelve (54-C0147/C1) 18 mm diameter bars. A slump cone and steel plate test are also required to perform the test - see Accessories.



54-C0147/C

54-C0147/C

J-Ring apparatus (Narrow Gap)
Weight: 10 kg (approx.)

54-C0147/C1

J-Ring apparatus (Wide Gap)
Weight: 10 kg (approx.)

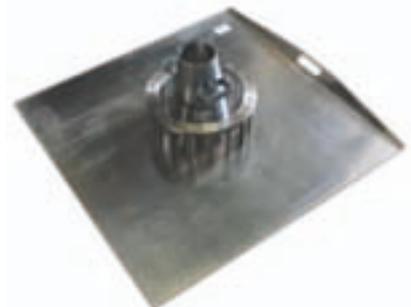
Accessories

54-C0149/D

Slump cone.

54-C0149/20

Steel plate, 900 x 900 mm, with engraved circles.



54-C0147/C with 54-C0149/D
and 54-C0149/20

Analysis of freshly mixed concrete: LCPC French method

Joisel apparatus



54-C0153

This apparatus basically consists of three sieves which are placed one inside the other and it is designed for separating concrete into its various components of cement, sand and aggregates. The test procedure simply involves the weighing of the sample before and after washing.

54-C0153

Joisel apparatus.
Overall dimensions: 140 mm diameter x 220 mm height.
Weight: 1.5 kg (approx.)



54-C0167/1

Density of fresh concrete

Unit Weight measures

Standards
EN 12350-6

Several versions of unit Weight measure are available including the 54-C0167/1, 10 L model which strictly conforms to the EN 12350-6 standards, having dimensions of 200 mm diameter x 320 mm height, a 4 mm thick wall with a machined rim and a base internal radius of 20 mm. Other models 54-C0166/2 to 54-C0169 have internal dimensions conforming to ASTM C29 and ASTM C138.

All models are made from corrosion-resistant sheet steel.



54-C0166 to 54-C0169

Technical specifications

Product code 54-	C0167/1*	C0166/2	C0166/1	C0166	C0167	C0168	C0169
Capacity, litres	10	2	3	5	10	14	28
Int. dimensions, mm (dia.xh)	200 x 320	154 x 111	154 x 165	188 x 180	213 x 281	234 x 320	347 x 299
Max. size of aggregates, mm	50	-	12.5	12.5	25	37.5	75
Weight, kg (approx.)	8	2	3	4	6	9	13

* Conforming to EN 12350-6

Water testing

Standards
EN 1008 | EN 206 | DIN 4030

54-D1866/A

Water test set for concrete mixing water.

A carrying case containing a reagent kit for performing:

- Carbonate hardness determination
- Ammonium determination
- Total hardness determination
- Colorimetric pH determination
- Sulphate test
- Magnesium test
- Chloride test
- Carbon dioxide test

Case dimensions: 500 x 420 x 135 mm
Weight: 3.4 kg (approx.)

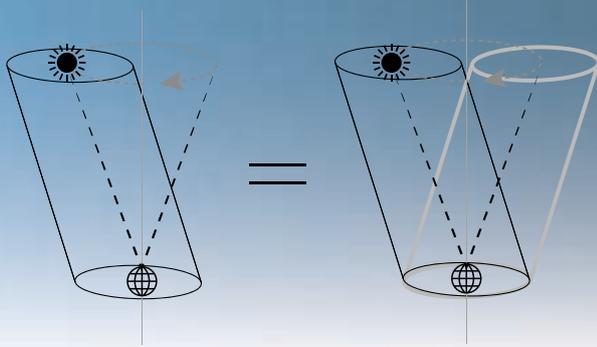


54-D1866/A

Workability of no-slump concrete

Standards

NT Build 427, (Scandinavian NORDTEST method)



54-C0252/C

Gyrotory compactors for cement and concrete

This test method, very popular in Scandinavia, is used for mix design and quality control, mainly in concrete product plants where no-slump concrete with low workability is used (for such products as hollow-core slabs, tubes and paving blocks).

In addition to simulating selected production processes for mix design, the method is also used in preparation of specimens (fresh and cured) for strength testing and for research of mix related phenomena (workability, curing time, admixtures, etc.).

The apparatus compacts the specimen by applying a low-stress static compression combined with a shearing action that results from the motion of the centre line of the test piece, which generates a conical surface of revolution while the end of the test piece remains approximately perpendicular to the axis of the conical surface.

We propose two versions:

54-C0252/C Standard model;

54-C0251/A Research model which can also measure, in real time, the shear resistance of the material during compaction which is an important parameter for research purposes.

Both models are pneumatically operated.

The machines are supplied complete with: one 100 mm diameter mould; accessories for performing the test; WIN-ICT software for machine control, data acquisition and compaction curve processing; Excel templates for complete data processing of the gyrotory compaction tests (PC not included.)



54-C0251/A

Product code	54-C0252/C	54-C0251/A
Specimen size, mm	100 dia. x 90-130 high	100 dia. x 90-130 high
Gyrotory angle (calibrated by 40 mrad)	2° 17" fixed	Adjustable from 0 to 50 mrad (2° 86")
Number of cycles	Adjustable 2 to 512	Adjustable 2 to 512
Rotation speed, cycles/min	Adjustable 30 to 120	Adjustable 30 to 120
Vertical pressure, kPa	Adjustable 60 to 320	Adjustable 60 to 320
Working air pressure, bar	8	8
Recommended air supply	10 bar with 5 µm filter	10 bar with 5 µm filter
Vertical pressure gauge range, bar	0-10	0-10 and 0-4
Shear force measurement method	None	By incorporated load cell
Dimensions, mm (approx.)	350 x 480 x 930	500 x 600 x 1100
Weight, kg (approx.)	55	95

Ordering information

54-C0251/A

Gyrotory compactor for cement and concrete. Research version with shear resistance measurement. 230 V, 50-60 Hz, 1 ph.

54-C0252/C

Gyrotory compactor for cement and concrete. Standard version. 230 V, 50-60 Hz, 1 ph.

Accessories

54-C0252/C1

Indirect tensile tester for compacted fresh concrete.
 Portable device fitted with 600 N load cell.
 Weight: approx.: 30 kg

54-C0252/C2

Electronic apparatus for determining the setting and consistency time of fresh concrete.

54-C0251/A1

Base for 54-C0251/A Gyrotory compactor.

54-C0252/C3

Base for 54-C0252/C Gyrotory compactor.

76-PV0250/7

Low-noise air compressor. 230 V, 50 Hz, 1 ph.

76-PV0250/7Y

As above but 220 V, 60 Hz, 1 ph.
 (For more information see page 571)

Spare parts

54-C0250/C5

100 mm diameter mould for gyrotory compactors.



54-C0252/C2



54-C0250/C5

Setting time by penetration

54-C0143

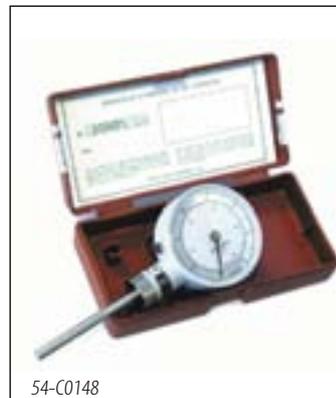
Concrete mortar penetrometer

Standards

ASTM C403 | AASHTO T197 | UNI 7123

This apparatus consists of a spring-loaded device which is graduated from 1 to 100 daN, supplied complete with a set of needle points with surface areas of 650, 325, 160, 65, 32, and 16 mm². A sliding ring indicates the load reached. Supplied complete with carrying case.

Weight: 5 kg (approx.)



54-C0148



54-C0145

54-C0145

Concrete pocket penetrometer

Force-measuring device with stainless steel plunger, 32.3 mm² (1/20 sq in) surface area, graduated from 0 to 5 MPa.

Weight: 0.3 kg (approx.)

main features

- > Gives instant field or laboratory estimate of concrete condition
- > Large dial with scale readable in both MPa and psi.
- > Readings locked in position until release button is pressed

54-C0148

Concrete pocket penetrometer, dial model

This dial model has a stainless steel plunger with a surface area of 32.3 mm² (1/20 sq. in.) and a 57 mm diameter dial with a dual scale: 0-5 MPa and 0-700 psi. The readings remain locked in position until released by pressing a button. The calibration can be easily verified using an ordinary balance.

Weight: 0.2 kg (approx.)



54-C0252/C1

Air entrainment meters

Standards

EN 12350-7 | ASTM C231 | AASHTO T152

The air content of fresh concrete is a very important parameter for evaluating the behaviour of concrete when exposed to weathering and for verifying variations in air content due to the use of chemical additives to increase the workability. The EN and ASTM standards describe test methods using two different apparatus: the water column type (e.g. our model 54-C0170/L) and the pressure gauge type (e.g. our models 54-C0170/F and 54-C0170/D), which have the following advantages over the water column type: quick action clamping system, unaffected by changes in barometric pressure and direct pressure gauge readings.

54-C0170/L

Air entrainment meter, water column type, 5 l cap., complete with hand pump, tamping rod, calibration apparatus and carrying case.

54-C0170/D

Air entrainment meter, pressure gauge type, 8 l cap., incorporating hand pump, complete with calibration cylinder.

54-C0170/F

Air entrainment meter, pressure gauge type, 7 l cap., incorporating hand pump, complete with tamping rod, calibration cylinder and carrying case.

Accessories

54-C0170/D1

Filling ring for 54-C0170/D.



54-C0170/L

Shown to the right of the device is the calibration cylinder apparatus which is essential for adjustment to site barometric pressure

54-C0170/D



54-C0170/F

Technical specifications

Product code	54-C0170/L	54-C0170/F	54-C0170/D
Capacity, litres	5	7	8
Air content range, %	0 - 10%	0 - 15%	0 - 10%
Graduations	0.1%	0.1% up to 6%; 0.2% from 6 to 8%; 0.5% from 8 to 15%	0.1% up to 8%; 0.5% over 8%
Weight, kg (approx.)	14	10	12

Concrete mixers

Standards EN 12390-2

Pan-type mixers

Specially selected for preparing concrete specimens and samples in the laboratory and on site. These forced mixers have a vertical axle and an oil bath gear-box. Discharge is manually controlled for easy unloading of the mixer into a suitable container or wheelbarrow.

Models 54-C0199/11 and 54-C0199/20 can be completed with optional wheels and drawbar - see Accessories.

The 54-C0199/9A model is supplied complete with wheels, drawbar and additional interchangeable mixing paddle, particularly suitable for low-slump concrete.



54-C0199/11 complete with accessory
54-C0199/R1: 4" wheels and drawbar



54-C0199/20 complete with accessory
54-C0199/R1: 4" wheels and drawbar

Technical specifications

Product code	54-C0199/9A 54-C0199/9AY 54-C0199/9AZ	54-C0199/11 54-C0199/11Z	54-C0199/20 54-C0199/20Z
Pan capacity, L	130	200	300
Mixing capacity, L	90	110 - 120	160 - 200
Power, kW	2	4	5.5
Overall dimensions, mm (w x d x h)	850 x 800 x 1250	1100 x 850 x 1200	1250 x 1200 x 1300
Weight, kg (approx.)	100	260	340

Ordering information

54-C0199/9A

Pan-type mixer. Pan capacity 130 L, mixing capacity 90 L, complete with wheels, drawbar and additional interchangeable mixing paddle. Power 2 kW. 230 V, 50 Hz, 1 ph.

54-C0199/9AY

As above but 220 V, 60 Hz, 1 ph.

54-C0199/9AZ

As above but 110 V, 60 Hz, 1 ph.

54-C0199/11

Pan-type mixer, 200 L pan capacity, 110 L mixing capacity. 380 - 400 V, 50 Hz, 3 ph.

54-C0199/11Z

As above but 220 V, 60 Hz, 3 ph.

54-C0199/20

Pan-type mixer 300 L pan capacity, 200 L mixing capacity. 380 - 400 V, 50 Hz, 3 ph.

54-C0199/20Z

As above but 220 V, 60 Hz, 3 ph.

Accessories

54-C0199/R1

Wheels, 4" size, and drawbar for 55-C0199/11 and 55-C0199/20 mixers.

54-C0196/1

Drum-type mixer

This model is a light weight but sturdy concrete mixer with a drum capacity of 115 litres and a mixing capacity of 75 litres. It is particularly suitable for field use, to prepare low to medium strength concrete.

115 L capacity. 220 V, 50 Hz, 1 ph.

Power rating: 370 W

Overall dimensions:

600 x 1400 x 1300 mm (d x w x h)

Weight: 50 kg (approx.)



54-C0199/9A Supplied complete with wheels and drawbar



54-C0199/9A
Detail of the additional mixing paddle (included), particularly suitable for low slump concrete.



54-C0196/1

Cube and beam moulds

We supply a range of cube moulds, from traditional cast iron versions conforming to EN 12390-1 standards that are ideal for laboratory use, to plastic models that are very practical for field use and ideal for production control.

Cast iron models 55-C0100/M10 and 55-C0100/M15 can be supplied, on request, with a certificate of compliance which states that the individual mould has been verified using certified instruments. For ordering, add the suffix 'C' to the relevant product code (e.g. 55-C0100/M10C).

Cast iron cube moulds

Standards

EN 12390-1 | BS 1881:108

Two-part cast iron cube moulds to EN 12390-1

High-precision; fast and easy sample release, maintenance and re-assembly.



55-C0100/M15

55-C0100/M10

Two-part cast iron single cube mould, 100 mm. Weight: 8.5 kg approx.

55-C0100/M15

Two-part cast iron single cube mould, 150 mm. Weight: 18 kg approx.

Four-part cast iron cube moulds

55-C0100/M10L

Four-part cast iron cube mould, 100 mm. Weight: 8 kg approx.

55-C0100/M15L

Four-part cast iron cube mould, 150 mm. Weight: 17 kg approx.



55-C0100/M10L



55-C0100/M15L

Steel large-size cube moulds

55-C0100/M20

Four-part steel single cube mould, 200 mm. Weight: 29.5 kg.

55-C0100/M30

Four-part steel single cube mould, 300 mm. Weight: 98 kg.



55-C0100/M20

Plastic cube moulds

These moulds are manufactured in one piece from a robust plastic which is resistant to shock and abrasion. Ideal for field use, the specimen is ejected from the mould using compressed air and only a simple cleaning and oiling is required before the mould is ready to use again.

Specifications

Three sizes are available: 100, 150 and 200 mm. The 100 and 150 mm size are also available in a two-gang version. All models are supplied complete with bottom stopper and plastic sheet. The 150 mm version includes a polystyrene cover for safe transportation and thermal protection.

Ordering information

55-C0100/P10

Plastic single cube mould, 100 mm. Weight: 0.57 kg approx.

55-C0100/P102

Plastic two-gang cube mould, 100 mm. Weight: 1 kg approx.

55-C0100/P15

Kubo 15 plastic cube mould, 150 mm, with polystyrene cover, base sheet and stopper. Weight: 1.4 kg approx.

55-C0100/P156

Kubo 15 plastic cube moulds, 150 mm, with polystyrene cover, base sheet and stopper. Pack of 6. Weight: 9 kg approx.



55-C0100/P152 and 55-C0100/P102



55-C0100/P20, 55-C0100/P15 and 55-C0100/P10



55-C0100/P15 Kubo 15, 150 mm plastic cube mould. Supplied complete with polystyrene cover (for safe transportation and thermal protection), base sheet and stopper.

Hard plastic 150 mm split cube mould



55-C0100/P156 Six piece package of KUBO 15 plastic moulds for 150 mm specimens. All moulds are supplied complete with a polystyrene cover, base sheet and stopper.



main features

- > Precise and economical
- > Metal bottom and rims for long life
- > Easy sample release
- > Easy to handle
- > Ideal for site use

55-C0100/P15A

55-C0100/P152

Plastic two-gang mould, 150 mm. Weight: 1.9 kg.

55-C0100/P20

Plastic single cube mould, 200 mm. Weight: 2.4 kg approx.

55-C0100/P15A

Hard plastic split cube mould, 150 mm. Weight: 2.7 kg approx.

Spare parts

55-C0100/15S

Spare stopper for 100 mm and 150 mm plastic cube moulds. 100 pcs.

55-C0100/P15W

Spare cover for Kubo15 moulds.

55-C0100/P10K

Spare base sheet for 100 mm plastic cube moulds. 50 pcs.

55-C0100/P15K

Same as above, but for Kubo15 moulds.

Accessories

55-C0140

Tamping rod, 16 mm diameter x 600 mm length.

55-C0140/1

Tamping bar, 25 mm square x 380 mm length.

55-C0140/3

Tamping rod, 10 mm diameter x 250 mm length.

55-C0140/2

Steel straight edge.

55-C0119/5

Specimen mould spanner.

55-C0139/A

Mould oil, 10 kg can.



55-C0100/MB15

Beam moulds

Steel beam moulds

These moulds comprise a structural steel channel with a base plate insert. All internal parts are totally machined.

55-C0100/MB10

Concrete beam mould, 100 x 100 x 400 mm. Weight: 17.5 kg approx.

55-C0100/MB11

Concrete beam mould, 100 x 100 x 500 mm. Weight: 17.5 kg

55-C0100/MB15

Concrete beam mould, 150 x 150 x 600 mm. Weight: 33.5 kg approx.

55-C0100/MB16

Concrete beam mould 150 x 150 x 750 mm. Weight: 44.5 kg

Plastic beam moulds

55-C0100/PB11

Plastic beam mould, 100 x 100 x 500 mm. Weight: 2 kg.

55-C0100/PB15

Plastic beam mould, 150 x 150 x 600 mm. Weight: 2.6 kg.

Identification labels

Our identification labels, made from PVC and 100 x 60 mm in size, are used for writing sample identification data. The corners can be folded for immersion in the fresh concrete specimen.

55-C0100/ID

Identification labels for concrete specimens. Pack of 100.



55-C0100/1 Identification labels



55-C0100/PB11 and 55-C0100/PB15

Cylinder moulds

The models we produce range from traditional steel versions that conform to EN, ASTM and AASHTO standards, to the split and one-piece plastic models which are very practical for field use and ideal for production control.



Steel cylinder moulds

Standards

EN 12390-1 | ASTM C39 | AASHTO T23 | AASHTO T126

55-C0100/MC10

Steel cylinder mould, 100 mm diameter x 200 mm height. Weight: 5.5 kg.

55-C0100/MC15

Steel cylinder mould, 150 mm diameter x 300 mm height. Weight: 10 kg

55-C0100/MCIN

Steel cylinder mould, 6 in. diameter x 12 in. height. Weight: 17 kg.

55-C0100/MC16

Steel cylinder mould, 160 mm diameter x 320 mm height. Weight: 18 kg.

55-C0100/MC25

Steel cylinder mould, 250 mm diameter x 500 mm height. Weight: 80 kg.



Steel split cylinder moulds

Practical and easily transportable, with lateral hinges that allow full opening.

55-C0100/MC15A

Steel split cylinder mould, 150 mm diameter x 300 mm height. Weight: 8.5 kg.

55-C0100/MC16A

Steel split cylinder mould, 160 mm diameter x 320 mm height. Weight: 11 kg.



Hard plastic split cylinder moulds

Main features

- Precise and economical
- Metal bottom and rims for long life
- Easy sample release
- Easy to handle
- Ideal for site use

55-C0100/PC10A

Hard plastic split cylinder mould, 100 mm diameter x 200 mm height. Weight: 0.9 kg approx.

55-C0100/PC15A

Hard plastic split cylinder mould, 150 mm diameter x 300 mm height. Weight: 1.7 kg approx.



Plastic one-piece cylinder moulds

55-C0100/PC10

Plastic cylinder mould, 100 mm diameter x 200 mm height. Weight: 1 kg approx.

55-C0100/PC15

Plastic cylinder mould, 150 mm diameter x 300 mm height. Weight: 1.9 kg approx.

55-C0100/PC16

Plastic cylinder mould, 160 mm diameter x 320 mm height. Weight: 1.9 kg approx.

Specimen verification

Standards EN 12390-1

These instruments are used for the assessment of flatness, perpendicularity and straightness of test specimen and moulds as specified by EN 12390-1. They are available, on request, with certificates of calibration issued by a competent authority such as NAMAS, ACCREDIA, Cofrac etc.



82-C0106/1, 82-C0107/1,
82-C0108/1, 82-C0109/1 and
82-C0110/1

Ordering information

82-C0106/1

Go/no go gauges for 100 mm cube moulds.

82-C0106/2

Go/no go gauges for 150 mm cube moulds.

82-C0107/1

Engineer's square, 150 mm.

82-C0108/1

Straight edge, 300 mm.

82-C0109/1

Digital Vernier caliper, 155 mm.

82-C0110/1

Set of 13 feeler strips, 90 mm length. Thickness from 0.03 to 0.5 mm.



Flatness verification using Straight edge 82-C0108/1 and Set of feeler strips 82-C0110/1



Verification of a cube mould with Go/No go gauges



Verification of diameter using Digital Vernier caliper 82-C0109/1



Straightness verification using Straightedge 82-C0108/1 and Set of feeler strips 82-C0110/1

Concrete specimen compaction

Robustly manufactured to operate with minimum noise levels, these tables operate at 3000 vibrations per minute (3600 at 60 Hz) and have retaining edges to avoid the moulds falling from the table. All models can be completed with a clamping device and pedal switch (see Accessories), except model 55-C0161/LC which includes the above items as standard.

Model 55-C0161/LC is fitted with two vibrators for a better and more uniform vibration over the entire table surface.

Vibrating tables

Standards EN 12390-2

Ordering information

55-C0159/L

Vibrating table, 600 x 400 mm, with retaining edges. 230 V, 50-60 Hz, 1 ph.

55-C0159/LZ

As above but 110 V, 60 Hz, 1 ph.

55-C0160/L

Vibrating table, 800 x 800 mm, with retaining edges. 230 V, 50-60 Hz, 1 ph.

55-C0160/LZ

As above but 110 V, 60 Hz, 1 ph.

55-C0161/LC

Vibrating table, 1250 x 625 mm, with retaining edges and two vibrating units, complete with clamping device for moulds and waterproof CE pedal switch. 230 V, 50-60 Hz, 1 ph.

55-C0161/LCZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

55-C0159/10

Clamping device for 55-C0159/L. Weight: 3 kg.

55-C0160/10

Clamping device for 55-C0160/L. Weight: 8 kg.

55-C0159/11

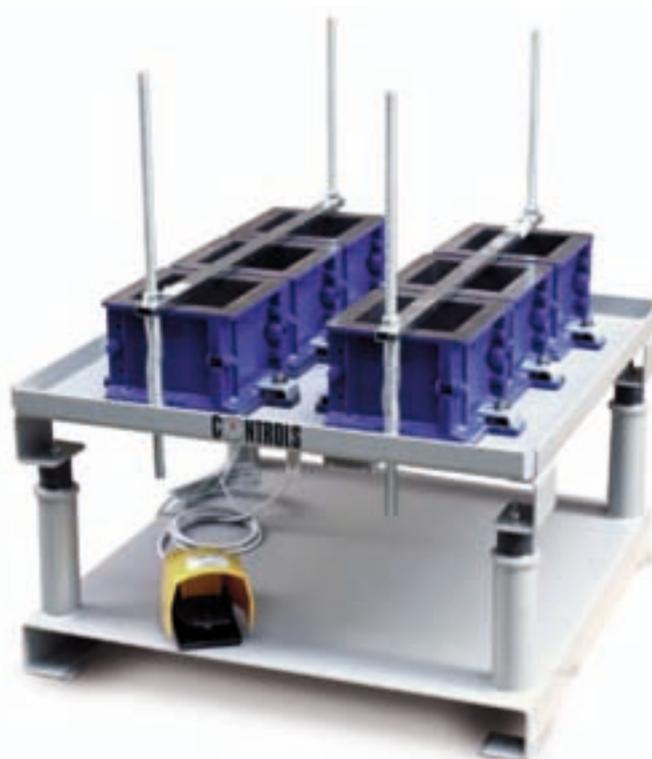
Waterproof pedal switch for vibrating tables.



55-C0159/L with 55-C0159/10 clamping device, 55-C0159/11 Waterproof pedal switch and two 150 mm cube moulds

Specifications

Product code	55-C0159/L 55-C0159/LZ	55-C0160/L 55-C0160/LZ	55-C0161/LC 55-C0161/LCZ
Dimensions, mm	600 x 400	800 x 800	1250 x 625
Vibrations/min (50 Hz) (60 Hz)	3000 3600	3000 3600	3000 3600
Power, W	180	180	2 x 180
Weight, kg (approx.)	50	115	185



55-C0160/L with 55-C0160/10 clamping device (2 pcs), 55-C0159/11 Waterproof pedal switch and six 150 mm cube moulds

Vibrating plate

Light and portable and capable of being powered by a car lighter socket, this machine is ideal for field use. It is suitable for vibrating plastic cube moulds up to 150 mm and cylinder moulds up to 160 mm diameter x 320 mm and is supplied complete with an elastic cord to secure the mould to the plate.

Specifications

- Voltage: 12 V DC for connection to a vehicle's cigarette lighter or to a standard 12 V battery
- Permanent magnet motor 12 V, 3000 rpm, 30 W
- Dimensions: 250 x 250 x 200 mm (w x d x h)
- Weight: 10 kg (approx.)

Ordering information

55-C0157/B

Universal vibrating plate, 12V DC.

Poker vibrators

Standards

EN 12390-2 | ASTM C31 | ASTM C192 | AASHTO T23 | AASHTO T126

This apparatus is ideal for the internal compaction of concrete specimens both in the laboratory and on site. It makes a good alternative to the traditional tamping bar, especially when there are a large number of specimens to be compacted.

Three versions are available: electric, petrol and battery powered.

Specifications

Product code	55-C0162/E	55-C0163/C	55-C0162/BT
Fuel type	Electricity	Petrol	Battery 18V
Poker dimensions, mm (dia. x l)	25 x 250	25 x 250	25 x 250
Flexible shaft length, mm	2000	2000	800
Vibrations/min	12000	12000	13000
Power, W	2300	2900	3,0 Ah
Weight, kg (approx.)	8	35	3

Ordering information

55-C0162/E

Electric poker vibrator, 12,000 vibrations/minute. 230V, 50-60 Hz, 1 ph.

55-C0163/C

Petrol poker vibrator, 12,000 vibrations/minute.

55-C0162/BT

Battery operated poker vibrator, 13000 vibrations/minute. 18V, 3 Ah



55-C0163/C



55-C0162/E



55-C0162/BT



55-C0157/B with 55-C0100/P15 and 55-C0100/PC15

Concrete curing tanks

Standards

EN 12390-2 | ASTM C31 | ASTM C192 | AASHTO T23

We produce two series of tanks, both of which are suitable for all applications and satisfy the requirements of the relevant standards.

Large zinc-plated steel tank, model 55-C0191

Large capacity, designed for curing concrete cubes and cylinders. The temperature can be set and maintained at the required value using one of the following heating systems:

- Thermostatic analogue heating system 55-C0191/10
- Thermostatic digital heating system 55-C0191/11

See Accessories.

The tanks are supplied complete with a metal base grid for supporting specimens. Upper racks suitable for holding a second layer of concrete cubes are available on request (55-C0191/3), along with a metal cover (55-C0191/A1). A maximum of 8 upper racks can be used in each tank; each rack is capable of holding four 150 mm cube specimens. See Accessories.

Heavy plastic tanks, models 55-C0193/A and 55-C0193/R

Ideal for site laboratories, supplied complete with a robust metal internal base to hold concrete specimens without distorting. The temperature can be set and maintained at the required value using one of the following heating systems:

- Thermostatic analogue heating system 55-C0193/5
- Thermostatic digital heating system 55-C0193/6

The tanks can be completed with plastic covers: 55-C0193/A1 (for 55-C0193/A) or 55-C0193/R1 (for 55-C0193/R) - see Accessories.

All models of tank can be used with the Submersible circulator pump 55-C0191/5, to obtain better water temperature uniformity - see Accessories.

Technical specifications

Product code	55-C0191	55-C0193/A	55-C0193/R
Description	Plated steel curing tank	Heavy plastic curing tank	Heavy plastic curing tank with drain valve
Internal dimensions, mm	1500 x 750 x 780	1040 x 1040 x 605	1100 x 710 x 690
External dimensions, mm	1550 x 805 x 820	1130 x 1130 x 760	1200 x 800 x 850
Capacity, l	1000	650	550
Specimen capacity* (no. of 150 mm cubes)	64 (with racks)	36	24
Weight, kg (approx.)	110	30	30
Accessories			
Analogue immersion heater	55-C0191/10 55-C0191/10Z**	55-C0193/5 55-C0193/5Z**	55-C0193/5R 55-C0193/5RZ**
Digital immersion heater	55-C0191/11 55-C0191/11Z**	55-C0193/6 55-C0193/6Z**	55-C0193/6R 55-C0193/6RZ**
Cover	55-C0191/A1 (steel)	55-C0193/A1 (plastic)	55-C0193/R1 (plastic)
Submersible circulator pump	55-C0191/5 55-C0191/5Z**	55-C0191/5 55-C0191/5Z**	55-C0191/5 55-C0191/5Z**

*Conventionally we have specified 150 mm cube specimens but any other type or size are accepted, within the limits of the tank dimensions.

**For 110 V, 60 Hz, 1 ph.

Ordering information

55-C0191

Zinc-plated steel curing tank, 1000 litre capacity, complete with metal base specimen support grid.

55-C0193/A

Heavy plastic curing tank, 650 litre capacity, complete with metal base specimen support grid.

55-C0193/R

Heavy plastic curing tank, 550 litre capacity, complete with metal base specimen support grid and drain valve.



55-C0191 with eight 55-C0191/3 upper racks



55-C0193/A with 55-C0193/5, 55-C0191/5 and 55-C0193/A1



55-C0193/R

Accessories

Immersion heaters

Three analogue and three digital versions of heater are available for each tank series. The heating circle is placed under the metal base rack so there is no interference or contact with the specimens.

110 V, 60 Hz versions are also available and are identified by the code suffix Z (eg. 55-C0191/10Z).

Weight:(all models): 1.7 kg (approx.)



55-C0193/5 and detail of 55-C0193/6

Analogue versions

55-C0191/10

Thermostatic analogue submersible heating system for 55-C0191, metal curing tank, 2000 W, 230 V, 50-60 Hz, 1 ph.

55-C0193/5

Thermostatic analogue submersible heating system for 55-C0193/A plastic curing tank, 1500 W, 230 V, 50 - 60 Hz, 1 ph.

55-C0193/5R

Thermostatic analogue submersible heating system for 55-C0193/R plastic curing tank, 1500 W, 230 V, 50 - 60 Hz, 1 ph.

Digital versions

55-C0191/11

Thermostatic digital submersible heating system for 55-C0191 zinc-plated metal curing tank, 2000 W, 230 V, 50 - 60 Hz, 1 ph.

55-C0193/6

Thermostatic digital submersible heating system for 55-C0193/A plastic curing tank, 1500 W, 230 V, 50-60 Hz, 1 ph.

55-C0193/6R

Thermostatic digital submersible heating system for 55-C0193/R plastic curing tank, 1500 W, 230 V, 50-60 Hz, 1 ph.

Submersible pump and covers

55-C0191/5

Submersible circulator pump, 230 V, 50-60 Hz, 1 ph. Weight:1 kg approx.

55-C0191/5Z

Same as above, but 110 V, 60 Hz, 1 ph.

55-C0191/12

Metal cover for metal tank 55-C0191. Weight:10 kg approx.

55-C0193/A1

Plastic cover for plastic tank 55-C0193/A. Weight:2 kg approx.

55-C0193/R1

Plastic cover for plastic tank 55-C0193/R. Weight:2 kg approx.



55-C0191/5

Specimen racks

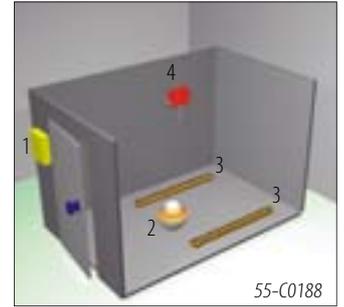
55-C0191/3

Upper rack for metal curing tank 55-C0191.

A maximum of 8 racks will fit in a tank. Each rack can hold up to four 150 mm cubes.

Moist curing room kit

A room of about 150 m³ can be easily converted for curing samples by installing a curing room humidifier, electric heaters, a humidity/temperature sensor and an electronic control panel. A typical layout of a moist curing room is shown in sketch).



55-C0188

Ordering information

55-C0188

Curing room humidifier

Capable of humidifying curing rooms up to 150 m³. Supplied complete with automatic level control for mains water connection.

Humidifying capacity: 0.5 L/h
Power: 40 W - 230 V, 50 Hz, 1ph
Dimensions: 360 mm diameter x 230 mm height
Weight: 3.5 kg (approx.)

- 1 Control panel 55-C0186
- 2 Vaporiser 55-C0188
- 3 Heaters 55-C0187
- 4 Humidity / temperature sensor 55-C0189/A



55-C0189/A

55-C0187

Electric resistance heating element

Finned type, made of copper.
Power: 750 W.
Dimensions: 1200 mm long x 36 mm diameter.
Weight: 1.8 kg (approx.)
Note: 2 heaters are required for a 150 m³ room.



55-C0188

55-C0186

Digital control panel

Includes humidity and temperature display, main switch and auxiliary contact for door open with pilot lamp.
Dimensions: 250 x 140 x 300 mm
Weight: 6.5 kg (approx.)



55-C0186

55-C0189/A

Humidity and temperature PT 100 sensor

Working ranges:
Humidity: up to 100%
Temperature: -40 to +80°C
Dimensions: 120 x 80 x 300 mm
Weight: 0.5 kg (approx.)



55-C0187

Accelerated concrete curing

This range of tanks is for curing concrete specimens under conditions intended to accelerate the development of strength. Three models are available:

- **55-C0194/D** for the ASTM C684 (Procedure A) warm water method and the BS 1881:112, 35-55°C hot water method
- **55-C0194/DV** for the steam method
- **55-C0194/E** which can perform all the methods covered by the above models (i.e. both the ASTM C684 and BS 1881:112 warm/hot water methods and the steam method)



55-C0194/D, 55-C0194/DV,
55-C0194/E

55-C0194/D

Programmable accelerated concrete curing tank

(Warm water method)

Standards

ASTM C684 | BS 1881:112

This special curing tank has been designed for hot water curing in accelerated strength concrete. The interior and exterior are made from stainless steel. The electronic programmer can control up to four test cycles with different thermal gradients and curing times, at defined temperature values, for a completely automatic curing cycle. The control panel includes a 24-column thermal printer.

55-C0194/DV

Programmable accelerated concrete curing tank

(Steam method)

This version suitable for accelerated curing by steam method allowing programmable test cycles complete with controlled cooling ramps up to ambient temperature. The most popular application is in the pre-cast concrete industry for evaluating the final strength of the mixture.

Technical specifications

Product code	55-C0194/D 55-C0194/DZ	55-C0194/DV 55-C0194/DVZ	55-C0194/E 55-C0194/EZ
Conforming to standards	ASTM C684 BS 1881:112	-	ASTM C684 BS 1881:112
Method	warm/hot water	steam	warm/hot water and steam
Max. water temperature, °C	90	-	90
Max. steam temperature, °C	-	100	100
Temperature sensor	PT 100		
Heating system	Three 1500 W electric resistance heaters submerged in water		
Submersible circulation pump	-	-	yes
Cooling system	-	With mains water controlled by solenoid valve*	
Temperature control	By closed loop P.I.D. digital system		
Temperature curing cycle	Programmable: -Rising time up to the selected value -Maximum temperature holding time	Programmable: -Rising time up to the selected value -Maximum temperature holding time -Cooling time down to ambient temperature	
Power rating, W	4500		
Printer	24-column, included		
Overall dimensions, mm (w x d x h)	970 x 1000 x 920		
Weight, kg (approx.)	125		

*Note: cold water is supplied to the bottom of the tank in order it does not hit the specimens.

55-C0194/E

Programmable accelerated concrete curing tank

(Warm/Hot water method and steam method)

Standards

ASTM C684 | BS 1881:112

This version is physically similar to the above unit 55-C0194/DV except for the water/steam temperature control and water circulating systems which are designed to perform both the warm/hot water method and the steam method.

The unit in addition is fitted with water level sensors for automatic filling up of the tank (when used for hot water method)

Ordering information

55-C0194/D

Programmable accelerated concrete curing tank, warm/hot water method, to ASTM C684 and BS 1881:112, complete with printer. 380V, 50 Hz, 3 ph.

55-C0194/DZ

As above but 220V, 60 Hz, 3 ph.

55-C0194/DV

Programmable accelerated concrete curing tank, steam method, complete with printer. 380V, 50 Hz, 3 ph.

55-C0194/DVZ

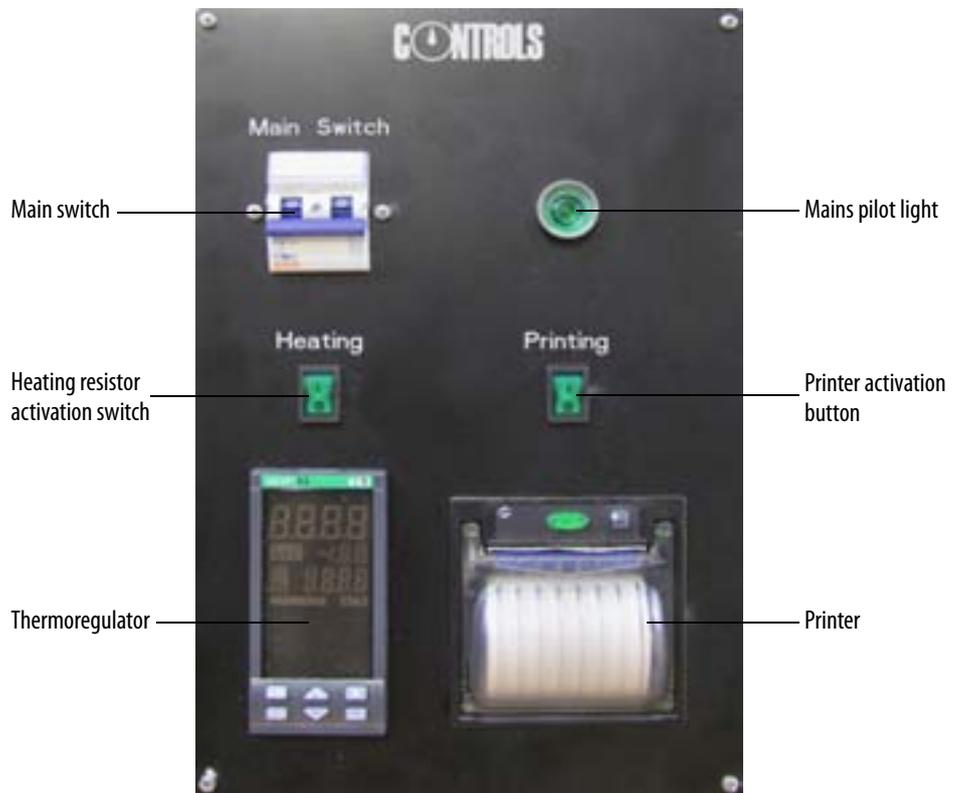
As above but 220V, 60 Hz, 3 ph.

55-C0194/E

Programmable accelerated concrete curing tank, warm/hot water method, to ASTM C684 and BS 1881:112, and steam method. Complete with printer. 380V, 50 Hz, 3 ph.

55-C0194/EZ

As above but 220V, 60 Hz, 3 ph.



Detail of control panel (55-C0194/D, 55-C0194/DV)



Detail of vent opening



Internal view with detail of base supporting grid

Specimen preparation for compression testing



55-C0201/B

Specimen grinding machine

Standards

EN 12390-2 | ASTM D4543

These machines are used to grind and polish concrete specimens, natural stones, ceramic materials, etc and are proposed in two versions:

- **55-C0201/B** standard version in which the radial displacement of the grinding head is motor operated and activated by a push button.
- **55-C0201/C** automatic version in which the radial displacement is fully automatic and controlled by travel limit switches.

Both cube and cylinder specimens can be easily locked onto the table and the 330 mm diameter grinding head can be radially moved either manually or automatically in both directions. The only manual operation required is the lowering of the grinding head using the top hand wheel.

The machine is supplied complete with a safety chip guard which, when removed, automatically stops the machine; a coolant tank; a motor pump and one set of

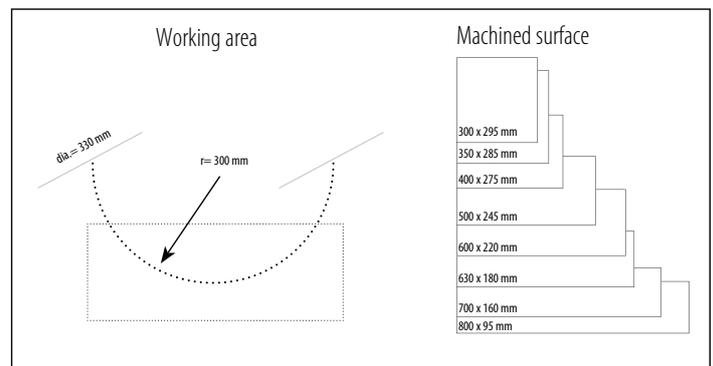
abrasive sectors. Diamond grinding sectors are available on request (see Accessories). The machine also includes a clamping element for 100, 150 and 200 mm cubes. This element can also be used to fit the 45-D0534/B Core face preparation jig. Clamping devices for cylinders, and devices for dry grinding procedures are also available on request (see Accessories).

Technical specifications (common to both models)

- Table dimensions: 775 x 280 mm
- Grinding wheel diameter: 330 mm
- Maximum vertical clearance: 350 mm
- Minimum vertical clearance: 145 mm
- Maximum specimen size: 200 mm cubes and 160 x 320 mm cylinders
- Machined surfaces: see schematic representation
- Grinding head stroke: 205 mm
- Number of grinding segments: 10
- Grinding wheel speed: 1400 rpm
- Total power: 2200 W
- Overall dimensions: 1200 x 1020 x 1640 mm (w x d x h)
- Weight: 350 kg (approx.)
- Gross weight: 415 kg (approx.)
- Automatic cross feed in both directions (model 55-C0201/C only)

main features

- > Suitable for grinding concrete specimens, natural stones, tiles, block pavers, ceramic materials, etc.
- > Large base table for grinding up to three 100 mm cubes, three 150 mm cubes, or two 200 mm cubes and concrete/tile blocks of various sizes simultaneously (see drawing of working area)
- > Fits cylinders up to 160 mm diameter x 320 mm height
- > Motorized radial displacement in both directions by pushbutton or totally automatic with the 55-C0201/C version
- > Safety guard with door locking switch conforming to CE
- > Complete with clamping elements for cubes
- > Suitable for dry grinding procedure (see Accessories)
- > Diamond impregnated sectors available as alternative to abrasive
- > Ideal for surface preparation of rock samples using the accessory 45-D0534/B



Ordering information

55-C0201/B

Specimen grinding machine. 380 V, 50 Hz, 3 ph.

55-C0201/BZ

As above but 220 V, 60 Hz, 3 ph.

55-C0201/C

Specimen grinding machine with automatic radial displacement of the grinding head. 380 V, 50 Hz, 3 ph.

55-C0201/CZ

As above but 220 V, 60 Hz, 3 ph.

Accessories

55-C0201/B2

Set of 10 diamond impregnated sectors. Weight: 10 kg approx.

55-C0201/B3

Accessory to connect an aspirator for drying grinding procedure. (Aspirator not included.)

55-C0201/B4

Clamping device for concrete cylinders from 100 x 200 mm to 160 x 320 mm (diameter x height).

55-C0201/B6

Device for clamping one additional cylindrical specimen from 100 up to 160 mm diameter. (This item must be used along with accessory 55-C0201/B4).



55-C0201/B4



55-C0201/5



55-C0201/B2

55-C0201/B5

Clamping device for concrete cylinders from 50 to 100 mm diameter.

55-C0201/B7

Device for clamping one additional cylindrical specimen from 50 up to 100 mm diameter. (It must be used along with accessory 55-C0201/B5).

55-C0201/5

Clamping device, vice mounted, for concrete cylinders from 100 x 200 mm to 160 x 320 mm (diameter x height) – as an alternative to model 55-C0201/B4. Weight: 30 kg approx.

Note: accessories for rock specimen clamping described on page 178

Spare parts

55-C0201/B1

Spare set of 10 abrasive sectors.

Specimen cutting saw

This universal saw, when completed with the suitable accessories, can be used to cut concrete, asphalt, rock cores and irregular rock samples in order to obtain geometrically defined specimens. It can be fitted with 350 to 450 mm diameter blades.

The motor head is adjustable in height and can also be tilted, permitting cuts at angles of up to 45° to be made. The tank and the table are zinc-plated to avoid corrosion. Complete with water pump for cooling the blade and double filtering system.

The cutting blade, and accessories to cut cores, asphalt, rock and other building materials are not included - see Accessories.

Technical specifications

- Maximum cutting height: 115 mm with 350 mm diameter blade and 165 mm with 450 mm diameter blade
- Maximum blade diameter: 450 mm
- Power: 3 kW
- Overall dimensions: 1300 x 700 x 700 mm (w x d x h)
- Weight: 92 kg (approx.)

Ordering information

55-C0210/D

Concrete, asphalt, rock and masonry saw. 380V, 50 Hz, 3 ph.

55-C0210/DZ

As above but 220V, 60 Hz, 3 ph.

Accessories

45-C0211/4

Diamond blade, 350 mm diameter, for hard rock.

50-C0211/1

Diamond blade, 350 mm diameter, for concrete and asphalt.

50-C0210/1

Diamond blade, 450 mm diameter, for concrete and asphalt.

50-C0210/5

V-shaped support for cylinders and cores up to 160 mm diameter. Weight: 4 kg approx.

45-C0210/6

Locking clamp device for irregular pieces.



Detail of the 45-C0210/6 Locking clamp device for irregular pieces



45-D0534/B



55-C0210/D with 55-C0210/1 blade and 55-C0210/5 V-shaped support

Specimen preparation for compression testing

Sulphur capping equipment

Standards

EN 12390-3 | ASTM C31 | ASTM C192 | ASTM C617 | AASHTO T23 | AASHTO T126



55-C0121/3, 55-C0121/21, 55-C0121/37, 55-C0121/5 and 55-D1403

When testing concrete cylinder specimens it is essential that the two ends are perfectly flat. This range of equipment allows the ends of various sizes of concrete cylinders or cores to be capped using a sulphur capping compound.

Cylinder cappers

Cappers are used to assure plane end surfaces perpendicular to the axis of the cylinder during the capping. The base and capping plates are machined from steel and the guide from cast aluminium or steel.

Cylinder carriers

A simple accessory for an easy handling of specimens, these are only available for specimens sized 150 x 300 mm (6 x 12 in.) and 160 x 320 mm.

Capping compound

The compound is a mixture of sulphur and mineral filler which gives a high finish and performance.

Melting pot

Used to melt the capping compound, the pot has a pilot lamp and an adjustable electronic thermo-regulator to set and maintain the temperature at the desired value. The unit is fully isolated conforming to CE requirements.

Capacity: 5 L (approx.)

Temperature range: from +30 to +150°C

Power: 700 W

Dimensions:

- internal: 200 mm diameter x 160 mm height

- external: 285 mm diameter x 275 mm height

Weight: 2.7 kg (approx.)

Capping plate for concrete blocks

Used for capping concrete blocks with cement paste. This accurately machined plate is made from corrosion-resistant steel, measures 500 x 300 mm and is 20 mm thick.

Ordering information

Cylinder cappers

55-C0121/A3

Vertical cylinder capper for specimens 3 x 6 in. (76 x 152 mm) (dia. x h).

Weight: 7 kg approx.

55-C0121/A4

Vertical cylinder capper for specimens 4 x 8 in. (102 x 203 mm) (dia. x h).

Weight: 7 kg approx.

55-C0121/23

Vertical cylinder capper for specimens 100 x 200 mm (dia. x h). Weight: 7 kg approx.

55-C0121/21

Vertical cylinder capper for specimens 150 x 300 mm (dia. x h). Weight: 8 kg approx.

55-C0121/22

Vertical cylinder capper for specimens 160 x 320 mm (dia. x h). Weight: 8 kg approx.

55-C0121/22A

Vertical cylinder capper for specimens 160 x 320 mm (dia. x h), complete with ball tracks for a positive location of the specimen. Weight: 8 kg approx.

Universal capping frame

55-C0121/U

Universal cylinder capping frame for 100 and 150 mm dia. cylinders.

Comprising a vertical support, mounted on a steel base and capping plates for the above specimens.

Weight: 13 kg approx.

Compatible capping plates having 75 mm and 160 mm diameter available on request.

Cylinder carriers

55-C0121/3

Cylinder carrier for specimens 150 x 300 mm and 6 x 12 in. (dia. x h).

Weight: 1.2 kg approx.

55-C0121/6

Cylinder carrier for specimens 160 x 320 mm. Weight: 1.2 kg

Capping compound

55-C0121/37

Ultra strong capping compound, 22.5 kg pack.

Melting pot and ladle

55-D1403

Melting pot, 5 L capacity, 700 W, 230 V, 50-60 Hz, 1 ph. Weight: 2.7 kg approx.

55-D1403/Z

As above but 700 W, 110 V, 60 Hz, 1 ph.

55-C0121/5

Stainless steel ladle.

Capping plate

55-C0125/A

Steel capping plate, 500 x 300 mm, 20 mm thick. Weight: 30 kg approx.



55-C0121/U. Universal cylinder capping frame for 100, and 150 mm dia. cylinders.



55-C0121/22A

Capping system using unbonded caps

Standards

ASTM C1231 | AASHTO T22 | AASHTO T851

This method is used as an alternative to the hot sulphur capping of concrete cylinder specimens. The system consists of two alloy steel cap retainers and two 12.5 mm thick neoprene pads which are in contact with the upper and lower concrete surfaces. The pads even out irregularities, distributing the test load uniformly to ensure reliable strength results. Pads can be re-used for many tests.

Ordering information

Capping retainers

55-C0122/A3

Capping retainers for 3 inch diameter concrete cylinders, set of 2. Weight: 3 kg approx.

55-C0122/A4

Capping retainers for 4 inch diameter concrete cylinders, set of 2. Weight: 5 kg approx.

55-C0122

Capping retainers for 150 mm (6 inch) diameter concrete cylinders, set of 2. Weight: 8 kg approx.

55-C0122/B

Capping retainers for 160 mm diameter concrete cylinders, set of 2. Weight: 9 kg approx.

Neoprene pads

55-C0122/A33

Neoprene pads for 3 inch diameter concrete cylinders, set of two. Weight: 0.3 kg approx.

55-C0122/A44

Neoprene pads for 4 inch diameter concrete cylinders, set of two. Weight: 0.4 kg approx.

55-C0122/2

Neoprene pads for 150 mm (6 inch) diameter concrete cylinders, set of two. Weight: 0.8 kg approx.

55-C0122/4

Neoprene pads for 160 mm diameter concrete cylinders, set of two. Weight: 1.0 kg approx.



55-C0122. Retainers and 55-C0122/2 pads

Depth of penetration of water under pressure in concrete

Standards EN 12390-8



55-C0246/6

Water penetration apparatus

These apparatus are used to determine the depth that water under pressure penetrates into concrete specimens. The test is performed by clamping the specimen (cubical, cylindrical or prismatic) between two flanges with special circular gaskets. The water, under controlled pressure, is then applied to the surface of the concrete specimen. The penetration of water is measured, after the testing period, by breaking the specimen. The quantity of penetrated water can also be measured using the graduated burettes of the apparatus.

The apparatus consists of a robust steel frame with clamping system, incorporating a hydraulic circuit, valves and gauge to check the water pressure and graduated burettes (one per specimen) to measure the quantity of penetrated water.

The clamping system can accept cube or prismatic specimens with bases from 150 to 200 mm square and cylinders 150/160 mm diameter x 300/320 mm high.

Two models are available:

- **55-C0246/3** Three-bay model
- Overall dimensions: 1155 x 776 x 1515 mm (w x d x h)
- Weight: 120 kg (approx.)
- **55-C0246/6** Six-bay model
- Overall dimensions: 1155 x 886 x 1860 mm (w x d x h)
- Weight: 176 kg (approx.)

Both models are supplied complete with gaskets for 150 mm cube specimens. The apparatus have to be fitted with a suitable air compressor with a maximum working pressure of 10 bar. See Accessories and spares.

Ordering information

55-C0246/3

Three-bay water-under-pressure penetration apparatus, complete with water pressure gauge, graduated burettes to measure the quantity of penetrated water and set of rubber gaskets for 150 mm cube.

main features

- > One to three or one to six specimens can be tested at the same time
- > Complete with manometer to check the water pressure
- > Complete with graduated burettes to measure the quantity of penetrated water in each specimen
- > Suitable for cubes 150/200 mm, cylinders 150/160 mm diameter x 300/320 mm high, portions of beams with sides measuring 150/200 mm and 200 x 200 x 120 mm prisms.



55-C0246/3

55-C0246/6

Six-bay water-under-pressure penetration apparatus, complete with water pressure gauge, graduated burettes to measure the quantity of penetrated water and set of rubber gaskets for 150 mm cube.

Accessories and spares

55-C0246/2

Set of three rubber gaskets for 200 mm cubes or prisms.

55-C0246/5

Adapter to fit in one testing chamber specimens up to 320 mm high (e.g. cylinders up to 160 x 320 mm).

86-D2015

Laboratory air compressor, 10 bar maximum pressure, 50 L capacity. 230 V, 50 Hz, 1 ph. (For more information see page 571) Pressure regulator not included.

55-C0246/4

Set of three spare rubber gaskets for 150 mm cubes.

Surface water absorption

Standards

BS 1881:208 | BS 1881:5

Initial surface absorption apparatus (ISAT)

This apparatus is designed for assessing concrete surface absorption characteristics by measuring the flow rate of water per unit area into a concrete surface when subjected to a constant head of 200 mm. The unit consists of a capillary tube mounted on a scale, a water reservoir, and connecting tubes. They are all mounted on a stand for ease of use. Test cups are not included - see Accessories.

Weight: 1.4 kg (approx.)

Ordering information

55-C0241/A

Initial surface absorption test apparatus (ISAT).

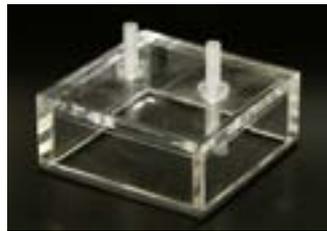
Accessories

55-C0241/1

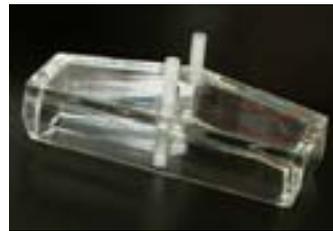
Clear plastic cup.

55-C0241/2

Clear plastic cup for vertical surfaces.



55-C0241/1



55-C0241/2



55-C0241/A



Density of hardened concrete

Standards

EN 12390-7 | EN 1097-6 | BS 812 | BS 1881:14 | UNI 6394-2

Specific gravity frame

This apparatus is a purpose-built robust frame designed to support an electronic balance for specific gravity determination of fresh and hardened concrete and aggregates. The lower part of the frame incorporates a moving platform which holds the water container, allowing test specimens to be weighed in both air and water.

The balance is not included and should be selected according to the weighing range required. Any type of electronic balance fitted with an under-bench weighing facility can be used. All our balances have this feature - our model 11-D0630/30, 30 kg capacity, 0.5 g resolution is ideal for this and other applications. See Accessories or, for other capacities, see page 9

The frame has to be completed with the 11-D0612/A1 cradle for holding concrete specimens or Density baskets for testing aggregates (see page 204)

Overall dimensions: 400 x 650 x 1000 mm
Weight: 25.5 kg (approx.)

Ordering information

11-D0612/B

Specific gravity frame.

Accessories

11-D0630/30

Electronic top loading balance, 30 kg capacity, 0.5 g resolution.

11-D0612/A1

Cradle for holding specimens.

11-D0612/B with balance and cradle

Hydraulic shrinkage determination

Standards UNI 11307

(comparable to ASTM C426)

The UNI 11307 method is for determining the hydraulic axial shrinkage of concrete beams during hardening. According to this method, steel pins are glued onto the end surfaces of the specimen in order to measure the dimensional changes of the specimen, which is properly stored under specified temperature and humidity conditions. The test is performed with the 55-C0100/MB11 beam mould and the shrinkage is measured by the 55-C0115/3D apparatus.

Ordering information

55-C0100/MB11

Beam mould, 100x100x500 mm.
Weight: 19 kg approx.

55-C0115/11

Steel pins for concrete shrinkage determination to UNI 11307. Pack of 10.

55-C0115/3D

Shrinkage measuring apparatus with reference bar and 12.5 x 0.001 mm digital gauge.

Weight: 14 kg approx.



55-C0100/MB11, 55-C0115/3D, 55-C0115/11



55-C0117/8, 55-C0117/81, 55-C0117/7, 55-C0117/71

Determination of restrained expansion of mortar and concrete

Standards

UNI 8147 | UNI 8148

Used for determining the restrained expansion of a concrete or mortar containing expansive agent. Made from steel, the apparatus comes complete with a rod and restrained end plates for each gang.

Two models are available:

- 55-C0115/7 conforming to UNI 8148, 320 x 280 x 80 mm
- 55-C0115/8 conforming to UNI 8147, 50 x 50 x 250 mm

Ordering information

55-C0115/7

Three gang mould, 80 x 80 x 240 mm, conforming to UNI 8148. Weight: 15 kg approx.

55-C0115/8

Three gang mould, 50x50x250 mm, conforming to UNI 8147. Weight: 10 kg approx.

Accessories

62-L0035/A

Digital length comparator, 12.5x0.001 mm.

62-L0034/8

Reference rod, 280 mm long.

Spare parts

55-C0115/71

Set of two end plates with rod for 55-C0115/7.

55-C0115/81

Set of two end plates with rod for 55-C0115/8.



62-L0035/A with reference rod. For more information and detail see page...

Creep test on concrete

Standards ASTM C512

Load frame for creep test on concrete

This test is performed for measuring the shrinkage of cylindrical specimens under loads at different time intervals. The apparatus consists of a load frame designed to apply and maintain the required load on the specimen. The initial compression is applied by a portable hydraulic jack. The load maintaining element is a series of springs preloaded by the hydraulic jack.

The apparatus is supplied complete with hand pump, two 200 mm diameter precision gauges (one permanently connected, the other for loading) and a hydraulic jack.

The typical application of this apparatus is for research purposes. We are at your disposal for all information you may need.



Technical specifications

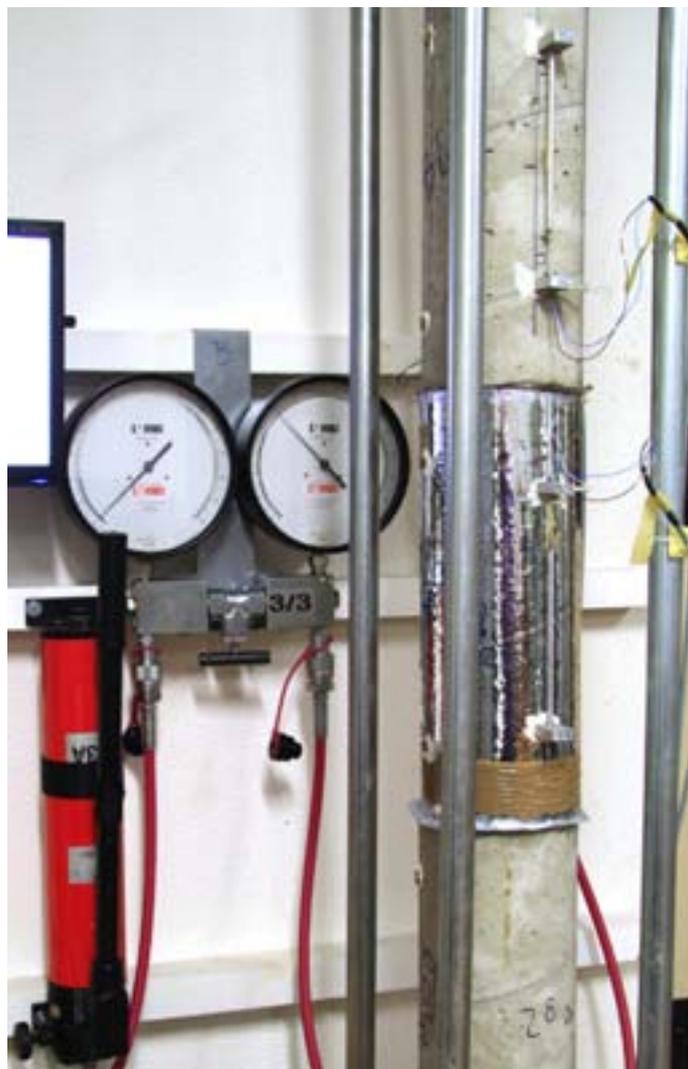
- Maximum load: 300 kN
- Vertical testing space: 1650 mm
- Compression platens: 165 mm diameter. The upper platen is spherically seated.
- Hydraulic jack: 300 kN capacity
- Hand pump with precision Bourdon gauge 200 mm diameter
- Bourdon gauge 200 mm diameter permanently connected
- Frame dimensions: 450 mm diameter x 2680 mm height
- Weight: 300 kg (approx.)

Note: Load frames with different vertical space are available on request.

Ordering information

55-C0235/A

Load frame, 300 kN capacity, for creep tests on concrete.



Digital data acquisition and strain measurement system

Code	Description	Qty
82-P9008	DATALOG 8, 8 channels multipurpose data logger	1
82-P9008/SOF	Data acquisition software	1
82-P0398	Electrical compensation device	1
82-P0393 *	Strain gauges, 60mm length. Pack of 10.	1
82-P0399/B	Strain gauge application kit.	1
82-P0399/1	connecting terminals, 50 pairs	1
55-C0235/LC	Upgrade of the 55-C0235/A creep tester with a 300kN load cell for digital acquisition of the axial load	1 (as opt)

* Other strain gauge sizes available on request

Concrete Testing

58 | NDT Non Destructive Testing

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The development and improvement of in-situ test techniques better known as non-destructive test methods (NDT) are the result of the need to investigate the progressive ageing of concrete structures, the effect of chemical attacks on concrete often due to air pollution or to the use of chlorides in winter to prevent icing, the quality and integrity of new structures and the problems associated with historical buildings. This catalogue includes a vast selection of NDT instruments and apparatus leading to the following subjects:

58 Concrete durability evaluation

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Water penetration test set	313
Surveymaster moisture meter	313
Deep scanning metal locator	313
Carbontest	314
Carbonation test set	315
Resonance frequency meter	315

Concrete strength evaluation

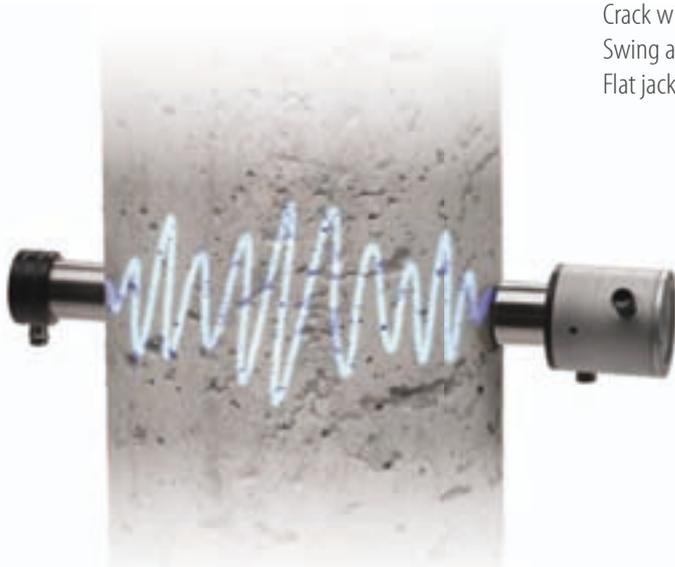
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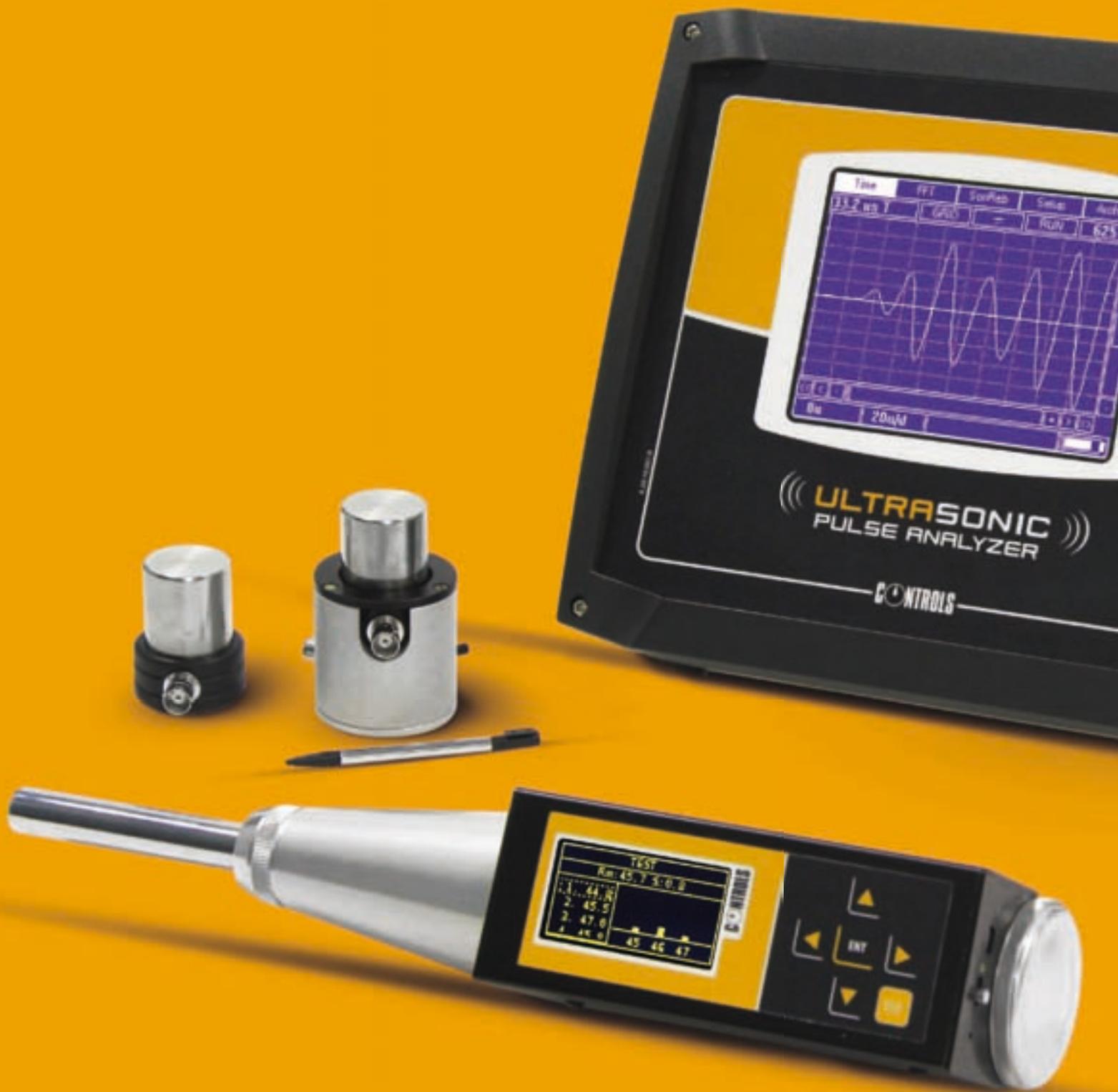
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Concrete durability evaluation

The various problems that relate to the durability of concrete are assuming ever increasing importance due to their close relationship with the quality of the structure as a whole. The main problems associated with the durability of concrete are normally caused by the poor quality of the concrete itself. Knowledge of the degrading processes and the availability of materials and methods that can overcome them, permits the design of concrete that is both resistant and durable.

A complete range of instruments is available to measure the durability of concrete in answer to most of the requisites of operators in the construction industry. Controls has specific knowledge and considerable first-hand experience in this field which can be made available to help in the analysis of test results.



58-E0065/A Complete system



58-E0065/A

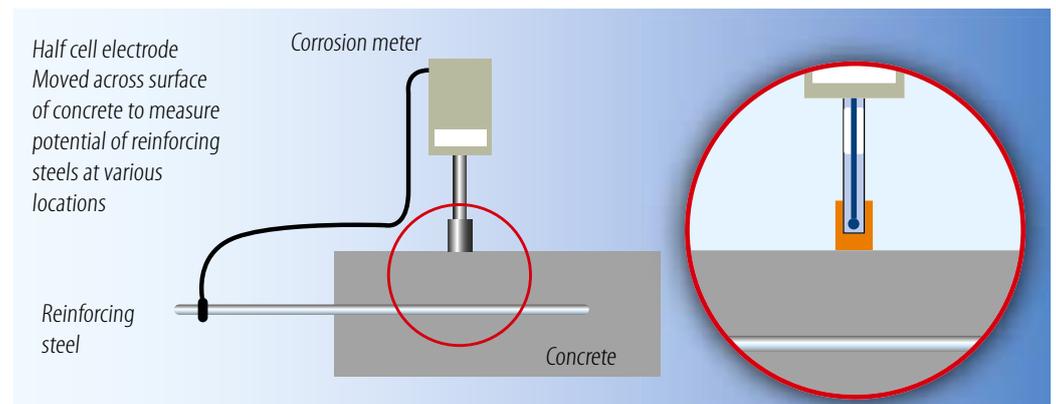
Cor Map apparatus for rebar corrosion location (Half-cell method)

Standards

ASTM C876 | BS 1881:201 | UNI 9535

Corrosion, which is an electrochemical process, occurs in concrete when oxygen and moisture are present. Measurements to detect them, made with the Cor Map apparatus using the half-cell method, can be plotted on a grid and lines of equipotential contours drawn, highlighting areas of possible corrosion activity.

The Cor Map apparatus is a simple and economical method for identifying areas of probable rebar corrosion in (for example): Bridge decks, Parking garages, Concrete piers and docks, Substructure, Tunnel lining and Foundations.



58-E0065/A Operating principle

The apparatus comprises:

- High impedance voltmeter
- Electrode extension
- Reference electrode including copper sulphate reservoir
- Container of copper sulphate (capacity 250 ml)
- Wetting agent reservoir (capacity 125 ml)
- Dispensing sponge
- Cable reel with 80 m of cable
- Carrying case

- Case dimensions: 50 x 420 x 190 mm (approx.) (reel packaged separately)
- Weight: 7.5 kg (approx.) (case + reel)

58-E0064
Chloride content field test system

Standards
ASTM C114 | AASHTO T260

This test set, which relates to ASTM C114 and AASHTO T260, is used to determine the chloride ion concentration in concrete in order to identify the risk of chloride-induced reinforcement bar corrosion. The method involves performing an acid extraction on a representative drilled sample of concrete, which is then tested using an ion selective electrode. The potential is then compared with a calibration drawn up from a series of five known standard solutions supplied with the test kit.

- The test set comprises:
- Electronic battery powered meter with microprocessor for direct conversion to percentage of chloride
 - Chloride combination electrode with externally mounted temperature sensor, cable and connectors
 - Bottle of electrode wetting agent
 - Replacement pack of 12 jars each with 20 ml of extraction liquid and 5 jars of coloured calibration liquid
 - Carrying case and instruction manual
 - Weight: 5 kg (approx.)

Spare parts

58-E0064/1
Pack of 12 jars of 20 ml extraction liquid and 5 jars of coloured calibration liquid.



58-E0064 complete set

58-E0062/B
Digital resistivity test set to assess corrosion currents in concrete

The electrical conductivity of concrete is an electrolytic process that takes place through the movement of ions in the cement matrix. This ionic movement will occur when contaminants such as chloride ions or carbon dioxide are introduced into the cement mortar matrix. A highly permeable concrete will have a high conductivity and low electrical resistance. Because resistivity is proportional to current flow, the measurement of the electrical resistance of concrete provides a measure of the possible rate of corrosion. Since carbonation seriously affects surface resistance, measurement on the concrete surface should be avoided. The resistivity meter, has two probes spaced 5cm (1.97 inches) apart which are placed in two holes drilled to a depth of 8mm (3/8 inch) and filled with conductive gel. The concrete resistivity is displayed on an LCD when the control switch is activated.

- The system comprises:
- Electronic meter
 - Probe
 - 3 m cable with connectors
 - 85 ml jar of conductive gel
 - ¼" drill bit

Technical specifications

- Display: LCD with 4½" digits
- Resolution: ±0.1 KΩ·cm
- Battery: 9 Volt
- Range: 0.5 – 20 KΩ·cm
- Weight: 4 kg (complete with carrying case)

Main features

- Assesses damaging corrosion current-sin concrete
- Economical and easy to use
- Direct digital readout of resistivity
- Measuring from two small holes avoidsthe problems and errors of surface measurements
- Used in conjunction with CorMap System 58-E0065/A (see page 306) to produce resistivity plots

The following table correlates a range of resistivity values against the possible rate of corrosion of the reinforcement bars.

Resistivity level (KΩ·cm)	Possible corrosion rate of reinforcement rebars
<5	Very high
5 to 10	High
10 to 20	Moderate to low
>20	Insignificant



58-E0062/B



58-E0062/B complete set

Concrete durability evaluation

Chloride ion penetration (CI-Meter)

Standards

ASTM C1202 | AASHTO T277

Concrete durability is negatively influenced by chloride ion penetration. This test method allows concrete to be evaluated in terms of its chloride permeability characteristics. The test is performed to monitor the amount of electrical current passing through concrete cores or cylinders. A potential difference is maintained across the ends of the specimen, one of which is the negative end and is immersed in a sodium chloride solution, the other (positive end) in a sodium hydroxide solution. The total charge passed, which is related to the resistance of the specimen to chloride ion penetration, is measured in Coulombs.

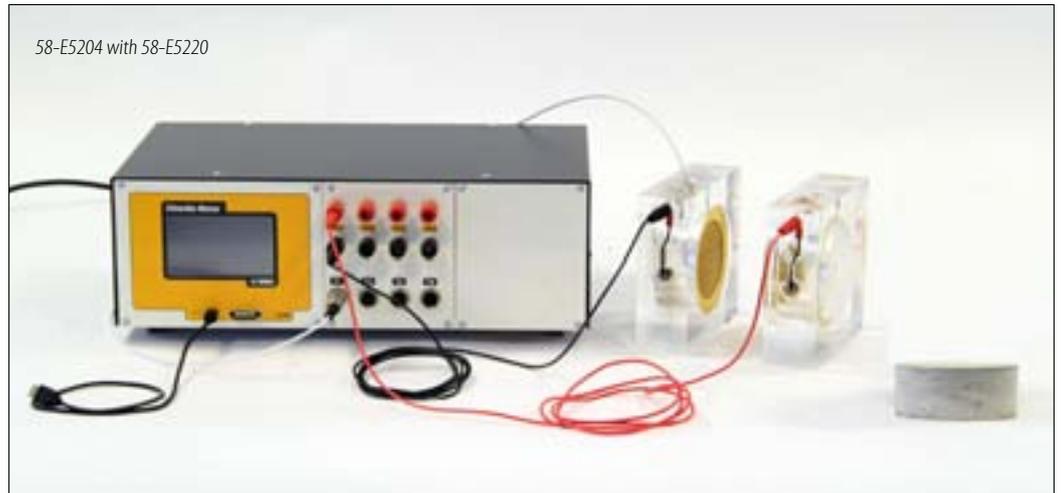
Two models are available:

- **58-E5204** four-channel capacity, suitable for performing tests on up to four specimens simultaneously.
- **58-E5208** eight-channel capacity, for up to eight specimens
- Each specimen requires a test cell which is offered separately - see Accessories, product code 58-E5220.

The standards also require the full water saturation of the specimen, which can be performed with the relevant Vacuum saturation apparatus 58-E0052/1 - see Accessories.

Technical specifications

- Four and eight cell capacity versions for testing up to four/eight specimens simultaneously
- Every channel is independent
- Programmable test duration
- Adjustable measuring rate starting from 1 minute
- Measurement and recording of the test temperature during the whole test



Measuring technique:

- transmitted current is measured and integrated over time in the presence of a precisely applied and maintained 60V DC potential difference
- 4.3" touchscreen colour display
- Data storage on SD card
- Micro USB port to download data to PC
- Easy to use interface
- Accuracy: $\pm 0.1V$, $\pm 1mA$
- Dimensions:
 - Instrument: 450 x 265 x 150 mm
 - Cell: 165 x 155 x 50 mm
- Weight: 11.5 kg

Ordering information

58-E5204

Digital 4-channel chloride penetration meter. 110-230V, 50-60 Hz, 1 ph.

58-E5208

Digital 8-channel chloride penetration meter. 110-230V, 50-60 Hz, 1 ph.



58-E5220

Accessories

58-E5220

Complete test cell for chloride ion penetration meter including heads and cables.



58-E5204 Detail of display



58-E5220 with specimen

58-E0052/1

Vacuum saturation apparatus, required by ASTM C1202 in order to fully saturate the specimen with water. Comprises vacuum pump, air drying unit with silica gel, vacuum desiccator, glass vessel, stands and clamps.

230V, 50 Hz, 1 ph.

Weight: 40 kg (approx.)

58-E0052/1Z

As above but 110V, 60 Hz, 1 ph.



Concrete durability evaluation



main features

- > Rebar location detection
- > Rebar orientation detection
- > Depth of cover measurement
- > Cover thickness reading in millimetres or inches
- > Large graphic display with backlight
- > Multiple language menu structure
- > Signal strength bar
- > Interchangeable heads with LED and keypad
- > User selectable bar range sizes and numbers
- > Auto-size mode for quick bar diameter determination
- > Orthogonal mode for bar diameter determination
- > Other models of search head (narrow pitch search, deep cover search, borehole probe) available on order – see Accessories.
- > RS 232 output to PC
- > EDTS MS EXCEL link software
- > Data logging
- > Adjustable beep volume & earphone socket

Rebar detection and cover-size measurement

Standards

BS 1881:204

This apparatus is used to measure the thickness of concrete cover over steel reinforcement bars and metal pipes and can also identify the location, orientation and diameter of reinforcement bars (rebars). The basic unit can be completed with a number of optional probes for the various different determinations – see Accessories.

Description

The BARTRACKER, which uses the Pulse induction technique, features a rugged waterproof IP 65 case with probe storage for easy portability.

The battery pack can be recharged inside or outside the gauge. The display screen shows you everything you need to know. The gauge is supplied complete with:

- Main unit
- Standard search head to meet most measurement requirements for identifying 40 mm diameter bars at up to 95 mm depth (approx.) and 8 mm

diameter bars at up to 70 mm depth (approx.). Sensing area 120 x 60 mm.

- PC cable
- Battery pack and charger
- Shoulder strap
- Earphone
- Carry case and instruction manual

Important note: Standard and optional search heads can be supplied with calibration certificates on request. See Accessories.

Technical specifications

- Reinforcement bar diameter identification range:
 - Metric: 5 – 50 mm diameter (21 selectable sizes)
 - US bar numbers: #2-#18 bar sizes (16 selectable sizes)
- Rechargeable power supply:
 - 7.4 V lithium ion battery pack providing up to 32 hours of continuous use (20 hours if backlight is on). Rechargeable in 4 hours either inside or outside the gauge using the external charger
 - Maximum operating temperature: 50°C
 - Main unit dimensions: 230 x 130 x 125 mm
 - Main unit weight: 1.54 kg

Ordering information

58-E6102

BARTRACKER covermeter complete with standard search head, carry case, gauge-to-PC transfer cable, battery pack and Euro battery charger.

100-240 V, 50-60 Hz, 1 ph.



Detail of extractable battery pack



58-E6102

Accessories

BARTRACKER 58-E6102 search heads and probes (optional)

58-E6100/1

Narrow pitch search head. Accurately measures the cover thickness when the gaps between each of the rebars (pitch) are close together.

- Range: 40 mm diameter bars at up to 80 mm depth (approx.) and 8 mm diameters bars at up to 60 mm depth (approx.)
- Sensing area: 120 x 60 mm
- Dimensions: 155 x 88 x 42 mm

58-E6100/2

Deep cover search head. The ideal search head for accurately measuring rebars that are deep within the structure.

- Range: 40 mm diameter bars at up to 180 mm depth (approx.) and 8 mm diameter bars at up to 160 mm depth (approx.)
- Sensing area: 160 x 80 mm
- Dimensions: 170 x 94 x 54 mm

58-E6100/3

Short borehole probe. The solution for locating tendon ducts and multiple layers lying deep within the concrete.

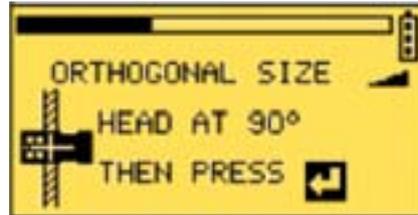
- Measurement depth: 0-40 cm
- Approximate detection ranges: tendon ducts 70 mm/2.75" up to 90 mm/3.54"; reinforcement bars up to 60 mm/2.36"

58-E6100/4

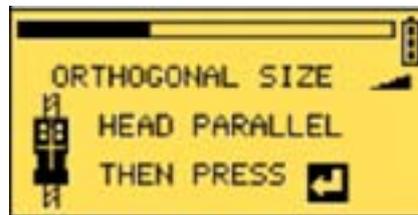
Long borehole probe. Approximate detection ranges: tendon ducts 70 mm/2.75" up to 90 mm/3.54"; reinforcement bars up to 60 mm/2.36"



Example of display. This typical view of the cover display screen shows you all need to know. The easy to use menus, in multiple languages, enable you to access all the data you need while on site, without constantly referring to the instruction manual.



Orthogonal size function. Simply access the menu and then follow the clear on-screen instructions.



Orthogonal size function. When step 2 is complete, the bar size and depth cover will be shown.

Traceable calibration certificates
(to be requested at time of ordering)

58-E6100/CAL1

Calibration certificate for BARTRACKER cover meter with standard search head.

58-E6100/CAL2

Calibration certificate for BARTRACKER cover meter with 58-E6100/1 narrow pitch search head.

58-E6100/CAL3

Calibration certificate for BARTRACKER cover meter with 58-E6100/2 deep cover search head and 58-E6100/3 short borehole probe.

58-E6100/CAL4

Calibration certificate for BARTRACKER cover meter with 58-E6100/4 long borehole probe.

58-E6100/10

Basic calibration block with dia. 16 mm re-bar.

58-E6100/11

Advanced calibration block featuring multi-spaced holes and 5 smooth re-bars, 300 mm length, dia. 8, 10, 12, 16 and 20 mm.

Concrete durability evaluation

58-E0031

Oxygen permeameter (CEMBUREAU method)

Standards

UNI 11164

This method, which is applicable to cast and cored concrete specimens, concerns the determination of the permeability of concrete to oxygen, conforming to the Hagen-Poiseuille relationship.

The apparatus consists of:

- Permeability cell for specimens 150 mm diameter x 50 mm high
- Volumetric gas flow meter, soap bubble type
- High precision pressure regulator
- Digital readout unit and pressure transducer
- Stainless steel panel for wall-mounting plus connections
- Oxygen cylinder not included

Specifications

Panel: 700 x 1100 x 120 mm (w x h x d), weight 14 kg.

Cell: 345 x 180 mm (dia. x h), weight 19 kg.



58-E0031 Detail of permeability cell

58-E0031



58-E0030

Air and water permeability test set (John Figg method)

This method covers the determination of the susceptibility of concrete to chloride and carbonation penetration.

The apparatus can be used for:

Internal (deep permeability) testing

A hole 10 mm diameter and 40 mm deep is drilled and plugged leaving a cylindrical test void 10 mm diameter by 20 mm high, situated 20 mm below the surface of the concrete. The time required for air and water to permeate through the test material to the void is used as an index to determine the quality of the concrete.

Air permeability testing

The air permeability test is always done first since moisture has a significant effect on permeability. Following the test procedure instructions, based on the vacuum technique, the instrument timer and manometer automatically show the time in seconds for the vacuum to rise from -55 kPa to 5 kPa. This time measurement is known as the Figg number for the air permeability of concrete.

Water permeability testing

After filling and forcing the water into the test cavity, the air is displaced out through the overflow tube. The instrument flow sensor and timer, following the test procedure, measure the time taken for the water meniscus to travel a distance of 50 mm. The time in seconds displayed on the meter is the Figg number for water permeability of concrete.

Surface permeability testing

Measurements are carried out at the surface by clamping a stainless steel chamber onto the smooth surface of the concrete. A measurement of the time required for related amounts of air and water to permeate through the concrete is used as an index of the surface conditions.

The apparatus comprises:

- Digital manometer
- Hand vacuum pump
- Water syringe
- Pack of 25 test plugs
- Cup grinding wheel
- Stainless steel surface chamber and clamping pliers, drill bits, anchors
- Carrying case and instruction manual

Specifications

- Power supply: standard 9V battery
- Case dimensions: 430 x 300 x 150 mm
- Weight: 5.4 kg (approx.)

Spare parts

58-E0030/1

Pack of 25 test plugs.



58-E0030 complete set

Water penetration test set (Dr Karstens method)

58-E0023

Standards

EN 1323

General description and specifications

This test set is used for the determination of water permeability of building materials and pre-fabricated building parts. It consists of three vertical and three horizontal water penetration test tubes, a 250 ml washing bottle and 250 g of plasticine cement. The test can be performed either horizontally or vertically. Case dimensions: 420 x 280 x 90 mm Weight: 1.75 kg (approx.)

Spare parts

58-E0023/3

Plasticine cement, 250 g.



58-E0023

58-E0058

Surface dampness determination

with the Protimeter Surveymaster SM

The Surveymaster is the industry standard moisture meter for surveying and investigating moisture in buildings. It has two modes of operation -Search and Measure -helping the user to distinguish sub-surface from surface moisture, essential information when trying to establish the extent and cause of a dampness problem. The actual moisture content of wood is shown on the digital display with the corresponding moisture condition shown on the accompanying scale of colour-coded lights. This value can be used as a reference to estimate the moisture content of other building materials or for comparisons of different moisture conditions.

The meter is supplied complete with:

- 127 mm insulated deep wall probes
- Moisture probe
- Calcheck WME mode calibration check
- 2 spare pins
- Pouch and instructions
- Wood species calibration table

Technical specifications

- Range: 7% to 99% WME (Wood Moisture Equivalent)
- Display 1: Digital LCD
- Display 2: 60 LEDs, green (dry), yellow (at risk) and red (wet)
- Depth of measurement: Non-invasive method, up to 19 mm; Pin method, up to 12.7 mm
- Power: 9V 6F22R battery (included)
- Features: Audible tone that can be switched on/off; auto switch off that can be set to between one and three minutes by the user.
- Dimensions: 175 x 30 x 48 mm
- Weight: 100 g (approx.)



58-E0058

58-E0032/B

Deep-scanning metal locator in concrete

Finds rebars and metallic pipes, conduit, metal studs, junction boxes and metal framing up to 150 mm deep before drilling or remodeling. It scans through most non-metallic construction material, including solid concrete.

main features

- > Scans through solid concrete
- > Pinpoints the location and depth of target
- > Differentiates between steel rebar and copper pipe
- > Eliminates guesswork, needless holes and broken drills and saw blades
- > Essential tool for concrete contractors, remodelers, plumbers and electricians



58-E0032/B

Technical specifications

- Battery: 9V alkaline (not included)
- Battery life: 1 year with normal use, with low battery indication
- Position accuracy: 14 mm diameter rebars/copper pipe at a minimum grid spacing of 152 mm are typically located to within 13 mm
- Testing depth: up to 152 ±25 mm
- Dimensions: 251 x 109 x 63 mm
- Weight: 320 g (approx.)

Concrete durability evaluation



58-E0066

CARBONTEST®

Kit for carbonation depth determination

Standards

EN 13295, UNI 9944

CARBONTEST® is the innovation in establishing the depth of carbonation. It introduces a new method of sampling, which is based on collecting the powder during a perforation carried out using a common percussion drill. A collecting device (picker), designed in careful detail to optimize the powder flow, has been developed to implement the method. Proper designing of the collection container allows analysis of the powder, making use of the chemical colour change of phenolphthalein in a quick and accurate manner.

CARBONTEST® Kit includes:

- 1 no. picker to collect the powder.
- 25 no. test tubes
- 1 no. measuring ruler to measure the powder collected in the test tube
- 1 no. bottle of 1% alcoholic solution of phenolphthalein
- 1 no. Pasteur pipette
- 1 no. cartridge of universal plaster for cement, 250 g, for sealing the collection hole.
- 1 no. block of survey sheets specially researched and designed for use when performing the survey.
- CARBONTEST® Report, processing software for creating a technical report

Ordering information

58-E0066

CARBONTEST® Kit for the determination of the depth of carbonation, comprising: picker, 25 test tubes, ruler, phenolphthalein solution, Pasteur pipette, cartridge of universal plaster, block of survey sheets and dedicated software.

main features

- > Innovative sampling design for measuring carbonation depth, based on the collection of powder
- > Easy sampling, requiring only a percussion drill. Everything needed is included in the kit; no other specialist equipment is necessary
- > Especially light, handy and portable, it can be used by a single operator without the need for specialized technical help
- > No risk to the structure. The hole made is 10 mm across and can be easily sealed using the universal plaster for cement that is included in the CARBONTEST® Kit.
- > Large accessibility to the test space.
- > A detailed and professional report is processed automatically by CARBONTEST® Software.
- > CARBONTEST® Reports set up real-time diagrams showing the spread of carbonation in order to estimate the working life of the structure.
- > Efficient, it can manage depth of carbonation testing whilst cutting financial and physical resources down to a minimum.

Spare parts

58-E0066/1

Spare kit with 25 test tubes, 125 ml phenolphthalein solution, 250 g cartridge of universal plaster.



Drilling phase with powder collection



Application of phenolphthalein solution on the test tube with concrete powder



Carbonation depth analysis by color changing through phenolphthalein application

58-E0063

Carbonation test set

Standards

EN 13295



58-E0063

The carbonation test is a simple procedure for measuring the depth of carbonation through the surface of concrete. The test set consists of two 250 ml washing bottles containing distilled water and phenolphthalein solution, and a depth gauge.

During the test, the broken or cored surface is sprayed with phenolphthalein solution to detect the loss of alkalinity associated with carbonation.

Weight: 0.9 kg (approx.)

Note: the Microcore apparatus (code 58-C0299) described and shown on page 321, can be conveniently used to take small cores suitable to perform the carbonation test.

58-E0035/C

Resonance frequency meter

Standards

ASTM C666 | BS 1881:209 | NF P18-414 | UNI 9771

This meter is used for determining the longitudinal, transverse (flexural) and torsional resonant frequency of concrete and natural stone samples. Obtaining the resonant frequency permits determination of the Dynamic Modulus of Elasticity and the Damping coefficient, frequently used to determine degradation due to freezing and thawing cycles, for example.

The 58-E0035/C meter incorporates a PC card, a 7" colour touch-screen monitor and multiple interfaces (1 x VGA, 1 x LAN and 2 x USB) that enable test data to be managed quickly and easily. The test procedure is easy to follow with the user-friendly displays.

The meter is supplied complete with RES-Lab software which allows the management of data with a PC and the production of test reports.

Technical specifications

Acquisition

- Maximum sampling frequency: 100 kHz (Nyquist: 50 kHz)
- Frequency resolution: min. 12.2 Hz (0-50 kHz), max. 0.49 Hz (0-2kHz)
- Automatic adjustment of the sampling rate
- Accelerometer activation threshold

General

- Battery operated: 7.2 V, battery charger included
- Typical consumption: 900 mA
- Working temperature: 0 to 60°C
- Dimensions: 270 x 120 x 246 mm (w x h x d)
- Weight: 3 kg (approx.)

Accessories

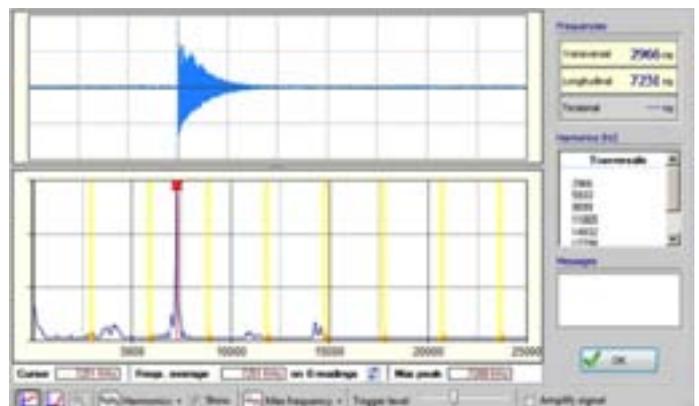
58-E0035/C1

Specimen supporting bench:

- Distance between supports adjustable from 75 mm up to 260 mm
- Supports width: 250 mm
- Distance between columns: 180 mm
- Max sample height / diameter: 160 mm
- Dimensions: 300 x 240 x 245 mm (w x d x h)
- Weight: 1.4 kg (approx.)



58-E0035/C



Example of display



58-E0035/C with specimen



58-E0035/C1

Concrete strength evaluation

The most commonly used non-destructive tests are the ones that provide an indication of the in-situ compressive strength of concrete.

These are normally well-known, simple tests, which have already been specified in many national standards. Controls is able to provide equipment complying with the most frequently used of these standards.



main features

- > In built test procedure conforming to EN 12504-2 and ASTM C805
- > Possibility to create customized test procedures
- > Storage capacity 2 Mb
- > Saving, displaying and downloading data to PC via USB port
- > PC software included
- > Power supply: integrated rechargeable lithium ion battery 1600 mAh capacity
- > Indication of the exact impact angle through internal triaxial inclinometer
- > Multiple correlations between rebound value and compressive strength
- > Programmable user defined algorithms
- > Automatic conversion of rebound value to equivalent compression strength as N/mm², MPa, kg/cm², psi
- > Calculation of averages and standard deviations; discard of outliers
- > Automatic verification of conformity to Standards
- > Battery life under continuous operation more than of 10 hours

Concrete test hammers

Standards

EN 12504-2 | ASTM C805 | BS 1881-202
| NF P18-417 | DIN 1048 | UNI 9189

Concrete hammers are used to evaluate the surface hardness of concrete in order to estimate the strength in various parts of the structure.

Two versions are available:

- Digital user programmable model 58-C0181/DGT
- Standard model 50-C0181/C

58-C0181/DGT

User programmable digital concrete hammer

The rebound hammers measure the rebound of an anvil impacting a plunger in contact with the concrete surface. In this advanced instruments the rebound value is calculated with an innovative technology taking into account the anvil speed before and after the impact.

The rebound value is a measure of the concrete surface hardness.

Advantages of this principle:

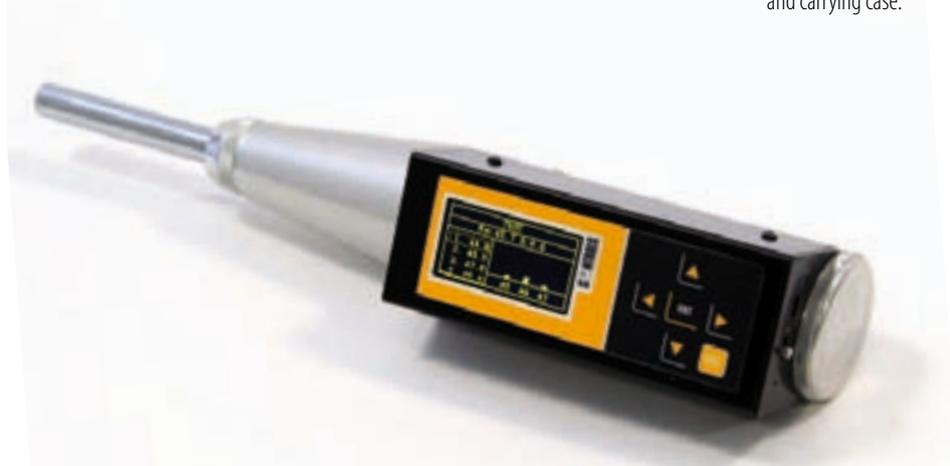
- > higher accuracy and stability of the readings not affected by wear and tear
- > setting of the impact angle no longer required
- > easier calibration procedure

Technical specifications

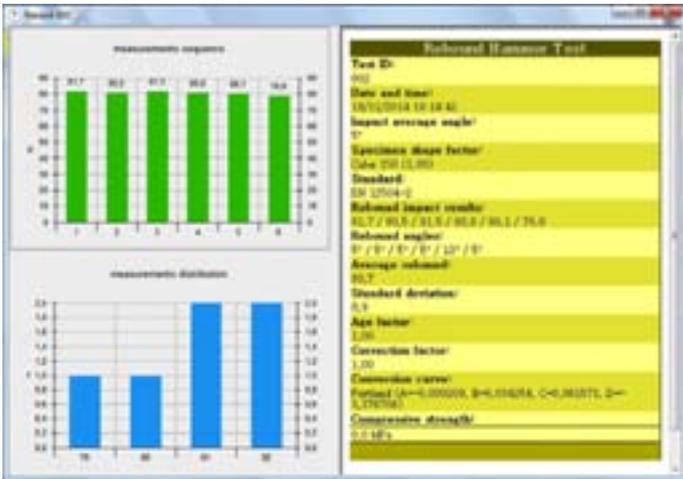
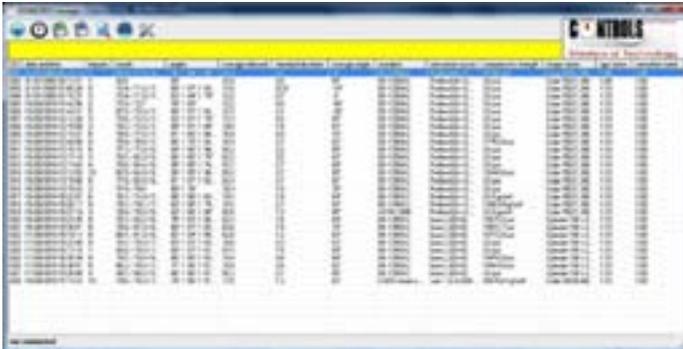
- impact energy: 2.207 Nm
- measuring range: from 10 to 100 N/mm²

- high-contrast graphic display 128 x 64 pixels and 6 soft keys membrane keyboard
- results are displayed as numerical and graphical format
- USB port
- case dimensions: 280 x 100 x 390 mm
- weight: 2 kg approx.

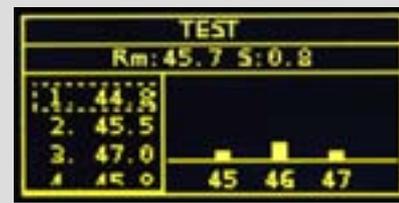
The instrument is supplied complete with: battery charger and cable; USB cable for PC connection; abrasive stone; user manual and carrying case.



Example of PC software screens



Example of screen display



58-C0181/C

Concrete test hammer, standard model

Aluminium body, complete with carrying case, grinding stone and instruction manual.
 - Impact energy 2.207 Nm
 - Measurement range: 10 to 70 N/mm²
 - Weight approx.: 1.5 kg.

The above model is also available complete with traceable calibration certificate, code 58-C0181/C1

58-C0184

Calibration anvil

Used for the periodical calibration of the concrete test hammer 58-C0181/C and 58-C0181/DGT. Made from special alloy steel.
 - Dimensions: 150 mm dia. x 230 mm height.
 - Weight approx.: 16 kg



Concrete strength evaluation



main features

- > Portable equipment for use in any location
- > High-resolution digital display unit
- > Graphic indication of applied load rate
- > Serial port for PC connection
- > Can be powered by AC adapter or battery
- > Indicator of ram position allowing an estimation of the brittle properties of the test sample
- > Supplied with traceable calibration certificate
- > Carrying case included

Pull-off tester

Standards

EN 1015-12 | EN 1348 | EN 1542 | EN 13963 | EN 14496

This apparatus is mainly used to evaluate the bond strength of two layers of concrete or the adhesive strength of a surface coating (e.g. cement plaster, lime, wall plaster) to its base.

The apparatus is basically a dynamometer fitted with a load cell and high-resolution digital display unit. The direct tensile force is applied by rotating the hand wheel. The 16 kN capacity and the high resolution assure a wide working range ideal for a vast number of materials and applications. The tester is supplied complete with carrying case. 20 and 50 mm diameter metal discs, square plate 50x50 mm, hole saws and adhesive compound have to be ordered separately - see Accessories.

Technical specifications

- Load capacity: 16 kN
- Readout unit: Load cell
- Resolution: 10 N
- Working range: 0.25 to 16 kN
- Accuracy: better than 1%
- Power: 9 V battery or AC adaptor
- Dimensions: 340 x 240 x 250 mm (approx.)
- Weight: 3.3 kg (tester only); 5 kg (with carrying case)

Ordering information

58-C0215

Pull-off/Bond strength digital tester, 16 kN capacity, battery or mains powered, complete with AC adapter. 110-240 V/50-60 Hz/1 ph.

Accessories

Hole saws and die

58-C0215/1

Hole saw with centering drill bit to obtain 50 mm diameter test surface.

58-C0215/2

Hole saw with centering drill bit to obtain 20 mm diameter test surface.

58-C0215/12

Metal ring (dinking die), with truncated cone profile for fresh plaster, conforming to EN 1015-12, 5.2.

Test discs and plate

58-C0215/4

Aluminium square plate 50 mm x 50 mm conforming to EN 1348.

58-C0215/5

Aluminium test disc 50 mm diameter x 20 mm thick.

58-C0215/8

Aluminium test disc 20 mm diameter x 20 mm thick.

58-C0215/3

Stainless steel test disc 50 mm diameter x 20 mm thick conforming to EN 1015-12 and EN 1542.

Miscellaneous

58-C0215/13

2-component adhesive: 2 x 15 ml binder and 2 x 15 ml hardener (4 vials).

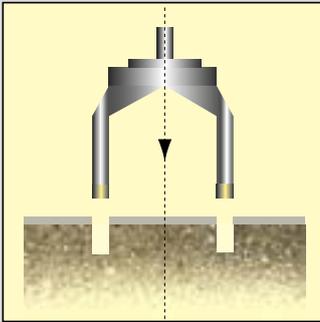
58-C0215/T2

Serial cable for PC connection. Requires a PC with RS232 serial port or RS232/USB adaptor (see our model 82-Q0800/3)

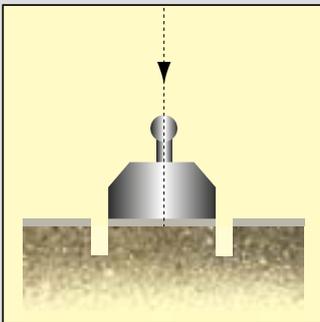


Hole saws and metal discs

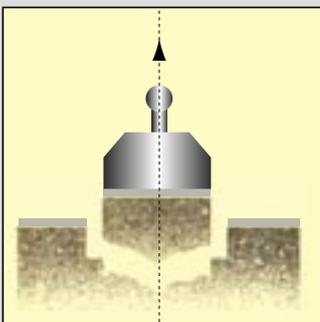
Operating principle



Using a drill, make a circular cut down to the base material, according to the dimensions of the discs, in order to exactly define the testing surface.



Stick a disc of the appropriate size onto the testing surface using a suitable adhesive.



Pull off the cut out section using the unit. The resulting pull-off force is shown in kN on the display.

58-C0178

Pullout test apparatus

Standards

ASTM C900



58-C0178

This apparatus is used for determining the pullout strength of hardened concrete in test specimens or structures by measuring the force required to pull an embedded metal insert and the attached concrete fragment from a concrete mass. It comprises a 100 kN capacity hydraulic jack, a 150 mm diameter precision measuring Bourdon gauge, bearing ring and 10 pullout inserts, all contained in a carrying case. Case dimensions: 740 x 300 x 255 mm Weight: 21 kg (approx.)

Spares

58-C0178/2

ASTM pullout inserts, 30 mm diameter.
Pack of 50.

Concrete strength evaluation



main features

- > Ideal for strength evaluation of concrete up to 37 MPa and mortar joints of existing buildings
- > Portable and completely self-contained
- > Safe to use: non-explosive
- > Economical: steel pin can be reused
- > Can be used to test polymer concrete and patching compound
- > Enables quick and easy quality control of precast elements such as block, brick slabs and pipe

58-C0179/B Windsor pin penetrometer set

58-C0179/B

Windsor pin penetrometer

Standards

ASTM C803

The operating principle of this apparatus is that a spring drives a steel pin into the surface of the material. Since the depth of penetration is inversely proportional to compressive strength, the device provides a fast and safe way of determining the in situ strength of material. The spring is loaded by tightening the retraction nut until the trigger mechanism latch closes to hold the spring in place. With the spring loaded it is held at a distance of 20 mm from the test surface. Once the trigger is pulled there is enough force to

test the compressive strength of concrete or mortar to a maximum of 37 MPa.

After the pin has penetrated the surface, the hole is cleaned with the blower and the penetration depth is measured with the micrometer (both included with the apparatus). The result can then be compared to a previously prepared chart for the compressive strength of your material. Charts for typical mortar and concrete are provided.

Overall dimensions: 430 x 300 x 150 mm
Weight: 8 kg (approx.)

Microcore apparatus

Standards

UNI 10766

The Microcore method is a proven technique for the non-destructive evaluation of concrete and masonry strength, taking 28 mm diameter cores which can then be used for compression tests. Taking the cores does not affect the integrity of the structure because of their small size, so the cored surface can be easily restored.

This technique can also be used for assessing the carbonation depth (with the appropriate reagents) and for masonry products to verify their physical condition or to evaluate compressive strength related to the direction of sampling.

The apparatus consists of the following parts:

- Electric drill
- Flanged guide assembly
- Two clamping pliers to fit the flanged guide assembly to the surface
- Diamond core bit, 28 mm inside diameter, 100 mm long
- Diamond core bit, 28 mm inside diameter, 200 mm long
- Set of accessories comprising 20 anchors, washers and drill bit
- Two carrying cases

Note: to perform the test, if mains water is not available, a pressure water reservoir 10/15 litre capacity should be provided, such as our model 83-D2020. See Accessories.

Specifications

1st case: 500 x 380 x 130 mm, weight 7.5 kg approx.

2nd case: 390 x 300 x 90 mm, weight 3.8 kg approx.



58-C0299

Important note about core preparation and compression:

The flatness of core ends is essential for obtaining reliable compression results so it is very important to make sure that the tolerance is within 0.01 mm. See 45-D0536/A, page 177 Furthermore the compression test should be performed with a suitable compression machine, taking into consideration that the maximum required load should be lower than 50 kN. Cement compression testers or small universal testers may be conveniently used.

Ordering information

58-C0299

Microcore apparatus complete set. 230 V, 50 Hz, 1 ph.

58-C0299/M

Microcore apparatus, mechanical parts only (same as 58-C0299 but without the electric drill).

Accessories and spares

83-D2020

Pressure water reservoir, 15litre capacity.



83-D2020

58-C0299/1

Diamond core bit, 28 mm inside diameter x100 mm length.

58-C0299/2

Diamond core bit, 28 mm inside diameter x200 mm length.

Concrete quality and homogeneity evaluation

To estimate homogeneity and structural integrity the most appropriate methods are those that utilise ultrasonics. The main aim is to measure the transit time of sonic/ultrasonic pulses through concrete.

The pulse velocity is dependent upon the density and the elasticity properties of the material. By comparing pulse velocities it is possible to evaluate homogeneity and identify the presence of cracks, voids, honeycombing, anomalies and non-homogeneity of elastic properties.

To gather more information about the material under study, different test methods can be combined, particularly ultrasonic readings with rebound hammer readings so as to obtain additional data concerning concrete strength.



main features

- > For the non-destructive evaluation of concrete homogeneity and determination of Dynamic Elastic Modulus
- > Ergonomic and compact
- > Lightweight and portable
- > Battery powered
- > Large size digital display (128 x 64 pixel)
- > Digital calibration
- > High quality to price ratio

58-E4800 complete set

Ultrasonic pulse velocity tester

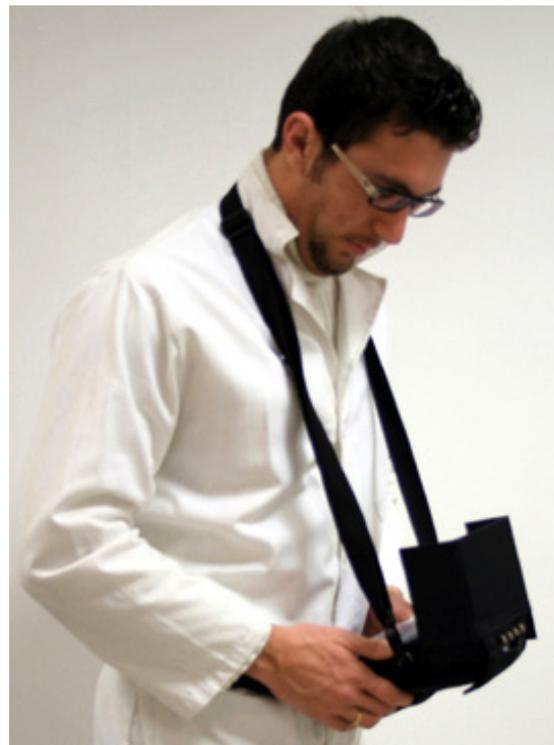
Standards

EN 12504-4 | ASTM C597

The 58-E4800 UPV tester is used for quality control and inspection of concrete. It measures the transit time of ultrasonic pulses through concrete for inspection of new and old structures, slabs, columns, walls, fire damaged areas, precast and pre-stressed beams, cylinders and other concrete forms.

Combined with an oscilloscope (not included), honeycombing, voids, cracks and other non-homogeneous conditions in concrete can be identified.

This lightweight, hand-held instrument is battery powered and incorporates a microprocessor. It is supplied complete with two 50 kHz transducers (transmitter and receiver), calibration rod, 250 cc of coupling agent, instruction manual and carrying case. The meter can also be used with low and high frequency transducers - see Accessories.



58-E4800 easy and practical to use

Technical specifications

- Microprocessor incorporated
- Battery powered with internal rechargeable battery pack (2400 MAh) and external charger
- 14 working hours using 1 Hz pulse rate
- RS 232 output for PC or printer
- Connectable to oscilloscope
- Transit time measurement: from 0.1 to 1999.9 microseconds
- Pulse rate: 1, 2, 5, 10 per second, selectable
- Resolution: 0.1 microseconds
- Transmitter output: 1200 V
- Frequency range: 24 to 150 kHz
- Receiver input impedance: 1 M Ω
- Weight: 0.5 kg (tester only), 2.3 kg (complete set)



58-E4800 during operation

Ordering information**58-E4800**

Ultrasonic pulse velocity tester.

Accessories**58-E0046/30**

24 kHz testing head (1 piece).

58-E0046/33

150 kHz testing head (1 piece).

Spares**58-E4800/P**

Piezoelectric head for ultrasonic tester. Nominal frequency 50 kHz. Can be used either as receiver or transmitter. Fitted with BNC connector for coaxial cable (not included).

58-E0046/2

Spare 2 m cable for testing probe connection

58-E0046/3

Coupling agent (contact paste), 250 cc bottle.



58-E4800 in use. Although the direction in which the maximum energy is transmitted is at right angles to the face of the transmitting transducer, it is possible to detect pulses which have travelled through concrete in other directions: adjacent faces (semi-direct transmission) or same face (indirect or surface transmission).

Concrete quality and homogeneity evaluation



58-E4900 Detail

main features

- > Digital scope, 2 MHz sampling rate, 12-bit resolution
- > Advanced picking algorithm providing the real arrival time of the pulse
- > Signal processing by FFT method (Fast Fourier Transform)
- > Assessment of concrete strength with combined method Ultrasonic velocity/Rebound index (SonReb)
- > 7 selectable pre-amplifier gains (impulse amplitude)
- > Data saved on memory card (2 GB=30000 tests)
- > 6" multifunctional touchscreen display
- > Strong carrying case included

58-E4900

Ultrasonic pulse analyzer

Standards EN 12504-4 | ASTM C597

The ultrasonic tester 58-E4900 is used for measuring the velocity of ultrasonic pulses through a concrete section, providing information on cracks, voids and strength, and giving quick estimates of Dynamic Modulus of Elasticity on site or in the laboratory. It can also be used to estimate times for formwork striking. The pulse velocity can be combined with the rebound hammer value for the strength evaluation of concrete.

The analyzer comes in a sturdy, portable case and has a large backlit touch-screen display that makes use of the apparatus practical and easy. Another tester for routine measurements is also available. See Ultrasonic pulse velocity tester, page 322

The Ultrasonic pulse analyzer 58-E4900 is provided complete with dedicated spreadsheet allowing download and post-processing of the test data.

Main applications

Standard UPV measurement with incorporated oscilloscope.

Conforming to EN 12504-4 and ASTM C597. The Dynamic Modulus of Elasticity can also be determined with this application as the meter features a very accurate measurement of the transit time.

Measurement of the Attenuation of the Transmitted Energy.

Very often the transit time alone is not enough to identify discontinuities and small areas of damage such as micro-cracking of concrete. With this technique however, these can be located well with proper processing of the acquired waveforms.

Frequency Spectrum Analysis by FFT Method (Fast Fourier Transform-Algorithm).

For determining the natural frequency of the ultrasonic pulse transmitted through the material. This determination is suitable for the examination of the pulse path and gives indications about possible cavities, delamination, multi-layer elements or other similar discontinuities.

Concrete Strength Evaluation combining the Rebound number and the UPV transit time.

It is possible to use our Digital concrete hammer (58-C0181/DGT) to obtain the average rebound number. This value can then be inserted into the dedicated menu of the UPV tester in order to combine a typical surface measurement with the deeper UPV transit time and obtain more reliable and extensive information.

Other applications include identifying and evaluating, for example, crack depth, honeycombing, and injection quality.

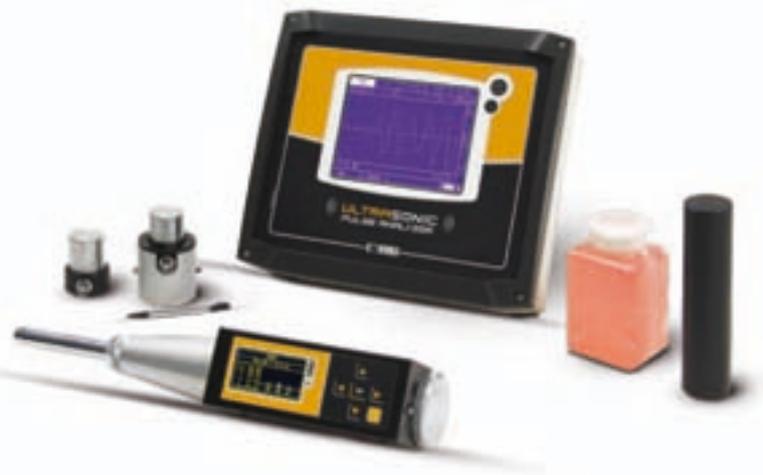
Technical specifications

- 2 MHz sampling rate with 12-bit resolution
- 8 selectable low-pass filter cut frequencies
- Advanced signal processing (Transit time, Wave shape, FFT, SonReb)
- Selectable pulse rate 1, 2, 5 per second
- Transmitter pulse 2500 V
- Transit time up to 16 ms with 0.1 μ s resolution

- Slot for memory card to save data
- RS 232 and USB port for real time downloading to PC
- Battery powered by internal rechargeable battery pack (7.2 Ah) up to 9 working hours before recharging
- Dimensions: 264 x 233 x 83 mm (instrument only); 500 x 400 x 140 mm (carrying case)
- Weight: 2.6 kg (instrument only); 5 kg (complete outfit) (approx.)



58-E4900 complete set



58-C0181/DGT Digital concrete hammer and 58-E4900 PULSONIC Ultrasonic pulse analyzer



Time menu for acquisition, display and storage of waves received

Ordering information

58-E4900

PULSONIC Ultrasonic pulse analyzer, standard outfit, comprising two 50 kHz testing heads (one of the two probes is fitted with a sampling button to select readings to be recorded), 2 m cables, calibration rod, bottle of contact paste and carrying case.

Accessories

Testing heads (probes)

The standard 50 kHz transmitter and receiver heads are supplied with the tester. Different heads are available with different nominal working frequencies of 25 and 150 kHz, which is the usual range for normal concrete. The higher one (150 kHz) is recommended for homogeneous concrete, the lower (25 kHz) for heterogeneous concrete. Model 58-E0046/5 special probes with exponential profile, are used for identification of minute cracks, air bubbles or material with low density. Two pieces are required. See table below.

Spare parts

58-E4800/P

Piezoelectric head for ultrasonic tester. Nominal frequency 50 kHz. Can be used either as receiver or transmitter. Fitted with BNC connector for coaxial cable (not included).

58-E4900/P

Piezoelectric head with sampling button for ultrasonic tester series 58-E4900. Nominal frequency 50 kHz. Fitted with BNC connector for coaxial cable (not included).

58-E0046/2

Spare 2 m cable for testing probe connection

58-E0046/3

Coupling agent (contact paste), 250 cc bottle.

Concrete hammers

58-C0181/C

Concrete test hammer, classic model, aluminium case (see page 317).

58-C0181/DGT

Digital concrete test hammer (see page 316).

Testing heads (probes)

Product code	Nominal frequency (kHz)(approx.)	Dimensions
58-E0046/30	25	Dia. 50 x 74 mm
58-E0046/33	150	Dia. 50 x 52 mm
58-E0046/5	50	Dia. 7/50 x 82 mm (exponential profile)



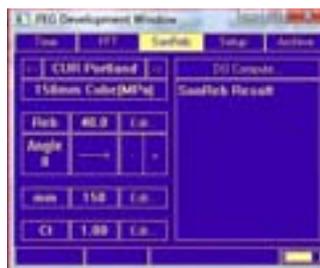
FFT menu for displaying Fast Fourier Transform of the signal



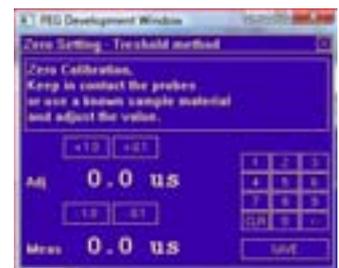
Menu for acquiring, showing and saving the received waveform



Setup menu for setting operative parameters

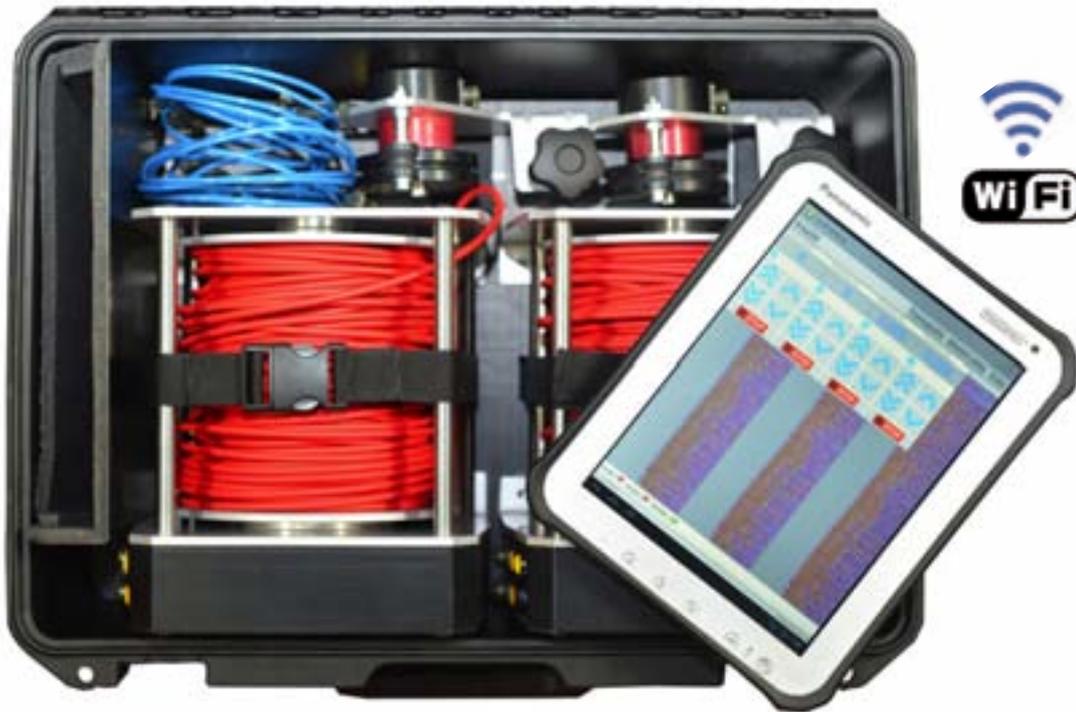


SonReb menu for evaluating the concrete strength combining the ultrasonic and concrete hammer measurements



SonReb menu for evaluating the concrete strength combining the ultrasonic and concrete hammer measurements

Concrete quality and homogeneity evaluation



58-E4600/E

Wireless modular system for cross-hole investigation on foundation piles

Standards ASTM D6760

The cross-hole method is aimed to investigate the foundation piles of buildings, which, with the use of cross-hole ultrasonic pulses, allows accurate, high-resolution tests to be carried out. An ultrasonic wave is sent from a transmitter to a receiver and is conveyed automatically by the device along the entire length of the pile via the pipes embedded into it during casting. The speed of the sonic wave and its energy are strongly influenced by the quality of the concrete and it is therefore possible to assess the characteristics and give a tomographic representation in 2D and 3D.

Operating principle

The instrument 58-E4600/E is a complete system for performing structural tests by ultrasound on piles, deep foundations, infrastructural works or buildings. Each reel system has a motorized probe with 60 m of cable and also houses the battery plus all the electronic controls that automatically manage the probe during the descent / ascent phases (cross-hole) and saving of the test data.

The configuration eliminates the need for physical cables and it is supplied with a 10.4" Rugged Android tablet which allows the setting all parameters, test management, and display / processing of the acquired test data in an easy, immediate and wireless way.

The system can directly manage up to 4 motorized coil systems from one tablet. Using 2, 3 or 4 motorized reels it is possible to increase the survey productivity and

reduce testing time: with a single ascent / descent of the probes in the pile to be checked (which must have 2, 3 or 4 integral pipes) it is possible to obtain results for the corresponding sections. The data are acquired at each pulse and displayed in real time on the tablet screen allowing any imperfections in the structure being inspected to be spotted immediately.

The procedure for running cross-hole surveys with 2, 3 or 4 channels is managed in a fully automated way. The only manual operations required are the positioning of the encoders for reading the position of the motorized probes on the pipes and the initial alignment of the probes on the pile head.

The test is started by simply pressing a button and it is possible to verify the test data step-by-step in order to check the test progress in real time.

The system comprehends 2 motorized reels (each unit includes motorized probe with 60 m cable; integrated battery and positioning encoder); Rugged Android tablet, 10.4" with dedicated application and carrying case

Technical specifications

Acquisition:

- time bases: 100 ns; 200 ns; 500 ns; 1 us; 2 us; 5 us; 10 us; 20 us
- sample resolution: 12 bit
- samples per event: 2048
- amplification factors: x1; x2; x4; x5; x8; x10; x16; x32
- band width: 50 MHz
- filter for ultrasounds: central frequency 50 kHz

Probes

- hole: resonant frequency of 52 kHz, diameter 35 mm
- peak excitation voltage: 500 V (standard) 2000 V (high)
- maximum pulse output frequency: 1 per second
- measuring step increment: 10 mm
- motorized reels: 2, 3 or 4 no. with 60 m cable
- position encoder: 2, 3 or 4 no.; accuracy 1.4 °
- speed and alignment: managed automatically
- hardware buttons for drive motors
- automatic switching transmit / receive ultrasonic

General

- complete control from Rugged tablet with dedicated Android application
- wireless technology: WiFi - 2.4 GHz - 802.11 b
- wireless synchronization: 5 GHz, 8 selectable channels
- selection radio channel: automatic
- power supply: 12V DC, 1 Li-Ion battery 10.5 Ah for each reel
- average intake (per reel): 180mA (standby) - 600mA (during measurement)
- diagraphy processing software: compatible with Microsoft Windows® operating systems
- ambient operating conditions: -20 to 80 °C
- single unit dimensions: 220 x 250 x 225 mm (L x W x H)
- carrying case dimensions: 538 x 406 x 270 mm (L x W x H)
- single unit weight approx.: 9.3 kg
- complete carrying case weight approx.: 27 kg

Ordering information

58-E4600/E

- Wireless modular system for Cross-Hole ultrasonic investigation on foundation piles comprising:
- 2 motorized reels: each unit includes 52 kHz probe with 60 m cable, integrated wireless system, integrated battery and positioning encoder
 - rugged Android tablet 10.4" with dedicated application
 - carrying case



Complete cross-hole system with 2 motorized reels. On site application.



58-E4600/E. Complete set, easily transportable with the very small wheeled suitcase

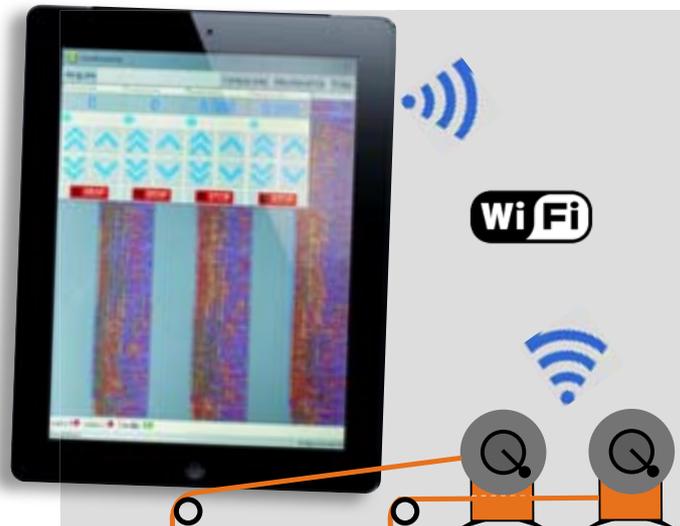
Accessories

58-E4600/E1

- Expansion options for 1 additional channel for Cross Hole instrument code 58-E4600/E, comprising:
- 1 motorized reel: the unit includes 52 kHz probe with 60 m cable, integrated wireless, integrated battery and positioning encoder
 - carrying case

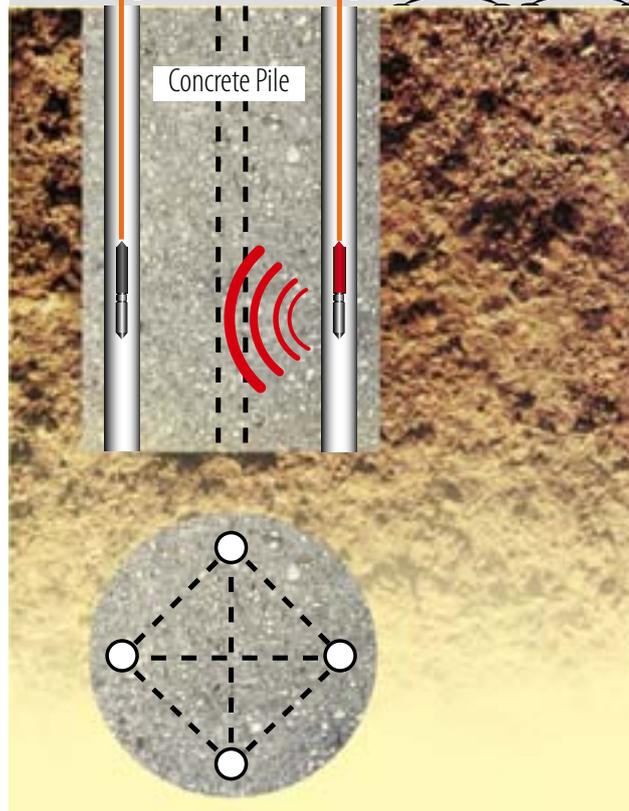
58-E4600/E2

- Expansion options for 2 additional channels for Cross Hole instrument code 58-E4600/E, comprising:
- 2 motorized reels: each unit includes 52 kHz probe with 60 m cable, integrated wireless system, integrated battery and positioning encoder
 - carrying case



Integrated motorized reel including the probe with 60 m cable; battery and control panel

Operating principle with integrated wireless system comprising 2 motorized reels with 52 kHz probes and 60 m cable



Pile section

The double reels system 58-E4600/E may be integrated with 1 (58-E4600/E1) or 2 (58-E4600/E2) additional measuring unit in order to increase the survey productivity on site. The whole system is managed directly by the tablet, included with 58-E4600/E, through WI-FI communication. In case of multi-reels system (up to 4) the tomographic investigation is performed providing complete information on pile quality and homogeneity over its whole length.

Structural inspection and monitoring

In addition to the previous more common methods used in non-destructive testing, the following range of instruments can measure geometric or physical parameters such as displacement and deformation.

The complexity of the instrument or system selected can be varied according to the level of sophistication required. This may go from the measurement of a single parameter such as crack width, up to a multiple structural monitoring system.

58-C0239

Digital instrumentation for testing structures

The determination of deflection of ceilings, bridges or any suspended structure can be easily performed using this modern digital system. This independent data acquisition unit, equipped with graphic display, high sensitivity keyboard and removable S.D. memory, is also ideal for acquisition from different types of sensors.

The testing set includes 8 channels Datalogger battery operated, three telescopic supports with displacement transducers and software for data acquisition and processing.

Additional transducers with telescopic supports can be ordered separately. See 58-C0239/1.

General description and specifications

Datalogger

- Resolution: 24 bit
- Number of channels: 8
- Maximum range of inlet signal (without influence): 0-2.5 V
- LCD graphic display 320x240 pixel (4.6")
- Battery operated: AA type rechargeable and replaceable (12 V-2.5 Ah. Battery charger 110-240V, 50-60 Hz, 1ph included.
- Recording:

Recording intervals from 10 seconds to 10 hours

Watch: integrated with buffer battery

Recording support: removable SD memory up to 2 GB

Data format: TSV, BMP

Measurement type: relative or absolute

Interface: LAN, USB

- Container: anti-crush

- Dimensions (l x h x d): 270x120x246 mm

- Weight: 3 kg approx.

Displacement transducers and telescopic supports

- Light alloy telescopic supports for measurements from 1.80 to 6 m. 3 pieces included.
- Displacement transducers, pre-loaded spring type, 50 mm travel, accuracy 0.01 mm. 3 pieces included.
- Weight (each unit): 5.5 kg approx.

PC Software

- Data and graphics displayed in real time
- Possibility of analyzing graphics achieved by one or more channels simultaneously
- Report creation with both in numerical and graphical format
- Accepts LAN and USB connections

Ordering information

58-C0239

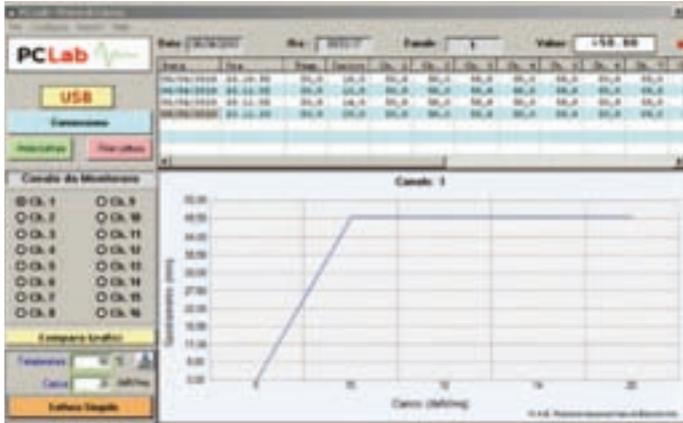
Digital system for structural testing including No 3 aluminium telescopic supports with 50 mm displacement transducers and 3 cables 10 m long; 8 channel Datalogger; data acquisition and processing software, battery charger and carrying bag.



Additional measurement element

58-C0239/1

Additional measurement element for 58-C0239 system, including one aluminium telescopic support (max. extension 6 m), displacement transducer 50 mm travel and 10 m cable. Weight 5.5 kg approx.



Example of PC software screen



Typical application of the 58-C0239 System

Flexible cisterns for loading structures

Made from polyester fiber in PVC envelope. Filled with water, used for loading structures to measure deflexions. Available in different sizes.



Models	Dimensions m	Volume m ³	Weight	Cubage m ³
58-C0239/10	2.50 x 2.25 x 0.70	2.5	18 kg	0.07 (folded)
58-C0239/11	2.50 x 3.50 x 0.80	5.0	25 kg	0.1 (folded)
58-C0239/12	3.75 x 4.25 x 1	10.0	45	0.2 (folded)

Accessories

58-C0239/13

Digital liter-counter, battery operated



Detail of displacement transducer



Telescopic support

Structural inspection and monitoring



main features

- > Digital gauge with 0.001 mm resolution
- > Serial output for PC connection (using 82-D1261/LINK cable not included, see Accessories and spares)
- > Complete set including double function bar for datum discs positioning and extensometer zeroing

58-C0230/30D complete set

Mechanical strain gauges

Standards

ASTM C426 | BS 1881:206

This apparatus used for determining length changes was originally designed for use on concrete structures, but can also be conveniently used for any other type of structure including steel. The test set includes an extensometer with a 0.001 mm resolution digital gauge, double function standard and calibration bar, fifty datum discs, adhesive compound for datum discs and a carrying case.

Two models are available, with 100 and 300 measuring bases.

Carrying case dimensions:
300 x 400 x 110 mm
Weight: 2.1 kg (approx.)

Ordering information

58-C0230/10D

Mechanical strain gauge for the measurement of length variation. Measuring base 100 mm x 5 mm range. Digital gauge, 0.001 mm resolution, output for PC connection (special cable required, see Accessories and spares).

58-C0230/30D

As above but measuring base 300 mm.

Accessories and spares

82-D1261/LINK

Serial cable for PC connection.

58-C0230/1

Datum discs. Pack of 50. Weight 100 g.

58-C0230/2

Tube of adhesive, 20 g.



58-C0230/30D

58-C0218

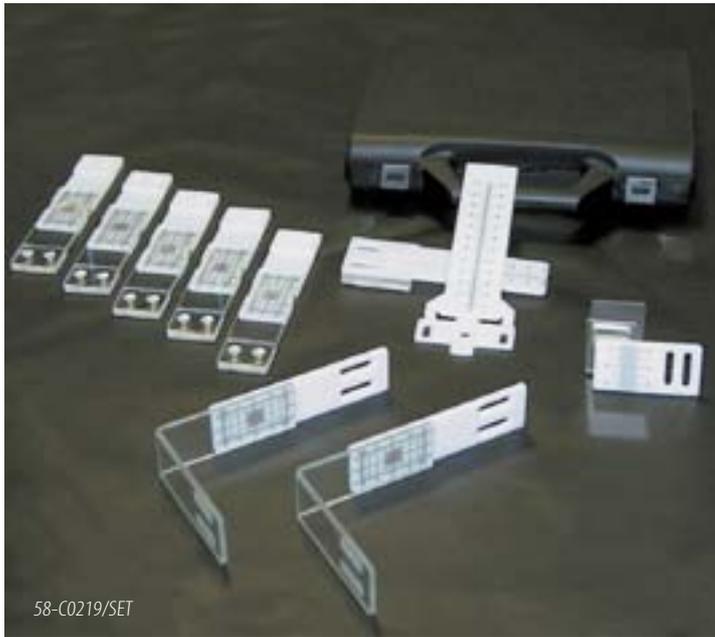
Crack measurement microscope

This is a high quality microscope designed for measuring crack widths in concrete members, masonry walls and other structures. The image is illuminated by the adjustable lamp unit and focused by turning a knob. The eyepiece scale can be turned through 360° to align with the direction of the crack or pitch under examination.

Technical specifications

Magnification: 40x
Measuring range: 4 mm
Subdivision: 0.02 mm
Battery powered
Dimensions: 150 x 80 x 45 mm
Weight: 550 g (approx.)





58-C0219/SET

Crack width gauges

Made from plastic, in four different versions for measuring the widths of cracks in walls, corners, floors and the difference of level between two surfaces. When purchased as a set, a carrying case is included.

Ordering information

58-C0219/A1

Crack width gauge for walls. Pack of 5.

58-C0219/B1

Crack width gauge for corners. Set of 2.

58-C0219/C1

Crack width gauge for floors.

58-C0219/D1

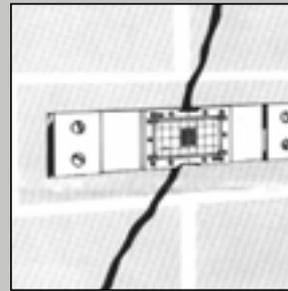
Crack width gauge for difference of level.

58-C0219/SET

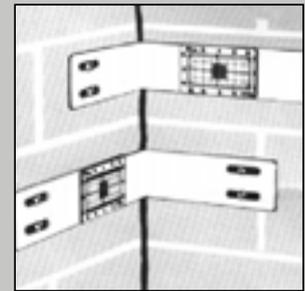
Complete set of crack width gauges including 58-C0219/A1 (for walls), 58-C0219/B1 (for corners), 58-C0219/C1 (for floors), 58-C0219/D1 (for difference of level) and carrying case. Weight 0.5 kg approx.

main features

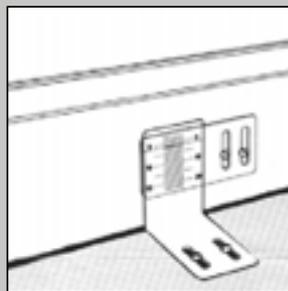
- > Internal or external use
- > Monitors the opening or closing of cracks with accuracy of 1 mm
- > Crack record cards supplied with each gauge simplify monitoring
- > Capable of monitoring vertical as well as horizontal movement



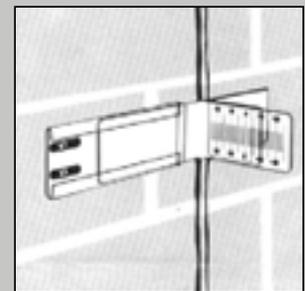
58-C0219/A1



58-C0219/B1



58-C0219/C1



58-C0219/D1



58-C0219/A1, C0219/C1, C0219/B1 and C0219/D1

58-C0223

Swing-arm deflectometer

Used for determining the deflection of bridges, ceilings or any suspended structure.

Comprising: three swing arms with clamps for total orientation in any position; three 20 m wire coil's; three 30 x 0.01 mm dial gauges; three plumb weights; one carrying case.

Weight: 3 kg (approx.)

Spare parts

58-C0224/1

20 m low thermal deformation steel wire.



Structural inspection and monitoring

Flat jacks

The in-situ stress, deformability and resistance characteristics of masonry can be determined by the flat jack method. The test is performed by making a cut to a uniform depth into the mortar courses and inserting the flat jack or a pair of jacks, which are then pressurized to the desired level.



There are two test configurations:
A single flat jack for stress determination;
Two flat jacks for deformability and resistance determination.

The flat jacks have to be pressurized and the strain measured using an analogue or digital setup with the following equipment (see Accessories for details):

Analogue measurement

- 58-D0568/A Hydraulic pump with gauge
- 58-D0567/RS Connecting hose (to connect the two jacks - for deformability and resistance determination only)
- 58-C0230/30D Mechanical strain gauge

Digital measurement

- 58-D0568 Hydraulic pump (without gauge)
- 82-P0050 Pressure transducer
- 82-P0349/ELT Connection cable for pressure transducer
- 58-D0567/RS Connecting hose (to connect the two jacks - for deformability and resistance determination only)

- 58-D0585 Electronic extensometer (one to three)
- 82-P9008 DATALOG8, 8-channel data acquisition system

Note: In order to conveniently fill the testing cut, sets of steel sheets of the same dimensions as the flat jack should be used. See Accessories.

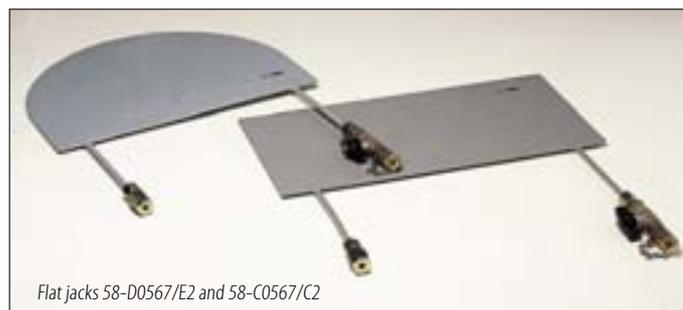
Weights:

- 58-D0567/C2, 58-C0567/C20 1,5 kg (approx.)
- 58-D0567/E2, 58-D0567/E20 1,5 kg (approx.)

Ordering information Flat Jacks

58-D0567/C2

Rectangular flat jack, 400 x 200 x 4,5 mm, 50 bar maximum working pressure.



Flat jacks 58-D0567/E2 and 58-C0567/C2

58-D0567/C20

As above but without valves.

58-D0567/E2

Semi-oval flat jack, 350 x 260 x 4,5 mm, 50 bar maximum working pressure.

58-D0567/E20

As above but without valves.

Accessories

Steel sheets to fill the testing cut

58-D0567/C11

Set of five rectangular steel sheets, 400x200 mm.

58-D0567/E11

Set of five semi-oval steel sheets, 350 x 260 mm.

For applying load

58-D0568/A

Hydraulic hand pump with pressure gauge, 0-100 bar scale. Complete with integral reservoir and 3 m of flexible hose. Weight 8 kg approx.

58-D0568

Hydraulic hand pump, without gauge, complete with integral reservoir and 3 m of flexible hose.

58-D0567/RS

Connecting hose to connect two jacks. (Only required for deformability and resistance determination.)

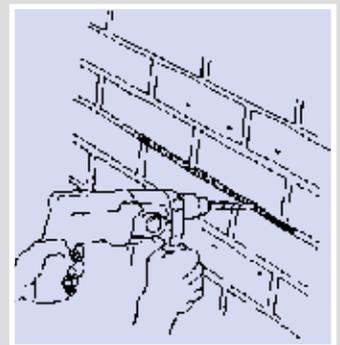
For strain measurement (analogue configuration)

58-C0230/30D

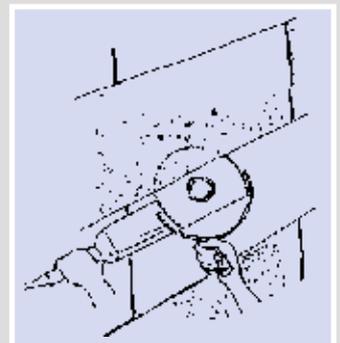
Mechanical strain gauge for the measurement of length variation. Measuring base 300 mm x 5 mm range. Digital gauge, 0.001 mm resolution, output for PC connection (special cable required, see 82-D1261/LINK).



Typical application of two semi-oval flat jacks with mechanical strain gauge for determining the strength and deformability features



Preparation of slots for the flat jacks on a brickwork surface using a simple drill, overlapping holes and completing manually



Preparation of the cut for the semi-oval and circular segment flat jacks using a cutting saw.

For strain and load measurement (digital configuration)

58-D0585

Tubular electronic extensometer (one to three) consisting of a tubular telescopic frame fitted with an electronic displacement sensor. It has to be attached to the wall using normal anchor bolts. Suitable cable is necessary for connection to DATALOG8

Measuring range: 10 mm
Span: 300 mm
Linearity: 0.3%
Weight: 0.2 kg (approx.)

82-P0050

Pressure transducer, 0-50 bar.

82-P0349/ELT

Connection cable for connecting transducer to data logger.

58-D0568/4

Connecting coupling for pressure transducer.

82-P9008

- DATALOG 8, 8 channels stand alone multipurpose data logger.
- Adjustable 5.7" touch screen colour graphic display
 - 8 independent input analogue channels
 - Numerical and graphical display of readings
 - Compatible with load cells, pressure transducers, strain gauges, LDT / LVDT / potentiometric displacement transducers
 - Programmable VEXC via firmware from 1 to 10 V for each couple of channels (up to 4)
 - Effective resolution: 131,000 points
 - Power: 110-230V / 50-60Hz / 1 Ph
 - 110-230V / 50-60Hz / 1 Ph

Note: requires power supply. Battery packs for in situ application are available as accessories. See page 553

82-P9008/ELT

Set of four cables for connecting load cells, pressure transducers, strain gauges, LDT / LVDT / potentiometric type displacement transducers to DATALOG 8 (82-P9008)

Note: cables P9008/ELT are necessary in addition to 82-P0349/ELT



Typical application with digital configuration composed with 3 electronic tubular transducers 58-D0585, pump assembly 58-D0568 fitted with pressure transducer 82-P0050, suitable cable P0349/ELT and DATALOG 8 82-P9008 for complete data acquisition.

82-P9008/SOF

DATA COMM 2

data acquisition software and LAN cable for PC connection of DATALOG 8 (82-P9008).

- Up to 8 data logger (total 64 channels) can be connected to a single PC creating a modular network (LAN hub is required)
- Free user setting of channel groups (nr. and type of channels)
- Numerical and graphical display of the readings
- Fully customizable multi-diagrams function including multi-channels plotted against the same axes and / or one channel plotted in relation to another
- Data export ASCII format
- Possibility to save and recall different calibration files allowing quick transducers swapping



58-D0568/A

Cement testing

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64 Building lime, grout and mud testing	350
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Inorganic binders have had a role in the construction industry since pre-classical times and, after successive transformations, are today briefly classified as cements, limes and plasters. Today, the various types of binders are well known, particularly cements, and they are becoming ever more sophisticated with pre-mixed cements designed to satisfy specific structural requirements.

We produce a vast range of machines and testing equipments described and illustrated in the above 62, 63 and 64 Sections, that satisfies practically all requirements prescribed by the testing Standards.

The apparatus and equipment for Strength evaluation are described and illustrated on Section 65.

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65 Determination of cement strength

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Cement samplers

Standards

EN 196-7 | ASTM C183 | AASHTO C127

Two models of cement sampler are available:

- **62-L0001** Packaged cement tube sampler.
Used to sample cement from packages. Made of brass, it has an outside diameter of 32 mm and is 700 mm long.
- **62-L0002** Bulk cement sampler.
Used to sample cement in bulk storage or bulk shipments. It consists of two concentric brass tubes with slots. The inner tube rotates to close the slots and take the sample. The capacity of the internal tube is approx. 3 litres.

Ordering information

62-L0001

Tube sampler for packaged cement.
Weight 2 kg approx.

62-L0002

Sampler for bulk cement.
Weight 5 kg approx.



62-L0001



62-L0002

Specific gravity (relative density)

Standards

EN 196-6 | ASTM C188 | AASHTO T133

62-L0003

Le Chatelier flask

Used to determine the specific gravity of hydraulic cement and lime, this 250 ml capacity flask is made of glass and has a neck with graduated markings from 0 to 1 ml and from 18 to 24 ml in 0.1 ml intervals with an accuracy of 0.05 ml.

Weight: 500 g (approx.)

Accessories

62-D1635

Chattaway spatula, made from pure nickel, 120 mm long



62-L0003



62-D1635

Air content of mortar, density method

Standards

ASTM C185 | AASHTO T137

62-L0048

Steel measure

The density method is used to determine the air content of freshly mixed mortars. The mould is made of steel, 88.1 mm high x 76.2 mm inside diameter, and is calibrated to hold 400 ± 1 ml of water at 23 °C.

Capacity: 400 ml

Weight: 800 g (approx.)

Accessories

62-D1635

Chattaway spatula, made from pure nickel, 120 mm long.

63-L2700/E24

Glass plate, 120 mm diameter.

63-L0040/11

Hardwood tamper 12 x 25 x 150 mm.



Steel measure 62-L0048 with accessories 62-D1635, 63-L2700/E24 and 63-L0040/11

Carbon dioxide content of cement

Standards EN 196-2

62-L0004

Apparatus for the determination of the carbon dioxide content of cement

220 V, 50-60 Hz, 1 ph.

The testing equipment consists of: a Y-piece with Mohr clip; CO₂ absorption tower for gas or air stream; dropping funnel; distillation flask with electric mantle heater and three-armed still head; condenser; wash bottle for concentrated sulphuric acid; two absorption U-tubes for hydrogen sulphide and water respectively; and three absorption tubes for water and carbon dioxide (two for weighing, the third for protection). Chemicals are not included. Gross weight: 8 kg (approx.)



62-L0004

Cement water retention

Standards

ASTM C91 | ASTM C110 | ASTM C207 | ASTM C1506

This apparatus is used for determining the water retention value of cement and lime.

Ordering information

62-L0061/B

Water retention apparatus including an aspirator pump, vacuum regulator, vacuum gauge, three way stopcock, flask, rubber gasket, brass funnel, perforated brass dish, filter paper and stand.

Weight: 8 kg (approx.)

62-L0061/C

This model includes a vacuum pump with ultimate vacuum 0.1mbar, digital vacuum regulator complete with vacuum gage 1mbar resolution as requested by the Standard, three-way stopcock, metal perforated dish, rubber gasket and funnel 230 V/50-60 Hz/1ph

Note: for more information on the Vacuum pump and Digital vacuum regulator see page 569



62-L0061/B

Bulk density of cement

62-L0060/A

Cement bulk density apparatus

This apparatus is used to determine the bulk density of cement as specified by the "Commission des méthodes d'essai des matériaux de construction". It consists of a sieve funnel, a 1 litre capacity unit weight measure, a tripod and a straightedge.

Overall dimensions: 350 x 350 x 520 mm

Weight: 3 kg (approx.)



62-L0060/A

Soundness of cement and hydrated lime

Standards

EN 196-3 | EN 459-2 | ISO 9597 | BS 6463 | NF P15-432 | UNE 80102

Le Chatelier moulds

Used for determining the expansion of cement, Le Chatelier moulds consist of a spring-tensioned split cylinder 30 mm inside diameter and 30 mm high, with two indicator stems attached either side of the split which measure 165 mm from their tips to the centre of the cylinder, and an O-ring. Two or three moulds are required for each test. A water bath is also required: 62-L0025/F version for performing tests conforming to the EN 196-3 standard and 64-L0025/G Steam cabinet version for the EN 459-2 standard concerning building lime.

Three packages are available:

- 62-L0025 Single Le Chatelier mould, identified by a serial number, individually checked and supplied with a certificate of conformity.
- 62-L0025/C Pack of six 62-L0025 Le Chatelier moulds.
- 62-L0025/B Le Chatelier soundness kit. This package includes all the accessories needed to perform the test and verify the conformity of the moulds, all contained in a carrying case.

The kit consists of:

- Three 62-L0025 Le Chatelier moulds
- Six 62-L0025/2 50 x 50 mm glass plates
- Three 62-L0025/3 100 g weights
- One 62-L0025/4 extensibility of mould apparatus
- One 62-L0025/5 tamping rod, 17 mm diameter x 70 g weight
- One 62-L0025/6 steel rule

Note: all of the above parts can be purchased individually.



62-L0025/B



Use of the extensibility of mould apparatus 62-L0025/4, included with 62-L0025/B kit



62-L0025. Each mould is supplied complete with a certificate of conformity

Ordering information

62-L0025

Le Chatelier mould, weight 30 g approx.

62-L0025/C

Le Chatelier moulds, pack of 6, weight 150 g approx.

62-L0025/B

Le Chatelier soundness kit, weight 1 kg approx



62-L0025/C

Le Chatelier water bath

Standards

EN 196-3 | ISO 9597 | BS 6463 | NF P15-432 | UNE 80102

This water bath has a stainless steel internal chamber housed in an insulated stainless steel exterior case and is capable of heating water to boiling point in 30 minutes. It comes complete with a rack for twelve 62-L0025 moulds.

Ordering information

62-L0025/F

Le Chatelier water bath.
 Outside imensions: 465 x 275 x 200 mm (w x d x h)
 Weight: 10.5 kg (approx.)
 Power: 1500 W
 220-240 V, 50-60 Hz, 1 ph.
[62-L0025/FZ](#)
 As above but 110 V, 60 Hz, 1 ph.

Steam cabinet for soundness of building lime

Standards EN 459-2

For use with 62-L0025 Le Chatelier moulds, this bath is designed for the determination of the soundness of building lime which is subjected to the continuous action of steam at atmospheric pressure for a period of 180 ±10 minutes. The bath, identical in shape to the 62-L0025/F, has a stainless steel internal chamber housed in an insulated stainless steel exterior case.

Ordering information

62-L0025/G

Steam cabinet.
 - Outside dimensions: 465 x 275 x 200 mm (w x d x h)
 - Weight: 11 kg (approx.)
 - Power: 700 W
 - 230 V, 50-60 Hz, 1 ph.

[62-L0025/GZ](#)

As above but 110 V, 60 Hz, 1 ph.

Expansion of portland cement

Standards

ASTM C151 | UNE 7207

High pressure cement autoclave

The autoclave is a high-pressure steam vessel with internal dimensions of 154 mm diameter and 430 mm height to accept a rack for holding 10 specimens obtained with the 62-L0033/B moulds (see Accessories). It is supplied complete with pressure gauge, pressure regulator, temperature regulator, control switches, safety valve and specimen rack.

Certified conforming to ISPELS procedure.

Specifications

Power: 2600 W
 Overall dimensions: 450x475x1080 mm
 Weight: 55 kg (approx.)

Ordering information

62-L0032/A

High pressure cement autoclave. 230 V, 50-60 Hz, 1 ph.
[62-L0032/AZ](#)
 As above but 110 V, 60 Hz, 1 ph.

Accessories

62-L0033/B

Two gang prism mould, 25 x 25 x 285 mm, complete with contact points. Gauge length 250 mm, total length 285 mm. Weight 6 kg approx.

Spare parts

62-L0033/B2

Spare contact points for 62-L0033/B moulds. Pack of 10.



62-L0025/F, 62-L0025/G



62-L0033/B



62-L0032/A

Length change of cement paste, mortar, concrete

Standards

ASTM C596 | ASTM C490 | ASTM C157 | ASTM C151

Shrinkage mould 25x25x285 mm

This mould is the same one used for the expansion of Portland cement test with the high pressure autoclave. See page 339

Ordering information

62-L0033/B

Two gang prism mould, 25 x 25 x 285 mm, complete with contact points. Gauge length 250 mm, total length 285 mm. Weight 6 kg approx.

Accessories

62-L0035/A

Length comparator, digital gauge 12.5 x 0.001 mm, with output for PC connection (special cable required, see below).

Spare parts

62-L0033/B2

Spare contact points for 62-L0033/B moulds. Pack of 10.

Hydraulic shrinkage of cement mortar

Standards

EN 12617-4 | EN 12808-4 | NF P15-433 | UNI 6687

Shrinkage moulds 40x40x160 mm

These moulds are used for the determination of linear shrinkage of cement mortars. The 62-L0009/F version conforms to EN 12617-4 and can also be used for testing grouts conforming to EN 12808-4 by replacing the standard plugs with the 62-L0010/H2 versions and placing two 15x40x160 mm plastic inserts 62-L0010/H3 inside each compartment (see Accessories). Moulds are made of special alloy steel with a minimum hardness of HV200. The shrinkage measurement has to be made with the 62-L0035/A Length comparator.

The 62-L0009 version differs slightly from the 62-L0009/F version to conform to UNI 6687 but is used for the same determination. Weight: 12 kg (approx.)

Ordering information

62-L0009/F

Hydraulic shrinkage mould, 40 x 40 x 160 mm, complete with shrinkage plugs, conforming to EN 12617-4, EN 12808-4 (with suitable accessories) and NF P15-433.

62-L0009

Hydraulic shrinkage mould, 40 x 40 x 160 mm, complete with shrinkage plugs, conforming to UNI 6687.

Accessories

62-L0010/H2

Contact points for 10 x 40 x 160 mm specimens, conforming to EN 12808-4. Pack of 12.

62-L0010/H3

Plastic inserts, 15 x 40 x 160 mm, conforming to EN 12808-4. Pack of 6.

62-L0035/A

Digital length comparator 12.5 x 0.001 mm, with output for PC connection (special cable 82-D1261/LINK required).

62-L0034/7

Reference rod, 160 mm, for prisms obtained with the 62-L0009/F mould.

Spare parts

62-L0009/1F

Spare shrinkage plugs, for 62-L0009/F, conforming to EN 12617-4. Pack of 12.

62-L0009/1

Spare shrinkage plugs for 62-L0009, conforming to UNI 6687. Pack of 12.

Standards

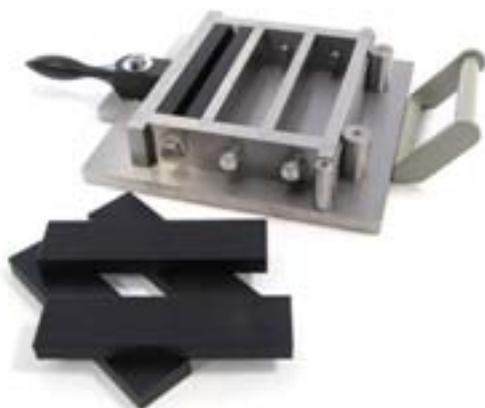
EN 1367-4 | EN 12617-4 | EN 12808-4 |



62-L0009/1



62-L0009/1F



62-L0009/F with plastic inserts 62-L0010/H3 and contact points 62-L0010/H2

Standard	Test determination
EN 1367-4	Drying shrinkage of aggregates
EN 1770	Thermal expansion of concrete/cement products for structure repair/protection
EN 12617-4, NF P15 413	Shrinkage/expansion of concrete/cement products for structure repair/protection
EN 12808-4	Shrinkage of grouts for tiles
ASTM C151, C157, C490, C596	Length change of hardened cement paste mortar and concrete
UNI 8147	Restrained expansion of mortar with expansive agent
UNI 8148	Restrained expansion of concrete with expansive agent
UNI 8520-22	Potential alkali reactivity of cement/aggregate combinations
ASTM C227, C1567, C1260	Potential alkali reactivity of cement/aggregate combinations
UNI 6687-73	Hydraulic shrinkage of mortar

* Note: 62-L0034/1 is INVAR made. 62-L0034/12 features the same length, 295mm, but is stainless steel made

ASTM C151 | ASTM C490 | NF P15-433 | NF P18-427 | BS 1881-5

62-L0035/A
Length comparator

This apparatus is a two-column steel frame with a cross bar that can be adjusted to suit the specimen length. It is fitted with a 12.5 x 0.001 mm digital gauge and can be used for a number of length measurement applications, mainly on cement and mortar specimens of various lengths. For this reason the reference rods are not included and have to be ordered separately; the specification table below can be used to quickly and easily make the appropriate choice.

Dimensions: 180 x 180 x 490 mm
Weight: 10.5 kg (approx.)

Accessories

82-D1261/LINK

Serial cable for PC connection.



62-L0035/A with reference rod

Potential alkali reactivity of cement-aggregate combinations

Standards

ASTM C227 | ASTM C1567 | ASTM C1260 | UNI 8520-22

Used for determining the potential alkali reactivity of cement-aggregate combinations (mortar bar method), the test can be carried out at 38°C according to ASTM C227 and UNI 8520-22 (point 8) for long term determinations or at 80°C according to the accelerated test method as requested by ASTM C1567, C1260, UNI 8520-22 (point 7).

Ordering information

62-L0033/B

Two gang prism mould conforming to ASTM, 25 x 25 x 285 mm, complete with contact points. Gauge length 250 mm, total length 285 mm. Made of steel with a maximum surface hardness of HV200. Weight 6 kg approx.

62-L0009/A

Three gang prism mould to conforming UNI, 25 x 25 x 280 mm, complete with plugs. Gauge length 250 mm, total length 280 mm Used for determining the potential reactivity of alkali in aggregates. Weight: 4.5 kg approx.

62-L0073

Mortar bar container for testing at 38°C temperature consisting of an acrylic cylinder container with an internal stainless steel rack to hold vertically specimens without plugs affecting. Dimensions: 170 mm diameter x 450 mm height
Weight: 3 kg approx.

62-L0074

Mortar bar container for testing at 80°C temperature consisting of a plastic vessel for horizontal positioning of mortar prisms. Complete with cover and internal stainless steel bars for specimens supporting. Weight: 3 kg approx.

Accessories

62-L0035/A

Length comparator, digital gauge 12.5 x 0.001 mm.

Spare parts

62-L0033/B2

Spare contact points for 62-L0033/B moulds. Pack of 10.

62-L0009/A1

Spare plugs for 62-L0009/A. Pack of 20.

Mould code	Plugs code	Rod code	Rod length [mm]
48-D0453	48-D0453/1	62-L0034/3	205
65-L0010/A	65-L0010/5	62-L0034/10	176
62-L0009/F	62-L0009/1F	62-L0034/7	160
62-L0009/F + 62-L0010/H3	62-L0010/H2	62-L0034/7	160
62-L0033/B	62-L0033/B2	62-L0034/1*	295
55-C0115/8	-	62-L0034/8	280
55-C0115/7	-	62-L0034/8	280
62-L0009/A	62-L0009/A1	62-L0034/11	294
62-L0033/B	62-L0033/B2	62-L0034/1*	295
62-L0009	62-L0009/1	62-L0034/9	188



62-L0073



62-L0009/A

Heat of hydration of cement

Standards

EN 196-8 | ASTM C186

Heat of hydration calorimeters

Two versions of calorimeter are available: one with a standard Beckman thermometer and one with a digital high-resolution thermometer.

The standard version 62-L0071/A consists of a Dewar flask housed in an insulated box, a constant speed electric stirrer, a filler funnel and a Beckman type thermometer with reader. The digital version 62-L0071/AD has a high-resolution battery-powered electronic thermometer mounted in place of the Beckman thermometer.

Overall dimensions:
300 x 200 x 650 mm

Weight: 13 kg approx.

Ordering information

62-L0071/A

Heat of hydration calorimeter. 230 V, 50-60 Hz, 1 ph.

62-L0071/AZ

As above but 110 V, 60 Hz, 1 ph.

62-L0071/AD

Heat of hydration calorimeter with high-resolution digital thermometer. 230 V, 50-60 Hz, 1 ph.

62-L0071/ADZ

As above but 110 V, 60 Hz, 1 ph.



main features

62-L0071/AD digital version

- > 0.001°C Resolution
- > System accuracy up to 0.05°C
- > Instrument memory for up to 10,000 readings
- > Displays, saves and prints Delta T, min, max and mean values
- > Audible alarm if limit values are exceeded
- > Protection class IP65
- > PT100 probe measuring range -40 to +300°C
- > Complete with resolution test certificate
- > Supplied complete with MS EXCEL template for data processing

62-L0071/AD

Accessories

62-L0072/V

Special set of glassware for water content determination including silica combustion tube and water absorption components. Conforming to BS 4550 and UNI 7208.

86-D0805

Paraffin wax, melting point 60°C approx. Used to coat all glass surfaces in contact with hydrofluoric acid.

65-D1409/A

Digital circulating water bath with cooler unit. Used to condition the temperature of the cement sample (either anhydrous or hydrated) before it is placed in the calorimeter. 230 V, 50-60 Hz, 1 ph.

65-D1409/AZ

As above but 110 V, 60 Hz, 1 ph.

Note: for more detail and information on the

65-D1409/A water bath, see page 363

Spare parts

62-L0071/6

Dewar flask.

62-L0071/2

Beckman thermometer (for 62-L0071/A only).

62-L0071/3

Filler funnel.

Loss on ignition

Standards EN 196-2

Muffle furnace

Used for determining the loss on ignition of cement and building lime.

Specifications

- Maximum temperature: 1200°C
- Power: 4200 W
- Inside dimensions:
210 x 280 x 145 mm (w x d x h)
- Outside dimensions:
510 x 650 x 650 mm
- Weight: 70 kg (approx.)

Ordering information

10-D1418/A

Muffle furnace, 1200 °C maximum temperature. 230 V, 50-60 Hz, 1 ph.

10-D1418/AZ

As above but 110 V, 60 Hz, 1 ph.



65-D1409/A



10-D1418/A

Fineness of cement

Standards

EN 196-6 | ASTM C204 | AASHTO T153

This test method concerns the determination of the particle size of Portland cement, limes and similar powders using the Blaine air permeability apparatus. The measure of fineness is expressed in terms of the specific surface area (the total particle surface area) in square centimetres per gram or square metres per kilogram.

We produce three models:

- 62-L0041/E - Automatic version
- 62-L0041/A - Manual version conforming to EN
- 62-L0041/C - Manual version conforming to ASTM

Automatic Blaine fineness

(air permeability) apparatus

This advanced apparatus fulfills both the EN 196-6 requirements and those concerning the validations demanded of the automatic methods by the ASTM C204. The accuracy and precision of results obtained using this apparatus exceed those acquired using the manual method.

Calibration of the apparatus must be done using a cement surface standard reference such as the reference material NIST 114q. To obtain the most accurate results, the test should be performed in a temperature-controlled environment.



62-L0041/E



62-L0041/A, 62-L0041/C

Manual Blaine fineness

(air permeability) apparatus

These versions consist of a stainless steel cell, perforated disc and plunger, with a U-tube glass manometer fitted to the steel stand. The set is supplied complete with a rubber aspirator and pack of filter paper. The two versions 62-L0041/A (EN) and 62-L0041/C (ASTM/AASHTO) differ from each other only in the cell and plunger dimensions which are tailored to the requirements of the relevant standards.

Overall dimensions:

220 x 170 x 470 mm

Weight: 8 kg (approx.)

Ordering information

62-L0041/E

Automatic Blaine fineness (air permeability) apparatus.

62-L0041/A

Manual Blaine fineness (air permeability) apparatus conforming to EN 196-6.

62-L0041/C

Manual Blaine fineness (air permeability) apparatus conforming to ASTM C204 and AASHTO T153.

Accessories

(for both manual models)

62-L0041/2

Manometer liquid, 250 ml bottle.

62-L0041/6

Reference cement, EN/ASTM, pack of 5 g.

63-L0028/7

Glass thermometer, -10 to +50°C.

Spare parts

62-L0041/A1

U-tube manometer for the 62-L0041/A and 62-L0041/C.

62-L0041/32

Filter paper, box of 100 discs.

VICAMATIC

Setting time and consistency of cement Vicat method



63-L2700/E with accessories

main feature

- > New functional and ergonomic design based on the innovative CVi-TECH philosophy developed by CONTROLS over recent years
- > Advanced electronic technology providing superior performance and total flexibility combined with simplicity of use
- > Two easy-to-use interface options: local mode, using the large size 4.3" touch-screen color display; and remote mode, using PC software
- > Supplied complete with PC software VICASOFT-BASIC for data processing
- > Optional PC software VICASOFT-PREMIUM can remotely control up to 32 independent units connected to a single PC via LAN port and hub. Adopting this multi-test network concept maximizes laboratory productivity
- > Easy setting and storage of user-defined test profiles allowing quick test start
- > Large test space with easy accessibility
- > Practical in-water testing accessory (optional)
- > Test procedures can be customized and stored to match user-defined requirements
- > Can incorporate an integrated graphic printer for printing numerical test data and setting time plot
- > Automatic calculation of initial and final setting time at programmable penetration depth limits
- > Wide range of accessories including EN and ASTM/AASHTO parts, in-water testing kit, needle cleaning device, integrated printer, probes for testing consistency and gypsum

VICAMATIC

Standards

EN 196-3 | EN 480-2 | EN 13279-2 | ASTM C191 | ASTM C187 | AASHTO T131

This method is used for determining the standard consistency and setting time of common cements, mortars and gypsum, and represents one of the most important parameters for quality inspection and verification. The production and use of new mortars, admixtures and similar materials within the research sector has highlighted the need for sophisticated apparatus capable of performing a variety of independent test cycles and procedures. Our new VICAMATIC-2 automatic tester, 63-L2700 series, fully satisfies all these requirements.

We also produce a standard manual model, 63-L0028 series, which is more suitable for occasional use.

The new VICAMATIC-2 apparatus has been designed using the latest developments in electronic technology - including a color touch-screen display - resulting in greater accuracy and reliability and making it possible to create a network with up to 32 independent units all controlled by a single PC via LAN hubs.

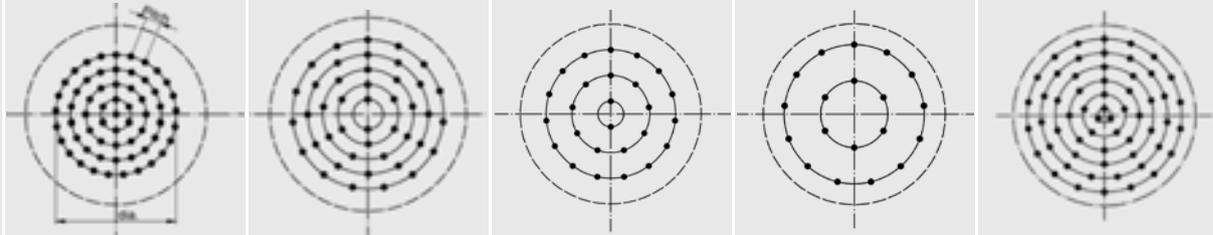
During a test, the needle (or probe) drops into the cement sample at regular intervals and in fixed positions pre-defined by the operator. Penetration depth is measured by a sensor with 0.1 mm resolution.

As the material hardens, the penetration depth decreases and when it matches the thresholds defined by the selected standard, initial and final setting times are automatically measured and recorded.



Test paths

Standards	ASTM C191	EN 196	EN 480-2	EN 13279-2	General purpose
Pitch (mm)	6.8	10	10	12	min 2 mm
Diameters (mm)	0 - 10 - 20 - 30 - 40	10 - 20 - 30 - 40 - 50	10-30-50	0 - 24 - 50	0 ≤ dia ≤ 60 (max 10 diameters)
Points per dia.	1 - 6 - 12 - 18 - 25	2 - 6 - 9 - 12 - 15	2 - 9 - 15	1 - 6 - 13	depending on diameter size



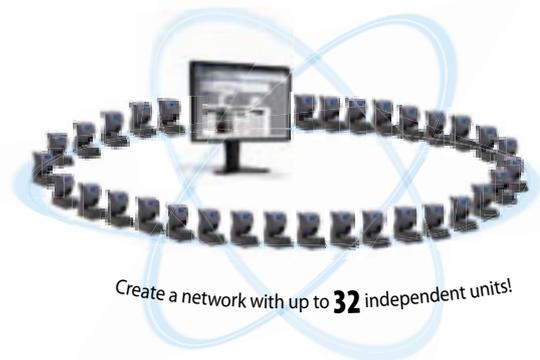
Technical specifications

- Conforms to EN 196-3, 13279-2, 480-2 and ASTM C191, C187
- Large size 4.3" colour touchscreen display
- LAN port for direct connection to PC of a single unit or connection via a LAN hub for creating a network with up to 32 independent units, all controlled by a single PC. One LAN cable is included
- USB port for data storage on memory stick (included)
- Minimum penetration time: 20 seconds*
- Penetration measurement by encoder
- Power: 50 W
- Dimensions: 200 x 400 x 410mm (d x w x h)
- Weight: 10 kg (approx.)

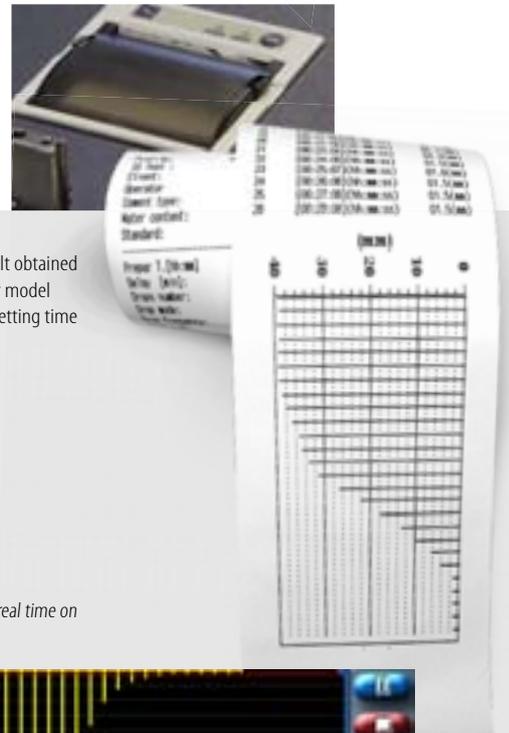
* depending on the test path

Firmware specifications

- Easy programming of customized test profiles, recallable for future tests, including:
 - adjustable test start delay
 - location of penetration points
 - manual or automatic penetration rate
 - free or driven dropping mode
 - holding intervals inside the sample
 - automatic end-test detection
 - automatic measurement of initial and final setting time
- Test data inputs: test number, operator, client, date, time, cement type, water percentage, time to first drop
- Easy calibration menu
- Clock calendar
- Multi-language



Create a network with up to **32** independent units!



A typical plot of a test result obtained with the integrated printer model 65-L2700/E13 including setting time diagram and readings

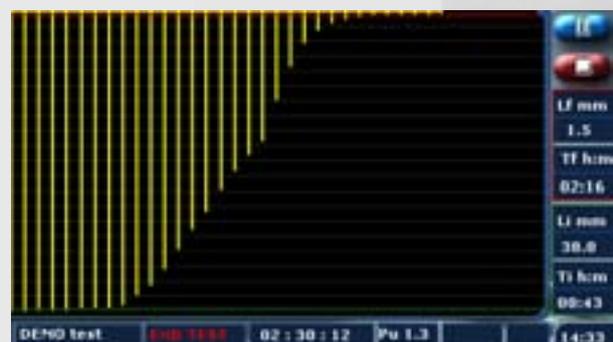
Setting time plot shown in real time on VICAMATIC-2 display



User menus have been optimized with large use of icons and graphics symbols making use very simple



Typical screenshot of test profile set-up



VICAMATIC

Ordering information

63-L2700/E

VICAMATIC-2 EN

Automatic electronic apparatus for setting time test on cement/mortar/gypsum, complete with cleaning device and EN 196-3 accessories: initial setting time needle 1.13 mm diameter mould and PC software VICASOFT-BASIC. 230V, 50-60Hz, 1ph.

63-L2700/EZ

As above, but 110V, 60Hz, 1 ph.

63-L2700/F

VICAMATIC-2 ASTM

Automatic electronic apparatus for setting time test on cement/mortar/gypsum, complete with cleaning device and ASTM C191 accessories: initial setting time needle 1.00 mm diameter mould and PC software VICASOFT-BASIC. 230V, 50-60Hz, 1ph.

63-L2700/FZ

As above, but 110V, 60 Hz, 1 ph.

63-L2700

VICAMATIC-2

Automatic electronic apparatus for setting time test on cement/mortar/gypsum complete with cleaning device and PC software VICASOFT-BASIC. Supplied without accessories. 230V, 50-60Hz, 1ph.

63-L2700/Z

As above, but 110V, 60 Hz, 1 ph.

Accessories

63-L2700/E10

Accessory for in-water testing.

63-L2700/E11

LAN hub for PC connection of up to 7 VICAMATIC-2 units or up to 6 units in the case of a multi-hub network. LAN cable from hub to PC is included. Each VICAMATIC-2 unit is supplied complete with 1 LAN cable

63-L2700/E13

Upgrade of a VICAMATIC-2 unit to incorporate a graphic printer into the top panel. Test settings and results are plotted in both numerical and graphical format including penetration depth/time plot. The upgrade is performed in our factory.

63-L2700/E14

Needle for final setting test conforming to EN.

63-L2700/E15

Cylindrical probe for consistency test.

63-L2700/E16

Additional weight, 700 g.

63-L2700/E18

Conical penetration probe, 8 mm diameter x 50 mm, complete with 100g calibrated weight for gypsum testing conforming to EN 13279.

82-SW/VS

VICASOFT-PREMIUM software for PC



Detail of the needle cleaning device supplied with any VICAMATIC-2 unit.

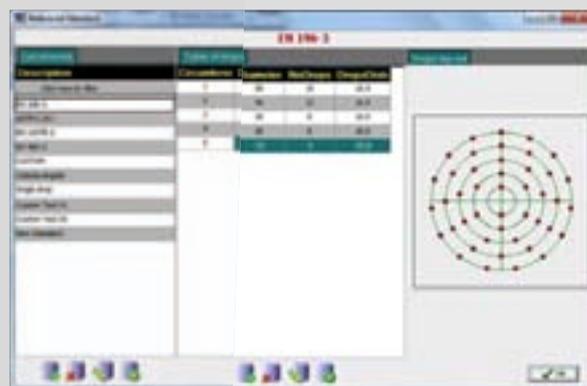


63-L2700/E10



Detail of communication ports : LAN port and USB 2.0 port

VICASOFT-PREMIUM software



Spare parts

63-L2700/E20

1.13 mm diameter needle for initial setting time test to EN.

63-L2700/E21

1 mm diameter needle for setting time test to ASTM/AASHTO.

63-L0027/E22

Plastic mould conforming to EN.

63-L0027/E23

Plastic mould conforming to ASTM/AASHTO.

63-L2700/E24

Glass base plate.

63-L2700/E25

Spare base plate for in-water testing kit.

63-L2700/E26

Spare container for in-water testing.

Water thermostatic unit for Vicamatic 2

The unit 63-L0027/E9 is provided with internal water tank and pump. The water in the tank is maintained at controlled temperature with suitable heating and cooling elements and is forced to the water bath 63-L0027/E10 and then back to the tank, in a closed loop system.

The unit can connect up to 2 independent VICAMATIC. Supplied without tubes.

Specifications

- Accuracy: +/- 1°C
- Optimize temperature range: 15 to 22°C
- Power: 350 W
- Capacity: 2 liters approx.
- Overall dimensions: 480 x 380 x 275 mm (wxhxd)
- Weight approx.: 20 kg
- 230V, 50-60 Hz, 1 ph



63-L2700/E18



63-L2700/E16 Additional weight to EN 480-2



63-L2700/E15



63-L2700/E10



63-L2700/E9

VICASOFT-PREMIUM software for PC

connection of up to 32 VICAMATIC-2 units including: remote control of each unit; acquisition, processing and storage of test data; and printout of test reports. Communication via LAN port (each VICAMATIC-2 unit is supplied complete with one LAN cable). The connection of one VICAMATIC-2 unit is direct into the PC LAN port, for more VICAMATIC-2 units (up to 32) one or more LAN hubs are required with total number of ports equal to (or greater than) the number of VICAMATIC-2 units included in the network. LAN hubs are not included. See accessories.



63-L2700/E22

63-L2700/E23

63-L2700/E25

63-L2700/E24



63-L2700/E14

63-L2700/E21

63-L2700/E20

Ordering information

63-L0027/E9

Water thermostatic unit for Vicamatic 2. 230 V, 50-60 Hz, 1 ph

63-L0027/E9Z

Same as above but 110 V, 60 Hz, 1 ph



63-L0027/E9 Connection points

Standard Vicat apparatus

Standards

EN 196-3 | EN 480-2 | ASTM C191 | AASHTO T131

The Vicat frame consists essentially of a metal stand with a sliding rod. An adjustable indicator moves over a graduated scale. The needle or plunger is attached to the bottom end of the rod to make up the test weight of 300 g.

The frame 63-L0028/1 is supplied without accessories, which have to be ordered separately depending on requirements. It can also be ordered as a set, with basic EN accessories (63-L0028) or ASTM/AASHTO accessories (63-L0028/A).

Weight: 4 kg (approx.)

Ordering information

63-L0028/1

Vicat apparatus, frame only.

63-L0028

Vicat test set conforming to EN method, including: mould, 1.13 mm diameter needle, 10 mm diameter consistency plunger, supporting plate, glass thermometer and final needle.

63-L0028/A

Vicat test set conforming to ASTM/AASHTO method, including: mould, 1 mm diameter needle, 10 mm diameter consistency plunger, supporting plate and glass thermometer.

Accessories

EN method

63-E0027/E22

EN Vicat mould.

63-L0028/31

Initial needle, 1.13 mm diameter.

63-L0028/41

Final needle.

63-L0028/8

Additional weight, 700 g, for testing conforming to EN 480-2.

63-L0028/10

Conical needle, dia.8mm x50mm to EN 13279 for gypsum testing. Complete with probe, total weight 100g..



63-L0028/1 with accessories

ASTM/AASHTO method

63-L0027/E23

ASTM Vicat mould.

63-L0028/21

Initial needle, 1 mm diameter.

For both methods

63-L0028/5

Consistency plunger, 10 mm diameter.

63-L0028/6

Supporting plate.

63-L028/7

Glass thermometer, temperature range-10 to +50°C.



Accessories

Setting time of cement: Gillmore method

Standards

ASTM C91 | ASTM C141 | ASTM C266 | ASTM C1398 | AASHTO T154

63-L0075

Gillmore apparatus

Used to determine the setting time of cement, this apparatus consists of two horizontal arms

which carry two weighted steel needles precisely machined to meet the requirements of the Standards. The initial needle is 2.12 mm diameter and weighs 113 g and the final needle is 1.06 mm diameter and weighs 453.6 g. Weight: 2.5 kg (approx.)



63-L0075



63-L0028/41

Flow of mortar

Standards ASTM C230 | UNI 7044

Flow tables

These tables are used to determine the consistency of mortars and building lime. We produce models conforming to ASTM, EN and UNI Standards. Here we present models compliant with ASTM and UNI Standards, for models to EN please refer to page 351. Motor-operated models are driven by a motor speed reducer and the number of drops are preset on the counter, which stops the machine automatically at the end of the cycle. All models are supplied complete with a bronze flow mould and hardwood tamper.

Ordering information

63-L0040

Hand-operated flow table, conforming to UNI 7044.

63-L0040/A

Hand-operated flow table, conforming to ASTM C230.

63-L0040/E

Motor-operated flow table, conforming to ASTM C230. 230 V, 50 Hz, 1 ph.

63-L0040/EY

As above but 220 V, 60 Hz, 1 ph.

63-L0040/EZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

63-L0040/1

Flow caliper conforming to ASTM C230 and UNI 7044.



63-L0040/1



63-L0040



63-L0040/A



63-L0040/E

Spare parts

63-L0040/10

Brass flow mould, 100 mm base diameter x 70 mm top diameter x 50 mm height, conforming to ASTM C230.

63-L0037/10

Brass flow mould, 100 mm base diameter x 70 mm top diameter x 60 mm height, conforming to UNI 7044.

63-L0040/11

Hardwood tamper, 12 x 25 x 150 mm, conforming to ASTM C230 and UNI 7044.

63-L0037/11

Tamper to UNI



Product code	63-L0040	63-L0040/A	63-L0040/E 63-L0040/EY 63-L0040/EZ
Standard	UNI 7044	ASTM C230	ASTM C230
Power, W	Hand operated	Hand operated	180
Table diameter, mm	300 (steel)	254 (bronze)	254 (bronze)
Height of drop, mm	10	12.7	12.7
Total mass of movable parts, kg	4.2 to 4.5	4.08 ±0.05	4.08 ±0.05
Flow mould dimensions, mm (base x top x height)	100 x 70 x 60 brass	100 x 70 x 50 brass	100 x 70 x 50 brass
Machine dimensions, mm (w x d x h)	420 x 300 x 410	288 x 254 x 321	677 x 470 x 321
Weight, kg (approx.)	35	10	40

Consistency of masonry cement and building limes

Standards

EN 413-2 | EN 459-2 | EN 1015-4

64-L0036

Plunger penetration apparatus

This apparatus is used for determining the consistency of masonry cement and building limes. It consists of a steel base with a recess to house the test cup and a vertical column holding the penetration plunger assembly. The height of the drop is 100 mm and the weight of plunger assembly is 90 g. Supplied complete with a test cup measuring 80 mm diameter x 70 mm deep and a tamper. Weight: 6 kg (approx.)



64-L0036

Air content of cement mortar, cement paste and lime mortar

Standards

EN 413-2 | EN 459-2 | EN 105-7

Air content meters



64-C0171 / 64-C0171/A

These meters have been designed to determine the air content of cement mortar, cement paste and lime mortar. The testers are made of cast aluminium, with the test pot and the upper part held together with an air-tight seal by means of two quick-action spring clamps. The air is compressed with a built-in hand pump. This air pump and the TEST and CORRECTION push buttons are arranged in a simple-to-use configuration on the front plate. The pressure gauge is built into the head of the meter and has a scale with an indication range of 0-50 percent volumetric air content.

The two models that we produce are practically identical except for their capacities:

- 64-C0171 model, 1litre capacity, conforms to the EN 459-2 standard
- 64-C0171/A, 0.75 litre capacity, conforms to EN 413-2

Electrically-operated versions of both models can be supplied, on request.

Dimensions: 320 mm high x 200 mm diameter

Weight: 3.5 kg (approx.)

Ordering information

64-C0171

Air content meter, 1 litre capacity, conforming to EN 459-2.

64-C0171/A

Air content meter, 0.75 litre capacity, conforming to EN 413-2.

Accessories

64-C0171/1

Filling ring for 64-C0171 and 64-C0171/A.

64-L0037/11

Tamper to EN.

Water retention of mortar

Standards

EN 413-2

64-L0095/6

Rigid plastic mould

100 mm diameter x 25 mm height.

Used for determining the water retention of masonry cement. Made from rigid non-porous plastic, 100 ±1 mm inside diameter, 25 ±1 mm inside height.

Weight: 127 g.



64-L0095/6

Flow of fresh mortar, building lime, gypsum binders and plasters

Standards

EN 459-2 | EN 1015-3 | EN 13279-2

Flow tables

These tables are used to determine the consistency of mortars and building lime and are available in two versions, one hand-operated and one motor-operated.

The motor-operated models are driven by a motor speed reducer and the number of drops are preset on the counter, which stops the machine automatically at the end of the cycle. All models are supplied complete with flow mould, tamper and filling hopper.

Technical specifications

- Table diameter: 300 mm
- Height of drop: 10 mm
- Total mass of movable parts: 4.2 to 4.5 kg
- Flow mould dimensions: 100 mm base, 70 mm top, 60 mm height
- Flow mould material: stainless steel
- Power rating (64-L0038/E): 180 W
- Overall dimensions: 421 x 310 x 395 (64-L0038/A); 500 x 525 x 352 mm (64-L0038/E)
- Weight: 35 kg (64-L0038/A); 50 kg (64-L0038/E) (approx.)

Ordering information

64-L0038/A

Hand-operated flow table for fresh mortar, building lime, gypsum binders and plasters.

64-L0038/E

Motor-operated flow table for fresh mortar, building lime, gypsum binders and plasters. 230 V, 50 Hz, 1 ph.

64-L0038/EY

As above but 220V, 60Hz, 1Ph.

64-L0038/EZ

As above but 110V, 60Hz, 1Ph.

Accessories

63-L0037

Flow caliper conforming to EN 459-2 and EN 1015-3.

63-L0037/10

Brass flow mould, 100 mm base dia., 70 mm top dia., 60 mm height.

Spare parts

63-L0038/10

Spare inox flow mould for EN flow tables.

63-L0037/11

Tamper.

63-L0037/12

Filling hopper.



63-L0037/1



64-L0038/A



64-L0038/E

Reactivity of lime

Standards

EN 459-2 | NF P98-102

Reactivity test apparatus

Ground quicklime is tested for its reactivity using this apparatus which consists essentially of a 1000 ml capacity Dewar vessel, stirring motor, calibrated thermometer, stand and accessories.

The apparatus is available in two versions:

- 64-L0035/E Digital, fitted with digital thermometer
- 64-L0035/D Digital, fitted with digital thermometer, temperature probe, serial cable for PC connection and dedicated software for download data.

Ordering information

64-L0035/E

Apparatus for testing reactivity of quicklime, complete with digital thermometer. 230 V, 50-60 Hz, 1 ph.

64-L0035/EZ

As above but 110 V, 60 Hz, 1 ph.



64-L0035/E, L0035/D without thermometer

64-L0035/D

Apparatus for testing reactivity of quicklime, complete with digital thermometer, serial cable for PC, connection and software for download data. 230 V, 50-60 Hz, 1 ph.

64-L0035/DZ

As above but 110 V, 60 Hz, 1 ph.

Spare parts

64-L0035/C1

Dewar vessel, supplied without stopper.

64-L0035/C2

Stirring paddle.

64-L0035/D1

Spare thermometer for L0035/D

- Max. temperature: 900° C
- Resolution: 0.1° C
- Accuracy: $\pm 0.5^\circ$ C

64-L0035/E1

Spare thermometer for 64-L0035/E

- Max. temperature: 220° C
- Resolution: 0.1° C
- Accuracy: $\pm 0.3^\circ$ C



64-L0035/E Detail of digital thermometer



64-L0035/D Detail of digital thermometer and probe

Yield of lime

Standards EN 459-2

64-L0031/A

Slaking vessel

Used to determine the yield of lime by safely containing a sample while it is left to slake, the vessel consists of an externally insulated stainless steel cylinder with a cover.

- Internal dimensions: 113 mm diameter x 120 mm height
- Overall dimensions: 155 mm diameter x 200 mm height
- Weight: 2.1 kg (approx.)



64-L0031/A

Bulk density of lime

Standards

EN 459-2

64-L0031/B

Bulk density apparatus

This apparatus is used for determining the bulk density of lime by the fall of the sample from a standard height into a container. It consists of a 1 litre capacity cylindrical container, hopper and spring loaded yoke.

Weight: 2.5 kg (approx.)



64-L0031/B

Fluidity test of grouts for pre-stressing tendons: grout spread method

Standards EN 445 (2007)

Mould for grout spread test

Stiff plastic mould, 39 mm internal diameter, 60 mm high, weight 60 g approx.

Ordering information

64-L0053/A

Mould for grout spread test.

Accessories

22-T0040/1

Glass plate, 300 x 300 mm.



64-L0053/A with 22-T0040/1

Water permeability of one-coat rendering mortars with substrates

Standards

EN 1015-21

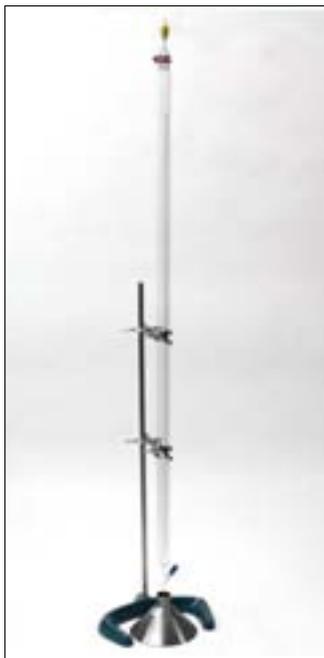
64-L0030/A

Apparatus for the determination of water permeability

in one-coat rendering mortars with substrates.

The apparatus for the determination of water permeability in one-coat rendering mortars with substrates consists of a metal cone with a base diameter of 200 mm and a reference mark at 100 mm. A 1 litre capacity glass burette with 1 ml graduation marks is held over the cone using an appropriate base with rod and clamps.

- Dimensions: 1400 x 300 x 300 mm (approx.)
- Weight: 10 kg (approx.)



64-L0030/A

Determination of workability test for flow of grout or mortar

Standards

EN 13395-2 | UNI 8997

64-L0054/A

Grout flow trough apparatus

This apparatus consists essentially of a metal channel with a special funnel mounted on one end. It comes complete with spirit level, graduated rule and feet.

- Overall dimensions: 960 x 210 x 400 mm (w x d x h)
- Weight approx.: 6 kg

64-L0054/B

As above but stainless steel made.



64-L0054/A

Fluidity test of grouts for pre-stressing tendons: Cone method

Standards

EN 445

64-L0055/A

Flow cone apparatus with sieve and 10 mm nozzle.

Used for determining the flow properties of mortars, grouts, muds and many other type of fluid materials, the apparatus comprises a metal stand supporting a stainless steel cone with inside dimensions of 150 mm upper diameter and 280 mm height. When fitted with the 10 mm nozzle the total height is 350 mm. The apparatus, as specified by EN 445, is supplied complete with a 150 mm diameter sieve with 1.5 mm openings, a 10 mm diameter nozzle with fitting bush and a 1 litre capacity cup. It can also be fitted with other nozzles of 8, 9, 11, and 13 mm inside diameter - see Accessories.

- Weight: 10 kg (approx.)

Accessories

64-L0055/2

Nozzle, 8 mm inside diameter.

64-L0055/3

Nozzle, 9 mm inside diameter.

64-L0055/5

Nozzle, 11 mm inside diameter.

64-L0055/6

Nozzle, 13 mm inside diameter.

Spare parts

64-L0055/1

Stainless steel cone with collar for nozzle.

64-L0055/4

Nozzle, 10 mm inside diameter.

64-L0055/7

Stainless steel sieve, 150 mm diameter with 1.5 mm openings.



64-L0055/A with 64-L0055/2, 64-L0055/3 and 64-L0055/5.

The sieve required to perform the test (150 mm diameter with 1.5 mm openings) is also supplied

Workable life and correction time of fresh mortars

Standards

EN 1015-9 (method A) | EN 13294

The test apparatus for determining the workable life and correction time of fresh mortars includes a vertical loading pillar complete with penetration rod, sample container and electronic balance with 30 kg capacity and 0.5 g resolution.

Weight: 10 kg (approx.)

Ordering information

64-L0098

Apparatus for determining the workable life and correction time of fresh mortars.



64-L0098

Water vapour permeability of hardened rendering and plastering mortars

Standards EN 1015-19

64-L0092

Water vapour permeability test cell

Made of hard corrosion-resistant plastic with a permeability area of approx 0.02 m².

Dimensions: 190 mm diameter x 55 mm height

Weight: 550 g (approx.)



64-L0092, disassembled and assembled



Fly ash: determination of fineness by wet sieving

Standards

EN 451-2 | ASTM C430

64-L0058

Wet sieving apparatus

This apparatus, used for determining the fineness of fly ash by wet sieving, comprises a special stainless steel sieve with 0.045 mm openings, a 17.5 mm diameter spray nozzle with seventeen 0.5 mm diameter holes oriented and spaced in accordance with specifications, an 80 mm diameter pressure gauge and fittings for connection to the water supply.

Weight: 2 kg (approx.)



64-L0058

Carbon dioxide determination in lime

Standards EN 459-2

64-L0062

Kleine apparatus

Used for the determination of the carbon dioxide in lime. The Kleine apparatus consists essentially of a 50 ml capacity decomposition flask, an absorption vessel to contain the potassium hydroxide solution, a measuring burette, funnel stopcocks, connections and wooden stand. To perform the test, a hot plate with magnetic



64-L0062 with 81-B0145/D hot plate

stirrer and an adjustable height support are also required - see Accessories.

Overall dimensions: 550 x 400 x 750 mm (w x d x h)

Weight: 15 kg (approx.)

Accessories

81-B0145/D

Hot plate with magnetic stirrer. 700W, 230 V, 50-60 Hz, 1 ph.

86-D1449

Adjustable height support.



86-D1449

Filtration behaviour of drilling fluids

Standards

API Recommended practice 13 B-1 and 13 B-2

64-L0063

Filter press for muds

Measuring filtration behaviour and wall-coke building characteristics of fluids is essential to drilling fluid control and treatment. This apparatus is the most effective means of determining the filtration properties of drilling muds and cement slurries.

It consists essentially of a mud reservoir mounted in a frame, a pressure source, a filtering medium and a graduated cylinder for receiving and measuring filtrate. Supplied complete with filter paper and CO₂ cartridges.

Overall dimensions: 200 x 230 x 480 mm (approx.)

Weight: 10 kg (approx.)



64-L0063

Determination of mud density

64-L0057

Mud balance

The mud balance provides a simple method for the accurate determination of mud density, with a durable construction that makes it ideal for field use. Principally the balance consists of a base with a fulcrum, and a graduated beam with cup, lid, weighted slider, built-in spirit level and counter-weight. The constant volume cup is affixed to one end of the graduated beam and the counter weight on the opposite end. A plastic carrying case is provided that holds the balance in its working position.

Weight: 3 kg (approx.)



64-L0057

Mud viscosity

Standards ISO 2431

64-L0056

Marsh funnel viscometer

The Marsh funnel is used for routine viscosity determinations on almost every drilling rig. It is made of rugged, shatterproof plastic that is resistant to temperature change deformation, assuring volumetric accuracy. A plastic handle provides insulation for the user's hand, while a metal orifice assures accurate readings. Supplied complete with a 1 liter capacity plastic measuring cup.

Specifications

- Top diameter: 150 mm
- Nozzle dimensions: 50 x 4.75 mm (length x internal diameter)
- Total length: 355 mm
- Weight: 0.5 kg (approx.)



64-L0056

Sand content of drilling muds

64-L0064

Sand content kit

This kit provides a complete sieve analysis apparatus for determining the sand content of drilling muds. It consists of a special 2 1/4" diameter 200-mesh sieve, fastened inside a collar with a small funnel fitted top and bottom.

Weight: 1.5 kg (approx.)



64-L0064

Transverse deformation of tile adhesives and grouts

Standards EN 12002



70-T0108/MINI

main features

- > Compact, solid and ergonomic design
- > Class 1 accuracy (load and deformation)
- > High productivity
- > Fully automatic test cycle. The complete test cycle is automatically performed by simply pressing the start button. Correct test execution conforming to the reference standard is continuously and automatically controlled.
- > Soft roller-to-specimen contact and smooth deformation rate control from the very beginning of the ramp
- > Load cell and device for measuring the specimen transverse deformation are included
- > Loading anvil and supports are included
- > Multiple selection of languages and units
- > Real-time clock and date

UNIFRAME-MINI Automatic testing machine

The UNIFRAME-MINI machine is a fully automatic unit specifically designed for transverse deformation testing of tile adhesives and grouts in conformance with the stringent requirements of EN 12002.

The high-stiffness frame allows wide access to the test area, and the attention to detail in the design of the machine is evident, for example, in the robust loading anvil and supports, the easily readable touchscreen graphic display mounted at head-height and oriented towards the user at a comfortable angle, the appropriately positioned connection ports on the rear of the machine, and the compact and ergonomic overall construction.

During operation, the machine measures the transverse deformation of a tile adhesive or grout strip specimen with specified dimensions (3mm thickness), whilst subjecting it to a 3-point bending load which is gradually increased in such a way that the transverse deformation rate is constant at 2 mm/min. The test is complete when failure occurs.

The transverse deformation rate is automatically controlled by an advanced closed-loop controller based on a customized algorithm. The user may also decide to perform the test with closed-loop load rate control.

Technical specifications

- Maximum load capacity: 250 N
- User interface: 240 x 128 pixel digital touchscreen graphic display showing numerical and graphical data
- Effective sampling and control rate: up to 50/sec
- Effective resolution: 17-bit
- Actuator stroke: 30 mm
- Data storage: USB memory stick (included)
- Connection to PC: via LAN port (software for data download is included)
- Control method: closed-loop PID of transverse deformation rate
- Maximum power absorption: 50W
- Overall dimensions: 440 x 300 x 550mm (w x d x h)
- Weight: 25kg (approx.)

Ordering information

70-T0108/MINI

UNIFRAME-MINI Automatic testing machine for transverse deformation of tile adhesives and grouts conforming to EN12002. 230V, 50 Hz, 1ph.



Detail of the touchscreen graphic display

Accessories

70-T0108/M1

Rectangular mould for specimen to EN 12002, internal dimensions 280 x 45 mm, 5 mm thickness.

70-T0108/M2

Mould for specimen to EN 12002, dimensions 300mm x 45 mm, 3 mm thickness.

70-T0108/M3

10 kg weight with two handles for preparation of specimen to EN12002.



70-T0108/M1, 70-T0108/M2, 70-T0108/M3

Preparation of specimens: mixing of cement mortars



main features

- > Robust and stable frame
- > Easy and fast bowl mounting or removal
- > Automatic testing cycles
- > Automatic sand dispenser and additional dispenser for the manual addition of admixtures or water during the mixing cycle
- > 6 programmable mixing cycles conforming to EN, ASTM and DIN standards
- > Up to 10 mixing cycles programmable by the operator
- > Acoustic signal synchronized with cycle steps
- > Ergonomic and safe design

Standards

EN 196-1 | EN 196-3 | EN 413-2 | EN 459-2 | EN 480-1 | DIN 1164-5 | DIN 1167-7

AUTOMIX Automatic mortar mixer

This mixer has been developed with a high level of quality and reliability. It strictly conforms to the standards whilst, at the same time, meeting the demand for a wider scope in testing other materials for research applications. An important feature of this mixer is the ability to program special mixing cycles.

Technical specifications

- Distance between beater and bowl: 3 ± 1 mm throughout cycle
- Stainless beater and bowl
- Bowl capacity: 5 litres
- Sand dispenser electronically controlled
- 6 programmable mixing cycles conforming to EN 196-1, EN 196-3, EN 480-1, ASTM C305 (cement paste), ASTM C305 (mortar), ASTM C451
- Up to 10 customisable mixing test cycles
- Alphanumeric 4 x 20-character display
- Planetary speeds: 62 ± 5 and 125 ± 10 rpm
- 2 mixing speeds: 140 ± 5 and 285 ± 10 rpm
- Safety features: microswitch to avoid operation when the bowl is removed, transparent safety bowl cover
- Dimensions: 600 x 450 x 600 mm (d x w x h)
- Weight: 58 kg (approx.)

Although the ASTM mixing bowl and beater specifications are slightly different from the EN ones, the mixing action does not differ substantially and, in our opinion, should not affect the final result, so this model should satisfy the client's requirements for both EN and ASTM standards.

Ordering information

65-L0006/AM

AUTOMIX, Automatic programmable mortar mixer complete with automatic sand dispenser and additional dispenser for the manual addition of admixtures or water during the mixing cycle. 230 V, 50-60 Hz, 1 ph.

65-L0006/AMZ

As above but 110 V, 60 Hz, 1 ph.



Detail of the front panel



Examples of the display



Easy removal of bowl and beater



Accessories

65-L0006/5

Steel whisk for mixing admixtures and other materials.

65-L0007/1

Reference sand, 32 bags, 1350 g each, total 43.2 kg.

Spare parts

65-L0006/2

Stainless steel mixing bowl, 5 L capacity.

65-L0006/4

Stainless steel beater.



65-L0006/5

Important note: the AUTOMIX, as specified above, can also automatically perform ASTM C305 and ASTM C451 test cycles.

Preparation of specimens: mixing of cement mortars



common main features

- > Machine operated by a dedicated and easy to use in-built software
- > Continuously variable speed (VFD technology)
- > Either Standard or user defined speeds can be easily selected (also adjustable during mixing)
- > Blade/Planetary speeds adjustable from 30/13 to 380/165 rpm, depending on the mix consistency
- > Micro-switch preventing the machine to be started without bowl, and emergency stop button
- > Conforming to CE requirements.

automatic model

- > The pre-defined procedures guide the operator in mixing operations according to Standards allowing manual introduction of sand by the top filling hopper
- > Complete with steel sand hopper and second filling hopper as option
- > Device to lock/unlock the bowl in few seconds, according to Standard requirements
- > 3-point mechanical device to adjust the gap between bowl and beater conforming to Standards
- > Possibility to create and recall user defined mixing procedures.

65-L0512

Automatic mortar mixer

Standards EN 196-1 | ASTM C305 | EN 196/3 | EN413-2 | EN459-2 | EN480-1

A robust device for the efficient mixing of cement mortars, this mixer is a table mounted unit with planetary mixing action and a bowl and beater that are easily fitted and removed. The front grill, when opened, automatically stops the machine for operator protection conforming to CE requirements.

The machine operates with a dedicated and easy to use display and keyboard control. The in-built procedures automatically perform the mixing according to Standards, allowing manual introduction of sand by the top filling hopper during mixing.

The machine is supplied complete with bowl, EN Stainless steel beater and sand hopper. ASTM beater is available as optional. See accessories

Technical specifications

- Planetary speeds: 62 and 125 rpm or user defined
- Beater speed: 140 and 285 rpm or user defined
- Bowl capacity: 5 litres
- Alphanumeric display 2 x 16 characters
- Power: 370 W
- Overall dimensions: 465 x 540 x 620 mm (l x d x h)
- Weight: 35 kg (approx.)

Ordering information

65-L0512

Automatic digital mortar mixer, 5 l capacity complete with mixing bowl, stainless steel beater and open type sand hopper. 230 V, 50-60 Hz, 1 ph

65-L0514

Same as above but 110 V, 60 Hz, 1 ph

Note: the machine can be supplied, on request, complete with a second open-type hopper to add other products. (e.g. admixtures or additives). See Accessories

Accessories

65-L0512/1

Second steel filling hopper

65-L0005/5

Hard rubber scraper.

65-L0007/1

Reference sand, 32 bags, 1350 g each, total 43.2 kg.

65-L0512/AS

Stainless steel beater conforming to ASTM C305



65-L0512/EN beater

Spare parts

65-L0512/2

Stainless steel mixing bowl.

65-L0512/EN

Stainless steel beater conforming to EN 196-1



65-L0007/1



Detail of 65-L0512 fitted with a second filling hopper (available on request).



Device for fast and easy lock/unlock the bowl



Detail of the 3-point mechanical device to precisely adjust the gap between bowl and beater conforming to Standards

Digital mortar mixer

The machine structure is similar to the automatic model. A robust device for the efficient mixing of cement mortars, this mixer is a table mounted unit with planetary mixing action and a bowl and beater that are easily fitted and removed. The machine operates with a dedicated and easy to use display and keyboard control. Either Standard speeds or user defined speeds can be easily selected (also adjustable during mixing). The front grill, when opened, automatically stops the machine for operator protection conforming to CE requirements.

The machine is supplied complete with bowl and cement beater.

Technical specifications

- Planetary speeds: 62 and 125 rpm or user defined from 13 to 165 rpm
- Beater speed: 140 and 285 rpm or user defined from 30 to 380 rpm
- Bowl capacity: 5 litres
- Power: 370 W
- Overall dimensions: 465 x 540 x 620 mm (l x d x h)
- Weight: 35 kg (approx.)

Ordering information

65-L0502

Digital mortar mixer, 5 L capacity, complete with mixing bowl and stainless steel beater. Conforming to CE requirements. 230 V, 50-60 Hz, 1 ph.

65-L0504

As above but 110 V, 60 Hz, 1 ph.

Accessories

65-L0005/5

Hard rubber scraper.

65-L0007/1

Reference sand, 32 bags, 1350 g each, total 43.2 kg.

65-L0502/1

Steel sand filling hopper

Spare parts

65-L0502/2

Stainless steel mixing bowl.

65-L0512/EN

Stainless steel beater.

65-L0502 fitted with the optional steel sand hopper.



Preparation of 40x40x160 mm prisms



main features

- > Individually checked with certified instruments
- > All parts marked and identified
- > Model 65-L0010/B has a minimum surface hardness of HV 400, is surface-protected with a rust inhibitor treatment, and includes a traceable certificate of conformity

65-L0010/B

Standards

EN 196-1 | EN 196-3 | EN 413-2 | EN 459-2 | EN 480-1

Prism moulds

Used to produce mortar specimens for compression and flexural tests, these moulds are made from special alloy steel and are available in two versions:

Standard (65-L0010/A) with a minimum surface hardness of HV200

Heavy duty (65-L0010/B) with a minimum surface hardness of HV400 which is recommended by the EN standards. Furthermore, the surface of this model is protected by a rust inhibitor treatment. It is supplied complete with a traceable certificate of conformity and a serial number identification.

Specimens can be fitted with the 65-L0010/5 type B measuring pegs for determining the coefficient of thermal expansion conforming to EN 1770. See Accessories.

Weight: 10.9 kg (approx.)

Ordering information

65-L0010/A

Standard three-gang mould for 40 x 40 x 160 mm rectangular prisms conforming to EN 196-1, minimum surface hardness HV200.

65-L0010/B

Heavy duty three-gang mould for 40 x 40 x 160 mm rectangular prisms conforming to EN 196-1, minimum surface hardness HV400, complete with traceable certificate of conformity and rust inhibitor treatment.

Accessories

65-L0010/5

Measuring pegs, type B, for determining the coefficient of thermal expansion to EN 1770. Pack of 12. See page 340

Jolting apparatus



65-L0010/B Detail of serial number



65-L0010/5

This machine, used to compact the 40 x 40 x 160 mm cement prisms in the mould, has been developed to precisely satisfy the EN and ISO standards. Each single requirement, such as weight distribution, dimensions, structural design and working cycle, is individually checked and verified.

Prism moulds, feed hopper, scrapers and glass plate are not included and have to be ordered separately - see Accessories.

Technical specifications

- Highly rigid structure, joints between main parts (table – arms – base) easily removable to check weights
- Drop height: 15 mm (since the mechanical parts are subject to wear and tear and this height tends to change with use, the hammer height is adjustable, making it possible to restore the initial drop height)
- Motor power: 250 W, 60 rpm
- Digital control panel: 4-figure segment display, keyboard with 4 keys and 3 LEDs, large and immediately accessible emergency stop button
- Overall dimensions: 1000 x 310 x 385 mm (wx dx h)
- Weight: 55 kg (approx.)

Ordering information

65-L0012/E

Jolting apparatus. 230 V, 50 Hz, 1 ph.

65-L0012/EY

As above but 220 V, 60 Hz, 1 ph.

65-L0012/EZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

65-L0011

Feed hopper to fit the three-gang mould on the 65-L0012/E apparatus.

65-L0010/A1

Pair of scrapers: small and large.

65-L0010/A2

Glass plate, 210 x 185 x 6 mm.

Preparation of 70.7 mm mortar cubes

Standards BS 4550

Vibrating machine and 70.7 mm cube mould

This apparatus is for the preparation and compaction of 70.7 mm mortar cube specimens. The mould table is mounted on four springs attached to an eccentric shaft which allows each sample to be vibrated at 12,000 cycles per minute in accordance with the specifications. The cube mould is not included and has to be ordered separately - see accessories.

Preparation of 50 mm/ 2" mortar cubes

Cube moulds

Cube moulds are used to produce specimens for compression tests.

Ordering information

65-L0080

Three-gang mould for 50 mm cubes, precisely-machined steel. Weight: 6 kg (approx.)



65-L0012/E with 65-L0011 Feed hopper and 65-L0010/A mould



Detail of the system for quick locking of the mould



65-L0010/A2, 65-L0010/A1 and 65-L0011



65-L0050 with 65-L0051



65-L0080

Ordering information

65-L0050

Vibrating machine for 70.7 mm cube moulds.
Electric motor: 375 W
Overall dimensions: 960 x 320 x 560 mm
Weight: 70 kg (approx.)
230 V, 50 Hz, 1 ph.

Accessories

65-L0051

Mould for 70,7 mm cubes, without base, for use with 65-L0050 vibrating machine. Made of steel with internal surfaces machined to suit BS requirements. Weight: 2 kg (approx.)

65-L0051/A

As above but with base plate. Weight: 2.5 kg (approx.)



65-L0051

Testing Certificate Certificato di collaudo

Certificate nr. Certificato nr:	10299
Date of issue: Data di emissione:	20 th -December- 2010 20 - dicembre - 2010
Referred to: Si riferisce a:	
Item: Oggetto:	Three place mould for 40.1x40x160 mortar prisms Stampo a tre posti per prismi di malta da 40.1x40x160 mm
Supplier: Fornitore:	Controls s.r.l.
Model: Modello:	65 - L0010/B
Serial nr.: Matricola:	Example

The measuring have been obtained with the measuring apparatus belonging to the Controls metrologic chain which leads to instruments certified by SIT as follows.

Le misure effettuate sono state ottenute utilizzando i campioni appartenenti alla catena metrologica Controls che fa capo a strumenti provvisti di certificato SIT indicati di seguito:

Description Descrizione	Serial nr Matricola	Certificate nr N° certificato	Expiring date Scadenza	Uncertainty Incertezza
100mm square Squadra 100mm	SM015	SM015/09/07	23 - 09 - 2011	± 2'
Millemeter elevation meter Altimetro millesimale	4D 0610 01	4D 0610 007 43	24 - 06 - 2011	± 2 µm
2.5-30kg balance Bilancia 2.5 - 30 Kg.	SM08	SM08/03/07	17 - 03 - 2011	± 50 g
Digital caliper Calibro digitale	CD001	CD001/03/07	14 - 03 - 2011	± 0.04mm
0 - 600 mm caliper Calibro 0 - 600 mm	CC022	CC022/03/07	09 - 03 - 2011	± 0.04mm
Roughness meter Rugosimetro	SR001	981503/07	10 - 09 - 2011	± 0.021 µm
Feeler gauge Siacometro	SM023	SM023/07/07	07 - 07 - 2011	± 0.01mm
Hardometer plate Piastrina durometro	99534	90892	25 - 03 - 2011	± 0.6HRC

Specimen curing



main features

- > Strong, chemical resistant polypropylene structure
- > Robust internal stainless steel racks
- > High capacity
- > Humidity from 95% to saturation by water atomisers
- > Connectable to the water refrigerator for better temperature control

65-L0013/D

Standards

EN 196-1 | EN 196-8 | ISO 679 | ASTM C109 | ASTM C511

CURACEM Cement curing cabinet

Ideal for curing cement specimens in commercial and site laboratories, this cabinet is very practical and easy to use. The frame is a strong polypropylene structure, which is chemical resistant and particularly suitable for cement applications, and has front doors fitted with transparent glass. The humidity is maintained from 95% to saturation by water atomisers, while the temperature is maintained at $20 \pm 1^\circ\text{C}$ by an immersion heater and a separate refrigeration unit (see Accessories, 65-D2031). The four internal stainless steel racks can support moulds with specimens and a large number of cement prisms. It can also be used for concrete cubes and other mortar specimens. Using a simple plastic pan (see Accessories, 65-D1326) it is also possible to cure specimens in water.

The unit has to be connected to a suitable air compressor such as our model 65-L0013/D1 (see Accessories).

Technical specifications

- Power: 1700 W (approx.)
- Inside dimensions:
1115 x 435 x 1500 mm (w x d x h)
- Outside dimensions:
1160 x 550 x 1900 mm
- Weight: 200 kg (approx.)

Ordering information

65-L0013/D

CURACEM Cement curing cabinet. 230 V, 50-60 Hz, 1 ph.

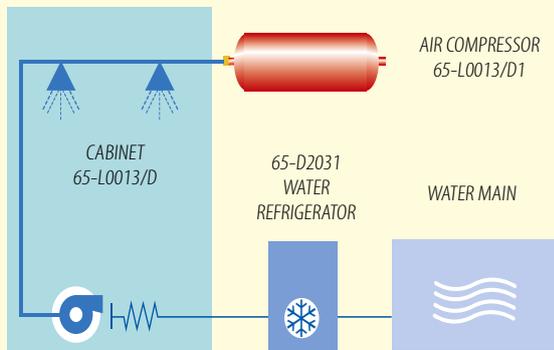
65-L0013/DZ

As above but 110 V, 60 Hz, 1 ph.



65-L0013/D

Schemating drawing of the operating principle



Operating principle

The cold water coming from refrigerator-circulator 65-D2031 is atomized inside the 65-L0013/D by nebulisers. The internal immersion heater is automatically operated if necessary to maintain constant the curing temperature (normally $20 \pm 1^\circ\text{C}$) and the humidity goes over 95%. The water consumption is about 2 l/h max.

Curing bath with cooler unit

This multi-purpose unit is designed for curing 40 x 40 x 160 mm cement specimens in water but it can also be used for storing the hydrated samples at a temperature of 20°C (EN 196-8). Internal surfaces are polished stainless steel and the outer case is made from insulated sheet steel. The cooler unit is located under the water bath. A re-circulating unit is fitted to ensure temperature uniformity.

main features

- > Automatically maintains the set temperature
- > Two-channel electronic thermoregulator for heating/cooling with digital display
- > Complete with re-circulating unit
- > Incorporated refrigeration compressor
- > Multi-purpose unit suitable for many other applications

Accessories

65-D2031

Water refrigerator. 230 V, 50-60 Hz, 1 ph. This unit has been designed for laboratory use to provide cold water. It comprises a silent and CFC-free refrigeration compressor, a water reservoir with cooling coil and an electronic thermoregulator with a digital display which shows the water/liquid output temperature, all enclosed in a sound-proof metal case. The water is circulated internally by mains water pressure.

- Output water temperature range: +2 to +25°C
- Power: 800 W
- Water or liquid tubing connections: 3/4"
- Dimensions: 450 x 450 x 825 mm (w x d x h)
- Weight: 35 kg (approx.)



65-D2031

65-D2031/Z

As above but 110 V, 60 Hz, 1 ph.

65-L0013/D1

Air compressor, 200 L capacity. 230 V, 50 Hz, 1 ph.

65-D1326

Plastic pan, 220 x 220 x 70 mm for water curing of three 40 x 40 x 160 mm cement specimens.



65-D1326



Technical specifications

- Capacity: 40L (70 cement specimens measuring 40 x 40 x 160 mm)
- Power: 2000 W
- Temperature range: +5 to +60°C
- Accuracy: $\pm 1\%$
- Inside dimensions: 550 x 360 x 200 mm (w x d x h)
- Outside dimensions: 830 x 480 x 950 mm
- Weight: 62 kg (approx.)

Ordering information

65-D1409/A

Digital water bath with cooler unit. 230 V, 50-60 Hz, 1 ph.

65-D1409/AZ

As above but 110 V, 60 Hz, 1 ph.

Semi-automatic and automatic testers

For determination of strength of cement, mortar, resins, refractory materials, low-strength concrete, soil-cement etc.

Standards

EN 196-1 | ASTM C109 | ASTM C78

Model synopsis

The testing machines and frames we produce, with capacities of 15, 300, 500 and 600 kN, provide the highest possible degree of flexibility according to:

- the standard in use
- the material to be tested
- the expected strength value
- the type of test: Compression or Compression/Flexural
- the configuration of the testing system (when a frame only is selected for connection to a separate stand-alone Power and Control Console e.g. PILOT/AUTOMAX Smart-Line, AUTOMAX E-Modulus, MCC, ADVANTEST)
- The various options are summarized below:



main features

- > A multipurpose semi-automatic machine ideal for principal laboratories, for testing cement, mortars, resins, refractory materials, lightweight concrete, soil-cement specimens etc.
- > Large testing space
- > High capacity, ideal for high strength mortars, resins etc.
- > High rigidity solid one piece steel frame
- > Ergonomic design

50-C92A02 WIZARD

Semi-Automatic compression tester, 600 KN cap.

Fitted with accuracy Class 1 from 6 to 600 kN, extendable with a special calibration procedure from 0.6 to 600 kN. Suitable for testing in compression using the appropriate accessory.

For more information see page 366



main features

- > Usable for both flexural and compression test due to its high accuracy
- > A multipurpose machine ideal for principal laboratories, for testing cement, mortars, resins, refractory materials, lightweight concrete, soil-cement specimens etc.
- > Automatic test execution
- > Large testing space
- > High capacity, ideal for high strength mortars, resins etc.
- > High rigidity solid one piece steel frame
- > Ergonomic design
- > Gives the best quality to price ratio

50-C92C12 PILOT

Automatic compression and flexural tester, 500 KN cap.

A unique economical tester, fitted with a high-precision load cell with accuracy Class 1 from 5 to 500 kN, extendable with a special calibration procedure from 0.5 to 500 kN. Suitable for testing in flexure and compression using the appropriate accessory.

For more information see page 366



main features

- > A 600/15kN capacity double chamber compression/flexural frame controlled by AUTOMAX E-Modulus control console for the automatic determination of the Modulus of Elasticity on low strength/small size specimens.

**50-C20E82 with 50-C9Z220
AUTOMAX E-Modulus
with Double-station
compression/flexural frame**

A 600/15kN capacity compression/flexural frame featuring two testing chambers, with AUTOMAX E-Modulus stand-alone Power and Control Console.

For more information see page 252 and 366



main features

- > Floor mounted, ideal for principal laboratories
- > Single and double station four-column rigid frame
- > Fitted with high-precision load cell/cells
- > EN version with inbuilt flexure and compression jigs also available
- > Ergonomic design

65-L18*, 65-L27***, 65-L28***
series PILOT and AUTOMAX
Automatic and Super
Automatic testers**

15/300 kN capacity, high stiffness, four-column compression/flexural systems.



For more information see page 368



main features

- > Load measurement by high-precision load cell
- > Robust four-column frame
- > Piston travel limit switch included
- > Pedestal included
- > Complete with kit for connection to Control Console

**65-L18Z10, 65-L27Z10,
65-L28Z10, 65-L58Z10
High-stiffness frames**

300, 15/300 kN capacity, high-stiffness frames for connection to stand-alone Power and Control Consoles such as PILOT/ AUTOMAX Smart-Line, AUTOMAX E-Modulus, MCC and ADVANTEST.

For more information see page 370

MULTIPURPOSE Compression testers 500 | 600 | 15/600 kN

Standards EN 196-1 | EN 13286-41 | EN 933-5 | ASTM C109 | ASTM C348

COMPACTline



50-C92C22 with pedestal 50-C99/B, printer 50-C10B/PR and accessories



50-C92C12 with pedestal 50-C99/B, printer 50-C10B/PR and accessories

This serie is proposed with different power and control systems:

WIZARD 2

Semi-automatic power and control system

Note Also available, as alternative, the configuration with DIGIMAX 3, Semi-automatic power and control system. See page 232 and ask for our technical support.

PILOT

Automatic system with closed loop control

Note Also available, as alternative, the configuration with AUTOMAX, super automatic power and control system. See page 237 and ask us for technical support.

Common specifications

Frame

Rigid welded steel construction. Spherical seat allows free alignment at the initial contact with the specimen.

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, front door and rear flexible fragment guard.

Machine Accessories

- Distance pieces to reduce the vertical daylight
- Frame pedestal

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional softwa-

re DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

Test Accessories

These machines can be equipped with accessories to perform:

- Compression on cement samples
- Flexure on cement samples
- Flexural test on concrete beams
- Splitting tensile test

Upgrading Options

Additional testing frame connection For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233

For PILOT and AUTOMAX PCS. See page 236

Printer installation

For WIZARD 2 and DIGIMAX 3 PCS. See page 232, 233
For PILOT and AUTOMAX PCS. See page 236

Fragment guard lock switch

Prevents test execution with the front door open.

50-C50/P1

For testers with PILOT PCS.

50-C50/P3

For testers with DIGIMAX PCS and WIZARD PCS..

Special calibration procedure

See page 240

Certified platen hardness

See codes 50-C0050/HRD2 and 65-L0050/HRD (just for models 50-C92x2x) on page 240

Frame physical specifications

model 50-	C92xxx	C92x1x	C92x2x
Cap. kN	600	500	15/600
Load measurement	Pressure transducer	Load cell	Load cell/ P.transducer
Max. vertical daylight, mm	263	345	205/265
Horizontal daylight, mm	265	265	-/265
Platen dimensions, mm	dia.165		
Surface hardness	55 HRC		
Flatness tolerance	0.03 mm		
Ram travel, mm	50	50	30/50
Class 1 range	60÷600kN	50÷500kN	1.5÷15kN / 60÷600kN
with C0050/CAL	6÷600kN	5÷500kN	6÷600kN
with C0050/CAL5	-	-	0.75÷15kN
with C0050/1CAL	-	0.5÷500kN	-



50-C92C02 with pedestal 50-C99/B, printer 50-C10B/PR and accessories

main features

- > A multipurpose machine ideal for testing Cement, Mortars, Resins, Refractory, Lightweight concrete, Soil-cement specimens etc.
- > Large testing space
- > Ideal for splitting tests and flexural tests on concrete specimens
- > High capacity, ideal for high strength mortars, resins, etc.
- > High rigidity solid one piece steel frame
- > Ergonomic design
- > Featuring the best QUALITY/PRICE RATIO
- > High accuracy 500kN model, suitable for both flexural and compression tests, fitted with high precision load cell, available in Class 1 from 0.5 to 500 kN.

WIZARD 2

kN	kN	kN	Icon
500	600	15/600	2

50-C92A02

WIZARD 2, 600 kN cap. semi-automatic compression tester, load measurement by pressure transducer. 230V, 50 Hz, 1 ph

50-C92A12

WIZARD 2, 500 kN cap. semi-automatic compression tester, load measurement by load cell. 230V, 50 Hz, 1 ph

50-C92A22

WIZARD 2, 15/600 kN cap. semi-automatic double chamber compression tester, load measurement of the 15 kN station by high precision load cell and of 600 kN station by pressure transducer. 230V, 50 Hz, 1 ph

PILOT

kN	kN	kN	Icon
500	600	15/600	3

50-C92C02

PILOT Compact-Line, 600 kN cap. automatic compression tester, load measurement by pressure transducer. 230V, 50-60 Hz, 1 ph

50-C92C12

PILOT Compact-Line, 500 kN cap. automatic compression tester, load measurement by load cell. 230V, 50-60 Hz, 1 ph

50-C92C22

PILOT Compact-Line, 15/600 kN cap. automatic double chamber compression tester, load measurement of the 15 kN station by high precision load cell and of 600 kN station by pressure transducer. 230V, 50-60 Hz, 1 ph

Frames only

All frames are supplied complete with pressure transducer (or load cell where foreseen) and connection kit for separate control console

kN	kN	kN	kN
500	600	15/600	1500

50-C92Z00

600 kN cap. compression frame, load measurement by pressure transducer.

50-C92Z10

500 kN cap. compression frame, load measurement by load cell.

50-C92Z20

15/600 kN cap. double chamber compression frame, load measurement of the 15 kN station by high precision load cell and of 600 kN station by pressure transducer.

+ info

AUTOMAX	p. 234
PILOT	p. 234
DIGIMAX 3	p. 233
WIZARD 2	p. 232
Dimensions and weights	p. 230
Certificate of platen surface hardness	p. 240
Machine accessories	p. 241
Test accessories	p. 263
DATAMANAGER Software	p. 238
Special calibration	p. 240

⚡ For 110V, 60 Hz versions change last code number from 2 to 4. Ex. 50-C92C04

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)

Automatic and Super-Automatic Compression-Flexural testers 300 | 15/300 kN

Standards EN 196-1 | EN 12190 | EN 12808-3 | EN 13892-2 | ASTM C109 | ASTM C348



65-L28D12 with Flexural jig 65-L0019/B



65-L27C12 with flexural jig and compression device conforming to EN 196-1

This serie is proposed with different power and control systems:

AUTOMAX

Super-automatic system with closed loop control

Common specifications

Frame

Very rigid four columns frames, fitted inbuilt flexural and compression jig conforming to EN (models 65-L27xxx), or round platens suitable for receiving all compression and flexural accessories (models 65-L28xxx, 65-L18xxx).

Compression Platens

See physical specifications table.

Safety Features

Max. pressure valve to avoid machine overloading, piston travel limit switch, emergency stop button, optional fragment guard (see Machines Accessories).

Machine Accessories

- Distance pieces to reduce the vertical daylight. See page 242
- Fragment guards:

65-L1800/P

Transparent rigid fragment guard for 65-L18xx testers

65-L2701/P

Same as above for 65-L27x1x testers

65-L2800/P

Same as above for 65-L28xxx testers

Software

All our PCS are supplied complete with the 82-SW/TRM software allowing real time and deferred test data download to PC. Full data management and reporting is provided with optional software DATAMANAGER 82-SW/DM (not suitable for WIZARD 2 PCS). See page 238

PILOT

Automatic system with closed loop control

Note Also available, as alternative, the configuration with DIGIMAX 3, Semi-automatic power and control system. See page 233

Test Accessories

These machines can be equipped with accessories to perform:

- Compression on cement samples
- Flexure on cement samples

Upgrading Options

Additional testing frame connection

Optional control of a second frame for 65-L18C1x.
Optional control of a third frame for 65-L28D1x and for L27D1x.
See page 236

Printer installation

See page 236

Fragment guard lock switch

Prevents test execution with the fragment guard open.

65-L0050/P

For L type frames and machines

Special calibration procedure

See page 240

Certified platen hardness

See codes 65-L0050/HRD and 50-C0050/HRD5 (just for models 65-L27xxx) on page 240

+ info

AUTOMAX	p. 234
PILOT	p. 234
DIGIMAX 3	p. 233
Certificate of platen surface hardness	p. 240
Machine accessories	p. 241
Test accessories	p. 263
DATAMANAGER Software	p. 238
Special calibration	p. 240

⚡ For 110V, 60 Hz versions change last code number from 2 to 4.

Example: 65-L18C14

For 220V, 60Hz versions change last code number from 2 to 3 (only for WIZARD 2 and DIGIMAX 3)



65-L18D12

main features

- > Automatic test cycle with closed loop digital feedback.
- > Dual user interface display and PC
- > Accuracy Class 1 (EN) and Class A (ASTM) starting from 10% of full scale. Special calibration starting from 3 kN for 300 kN chamber and from 0.75 kN for 15 kN available on request. See upgrading options.
- > Compatible with the new, intuitive and smart DATAMANAGER software. See page 238
- > Soft platen-to specimen contact and smooth load rate control from the very beginning of the ramp.
- > Optional control of a second frame for 65-L18xxx single chamber testers. Active frame selection via valve selector.
- > Optional internal graphic printer including Load-Time plot
- > Universal compression testers, suitable to house various accessories for testing cement, mortar, resins and other materials.

Additional features of the AUTOMAX Super-Automatic System

- > When connected to PC, the system is fully computerized and controlled by the DATAMANAGER Software. See page 238
- > Double frame control as standard, with optional third frame control. Active frame selection via display/PC.

Ordering information

300 kN cap.

65-L18C12

300 kN cap., PILOT automatic compression tester. Load measurement by precision load cell. Round platens 165 mm dia. 230 V, 50-60 Hz, 1 ph.

65-L18D12

300 kN cap., AUTOMAX Super- automatic compression tester. Load measurement by precision load cell. Round platens 165 mm, 230 V, 50-60 Hz, 1 ph.

15/300 kN cap.

65-L27C12

15/300 kN double chamber PILOT automatic compression tester, inbuilt flexural jig and compression platens for 40x40x160 mm prisms conf. to EN 196-1. Load measurement by precision load cells. 230 V, 50-60 Hz, 1 ph.

65-L27D12

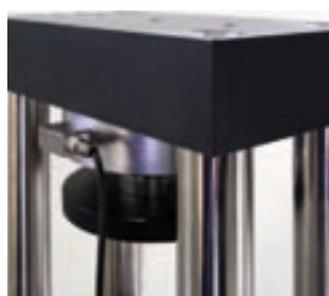
15/300 kN double chamber AUTOMAX Super- automatic compression tester, inbuilt flexural jig and compression platens for 40x40x160 mm prisms conforming to EN 196-1. Load measurement by precision load cells. 230 V, 50-60 Hz, 1 ph.

65-L28C12

15/300 kN double chamber PILOT automatic compression tester. Load measurement by precision load cells. Round compression platens 165 mm dia. 230 V, 50-60 Hz, 1 ph.

65-L28D12

15/300 kN double chamber AUTOMAX Super- automatic compression tester. Round compression platens 165 mm dia. 230 V, 50-60 Hz, 1 ph. Load measurement by precision load cells.



Detail of the high stiffness 4 columns structure and High precision load cell which fits all single and double station frames.

Models 65-	L18C12 (P) L18D12 (A)	L27C12 (P) L27D12 (A)	L28C12 (P) L28D12 (A)
Max. load kN	300	15/300	15/300
Ram travel mm	50	30/50	30/50
Vert. span, mm	200	-/50	200/200
Horiz. span, mm	220	-/220	-/220
Platen dim. mm	dia. 165	40 x 40	dia. 165
Flexural jig 40 x 40 x 160 mm	-	included	-
Overall dim. mm l x d x h	862 x 344 x 964	922 x 337 x 964	890 x 337 x 964
Weight approx, kg	215	260	266
Class 1 measuring Range from, kN:	30 to 300	1.5 to 15 30 to 300	1.5 to 15 30 to 300
Class 1 measuring range from, kN:*	3 to 300	0.75 to 15 3 to 300	0.75 to 15 3 to 300

(P)= Fitted with PILOT Automatic system

(A)= Fitted with AUTOMAX Super-Automatic system

* Available with the special calibration procedure, code 50-C0050/CAL for the 300 kN load scale and with procedure 50-C0050/CAL5 for the 15 kN load scale. To be specified at time of order. See page 240

Compression-Flexure Cement Testing Frames



65-L18Z10

65-L28Z10

main features

- > Load measurement by high precision load cell
- > Class 1 (EN) and A (ASTM) accuracy available from 1% of the 300 kN scale and from 5% of the 15 kN scale
- > Robust 4 column frame
- > Piston travel limit switch included
- > Pedestal included
- > Complete with connection kit to control console.

Common specifications

Frame

Four-column robust frame with single or twin test chamber. All frames includes pedestal and connection kit for control console.

Compression Platens

See physical specifications table.

Safety Features

Piston travel limit switch, optional fragment guard (see Machines Accessories).

Machine Accessories

- Distance pieces to reduce the vertical daylight. See page 242
- Fragment guards:

65-L1800/P

Transparent rigid fragment guard for 65-L18Z10 frame

65-L2800/P

Same as above for 65-L28Z10 and frame

Test Accessories

These machines can be equipped with accessories to perform:

- Compression on cement samples
- Flexure on cement samples

Upgrading Options

Pressure regulator

The 15 kN load piston of the twin test chamber model 65-L28Z10 and single chamber model 65-L58Z10, when connected to PILOT and AUTOMAX PCS, require the 65-L1400/X5 pressure regulator. However, this is not necessary when connected to MCC and Advantest consoles.

65-L1400/X5

Hydraulic pressure regulator for frames 65-L28Z10 and 65-L58Z10 connected to PILOT and AUTOMAX PCS.

Fragment guard lock switch

Prevents test execution with the fragment guard open (when the frame is connected to any automatic system).

65-L0050/P

For L type frames and machines

Special calibration procedure

All frames, when connected to a suitable control console, are calibrated to Class 1 starting from 10% of load scale. Special calibration procedure can be ordered to extend the Class 1 range. See specification table and page 240

Certified platen hardness

See code 65-L0050/HRD on page 240

+ info

AUTOMAX	p. 234
PILOT	p. 234
DIGIMAX 3	p. 233
SMART-Line Console	p. 237
AUTOMAX E-Modulus	p. 252
MCC Multitest	p. 256
ADVANTEST	p. 260

model 65-	L18Z10	L28Z10**	L58Z10**	L38Z10
Cap. kN	300	15/300	15	300
Load measurement	Load cell			
Vertical daylight, mm	205		350	
Horizontal daylight, mm	220		260	
Platen dimensions, mm	dia. 165			
Surface hardness	55.5 HRC			
Ram travel, mm	50	30/50	30	50
Class 1 range	30÷300kN	1.5÷15kN / 30÷300kN	1.5÷15kN	30÷300kN
with C0050/CAL *	3÷300kN	3÷300kN	-	3÷300kN
with C0050/CAL5*	-	0.75÷15kN	0.75÷15kN	-
Dimensions, lxdxh, mm	500 x 405 x1566			500 x 405 x 1720
Weight, kg	160	240	150	170

* For special calibration procedures see page 240

** When connected to AUTOMAX or PILOT PCS, the pressure regulator model 65-L1400/X5 must be used. See Upgrading Options.

Ordering information

300 kN cap.

65-L18Z10

300 kN cap.compression testing frame, fitted with round platens 165 mm dia.and precision load cell for load measurements.

65-L38Z10

300 kN cap.compression testing frame, fitted with round platens 165 mm dia.and precision load cell for load measurements. Version with increased testing space (vertical: 350mm, horizontal: 260mm)

15/300 kN cap.

65-L28Z10

15/300 kN double chamber testing frame, fitted with round platens 165 mm dia.and precision load cells for load measurements.

15 kN cap.

65-L58Z10

15 kN cap. flexural/compression testing frame, fitted with round platens 165 mm dia. and precision load cell for load measurements.



65-L58Z10 with Flexural device 65-L0019/B

Detail of the high stiffness 4 columns structure and High precision load cell which fits all single and double station frames.

Accessories for Compression and flexural testers

Flexure devices for mortar prisms

Standards

EN 196-1 | ASTM C348

We produce two versions of this apparatus: the 65-L0019/B conforming to EN and the 65-L0019/C which conforms to ASTM. Both models feature a robust frame fitted with one upper and two lower tilting bearers. The distance between the two lower bearers is 100 mm in the EN and 119 mm in the ASTM version.

Total height: 188 mm
Weight: 8 kg (approx.)

Ordering information

65-L0019/B

EN Flexure device for 40 x 40 x 160 mm prisms.

65-L0019/B1

Marking template for centering the mortar prism on the 65-L0019/B EN device.

65-L0019/C

ASTM Flexure device for 40 x 40 x 160 mm prisms.



65-L0019/B, 65-L0019/C

Compression devices for mortar specimens

Standards

EN 196-1 | EN 1015-11 | ASTM C109

Two versions of this device are available: 50-C9030/H conforming to EN and 50-C9032/H which conforms to ASTM. Both models feature a robust frame with an upper platen with a spring-mounted spherical seat that moves vertically. The 50-C9030/H model is fitted with a platen for portions of 40x40x160 rectangular cement prisms, while the 50-C9032/H model is fitted with round platens 75 mm diameter.

Vertical clearance: 53 mm
Weight: 8 kg (approx.)

Ordering information

50-C9030/H

EN Compression device to test portions of 40 x 40 x 160 mm prisms broken in flexure.

50-C9032/H

ASTM Compression device to test 50 mm (2") cubes.



50-C9030/H



50-C9032/H

Splitting tensile test devices

Standards

EN 1338 | EN 12390-6 | ASTM C496

This device is a two-column steel frame with a self-centering specimen holder at the base and an upper load beam suspended with springs for easy adjustment of the specimen. It can be easily placed on the lower platen of the compression testers 50-C92xxx and frame 65-L38Z10. See additional info on page 242

Ordering information

50-C9000/B

Splitting tensile test device for cylinders up to 160mm diameter x 320mm height. Conforms to EN 12390-6 and ASTM C496.

50-C9070/B

Splitting tensile test device for concrete block pavers and concrete cubes. Conforms to EN 1338 and EN 12390-6.

Accessories

50-C9002

Hardboard packing strips 4 x 15 x 345 mm, to EN 1338 and 12390-6. Pack of 50.

50-C9002/A

Plywood packing strips 3 x 25 x 345 mm, to ASTM C496. Pack of 50.

Flexural test device for concrete beams

Standards

EN 12390-5 | ASTM C78 | ASTM C293 | AASHTO T97

This device has a double upper bearer for two-point and centre-point tests. It can be easily placed on the lower platen of the compression testers 50-C92xxx and frame 65-L38Z10. See additional info on page 243

50-C9010/B

Flexural device for concrete beams 100 x 100 x 400/500 mm and 150 x 150 x 600/700 mm.

Frame pedestal

50-C99/B

Machine/Frame pedestal for series 50-C92xxx.
Dimensions: 660x370x400 mm
Weight: 26 kg.



50-99/B

Distance pieces to adjust vertical clearance

Made of steel, these pieces are used to reduce the vertical clearance of the compression machine to a height that is appropriate for the size of the specimen, considering that, in general, the maximum piston travel is 50mm (or 30 mm for 15kN chamber).

Ordering information

65-L1000/20

Distance piece, 165 mm diameter x 20 mm thick. Weight 3.5 kg approx.

65-L1000/30

Distance piece 165 mm diameter x 30 mm thick. Weight 5.5 kg approx.

65-L1000/40

Distance piece 165 mm diameter x 40 mm thick. Weight 7 kg approx.

65-L1000/68

Distance piece 165 mm diameter x 68 mm thick.
Weight: 9 kg approx.



65-L1000/30

Flexural strength of 40 x 40 x 160 mm mortar prisms

Automatic flexure/tension machine

This machine is used for the flexural strength determination of cement specimens and tensile tests on cement briquettes. It consists of a beam loading system with a sliding weight which is driven by an electric motor, providing a constant increase in load throughout the test. The machine is designed to accept either flexural or tensile attachments, which have to be ordered separately - see Accessories.

Scale ranges:

- 1000 N in 10 N subdivisions
- 5000 N in 50 N subdivisions
- Wattage: 40 W
- Dimensions: 510 x 1050 x 720 mm
- Weight: 52 kg (approx.)



65-L0015/A with 65-L0015/5

Ordering information

65-L0015/A

Automatic flexure/tension machine, 5 kN capacity. 230 V, 50 Hz, 1 ph.

65-L0015/AZ

As above but 110 V, 60 Hz, 1 ph.

65-L0015/AY

As above but 220 V, 60 Hz, 1 ph.

Accessories

65-L0015/1

Flexure testing attachment, design conforming to NF, DIN, UNI, EN standards.

65-L0015/4

Tensile testing attachment for cement briquette specimens.

65-L0015/5

Flexure testing attachment, design conforming to ASTM C348.

65-L0016

Briquette mould



65-L0016

Universal testing machines

70 | Steel mechanical testing and universal testers



This section illustrates universal testing machines and accessories, in particular those used for performing mechanical tests on steel specimens and reinforcing bars. Some of the machines shown however, for example the electromechanical models, can be used for testing other construction materials, in compression or flexure, such as concrete, cement, rock, asphalt and soil.

Most of the machines are PC-controlled, assuring a simplification and rationalization of test procedures together with all the other advantages associated with the use of the most modern electronic and technological practices.

70	Combined steel and concrete tension and compression testers – SEMI-AUTOMATIC MODEL	376
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Combined steel and concrete tension and compression testers

Two models available, semi-automatic and automatic computerized:

70-S10T02

Combined semi-automatic digital system, 500 kN cap. in tension and 1000 kN cap. in compression

70-S11U02

Automatic computerized system, 500 kN cap. in tension and 1000 kN cap. in compression or up to 5000 kN with a second frame.

These machines have been designed for performing, in the field or laboratory, tension tests on steel rebars up to 24 mm diameter and compression tests on cylindrical concrete specimens up to 160 mm diameter x 320 mm height and cubes up to 150 mm, using the appropriate accessories. They are comparatively lightweight, with small dimensions, good accuracy and a low cost, making them ideal for site and educational purposes.

Standards

EN ISO 6892-1 (method B) | EN 15630-1 | ASTM C39

Semi-automatic model

General description and specifications

The machine consists of rigid frame fitted with a double-acting cylinder assembly and a set of tensile holders with four grips for flat and round specimens up to a diameter/thickness of 12 mm, four grips for 12 to 18 mm diameter specimens and 4 grips for 18 to 24 mm diameter specimens.

The machine is fitted with the DIGIMAX UTM digital microprocessor unit, which has a large 240x128 pixel graphic display and can be connected to electronic extensometers (e.g. coaxial extensometers 70-C0961 series and universal extensometers 70-C0954/C) for elongation measurements. It is supplied complete with UTSofware Light, dedicated PC software for downloading and post processing test data. The PC is required and not included. Platens for compression tests on concrete not included, see accessories.

Frame

- Maximum capacity: 500 kN tension; 1000 kN compression
- For testing steel rebars up to 24 mm diameter and flats up to 12 mm thick
- Grips: 4 wedge grips for flat and round specimens up to dia./thickness 12 mm; 4 wedge grips for round specimens from 12 to 18 mm dia. and 4 wedge grips for round specimens from 18 to 24 mm dia.
- Maximum distance between grips (tensile mode): approx. 200 mm
- Specimen length (tensile mode): approx. 400 mm
- Maximum distance between platens (compression mode): approx. 580 mm
- Distance between columns: 310 mm
- Maximum ram travel: 100 mm
- Overall dimensions: 1820 x 740 x 420 mm (approx.)
- Weight: 535 kg (approx.)

Hydraulics

The machine is fitted with a dual stage pump complete with self compensated proportional valve for the manual preset of load rate. For technical specifications see page 232

Hardware and firmware DIGIMAX UTM:

- Touch screen graphic display 240x128 pixel
- 4 channels: 2 channels for load sensors and 2 channels for extensometers. A maximum of 2 channels (1 for load and 1 for extensometer) selected by the user can be contemporaneously used.
- Effective sampling rate up to 50 / sec
- Effective resolution 17 bit (131000 divisions)
- Data storage on USB pen drive (included)
- Connection to PC via LAN port (UTSofware Light included)
- Real time clock and date

TENSILE TEST:

- simultaneous display of load, stress and, using an extensometer, specimen elongation (acquisition only)
- graphical test data option showing the load/elongation curve (when an extensometer is used)

COMPRESSION TEST:

- Simultaneous display of load and stress

Machine outfit

The machine is supplied complete with tensile grips for 12 to 24 mm bar dia. as described. The compression platens for compression on concrete have to be ordered separately. See accessories.

Software

DIGIMAX UTM machine is supplied complete with UTSofware Light for:

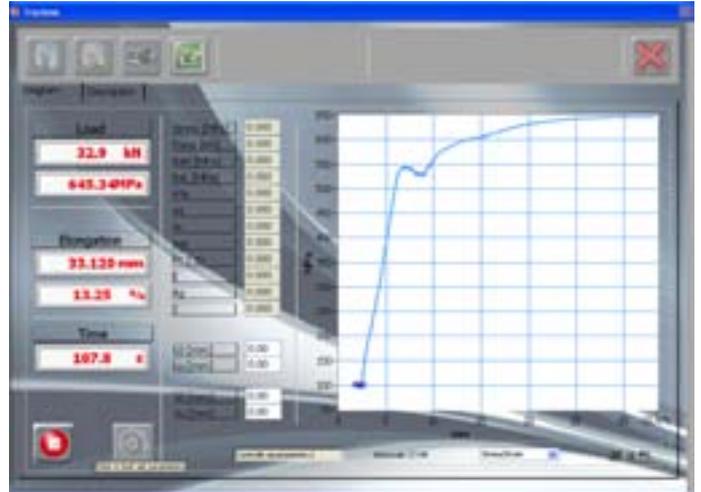
- Input of specimen identification, test and name of customer
- real time downloading of test data
- simultaneous display of stress/time and stress/elongation when extensometer is adopted (coaxial extensometer series 70-C0961/xx or universal extensometer series 70-C0954/x), with possibility to display multi diagrams
- elaboration of tension test results once test is completed: ReH, ReL or Rp, final elongation, etc. in conformity to EN ISO 6892-1 (method B) and EN 15630-1 (for steel rebars)
- machine calibration via software
- unit selection: kN, lbf, mm, in, MPa, psi
- printout of test reports
- multi-language software



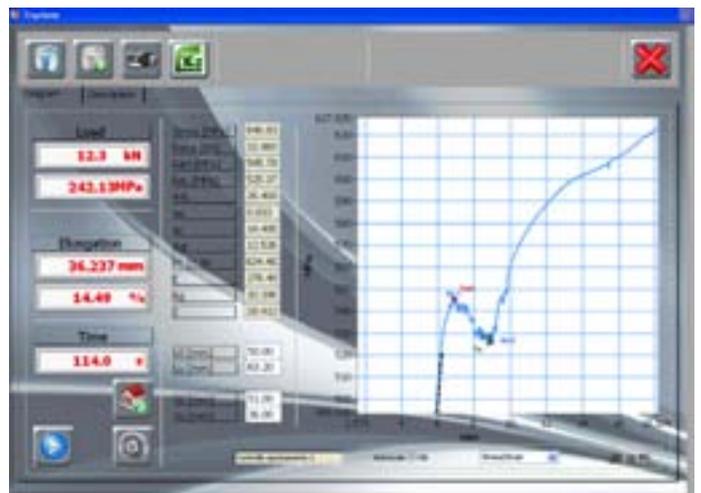
70-S10T02



70-S10T02 with accessory 70-C0019/41 during compression test on a concrete cylinder 150 mm dia. x 300 mm height.



Test execution



Test results

Ordering info

70-S10T02

Combined semi-automatic digital tension / compression testing machine, 500 kN cap. in tension and 1000 kN cap. in compression, for rebars tensile tests conforming to EN ISO 6892-1 (method B) and EN 15630-1.

70-S10T03

As above but 220V, 60 Hz, 1 ph

70-S10T04

As above but 110V, 60 Hz

Accessories

70-C0019/41

Compression test set comprising: upper and lower platen with spherical seat, 216 mm diameter, for testing cylinders up to 160 mm diameter x 320 mm and cubes from 100 to 150 mm; three distance pieces 200 mm diameter x 68 mm thick; one distance piece 96 mm diameter x 158 mm thick; one distance piece 200 mm diameter x 50 mm thick
Weight: 87.5 kg (approx.)

Coaxial extensometers

(see page 386)

Universal extensometers

(see page 387)

Combined steel and concrete tension and compression testers *(continued)*



main feature

- > For tensile tests up to 500 kN
- > Connectable to a second frame up to 5000 kN capacity for compression tests on concrete cubes, cylinders and block specimens, conforming to EN and ASTM
- > Can also be fitted with accessory for compression test
- > Fully automatic test cycle with closed-loop digital feedback
- > Double stage hydraulic pump with rapid approach and precise oil flow control
- > Adopts the latest ES technology for reduction of power consumption
- > Frame control expandable up to four, with active frame selection via software
- > Full conformity to EN ISO 7500-1, EN ISO 6892-1 (method B) and EN 15630-1 (for steel rebars)
- > Advanced data processing by intuitive very comprehensive software
- > The AUTOMAX control console can also be used for many other tests: flexure and splitting tests on concrete, compression tests on cement samples etc.
- > Elastic Modulus and Poisson ratio determination on concrete and cement specimens can be performed once upgraded with the suitable testing kit including the testing frame and the relevant accessories (see pages 264). Ask our technical department for more details

70-S11U02

Automatic computerized model

70-S11U02

Automatic computerized system, 500 kN cap. in tension and 1000 kN cap. in compression or up to 5000 kN with a second frame.

A unique testing system for steel rebars with possible extension to compression/flexural test on concrete

General description and specifications

The system includes the same frame already described for the DIGIMAX UTM machine and the AUTOMAX UTM Control Console which can automatically control up to two testing frames (expandable to four, see accessories) resulting in an extremely practical and convenient solution.

Frame

The frame features the same technical specifications listed on page 376 and in addition is fitted with a 100 mm travel high precision displacement transducer allowing test execution under cross-head separation control.

AUTOMAX UTM Power and Control Console

AUTOMAX UTM performs steel tensile testing, compression, flexure, splitting tests, Elastic Modulus and Poisson's ratio determination on concrete and cement specimens when connected to a suitable testing frame with the relevant accessories.

The console consists of an ergonomic cabinet which houses the hydraulic system, the power supply, the electronics and the PC. PC and software enable remote control of the complete system.

The technical specifications of the console are:

Hardware

- 131.000 points effective resolution
- Closed-loop P.I.D. control
- 4 channels for load sensors (pressure transducers and load cells)
- 6 channels to measure rebars elongation with extensometers (see accessories 70-C0954/C or 70-C0961 series) or strain/displacement under compression testing with LVDT and magnetostrictive transducers (e.g. our compressometers 55-C0222/F, see page 264)
- 4 channels for strain measurement with strain gauges
- memorization of the calibration curve enabling sensors to be easily connected and immediately operated
- digital linearization of the calibration curve (multi-coefficient)

Hydraulics

- Dual stage pump: centrifugal low pressure for fast approach and automatic switching to radial multi-piston high pressure for loading
- DC motor 720 W, 50-60 Hz
- Maximum working pressure 700 bar
- Third and fourth frame option, active frame selection by software
- Flow-sharing technology to perform loading and unloading cycles and advanced rebars testing in conformity to the Standards
- ES Energy Saving technology

User-interface:

- Fully PC controlled

Software

The new AUTOMAX UTM is supplied complete with UTSsoftware, specifically designed for tensile testing under:

- load/stress control
- crosshead separation control (by using the displacement transducer supplied with the machine)
- > real sampling rate: 100 per second;



70-S11U02, controlling a second frame 2000 kN cap. for compression test on concrete cubes and cylinders. All the other compression and flexural frames conforming to EN and ASTM shown and described on pages 216 to 225 can be controlled by the AUTOMAX UTM console.

- > simultaneous display of: stress/strain, stress/time; stress/%; strain/time and stress/elongation when extensometer is adopted (through coaxial extensometer series 70-C0961/x or universal extensometer 70-C0954/C), with possibility to display multi diagrams
- > elaboration of tension test results: ReH, ReL or Rp, final elongation, etc. in conformity to EN ISO 6892-1 (method B) and EN 15630-1 (for steel rebars)
- > machine calibration via software;
- > unit selection
- > multi-language software, customizable with a further local language (only latin letters)

DATAMANAGER software (see page 238) for compression, flexure and indirect tensile test on concrete and cement specimens is supplied with the controller.

E-MODULE software for Poisson ratio and Elastic Modulus determination available on request.

Machine outfit

The machine includes the AUTOMAX UTM control console, the testing frame fitted with tensile grips. The frame is identical to the 70-S10T02 model described on page 376

Ordering information

70-S11U02

Automatic computerized system 500 kN cap. in tension and 1000 kN cap. in compression, including AUTOMAX UTM control console and frame fitted with grips for tensile test conforming to EN ISO 6892-1 (method B) and EN 15630-1.

230 V, 50-60 Hz, 1 ph.

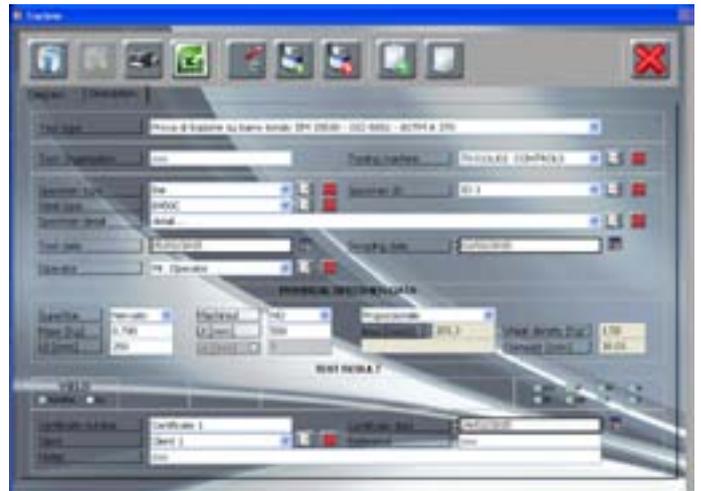
70-S11U04

Same as above but 110 V, 60 Hz, 1 ph

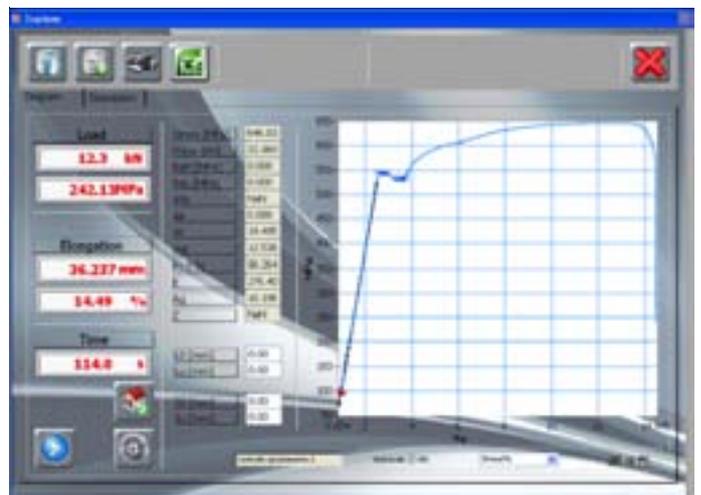
Accessories

70-C0019/41

Compression test set comprising: upper and lower platen with spherical seat, 216 mm diameter, for testing cylinders up to 160 mm diameter x 320 mm and cubes from 100 to 150 mm; three distance pieces 200 mm diameter x 68 mm thick; one distance piece 96 mm diameter x 158



Test data input



Test execution

mm thick; one distance piece 200 mm diameter x 50 mm thick
Weight: 87.5 kg (approx.)

50-C10D/3F

Hydraulic pack for AUTOMAX System for connection and control of a third frame.

50-C20E/4F

Hydraulic pack for AUTOMAX System for connection and control of a fourth frame.

AUTOMAX UTM for use with existing machine

It may be convenient to update an old tension/compression tester series 70-C0019/x, replacing the old semi-automatic system composed by hydraulic pump and readout unit with the AUTOMAX UTM automatic control console. This application requires a suitable upgrading kit, code 70-C0019/UP, see upgrading options.

Ordering info

70-C20U82

AUTOMAX UTM, computerized control console for multipurpose combined tension / compression testing frame model 70-S10Z00, for automatic rebars for tensile tests conforming to EN ISO 6892-1 and EN 15630-1 (for steel rebars).

230V, 50-60 Hz, 1 ph

70-C20U84

As above but 110V, 60 Hz, 1 ph

Upgrading options

70-C0019/UP

Upgrade kit comprehending displacement transducer 100 mm stroke and mounting device to be fitted on existing tension / compression systems.

Universal automatic computerized system, 1000/2000 kN



main feature

- > 1000 kN capacity in tension and 2000 kN in compression
- > Completely automatic test execution at a press of a button up to printing of the test certificate
- > Strain gauge load cell incorporated in the piston, providing accurate load measurement
- > Rapid vertical displacement of the mobile crossbeam by remote control
- > Hydraulic gripping system remote controlled
- > Three sets of grippers for round rebars up to 40 mm diameter and flats up to 70 x 35 mm
- > Front loading of specimens for quick and easy operation
- > Display of stress-strain diagram in real time
- > Printout of stress-strain diagram and test results

70-C0820/C complete with platens 70-C0901/5 for compression tests on concrete specimens

Standards

EN 15630-1; EN 15630-3; EN 10080; UNI EN ISO 6892-1

This machine has been specifically designed to suit the requirements of central and commercial laboratories of the construction industry and civil engineering in general. It is a universal tester that can be used for tensile tests on steel rebars up to 40 mm diameter and flats up to 35x 75 mm, as well as compression tests on standard concrete specimens. It can also be used, with the appropriate accessory, for transverse and bending tests on steel, flexural tests on concrete beams and general compression tests. Special accessories are also available for testing steel strands and electro-welded steel screen.

All the control functions are managed from a PC, which is supplied as standard. The software incorporates a complete suite of programs covering tensile, bending, flexure and compression tests.

Once the specimen has been placed in the machine (using accessories if required) and the specimen details entered, the test is run completely automatically at the press of a button, up to the printing of the test certificate and storage of the test data.

General description and specifications

The system includes:

Frame

- Steel base with rigid frame housing the lower grippers
- Piston/cylinder assembly mounted on the top of the rigid frame. Load cell incorporated in the piston
- Mobile crossbeam consisting of four high-tensile-strength columns, upper crosshead directly connected to the piston, intermediate crosshead with compression platen and lower crosshead housing the upper grippers
- Hydraulically operated gripping system and

vertical adjustment by two independent auxiliary cylinders controlled by the push button panel. This feature makes the machine extremely easy to operate, enabling one operator to perform the test in a very short time

- Crosshead displacement controlled by a bi-directional encoder

Control console

The lower section houses the hydraulic assembly which includes: hydraulic pump, proportional valve, hydraulic valves, heat exchanger to control the oil temperature, and oil tank. The upper section houses the control board.

Grippers

Three sets of standard grippers are supplied with the machine, for rounds and flats, plus two sets of grip liners to provide the maximum bearing and holding surface for specimens of all sizes.

Hardware

The upper section of the Control console houses an electronic card that controls all functions and has the following specifications:

- Effective resolution: 32000 divisions
- No. of outputs for electro-valves: 4
- Analogue output for load and strain control: 12 bit
- Load cell input

Safety features

- Pressure switch that automatically stops the machine when the oil pressure approaches the limit
- Maximum travel limit switch to stop the mobile frame at its upper position
- Software stops the machine when the maximum load is reached

Standard outfit

The machine is supplied complete with: 3 sets of grips for round specimens up to 40 mm diameter and flat specimens up to 70 mm wide x 35 mm thick plus two sets of grip liners; set of foundation bolts; service spanner; instruction manual; PC and a colour graphic printer.

Technical specifications

- Maximum load in tension: 1000 kN
- Maximum load in compression: 2000 kN
- Maximum piston speed: 83 mm/min
- Crosshead adjustment speed: 500 mm/min
- Maximum piston stroke: 610 mm
- Distance between columns: 330 mm

Dimensions:

- Testing frame (piston fully out): 955 x 635 x 3960 mm
 - Control console: 565 x 540 x 1350 mm
- Weights and shipping cubage (approx.):
- Testing frame: 2900 kg
 - Control console: 200 kg
 - Total gross weight: 4000 kg
 - Shipping cubage: 7 m³

Tensile test

- Maximum distance between rebars grips: approx. 700 mm *
- Maximum distance between strands grips: approx. 650 mm* ⁽¹⁾
- Minimum distance between rebars grips: approx. 100 mm*
- Minimum distance between strands grips: approx. 50 mm*

***Note:** the distance between grips varies according to the specimen size/diameter.

(1) This distance can be increased up to approx. 790 mm by modifying the testing frame. This frame upgrade must be specified at time of order. See upgrading option. Consequently also the minimum distance between grips is increased of about 140 mm.

- Gripping system: hydraulic with remote control
- Maximum rebar diameter: 40 mm
- Maximum plate specimen size: 75 x 35 mm

Transverse test (using accessory 70-C0820/2)

- Maximum load: 200 kN
- Maximum distance between bearers: 800 mm

Bending test (using the accessory 70-C0820/31)

- Maximum load: 200 kN
- Maximum distance between bearers: 800 mm

Ordering information

70-C0820/C

Computer controlled Universal Testing Machine, for tension tests up to 1000 kN and compression tests up to 2000 kN, complete with three sets of standard grips, PC, printer and software.

380 V, 50 Hz, 3 ph.

70-C0820/CZ

As above but 220 V, 60 Hz, 3 ph

Upgrading options

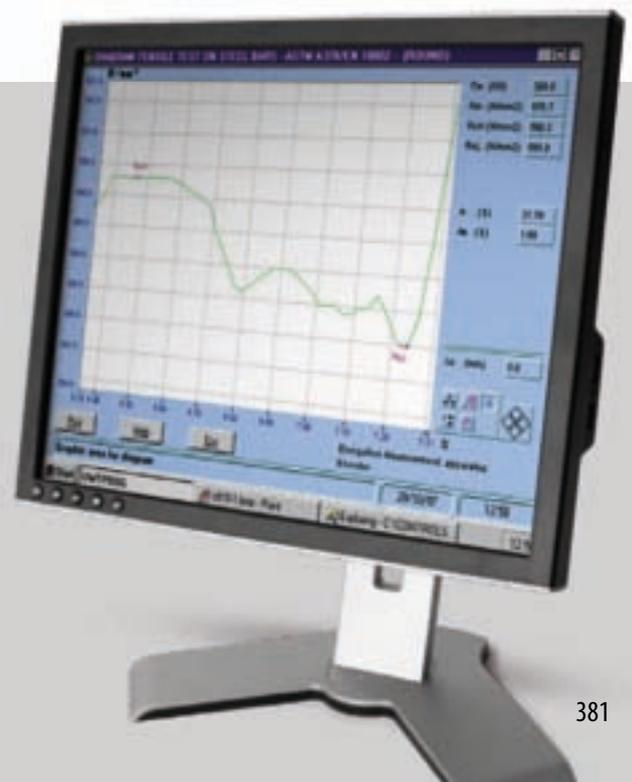
70-C0820/UP

Frame modification increasing the vertical clearance of approx. 140 mm. Particularly indicated for strands testing. The distances (max and min) between grips (for rebar and strands) are increased of 140 mm. To be specified at time of order.

Software

The software controls the machine either in manual or automatic mode to perform:

- Tensile tests on steel reinforcing bars in accordance to UNI EN ISO 6892 and ASTM A370
- General tensile tests, flexural (transverse) and bending tests on steel conforming to ASTM E290 and UNI 564
- Flexural tests on concrete beams conforming to EN 12390-5
- Compression tests on concrete specimens conforming to EN 12390-3



Accessories

70-C0901/20

Gripper for electro-welded steel grid. Used with the standard grips for flat specimens supplied with the 70-C0820/C tester. Weight 5 kg approx.

70-C0901/31

Grip for seven cord strands 9.3 to 15.2 mm diameter. Four pieces are required, with anti-sliding plates 70-T0901/T12 or 70-C0901/T15 - see below. Weight 5 kg approx.

70-C0901/T12

Anti-sliding plates, 15 x 200 mm, for 12.5 mm diameter wire strands. Pack of 100. For use with 70-C0901/31 grips.

70-C0901/T15

Anti-sliding plates, 15x200 mm, for 15.2 mm wire strands. Pack of 100. For use with 70-C0901/31 grips.

70-C0820/2

Transverse test attachment for performing transverse tests on steel specimens conforming to UNI 559. Maximum load: 200 kN Maximum distance between bearers: 800 mm Bearer dimensions: 50 mm diameter x 120 mm length Weight: 100 kg (approx.)

70-C0820/31

Bending test attachment for performing bending tests on steel specimens conforming to ASTM E290 and UNI 564. Maximum load: 200 kN Maximum distance between bearers: 800 mm Bearer dimensions: 50 mm diameter x 120 mm length Weight: 100 kg (approx.)

70-C0820/5

Compression device. Includes: upper and lower platens, 216 mm diameter x 50mm; spherical seat; distance pieces 200 mm diameter x100 mm and 200 mm diameter x50mm. Weight: 85 kg approx.

70-C0901/5

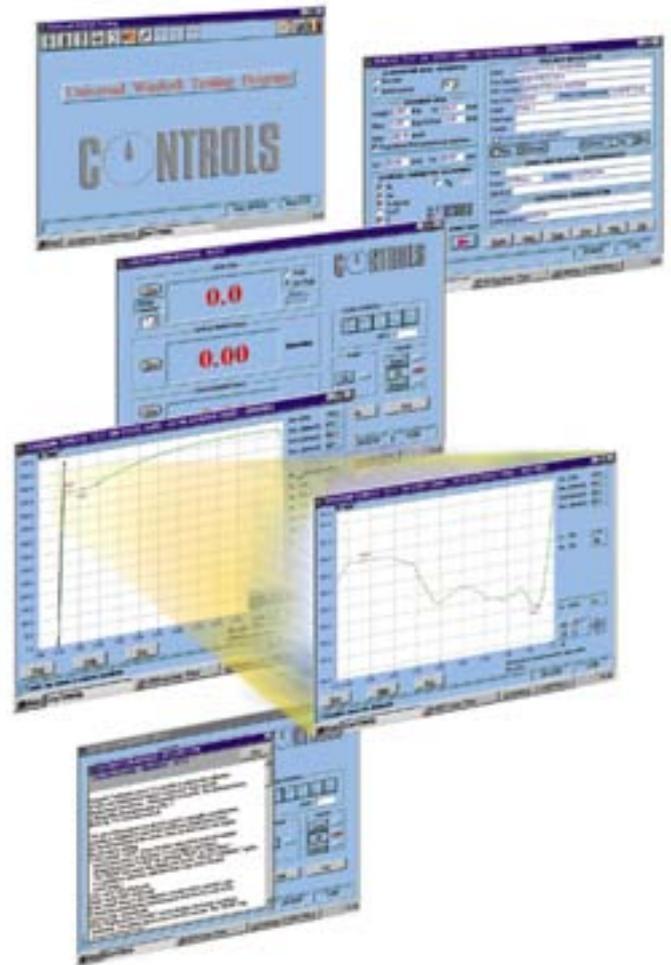
Set of compression platens for concrete specimens. Upper platen fitted with spherical seat. Platen dimensions: 310 x 435 x 50 mm Weight: 150 kg (approx.)

Extensometers

(see page 386)

PC cabinet

(see page 258)



Examples of software



70-C0820/2



70-C0820/31



Stress-strain graph

Spare parts

70-C0807/10

Gripper for flat specimens up to 70x35 mm and round specimens from 5 to 9 mm diameter. Four pieces are required per set.

70-C0807/12

Vee gripper for round specimens from 9 to 19 mm diameter. Four pieces are required per set.

70-C0807/14

Vee gripper for round specimens from 19 to 40 mm diameter. Four pieces are required per set.

70-C0807/16

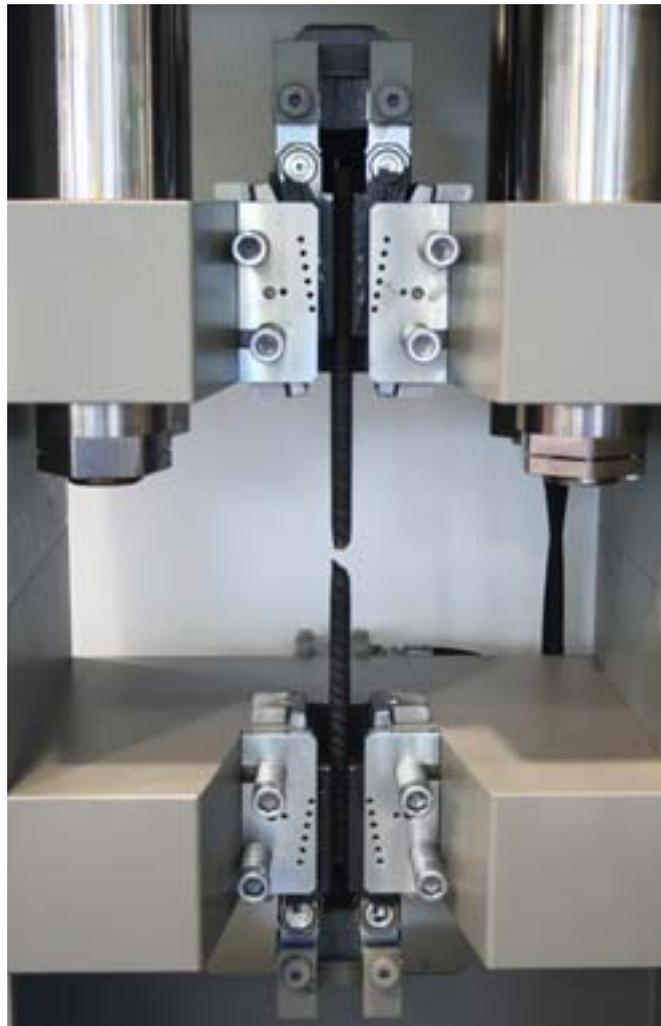
Grip liner 9 mm thick. Four pieces are required per set.

70-C0807/18

Grip liner 14 mm thick. Four pieces are required per set.

70-C0901/21

Graphite grease for grips. 1 kg can.



Detail of specimen failure



70-C0901/20



70-C0901/31 with 70-C0901/T12



Standard grippers supplied with the machine

Electromechanical universal testers



main feature

- > Electromechanical universal testers for performing tests under load/elongation control
- > Suitable for:
 - Tensile tests conforming to EN and ASTM
 - Marshall stability tests to EN and ASTM
 - Duriez tests conforming to EN and NF
 - CBR tests conforming to ASTM and EN
 - Compression tests on cement, concrete and other materials
 - Flexural and tension tests on various materials
- > Alternative models with different physical specifications are available on request

70-S18B2 with 70-S/UTM5

200 and 300 kN capacity

The UTM Series are versatile machines that satisfy the requirements of central and commercial laboratories performing tensile tests under load/elongation control on steel rebars, rounds and flats, and general compression, flexural and tension tests on various materials.

The machines consist essentially of a robust two-column frame with an upper crosshead which can be adjusted in height and a lower mobile crosshead moved by an electromechanical system with a single recirculating ball screw powered by a brushless servomotor which assures smooth application of load at constant speed.

The stress is measured by a load cell incorporated in the upper crosshead and the displacement by an encoder fitted in the servomotor.

The advanced microprocessor technology provides large flexibility in conducting tests.

The UTM Series is proposed in two versions: 200 kN (70-S18B2) and 300 kN (70-S19C2) capacity. Both of them have to be equipped with either the Hardware and Software package for

manual control of the crosshead, or the automatic control system by PC complete with software for Unconfined compression, CBR, Marshall and Duriez tests. See Firmware and software packages.

Another software package, 70-S/UTM3, is available for performing tensile tests conforming to EN 10002 and ASTM A370.

The machines are supplied complete with a high precision load cell.

PC, gripping systems, compression platens, extensometers and accessories are not included and have to be ordered separately - see Accessories.

Technical specifications

Product code	70-S18B2, 70-S18B4	70-S19C2, 70-S19C4
Maximum load, kN	200	300
Maximum vertical clearance (without accessories), mm	900	900
Maximum vertical clearance (with tensile grippers), mm	500	500
Force accuracy	0.5% of applied force	0.5% of applied force
Distance between columns, mm	450	650
Crosshead travel, mm	±200	±200
Testing speed range, mm/min	0.1 to 150	0.1 to 150
Maximum load rate, kN/s	100	100
Encoder resolution, mm	0.001	0.001
Encoder accuracy	better than 0.2%	better than 0.2%
Machine class	1	1
Overall dimensions, mm (w x d x h)	1000 x 600 x 2200	1200 x 600 x 2200
Weight, kg (approx.)	500	600

Ordering information

Frame

70-S18B2

Universal electromechanical frame, UTM series, 200 kN capacity. 230 V, 50-60 Hz, 1 ph.

70-S18B4

As above but 110 V, 60 Hz.

70-S19C2

Universal electromechanical frame, UTM series, 300 kN capacity. 230 V, 50-60 Hz, 1 ph.

70-S19C4

As above but 110 V, 60 Hz.

Control systems

Manual control option

70-S/UTM1

Manual control system including DIGIMAX data acquisition and processing system.

PC Automatic control system option

70-S/UTM2

PC control system with 16-bit A/D converter, Windows OS (different languages) and Multitest software for Unconfined compression, CBR, Marshall and Duriez test software.

Software for tensile test to EN and

ASTM

70-S/UTM3

Software package for steel tensile tests conforming to EN/ASTM A370.

Accessories

70-S/UTM4

Compression platens 200 mm diameter with spherical seat, maximum load 300 kN

70-S/UTM5

Upper and lower tensile heads complete with grips for round specimens 8 to 22 mm diameter.

70-S/UTM6

Grips for flat specimens up to 15 mm thick, 70 mm wide.

70-S/UTM7

Adapter for load cell to connect other compression devices for Marshall or CBR penetration piston.

86-D2999

PC cabinet to provide PC system protection from airborne contamination. Filtration achieved by two vented filters in the cabinet. Complete with three extractable shelves. 230 V, 50 Hz, 1 ph.

Extensometers (see page 386)



70-S/UTM1



70-S/UTM2 with 86-D2999 (Cabinet and printer optional, not included, see accessories)



Detail of 70-S18B2 fitted with compression platens 70-S/UTM4

Extensometers



main feature

- > Applied directly to the specimen up until failure
- > Measures extension of both elastic and plastic stages
- > High precision electronic transducer
- > Ideal for reinforcing bars

70-C0961/C1

Standards

ASTM A370

We produce two models:

- Electronic coaxial extensometers:
 - Applied directly to the specimen, these models remain connected until failure, measuring specimen extension with high precision during both the elastic and plastic stages.
- Standard extensometers:
 - Available in a mechanical and an electronic version, these models have to be removed from the specimen before the rebar failure.

Electronic coaxial extensometers

Most extensometers used for measuring the extension of specimens in traction, particularly in the case of steel and brittle materials, are only able to detect strain during the first stage of the test (while the brittle materials still have their elasticity) and have to be disconnected before failure.

This simple and economic version exceeds these limitations because:

- it is applied directly to the specimen
- it remains connected until breakage

- it measures specimen extension in both elastic and plastic stages with high precision and, with the appropriate simple adjustment, it is connectable to almost all testing machines
- it avoids markings on the test piece

Technical specifications

Product code	70-C0961/A1	70-C0961/B1	70-C0961/C1	70-C0961/D1
Measuring range dia. min/max, mm	5/11.5	11/18	17.5/26	26/36
Spacers ⁽¹⁾ for specimen diameter, mm	5-6-8-10	12-14-16-18	18-20-22-25	25-28-30-32
Measuring base ⁽²⁾	5 x d	5 x d	5 x d	5 x d
Transducer travel, mm	30	50	50	100
Weight, kg (approx.)	0.1	0.2	0.3	0.5

(1) Spacers for other specimen diameters are available on request.

(2) d = specimen diameter.



Cut away view of 70-C0961/B1 extensometer during operation

The extensometers are basically made from three separate aluminium tubular sections, joined telescopically to one another. The middle section, delimited by the larger diameter, determines the measuring base, which, as is well known, must be 5 times the diameter of the specimen (in the case of breaking point measurements). The two end sections consist of two mechanisms for gripping the specimen. One carries the electrical extensometer, the other an anvil.

Ordering information

70-C0961/A1

Coaxial electronic extensometer for round specimens from 5 to 11.5 mm diameter.

70-C0961/B1

As above but for specimens from 11 to 18 mm diameter.

70-C0961/C1

As above but for specimens from 17.5 to 26 mm diameter.

70-C0961/D1

As above but for specimens from 25 to 36 mm diameter.

Standards

UNI 7676

70-C0961/E

Coaxial electronic extensometer to measure the elongation of wires up to failure. Requires frame modification 70-C0820/UP (see upgrading options on page). Gauge length: 600 mm; Max travel: 50 mm. Weight: approx 1kg.

Standard extensometers

Used to measure the elongation of steel rebars and round and wire steel specimens, these models are ideal for use with Steel tensile testers. They are available in two versions: one with an electronic measuring system and one mechanical, both featuring a measuring base from 50 to 200 mm. They have to be removed before sample failure. Supplied in a carrying case.

Technical specifications

- Measuring base: 50 to 200 mm
- Linearity: better than $\pm 1\%$ (Electronic version)
- Maximum travel: 10 mm
- Weight: 1 kg (approx.) (both models)

Ordering information

70-C0953/C

Standard mechanical extensometer, dial gauge 10 x 0.01 mm, measuring base 50 to 200 mm. Complete with case.

70-C0954/C

Standard electronic extensometer, measuring base 50 to 200 mm. Complete with case.

Accessories

70-C0954/C5

Extension for electronic extensometer 70-C0954/C, to extend the measuring base to 600 mm.

70-C0980/M

Marking off machine. This simple and useful machine is used to mark off steel specimens before tensile testing. It is operated by rotating the handle. The carriage holding the specimen moves laterally by 5, 10 or 20 mm steps and the tool marks off the specimen at the desired intervals. Overall dimensions: 600 x 300 x 360 mm (approx.) Weight: 40 kg (approx.)



70-C0953/C



70-C0954/C



70-C0980/M



70-C0961/E

Uniframe



70-T1082 with CBR accessories



70-T1182



70-T1192 with Marshall accessories

Electromechanical automatic universal compression/flexural testers. 50, 100 and 200 kN capacity

The compact UNIFRAME Universal Automatic flexural and compression testers are suitable for any kind of test that requires load and/or displacement control such as CBR, Marshall, Quick Undrained Triaxial, Flexural, Unconfined compression and many more. The 200 kN version can also perform the Duriez test conforming to NF P 98-151.

These models feature a robust and compact two-column frame which is fitted with an upper crossbeam that can be set at various heights depending on the accessories to be used. The jack is driven by a DC motor controlled by a microprocessor.

The load jack, DC motor and controls are housed in the ergonomic base cabinet, the front panel of which is fitted with an emergency button for prompt stopping of the machine, conforming to CE requirements. Closed-loop control ensures reliable test execution for displacement and load applications. No external transducer is required for displacement measurement.

Sample failure is detected automatically and stops the test, but this feature can be disabled if required, and a travel or time limit can be set instead.

The user-interface is a large graphic touch-screen display, operated using a stylus pen (supplied). This interface allows the setting of speed/load and travel/load limits, data format download and graph settings, and saving of pre-set test procedures (up to 10 profiles can be saved in the internal memory of the machine). A real-time test graph and transducer data are displayed on the touchscreen during the test. Test data can be stored on a USB pen drive or downloaded through a LAN communication port in txt format, by using the 82-SW/TRM software (included) or the 82-SW/CMU software (optional, see page 154).

The firmware enables up to four transducer calibrations (two load cells and two potentiometric linear transducers) to be performed, saving data onboard.

All accessories have to be ordered separately.

The UNIFRAME Automatic tester is offered in four versions:

- 70-T1082, 50 kN capacity
- 70-T1182, 50 kN capacity, large (with increased testing space)
- 70-T1192, 100 kN capacity
- 70-T1292, 200 kN capacity

common main features

- > Stand-alone automatic
- > Automatic failure detection
- > Universal machines suitable for a wide range of tests
- > Closed-loop speed/load control
- > Four-channel onboard data acquisition
- > CBR and Marshall automatic test execution
- > Integrated transducer calibration facility
- > Infinitely variable speed from 0.05 to 51 mm/min (0.1 to 60 mm/min for model 70-T1292 only)
- > Large touchscreen display for viewing real-time graph and test data

Ordering information

70-T1082

UNIFRAME Automatic electromechanical tester, 50 kN capacity, 4-channel built-in data acquisition for load/displacement control. 230 V, 50-60 Hz, 1 ph.

70-T1084

As above but 110V, 60 Hz, 1 ph.

70-T1182

UNIFRAME Automatic electromechanical tester, 50 kN capacity, large version, 4-channel built-in data acquisition for load/displacement control. 230 V, 50-60 Hz, 1 ph.

70-T1184

As above but 110V, 60 Hz, 1 ph.

70-T1192

UNIFRAME Automatic electromechanical tester, 100 kN capacity, 4-channel built-in data acquisition for load/displacement control. 230 V, 50-60 Hz, 1 ph.

70-T1194

As above but 110V, 60 Hz, 1 ph.

70-T1292

UNIFRAME Automatic electromechanical tester, 200 kN capacity, 4-channel built-in data acquisition for load/displacement control. 230 V, 50-60 Hz, 1 ph

70-T1294

As above but 110V, 60 Hz, 1 ph.

TENSILE TESTING OPTION

The UNIFRAME tester can be upgraded, on request, to perform tension tests on various materials. For more information please get in touch with our commercial/technical department.



Technical specifications

Firmware

- Data download: using LAN port (TXT format)
- Real resolution: 132,000 divisions
- Sampling rate: 50 samples/s
- Touchscreen graphic display, 240 x 128 pixels
- Large data storage capacity on USB memory

Hardware

Product code	70-T1082	70-T1182	70-T1192	70-T1292
Maximum load capacity, kN	50	50	100	200
Min. testing speed, mm/min	0.05	0.05	0.05	0.1
Max. testing speed, mm/min	51	51	51	60
Type of control	Displacement and load	Displacement and load	Displacement and load	Displacement and load
Load rate, N/s	1-1000	1-1000	1-1000	1-1000
Maximum approach speed, mm/min	40	40	40	40
Power rating, W	800	800	500*	1000
Maximum ram travel, mm	100	100	100	100
Maximum vertical span (without accessories), mm	730	800	1040	1040
Horizontal span, mm	270	380	456	456
Overall dimensions, mm (w x d x h)	392 x 495 x 1213	500 x 570 x 1300	600 x 520 x 1830	600 x 520 x 1830
Weight, kg (approx.)	65	110	165	250

*This model is fitted with a high-efficiency ball screw-feed transmission which requires a low power motor.

Uniframe

Accessories

Load cells

The table below shows which models are available to fit the different UNIFRAME testers.

Load cells	UNIFRAME product code and capacity		
	70-T1082 70-T1182 50 kN	70-T1192 100 kN	70-T1292 200 kN
82-P0370, 2.5 kN capacity*	•	•	•
82-P0373, 10 kN capacity*	•	•	•
82-P0375, 50 kN capacity*	•	•	•
82-P0376, 100 kN capacity*	–	•	•
82-P0379, 200 kN capacity*	–	–	•

*For technical information see page 548

UNIFRAME testers are suitable for a wide range of tests on different kinds of materials. Each test requires a number of different accessories depending on the type of test and the reference Standard. A selection of tests and their relevant accessories is listed below:

Soil and soil mechanics

CBR, conforming to:

EN 13286-47 | ASTM D1883 | AASHTO T193 | BS 1377:4 | NF P94-078 | UNI CNR 10009

The test is performed under displacement control.

34-V0107/CBR

Test set for performing CBR tests in digital mode, comprising:

- 82-P0375 - Load cell, 50kN capacity
- 82-P0375/C - Adapter to fit load cell (two pieces)
- 82-P0322 - Displacement transducer, 25mm travel
- 34-T0104/81 - Adjustable transducer holder
- 34-T0103/1 - Adjustable CBR penetration piston



CBR test accessories and mould (digital mode)

Unconfined compression, conforming to:

ASTM D2166 | AASHTO T208 | BS 1377:7

The test is performed under displacement control.

Accessories

- 82-P0370 - Load cell, 2.5kN capacity
- 82-P0373 - Load cell, 10 kN capacity (as alternative)
- 82-P0375/C - Adapter to fit load cell
- 82-P0322 - Displacement transducer, 25mm travel
- 34-T0104/81 - Adjustable transducer holder
- 70-T0108/5 - Load cell extension
- 34-T0104/4 - Platens for unconfined compression



Unconfined compression test accessories (digital mode)

Uniaxial compression, conforming to:

ASTM D1633

The test is performed under displacement control.

Accessories

- The test is performed under displacement control.
- 82-P0370 - Load cell, 2.5 kN capacity
- 82-P0373 - Load cell, 10 kN capacity (as alternative)
- 82-P0375/C - Adapter to fit load cell (two pieces)
- 70-T0108/5 - Load cell extension
- 34-T0104/3 - Compression platens with spherical seat



Uniaxial compression test (digital mode)

**Quick triaxial, conforming to:
ASTM D2850 | BS 1377:7**

The test is performed under displacement control.

Accessories

- 28-WF0370/T - Load cell, 3.5 kN capacity
- 28-WF0373/T - Load cell, 10 kN capacity (as alternative)
- 28-WF6208 - Displacement transducer, 25 mm travel
- 30-WF1048/T - Mounting bracket

For triaxial cells and related accessories see page 75 and 78

Flexural strength of soil-cement

**specimens, conforming to:
ASTM D1635**

The test is performed under displacement control.

Accessories

- 82-P0370 - Load cell, 2.5 kN capacity
- 82-P0373 - Load cell, 10 kN capacity (as alternative)
- 70-T0108/5 - Load cell extension
- 70-T0108/7 - Flexure testing device for soil-cement specimens



Quick triaxial test accessories (digital mode)



Flexural strength test accessories (digital mode)

Asphalt

Marshall, conforming to:

- EN 12697-34 | ASTM D1559 | ASTM D5581 | ASTM 6927-06 | AASHTO T245 | BS 598-107 | NF P98-0251-2 | DIN 1996 | CNR 30

The test is performed under displacement control.

34-V0107/MAR

Test set for performing Marshall tests in digital mode, comprising:

- 82-P0375 - Load cell, 50kN capacity
 - 82-P0375/C - Adapter to fit load cell (two pieces)
 - 82-P0322 - Displacement transducer, 25mm travel
 - 34-T0104/81 - Adjustable transducer holder
 - 34-T0104/13 - Compression device extension
 - 34-T0104/10 - Compression device
 - 76-B0033* - Stability mould
- *for testing 6" diameter specimens ask for the 76-B0033/C Stability mould.



Marshall test accessories on 4" sample (digital mode)

CBR and Marshall, conforming to the Standards specified above

(To avoid duplications when both test have to be performed)

34-V0107/CM

Test set for performing CBR and Marshall tests in digital mode, comprising:

- 82-P0375 - Load cell, 50kN capacity
- 82-P0375/C - Adapter to fit load cell (two pieces)
- 82-P0322 - Displacement transducer, 25mm travel
- 34-T0104/81 - Adjustable transducer holder
- 34-T0103/1 - Adjustable CBR penetration piston
- 34-T0104/13 - Compression device extension
- 34-T0104/10 - Compression device
- 76-B0033 - Stability mould

Uniframe

Indirect tensile on bituminous mixtures, conforming to:

EN 12697-12 | EN 12697-23 | ASTM D4123 | CNR 34

The test is performed under displacement control.



Indirect tensile test accessories (digital mode)

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
82-P0322 - Displacement transducer, 25mm travel
34-T0104/81 - Adjustable transducer holder
34-T0104/13 - Compression device extension
34-T0104/10 - Compression device
76-B0078/B - Tensile splitting device or, alternatively, 76-B0078/C

Duriez, static test on bituminous mixtures, conforming to:

NF P98-251-1 | NF P98-251-4

The test is performed under load and displacement control.

Accessories

82-P0379 - High precision load cell, 200 kN capacity
70-T1292/2 - Set of lower platen and upper platen with spherical seat, 165 mm diameter.

Rock

Splitting tensile test of intact core specimens, conforming to:

ASTM D3967

The test is performed under load rate control.

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
50-D9032/H - Compression/splitting device

Modulus of rupture of natural building stones conforming to:

ASTM C880, C99, C120, EN 12372

The test is performed under load rate control.



Splitting tensile test accessories (digital mode)

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
T1180/3 - Flexure testing device. Consisting of a lower beam with two adjustable (from 50 mm to 320 mm) bearing rollers and of a ball seating upper beam with two adjustable (from 50 mm to 150 mm) loading rollers one of each can be removed and placed in the middle for centre point testing. Rollers: dia. 26 x 150 mm, rocker type (except one which is fixed).

Note: Load cells with small capacities may be more suitable for low strength materials. 82-P0370, 2.5 kN model is available and can be used instead of 82-P0375.

Cement, concrete and masonry building units

Flexural test on mortar prisms 40x40x160 mm, conforming to:

EN 196-1 | ASTM C348

The test is performed under load rate control.

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
34-T0104/10 - Loading rod
65-L0019/B - EN flexure testing device for mortar prisms
Or, alternatively:
65-L0019/C - ASTM Flexure testing device for mortar prisms

Compression on low strength mortar mixes, conforming to:

EN 196-1, ASTM C109

The test is performed under load rate control.

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
34-T0104/10 - Loading rod
50-C9030/H EN Compression device to test portions of 40x40x160 mm mortar prism broken in flexure.
Or, alternatively:
50-C9032/H - ASTM Compression device for mortar cubes

Flexural tests on concrete beams, concrete and clay tiles, conforming to:

EN 12390-5 | EN 491 | EN 538 | ASTM C78 | ASTM C293 | BS 1881:118 | NF P18-407 | UNE 83-305 | UNI 6133

The test is performed under load rate control.

Accessories

82-P0375 - Load cell, 50kN capacity
82-P0375/C - Adapter to fit load cell (two pieces)
70-T0108/1 - Flexure testing device. Consisting of a lower beam with two adjustable (from 60 mm to 330 mm) bearing rollers and an upper loading roller for centre point testing. Rollers: dia. 38 x 200 mm, rocker type (except one which is fixed).

Note: bearers with increased length available on request



Accessories for flexural test on mortar prism (digital mode)



Accessories for compression on light strength mortar prism (digital mode)



Accessories for flexural strength test on concrete beam (digital mode)

Note: For concrete and clay tiles testing wooden bearers, conforming to the shape of tiles, shall be provided by the users.

Transverse deformation of tile adhesives and grouts

Punching and bending test on clay and concrete block for flooring conforming to:

UNI 9730-3, EN 15037-2, EN 15037-3

The test is performed under load rate control.

Accessories

82-P0375 - Load cell, 50kN capacity
 82-P0375/C - Adapter to fit load cell (two pieces)
 70-T1180/6 - Punching and bending test device. Consisting of two adjustable bearing rollers (from 60 mm to 500 mm), an upper wooden puncher 50 x 50 mm and a central loading device having 20 mm width x 300 mm length. Rollers: dia. 20 x 300 mm, rocker type (except one which is fixed). Not suitable for model 70-T1082.

NOTE: The upper puncher and bearer are centrally fixed hence it's possible to apply the load in the most critical position by moving the lower supports. Since the max span between the supports is 500 mm it means that, for example for 300 mm length blocks, the load could be applied at max 100 mm distance from the center of the block.

Standards EN 12002

UNIFRAME-MINI Automatic testing machine

70-T0108/MINI



main features

- > 50N maximum load capacity
- > Compact, solid and ergonomic design
- > Class 1 accuracy (load and deformation)
- > High productivity
- > Fully automatic test cycle. The complete test cycle is automatically performed by simply pressing the start button. Correct test execution conforming to the reference Standard is continuously and automatically controlled.
- > Soft roller-to-specimen contact and smooth displacement rate control from the very beginning of the ramp

For more detailed information see page 356



Accessories for punching and bending test on clay and concrete block (digital mode)

Flexure test on clay block portions

Standards UNI 8942-3 | UNI 9730-3

Flexure testing device for clay portions

70-C0002/A

This device is used to perform flexure tests on strips obtained from the internal walls of clay blocks.

It consists of a top loading digital balance, 20 kg capacity with 0.1 g resolution, fitted with a flexure device. The load is applied by rotating a knob and is read directly on the balance display which retains the value of the load failure.

Weight: 15 kg (approx.)



70-C0002

Other accessories:

Also available accessories for testing:

- glass fiber reinforced concrete (GRC) to ASTM C947
- gypsum panels to ASTM C473 and EN 520
- ceramic tiles to EN 10545
- and many other construction materials. Ask our commercial/technical department.

Cold bend-testing machine

Standards

EN ISO 15630-1 | EN ISO 7438 | ASTM A615

This machine is used for bending and straightening steel reinforcing bars and can perform two types of test:

- Bending the specimen through 90° and then straightening it again up to a minimum of 20°.
- Bending through 180°

The machine consists essentially of a hydraulic jack with a cylindrical mandrel-stem, mounted horizontally within a strong steel frame which also holds two fixed reaction rollers. Two 50 and 100 mm diameter rollers are supplied with the machine but mandrels and mandrel holders have to be ordered separately. (Mandrels larger than 96 mm diameter do not need mandrel holders because they fit directly onto the stem.)

ASTM specifications require 100 mm diameter rollers only and bending only up to 90°.

Technical specifications

- Maximum loading capacity: 120 kN
- Maximum piston travel speed: 90 mm/min
- Power: 750 W
- Dimensions: 1500 x 665 x 1050 mm
- Weight: 210 kg (approx.)



70-C0977



Detail of bending



Detail of straightening

Ordering information

70-C0977

Cold bend testing machine, 120 kN capacity. 230 V, 50 Hz, 1 ph.

Accessories

Mandrel holders

70-C0977/61

Mandrel holder for mandrels from 24 to 50 mm diameter.

70-C0977/62

Mandrel holder for mandrels from 54 to 96 mm diameter.

Mandrels

Mandrels conforming to EN ISO 15630-1

Mandrel product code	Mandrel diameter (mm)	Re-bar diameter (mm)	Mandrel holder product code
<u>70-C0977/16</u>	24	4 - 6	
<u>70-C0977/19</u>	32	7	70-C0977/61
<u>70-C0977/21</u>	40	8	
<u>70-C0977/27</u>	56	10	
<u>70-C0977/29</u>	64	12	70-C0977/62
<u>70-C0977/33</u>	96	14	
<u>70-C0977/37</u>	112	16	
<u>70-C0977/39</u>	128	18	
<u>70-C0977/40</u>	132	20	
<u>70-C0977/41</u>	140	22	
<u>70-C0977/46</u>	180	24 - 26	Not necessary
<u>70-C0977/47</u>	200	28	
<u>70-C0977/49</u>	224	30 - 32	
<u>70-C0977/54</u>	320	34 - 38	
<u>70-C0977/55</u>	336	40	

Mandrels conforming to ASTM A615 & A615M

Mandrel product code	Mandrel diameter (mm)	Re-bar diameter (mm (in.))	Mandrel holder product code
<u>70-C0977/19</u>	32	9.5 (3)	
<u>70-C0977/23</u>	44	12.7 (4)	70-C0977/61
<u>70-C0977/27</u>	56	15.9 (5)	
<u>70-C0977/33</u>	96	19.0 (6)	70-C0977/62
<u>70-C0977/37</u>	112	22.2 (7)	
<u>70-C0977/39</u>	128	25.4 (8)	
<u>70-C0977/47</u>	200	28.7 (9)	Not necessary
<u>70-C0977/49</u>	224	32.2 (10)	
<u>70-C0977/50</u>	250	35.8 (11)	

Resilience test

Digital pendulum impact tester

Standards

EN 10045 | ASTM E23

This apparatus is used for determining the steel tension and bending strength by impact (Charpy method) and comprises:

- Pendulum with hardened knife
- Holding device for specimen
- Digital indicator
- Breaking mechanism to stop the pendulum
- Safety cage

The machine is supplied with the standard 300 J hammer but can also be used with the 150 J or 450 J hammer and the Izod apparatus which are available on request.

Technical specifications

- Max impact energy: 300 J
- Pendulum moment: 160.7695 Nm
- Angle resolution: 0.025°
- Angle of striking: 150°
- Velocity of striking: 5.2m/s
- Power consumption: 800 W
- Dimension (length x width x height): 1980 x 600 x 1700 mm
- Weight: 650 kg

Ordering information

70-C9902

Digital pendulum impact tester complete with safety cage. 380 V, 50 Hz, 3 ph.

Accessories

70-C9902/1

Cooling apparatus to lower the specimen temperature, including bath and tongs.

70-C9902/2

Dry ice maker.

Mandrels conforming to Italian D.M. January 14 th , 2008			
Mandrel product code	Mandrel diameter (mm)	Re-bar diameter (mm)	Mandrel holder product code
<u>70-C0977/16</u>	24	6	70-C0977/61
<u>70-C0977/19</u>	32	8	
<u>70-C0977/21</u>	40	10	
<u>70-C0977/24</u>	48	12	
<u>70-C0977/28</u>	60	12	
<u>70-C0977/30A</u>	70	14	
<u>70-C0977/31A</u>	80	16	70-C0977/62
<u>70-C0977/42</u>	144	18	
<u>70-C0977/44</u>	160	20	
<u>70-C0977/45</u>	176	22	
<u>70-C0977/46A</u>	192	24	
<u>70-C0977/47</u>	200	25	
<u>70-C0977/50A</u>	260	26	Not necessary
<u>70-C0977/52</u>	280	28	
<u>70-C0977/54</u>	320	32	
<u>70-C0977/55A</u>	340	34	
<u>70-C0977/55B</u>	360	36	
<u>70-C0977/56A</u>	400	40	



70-C9902



70-C0902/1



70-C9902/2

Asphalt Testing

75 | Analysis of Bituminous Mixtures

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PAVELAB® SYSTEMS, the Asphalt division of CONTROLS, has inherited the consolidated know-how and qualified experience accumulated in this sector by CONTROLS, who has almost 50 years of partnership and collaboration with the academic world and major international laboratories, as well as an active participation in trade associations and reference Standard organizations. Superpave™ methods are directing the market of asphalt pavement testing towards more advanced systems and the new division is aligned with these requirements.

This 75 section includes mainly all equipment and apparatus concerning the analysis of bituminous mixtures, including hot and cold extraction methods, centrifuge extractors, ignition systems etc.



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PAVELAB50**Automatic closed-system asphalt analyzer**

For separation and extraction of bitumen, filler and aggregates from asphalt samples by use of solvents



75-PV50A25

**Standards**

ASTM D2172 | EN 12697-1

These tests methods are used for quantitative determinations of bitumen in hot-mixed paving mixtures and paving samples for specification acceptance, service evaluation, control and research.

These methods prescribe the solvent or solvents that can be used for the binder extraction and recovery.

The representative bitumen sample can be used to perform other test such as penetration, softening point, etc.. Aggregates, including filler, are also separated and remain available for sample grading.

We are proposing several models of extraction system, including the Automatic Closed-system Asphalt Analyzer.

Operating Principle

The asphalt sample (maximum 3.5 kg) is placed in a washing drum lined with woven mesh cloth with openings 0.063, 0.075 or 0.090 mm wide and it is fitted into the washing chamber. Bitumen and filler are separated from the sample by washing with solvent and ultrasonic motion. The mixture of filler/bitumen/solvent is then centrifuged and the filler is separated. The aggregates and filler are dried by forced air circulation and the residue of solvent recovered by condensation.

The remaining bitumen/solvent solution is distilled and separated in two different tanks. Part of the bitumen/solvent solution can be drained off before distillation and connected to a flask for use with a rotary evaporator to recover a bitumen sample for other tests. The clean distilled solvent is recycled for other extractions.

The analyzer shall be connected to a suitable water cooling unit to feed the three different cooling coils of the apparatus (see Accessories).

Distinguishing features of the new generation

7" touch screen **swinging panel** displays the operating stage and recorded data. Machine software enable the test parameters set up.

Machine version incorporating balance also available (model 75-PV50A25). The sample can be weighted at the end of each stage and related data are recorded and used for automatic result calculation. All results, including those of previous tests, can be recalled for printout reports by the printer 82-P0172/B. See Accessories.

The condenser cleaning operations are facilitated by an **hinged opening** of the lid.



Level indicators are made of a high resistance material in order to be compatible with a **extensive range of solvents**.

Note

The machine can be configured for use with the following solvents:
 - Perchloroethylene (tetrachloroethylene)
 - Trichloroethylene
 - Dichloromethane (methylene chloride)

Main features

- > Fully automatic test cycle:
 - Washing of the asphalt sample (up to 3.5 kg) with solvent and ultrasonic motion, with simultaneous heating and rotation of the drum lined with screening mesh
 - High speed extraction centrifuge for separation of filler from binder solution
 Condensation of solvent vapour in a stainless steel tank including cooling coil, conforming to latest anti-pollution requirements
- Automatic recovery of solvent by a continuous distillation process
- Easy binder recovery for further tests such as penetration, softening point, etc.
- Fast connection for rotary evaporator flask available as option
- > Extraction time reduced to approx. 55 minutes (including drying)
- > No toxic fumes in the laboratory
- > 7" touch screen swinging panel
- > Version incorporating a balance for an accurate measurement of asphalt sample (10 kg ±0.1 g) also available
- > High extraction capacity: up to 200 g of filler for each extraction
- > Automatic sample drying after extraction
- > Silent operation



75-PV 50A15

The PAVELAB Automatic closed-system asphalt analyzer consists essentially of the following:

Machine body

Steel sheet, powder coated with epoxy resin. Wheel mounted.

Washing chamber

High quality stainless steel fitted with ultrasonic equipment, heating system, driving device for the rotation of the washing drum, valves, connections, etc.

Washing drum (Separate accessory)

Lined with screening mesh, 0.063 or 0.075 or 0.090 mm opening. This unit includes seating, support and closing ring for the cover. Each model should be fitted with the appropriate cover (see Accessories).

Centrifuge

High speed centrifuge for 120 mm diameter cup, complete with safety switch.

Condenser

Stainless steel tank complete with cooling coil for condensation of solvent vapour during the drying operation.

Forced air circulation pump

For drying aggregate and filler.

Recovery/distillation unit

Double chamber: one for distillation, one used as a reservoir. The distillation chamber comprises a base and upper heater providing solvent recovery up to approx.

30 litres/hour, and cooling coils above the chamber, incorporated in the cover. Both chambers are fitted with drain valves.

Sampling device for Rotary evaporator

A fast connection for the Rotary evaporator flask for bitumen solution collection is also available. See Accessories 75-PV5X100.

7" Touchscreen control panel

For controlling and operating the machine.

Balance option

For the accurate measurement of asphalt samples (model 75-PV50A25 only).

Water cooling system

The machines have to be connected to a suitable water cooling system which is not included and have to be ordered separately. See Accessories.

Safety features

The machine stops immediately if a lack of water, electric motor malfunctions etc. are detected and the reason for the stoppage is shown on the control panel display. The door is locked when the test is running.

Technical specifications

- Maximum sample size: 3.5 kg
- Centrifuge rotation speed: 6000 rpm
- External cup dimensions: 120 x 200 mm (diameter x height)
- Maximum filler capacity: approx. 200 g
- Extraction time (including drying of aggregate and filler): approx. 55 minutes
- Solvent used per extraction: approx. 10 litres (recycled)
- Power rating: 6 kW (excluding water cooling system)
- Overall dimensions: approx.

1400 x 750 x 1500 mm (w x d x h)
- Weight: approx. 240 kg



Placing the washing drum into the machine



Detail of centrifuge inlet



Placing the centrifuge cup into the centrifuge unit



Detail of 75-PV5 X100 fast connection for Rotary evaporator flask, for bitumen solution sampling



Detail of control panel display



Ordering information

Two versions of the analyzer are proposed:

-models 75-PV50A15
and **75-PV50A16**
without accessories.

-models 75-PV50A25
and **75-PV50A26**
without accessories but supplied with integrated balance.

Standard version

75-PV50A15

PAVELAB Automatic Closed-System Asphalt Analyzer for separation and extraction of bitumen, filler and aggregates from asphalt samples by use of solvents. 380 V, 50-60 Hz, 3 ph.

75-PV50A16

Some as above but 220 V, 60 Hz, 3 ph.

Version incorporating balance

75-PV50A25

PAVELAB Automatic Closed-System Asphalt Analyzer for separation and extraction of bitumen, filler and aggregates from asphalt samples by use of solvents. Complete with integrated scale. 380 V, 50-60 Hz, 3 ph.

75-PV50A26

Same as above but 220 V, 60 Hz, 3 ph.

Accessories

Washing drums and closing lid

75-PV50/KIT

Kit of accessories complete with:

75-PV5X010

washing drum, 0.063 mm mesh

75-PV5X040

closing lid for washing drums

75-PV5X150

centrifuge cup, 120 mm diameter

75-PV0005/2

lining paper for centrifuge cup.

Pack of 100.

Alternative washing drum

75-PV5X20

Washing drum, 0.075 mm mesh

75-PV5X30

Washing drum, 0.090 mm mesh

Solvent testing device

75-PV5X110

Testing device to verify the stability of recycled solvent from the pH value.

75-PV5X120

Solvent stabilizer. 1000 ml bottle. For stabilization of recycled solvent.



75-PV5X135

Water cooling system

75-PV5X135

Water cooling system providing water between 10 and 15°C, flow rate 5 litres/min, pressure 3 bar. 380 V, 60 Hz, 3 ph.

75-PV5X136

As above but 220 V, 60 Hz, 3 ph.

Centrifuge cup

75-PV5X150

Centrifuge cup, 120 mm diameter.

75-PV0005/2

Lining paper for centrifuge cup. Pack of 100.

75-PV5X160

Device for the extraction of the centrifuge cup.

Connection

75-PV5X100

Fast connection for rotary evaporator flask, for bitumen solution sampling (to be ordered at time of order).

Printer

82-P0172/B

24 column serial printer. External battery charger and batteries included. 110-230 V, 50-60 Hz, 1 ph.



75-PV5X150



75-PV5X010



75-PV5X040

Detail 75-PV5X010 with 75-PV5X040



Automatic binder extraction unit



main features

- > Fully automatic testing cycle for:
 - > Sieving
 - > Centrifugal extraction
 - > Solvent recovery
 - > Conforms to the latest anti-pollution requirements
 - > Ideal for mastic asphalt
 - > Big reduction of toxic fumes in the laboratory
 - > High extraction capacity: up to 400 g of filler per test
 - > Significant reduction of extraction time and cost
 - > Avoids solvent handling by the operator
 - > Low quantity of solvent material used
 - > Use of perchloroethylene as solvent

Standards

EN 12697-1 | ASTM D2172

This machine is used for separating and extracting bitumen by perchloroethylene or trichloroethylene solvents and sieving, with separation of the filler by centrifugal action and recovery of the solvent material. The complete cycle is carried out automatically.

We produce two versions that are identical except for the sieves: they are included with model 75-B0005 but not with model 75-B0005/A, which allows the user to complete the machine with sieves of the preferred openings.

The unit can be housed inside a cabinet with an aspirator, model 75-B0005/50, as shown in the pictures - see Accessories.

Description

The basic machine comprises:

- A sieving unit with a solvent spraying nozzle to separate out and wash the asphalt sample. The unit can hold seven 200 mm diameter sieves
- A filterless centrifuge to separate the filler from the solvent and bitumen solution
- A solvent recovery unit to recover the solvent

The machine is supplied complete with a separate electric control panel and three spare cups for the extraction centrifuge.

The 75-B0005 model is also supplied with the following parts:

- Four 200 mm diameter stainless steel sieves with 0.075, 0.250, 0.710 and 2 mm openings*
- 200 mm diameter sieve frame only
- 200 mm diameter sieve pan

- O-ring gaskets for above
- Lining paper sheets, pack of 100

**Other testing sieves of different openings can be used*

Technical specifications

- Maximum quantity of asphalt per extraction: 3.5 kg
- Maximum quantity of filler: 300-400 g
- Time required for a complete extraction: from 25 to 45 min
- Maximum solvent recovery capacity: from 40 to 50 L/h
- Rotating speed: 12000 rpm
- Power supply: 220-380 V, 50-60 Hz, 3 ph., 3.5 kW
- Overall dimensions of the testing unit: 1200 x 650 x 1200 mm (approx.)
- Weight: 170 kg (approx.)

Ordering information

75-B0005/A

Automatic binder extraction unit, supplied without sieves. 380 V, 50 Hz, 3 ph.

75-B0005/AZ

As above but 220 V, 60 Hz, 3 ph.

75-B0005

Automatic binder extraction unit, complete with four 200 mm diameter test sieves: 0.075, 0.250, 0.710 and 2 mm openings. Conforming to EN 12697-1 and ASTM D2172. 380 V, 50 Hz, 3 ph.

75-B0005/Z

As above but 220 V, 60 Hz, 3 ph.

Accessories

Cabinet with aspirator

75-B0050/50

The cabinet is designed to house the Automatic binder extraction unit and is fitted with an electric aspirator and a roof opening with a basket for activated charcoal. A wheel-mounted carriage is included for easy removal of the extraction unit. The use of this cabinet is recommended to minimize the diffusion of toxic solvents in the laboratory.

Overall dimensions:

1635 x 920 x 2300 mm (wxdxh)

Weight: 200 kg (approx.)

Power supply: 230 V, 50 Hz, 1 ph.

Test sieves and spares

75-B0005/1

Spare stainless steel cup for centrifuge.

15-D2330/J

200 mm diameter stainless steel sieve with 75 µm openings.

15-D2275/J

As above but with 250 µm openings.

15-D2230/J

As above but with 710 µm openings.

15-D2185/J

As above but with 2 mm openings.

75-B0005/2

Spare lining paper for centrifuge cup.
Pack of 100.

75-B0005/8

O-ring gasket. Pack of 10.

15-D2001/J

200 mm diameter sieve frame only.



75-B0005 in the 75-B0005/50 cabinet

Asphalt binder analyzer by ignition method



main features

- > Fully automatic test cycle with simultaneous display of all test parameters, including weight loss and percentage
- > Highly efficient heating system with additional afterburner for complete combustion of exhaust fumes, conforming to CE requirements
- > PID closed-loop temperature control
- > Built-in weighing system
- > Reduced test time of 30-40 minutes
- > Test performance menu comprising the simultaneous display of all test data
- > Internal database stores up to 100 tests. Each test can be displayed and printed or sent to a PC via the RS232 port

Standards EN 12697-39 | ASTM D6307 | AASHTO TP53

The PAVELAB Asphalt binder analyzer is a high precision apparatus that combines an ignition oven with a continuous weighing system to monitor the loss of weight of the asphalt sample, and to automatically determine, at the end of the test, the binder content and percentage. An independently controlled auxiliary afterburner chamber significantly reduces the furnace emissions.

The PAVELAB Analyser is supplied complete with a double sample basket, safety cover, extraction fork and 3 metres of metal exhaust ducting.



PC software-Typical weight/
time curve

Technical specifications

Oven and afterburner

- Highly efficient heating system with afterburner for total combustion of fumes to minimize emissions in accordance with CE requirements
- No need for filters or hoods = low maintenance costs
- Sample sizes up to 4500 g for a more representative test result
- Maximum power rating: 10 kW
- Holding power during the test: 3.5 kW
- Supplied complete with double sample tray, fork to handle the pan, cooling cage and 3 m of exhaust ducting

Hardware

- Large permanent memory to store test results
- On-board 40-column serial printer
- Weighing system: 10,000 g capacity, 0.1 g resolution, ±0.1 g repeatability
- Closed-loop PID thermo-regulation for both oven and afterburner
- 240 x 128 pixel large graphic display
- RS232 output for PC connection

Firmware

- Language selection
- Clock/calendar

- Bi-directional real-time communication with the weighing system
- Test setting menu, complete with physical and descriptive sample parameters
- Calibration menu for temperature and weight
- Optional manual control of test performance
- Test performance menu with simultaneous display of all test data
- Internal database for up to 100 tests. Each test can be sent to PC, displayed, printed or deleted
- Possibility to connect an external balance for automatic weight input (see accessories)

Safety features

- Door is automatically locked during the test, even if the power is interrupted
- Door closure is automatically monitored before the test starts

Overall dimensions:
590 x 830 x 973 mm (w x d x h)
Weight: approx.: 125 kg

Accessories

75-PV0008/5

Metal stand for 75-B0008.

75-PV0008/10

Face shield

75-PV0008/12

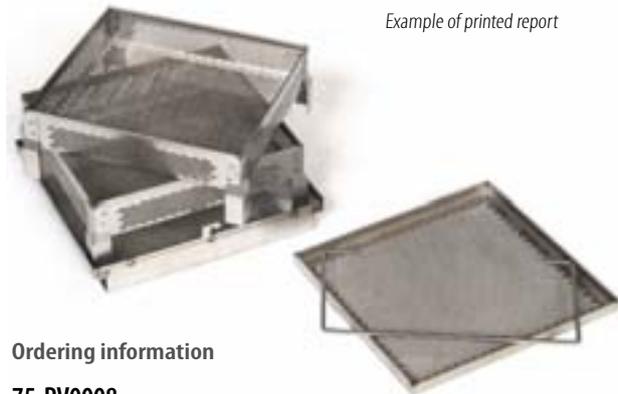
Safety cover for sample basket.

75-PV0008/14

Additional double sample basket



Example of printed report



Ordering information

75-PV0008

PAVELAB, Asphalt binder analyzer by ignition method. Complete with double sample basket/safety cover, extraction fork and 3 metres of metal exhaust ducting. 380 V, 50 Hz, 3 ph. 75-PV0008/Z As above but 220 V, 60 Hz, 3 ph.

75-PV0008/2

Auxiliary top pan digital balance, 10,000 g capacity, 0.1 g sensitivity, for connection to Asphalt binder analyzer 75-PV0008 via the RS232. 230 V, 50-60 Hz, 1 ph.

Note: this balance, or a similar suitable model, is used to weigh the sample before the test execution.



Test setup



Metal stand 75-PV0008/5, safety visor 75-PV0008/10 and exhaust ducting (supplied with the machine)



Extraction fork (supplied with the machine)

75-B0016**Hot extractor apparatus:
paper filter method****Standards**

EN 12697-1 Clause B.1.1

This apparatus is used for the extraction of binder from hot-mix paving mixtures and can also be used for determining the moisture content. It consists of a steel pot with gasket and gauze container, a Dean-Stark receiver and a Liebig condenser, and is supplied complete with a pack of 100 filter papers (Grade No.5, 400 mm diameter).

It has to be used with a suitable hot plate, which is not included and must be ordered separately - see Accessories.

The solvent used can be profitably recovered with the Solvent recovery unit (see page 411).

Overall dimensions (assembled):
1000 x 500 x 500 mm
Weight: 25 kg (approx.)

Accessories**10-D1402**

Hot plate, 160 mm diameter. 230V, 50-60 Hz, 1 ph.

10-D1402/Z

As above but 110V, 60 Hz, 1 ph.



75-B0015 with 10-D1402 and 75-B0015/6

75-B0015**Hot extractor apparatus:
wire mesh filter method****Standards**

EN 12697-1 Clause B.1.2

Used for the quantitative determination of bitumen in hot-mix paving mixtures and pavement samples, the apparatus consists of a glass jar with a wire basket suspended in it by a supporting ring, and a metal condenser. The bitumen content is calculated by difference from the weight of extracted aggregates.

The filler, or ash, passing through the 63 µm wire basket has to be separated from the bitumen/solvent solution using an appro-

appropriate centrifuge extractor (see the Filterless centrifuge extractor-model 75-B0024/N). The solvent used can then be profitably recovered using the Solvent recovery unit (see page 411).

The apparatus has to be used with a hot plate, such as our model 10-D1402, and an aluminium disk 75-B0015/6 for better heat distribution.

Maximum basket capacity: 3 kg
Overall dimensions: 165 mm diameter x 335 mm height
Weight: 2.8 kg (approx.)

Accessories**10-D1402**

Hot plate, 160 mm diameter 230V, 50-60 Hz, 1 ph.

10-D1402/Z

As above but 110V, 60 Hz, 1 ph.

75-B0015/6

Aluminium disk, 160 mm diameter.

Spare parts**75-B0015/1**

Metal condenser for 75-B0015

75-B0015/2

Spare glass jar, 5 l cap. For 75-B0015

75-B0015/3

Spare wire basket, 0.074 mm opening for 75-B0015

Reflux extractors**Standards** ASTM D2172

Used for the quantitative determination of bitumen in hot-mix paving mixtures and pavement samples, these extractors consist of two wire mesh cones with interlocking frames, a cylindrical glass jar and a water condenser with inlet/outlet tubes. The bitumen content is calculated by difference from the weight of extracted aggregates, moisture content and ash from an aliquot part of the extract. Two models are available with 1 or 4 kg capacities. The extractors have to be used with a hot plate and an aluminium disk for better heat distribution. Filter paper is not included and has to be ordered separately - see Accessories.

The solvent used can be profitably recovered using the Solvent recovery unit (see page 411).

Technical specifications

Capacity:

- 75-B0013/A, 1000 g

- 75-B0014/A, 4000 g

Overall dimensions (h x diameter):

- 75-B0013/A, 465 x 150 mm

- 75-B0014/A, 510 x 265 mm

Weight (approx.)

- 75-B0013/A, 3 kg

- 75-B0014/A, 9 kg



75-B0013/A with 10-D1402 and 75-B0015/6; 75-B0014/A

Ordering information**75-B0013/A**

Reflux bitumen extractor, 1000 g capacity.

75-B0014/A

Reflux bitumen extractor, 4000 g capacity.

Accessories**10-D1402**

Hot plate, 160 mm diameter 230 V, 50-60 Hz, 1 ph.

10-D1402/Z

As above but 110 V, 60 Hz, 1 ph.

75-B0015/6

Aluminium disk, 160 mm diameter.

75-B0013/4

Filter paper, 300 mm diameter, for 75-B0013/A. Pack of 50.

75-B0014/4

Filter paper, 400 mm diameter, for 75-B0014/A. Pack of 50.

Spare parts**75-B0013/1**

Glass jar for 75-B0013/A.

75-B0014/1

Glass jar for 75-B0014/A.

75-B0013/2

Stainless steel wire mesh cone for 75-B0013/A.

75-B0014/2

Stainless steel wire mesh cone for 75-B0014/A.

75-B0013/3

Brass condenser for 75-B0013/A.

75-B0014/3

Brass condenser for 75-B0014/A.

Kumagawa extractor**Standards****EN 12697-1**

Used for the quantitative determination of bitumen in hot-mix paving mixtures and pavement samples, this extractor consists of a round glass flask, a cooling unit, a Dean-Stark receiver, and an electric heating mantle with regulator and fittings.

Two models are available with 1 or 2 litre capacities.

The filtering cartridges are not part of the apparatus and have to be ordered separately - see Accessories.

The solvent used can be profitably recovered using the Solvent recovery unit (see page 411).

Weight: 15 kg (approx.)



75-B0018

Ordering information**75-B0018**

Kumagawa extraction apparatus, 1 litre capacity. 230 V, 50-60 Hz, 1 ph.

75-B0018/A

Kumagawa extraction apparatus, 2 litre capacity. 230 V, 50-60 Hz, 1 ph.

Accessories**75-B0018/1**

Kumagawa filtering cartridges, 58 mm diameter x 170 mm, for 75-B0018 1 litre capacity extractor. Pack of 25.

75-B0018/A1

Kumagawa filtering cartridges 80 mm diameter x 200 mm, for 75-B0018/A 2 litre capacity extractor. Pack of 25.

Centrifuge extractors

Centrifuge binder extractors (filter paper method)

Standards

EN 12697-1 | ASTM D2172 | AASHTO T164/A

These centrifuges are used for determining the percentage of bitumen in bituminous mixtures. All models comprise a removable, precision-machined rotor bowl housed in a cylindrical aluminium container, mounted on a base containing an electric motor. The motor is fitted with an AC drive (inverter) that has two functions: control of speed up to 3600 rpm (regardless of the frequency, 50 or 60 Hz) and electrical braking.

The rotating unit is connected to the base by four calibrated springs, which assures perfect stability throughout the test. The cover is precisely machined and fitted with a solvent-resistant gasket to avoid leakages.

The centrifuges are operated using a control panel with a start/stop button, a speed control knob and a digital display that shows the frequency (which is proportional to the speed). Using the speed control knob, the motor can be set to automatically ramp up to any speed of 3600 rpm or less.



main features

- > Speed control up to 3600 rpm at 50 or 60 Hz by AC drive (inverter)
- > Electric brake
- > Stable and silent throughout the test
- > Electronic control and digital display
- > CE version available with electromagnetic arrangement to prevent opening of the cover during rotation
- > Explosion-proof option
- > Supplied complete with 100 filter discs

75-B2212, 75-B2312

All models are fitted with a hand brake system for stopping the machine in an emergency.

Two versions are available, in two different capacities:

- **Standard** - 1500 g (75-B2212 / 75-B2214) and 3000 g (75-B2312 / 75-B2314) capacity
- **Explosion proof** - 1500 g (75-B2222) and 3000 g (75-B2322) capacity

The standard models can be upgraded with an electromagnetic system to prevent opening of the cover during rotation. This option (code 75-B2210/UP1) is applicable for standard models only and has to be factory installed.

All the centrifuges can be used with spare bowls of either capacity (75-B0022/2 and 75-B0023/2) and are supplied complete with a pack of 100 filter papers.

Technical specifications

Motor: AC drive (inverter), 550 W
Overall dimensions: 539 x 406 x 509 mm (wxdxh)
Weight: 54 kg (approx.)



75-B2222, 75-B2322 Explosion proof versions

Ordering information

Standard versions

75-B2212

1500 g capacity digital centrifuge extractor, speed control up to 3600 rpm, complete with 100 filter discs. 230 V, 50-60 Hz, 1 ph.

75-B2214

As above but 110 V, 60 Hz, 1 ph.

75-B2312

3000 g capacity digital centrifuge extractor, speed control up to 3600 rpm, complete with 100 filter discs. 230 V, 50-60 Hz, 1 ph.

75-B2314

As above but 110 V, 60 Hz, 1 p.

Explosion-proof versions

75-B2222

1500 g capacity digital centrifuge extractor, explosion-proof version. Speed control up to 3600 rpm, complete with 100 filter discs. 230 V, 50-60 Hz, 1 ph.

75-B2322

3000 g capacity digital centrifuge extractor, explosion-proof version. Speed control up to 3600 rpm, complete with 100 filter discs. 230 V, 50-60 Hz, 1 ph.

Upgrading options

75-B2210/UP1

Electromagnetic system to prevent opening of the cover during rotation, conforming to CE directives.

Note: Suitable for 75-B2212 and 75-B2312 Standard models only.
To be factory installed and specified at time of order

Accessories and spares

75-B0022/1

Filter discs for 1500 g capacity centrifuges. Pack of 100.

75-B0023/1

Filter discs for 3000 g capacity centrifuges. Pack of 100.

75-B0022/2

Spare bowl and cover for 1500 g capacity centrifuges.

75-B0023/2

Spare bowl and cover for 3000 g capacity centrifuges.



75-B0022/2, 75-B0022/1



Detail of 75-B2210/UP1 safety device

Centrifuge extractors

Filterless centrifuge extractors

Standards

EN 12697-1 | ASTM D1856

These extractors are used for rapid filterless separation of filler (ash) from binder solution generated by, for instance, the Hot extractor (wire mesh filter) apparatus 75-B0015. They can also be used for binder recovery from a previously disaggregated asphalt sample, using solvent and a funnel fitted with 200 mm diameter test sieves to gradually separate the aggregates.

The procedure is carried out by pouring the solvent from the top funnel into the rotating aluminium cup. Due to the centrifugal forces, the liquid spreads over the cup wall and moves upwards, leaving mineral particles in the cup whilst the liquid is discharged through the outlet tubing. A special electronic circuit enables a controlled ramp to be pre-set, which gradually increases the speed to the maximum.

Two models are available:

- **75-B0024/N** for filler extraction up to 100 g per test, fitted with a 70 mm aluminium diameter cup
- **75-B0024/B** for filler extraction up to 400 g per test, fitted with a 122 mm diameter cup

The 75-B0024/N, NY and NZ versions do not include sieves which have to be ordered separately, conforming to EN or ASTM standards - see Accessories. The cup should be internally lined with paper for better and complete removal of filler - see Accessories, code 75-B0005/2.

The solvent used can be profitably recovered using the Solvent recovery unit (see page 411).



main features

- > High speed with continuous flow
- > Filterless method assures complete filler recovery
- > Automatic ramp and pre-set speed control
- > Up to 100 g or 400 g can be extracted per test

75-B0024/N with sieves



75-B0024/B with sieves

Ordering information

75-B0024/N

Continuous flow filterless centrifuge, 70 mm diameter cup. 230 V, 50 Hz, 1 ph.

75-B0024/NY

As above but 220 V, 60 Hz, 1 ph.

75-B0024/NZ

As above but 110 V, 60 Hz, 1 ph.

75-B0024/B

Continuous flow filterless centrifuge, 122 mm diameter cup, complete with four 200 mm diameter sieves with 0.075, 0.250, 0.710 and 2 mm openings. 380 V, 50 Hz, 3 ph.

Product code	75-B0024/N 75-B0024/NY 75-B0024/NZ	75-B0024/B
Max. quantity of filler extracted per test	50-100 g	400 g
Cup dimensions, mm (dia. x height)	70x190	122x211
Maximum speed, rpm	11000	11000
Power, W	550	1000
Sieves included	See accessories	0.075, 0.25, 0.71, 2 mm
Overall dimensions, mm (w x d x h)	500 x 370 x 850	560 x 640 x 1200
Weight, kg (approx.)	55	100

Accessories

Test sieves

15-D2335/J

200 mm diameter ISO test sieve with 63 µm openings.

15-D2330/J

As above but with 75 µm openings.

15-D2300/J

As above but with 150 µm openings.

15-D2275/J

As above but with 250 µm openings.

15-D2230/J

As above but with 710 µm openings.

15-D2185/J

As above but with 2 mm openings.

Note: The EN standard requires sieves with 63 µm and 2 mm openings. The ASTM standards require 75 and 150 µm openings.

Lining paper

75-B0005/2

Lining paper for 75-B0024/N series and 75-B0024/B centrifuges. Pack of 100.

Spare parts

75-B0024/1

Spare aluminium cup, 70 mm diameter x 190 mm high, for 75-B0024/N series centrifuges.

75-B0005/1

Spare stainless steel cup, 122 mm diameter x 211 mm, for 75-B0024/B centrifuge.

Fume exhaust cupboard with aspirator

The extraction methods of the EN 12697-1 and corresponding ASTM standards often require the use of toxic solvents (e.g. methylene chloride) that are hazardous to health and are subject to occupational exposure limits, as described in relevant legislation and regulations.

This Class 1 Fume exhaust cupboard, fitted with a double aspiration system and certified as conforming to EN 14175-2-3 by the Bureau Veritas, fully satisfies the above requirements.

Ordering information

75-D3521

Fume exhaust cupboard with aspirator and activated charcoal filter for solvents. 220/400 V, 50-60 Hz, 3 ph.



main features

- > Double aspiration system, Class 1, certified conforming to EN 14175-2-3 by the Bureau Veritas
- > Activated charcoal filter for solvents
- > Electrical aspirator delivering up to 1350 m³/h
- > Waterproof light system
- > Stainless steel worktop 1200 x 750 mm, incorporating sink and bibcock
- > Front sash opening with counterweight
- > Electric control panel
- > Double current outlet
- > Base cabinet with two doors and two shelves
- > Overall dimensions: 1200 x 830 x 900 + 1600 mm (wxdxh)
- > Weight: 185 kg (approx.)

75-B3521

Solvent recovery unit

This apparatus is used to recover solvent liquid after its use for extraction tests. It is designed for recovering non-flammable solvents and has two stainless steel chambers - one for dirty solvent and the other for the cleaned solvent. An electric heater in the left-hand chamber distils the solvent, which then passes through a water cooling system and drops into the second chamber ready for re-use in a new test. Once the process is completed, a temperature switch automatically turns the heating elements off.

Supplied complete with 10 m of plastic tubing, tube clamps, a sieve insert with 0.6 mm openings and a lid. The unit is particularly useful for recovering solvent used with the Centrifuge binder extractors and Hot extractor apparatus etc.

Maximum temperature: 150°C
Solvent recovery rate: 10 L/h
Power: 1200 W
Overall dimensions: 400 x 320 x 650 mm
Weight: 17 kg (approx.)

Ordering information

75-B0027/A

Solvent recovery unit, 230V, 50-60 Hz, 1 ph.



75-B0027/A

Binder recovery apparatus

Rotary evaporator

Standards

EN 12697-3 | ASTM D5404 | AASHTO TP2

The apparatus is used for recovering soluble bitumen from bituminous pavement materials in a form suitable for further testing.

During operation, a solution of solvent and asphalt (bitumen) from a prior extraction is distilled by partially immersing the rotating distillation flask of the apparatus in a heated oil bath, while the solution is subjected to either a high vacuum with fine regulation of pressure (up to ± 0.1 kPa, in accordance with EN 12697-3) or a partial vacuum and flow of nitrogen gas (in accordance with ASTM D5404 and AASHTO TP2). The recovered asphalt (bitumen) can then be subjected to further testing as required.

The apparatus is supplied complete with a 1 litre capacity glass flat-bottomed evaporating flask (evaporating flasks up to 5 litre capacity can be used). For other parts conforming to EN and ASTM standards, see Accessories

Rotational speed: adjustable from 20 to 270 rpm

Temperature range: from +20 to +210°C

Power: 1300 W

Weight: 27 kg (approx.)

Ordering information

75-B0165

Rotary evaporation apparatus. 230 V, 50 Hz, 1 ph.

75-B0165/Z

As above but 110 V, 60 Hz, 1 ph.



75-B0165

Accessories and spares Conforming to EN 12697-3

75-B0165/5

Diathermic oil. 18 kg can.

75-B0165/4

Glass evaporating flask, 1 litre capacity.

75-B0165/3

Glass tubing with three way valve and transparent flexible hose for solution intake.

75-B0165/7

Flat-bottomed glass container, 3 litre capacity with rubber stopper.

86-D2003

Two stage portable vacuum pump. 230 V, 50-60 Hz, 1 ph.
(For 110 V / 60 Hz, ask for model 86-D2003/Z.)

86-D2064

Rubber tube for vacuum pump, ID 6.5, OD 16.5 mm, 2 m long.

86-D2004/1D

Vacuum regulator with digital gauge, 0.001 bar resolution. 110/220V/ 50-60Hz/1 ph.

Conforming to ASTM D5404 and AASHTO TP2

75-B0165/5

Diathermic oil. 18 kg can.

75-B0165/2

Glass flat-bottomed evaporation flask, 2000 ml capacity.

75-B0165/3

Glass tubing with three way valve and transparent flexible hose for solution intake.

75-B0165/7

Flat-bottomed glass container, 3 litre capacity with rubber stopper.

86-D2003

Two stage high vacuum pump. 230 V, 50-60 Hz, 1 ph.
(For 110 V / 60 Hz, ask for model 86-D2003/Z.)

86-D2004/1D

Vacuum regulator with digital gauge, 0.001 bar resolution. 110/220V/ 50-60Hz/1 ph.

86-D2064

Rubber tube for vacuum pump, ID 6.5, OD 16.5 mm, 2 m long.

75-B0165/6

Flow control device and flow meter to monitor the CO₂ flow rate up to 1000 ml/min.



86-D2004/1D



75-B0165/6

Binder recovery apparatus: Abson method

Standards

ASTM D1856 | CNR 33

Used for recovering the asphalt (bitumen) from a solution generated by a previous extraction. The asphalt is recovered with properties very close to those it possessed in the bituminous mixture and in quantities sufficient for further testing.

The apparatus is a distillation assembly that consists of:

- Extraction flasks
- Glass tubing
- Inlet aeration tube
- Electric heating mantle
- Water-Jacketed condenser
- Thermometer
- Gas flowmeter
- Stands and clamps

Weight: 10 kg (approx.)

Ordering information

75-B0026

Distillation assembly for recovery of binder from solution by Abson method. 230 V, 50-60 Hz, 1 ph.

75-B0026/Z

As above but 110 V, 60 Hz, 1 ph.



Binder recovery apparatus: vacuum pump method

Standards

EN 12697-1 | BS 598:102

This apparatus is used to remove the solvent from binder/solvent solutions in order to directly determine the total binder content of aggregate/binder mixtures.

The apparatus consists of a vacuum pump fitted with a regulator producing a vacuum down to 200 mbar, a thermostatically-controlled water bath, and two flat-bottomed 250 ml capacity flasks with rubber bungs, plus all other necessary fittings and connections.

The water bath can also be used for other applications such as the Marshall test. For more information see Water baths, model 76-B0066/A.

For more information on the vacuum pump, see Vacuum pumps,

model 86-D2001 with vacuum gauge regulator 86-D2004/5.

Power rating: 1380 W (1200 water bath + 180 vacuum pump)

Weight: 23 kg (approx.)

Ordering information

75-B0025/B

Binder recovery apparatus, vacuum pump method. 230 V, 50-60 Hz, 1 ph.

75-B0025/BZ

As above but 110 V, 60 Hz, 1 ph.



75-B0025/B

Determination of maximum density

Large vacuum pyknometers

Standards

EN 12697-5 | ASTM D2041

These pyknometers are for determining the theoretical maximum specific gravity of uncompacted bituminous paving mixtures. They can also be used for the calculation of the percentage of air voids in compacted bituminous mixtures and the amount of bitumen absorbed by the aggregates. We offer three models, all of which are fitted with a vacuum gauge, a coupling for vacuum application and a vent valve:

- 75-D1122, heavy duty version, 10 litre capacity, specially designed for this application, made from robust transparent plastic. Suitable for paving mixture samples up to 6 kg, with a maximum aggregate size of 50 mm (2").
- 75-D1123/C, 4.5 litre capacity, made from aluminium with a transparent lid. Suitable for paving mixture samples up to 2 kg, with a maximum aggregate size of 19.1 mm (¾").
- 75-D1123/D, 10 litre capacity, made from plastic with a transparent lid. Suitable for paving mixture samples up to 6 kg, with a maximum aggregate size of 50 mm (2").

The 10 litre models (75-D1122 and 75-D1123/D) can also be used as vacuum bells for small glass pyknometers with capacities up to 2000 ml.

All the above models have to be used with the 15-D0407/C vibro-deaerator which gently shakes the pyknometer to evacuate the air. A vacuum pump with de-airing system is also required to complete the apparatus. For more information see page 569 and 570. These are not included and have to be ordered separately - see Accessories.



75-D1123/D

Product code	75-D1122	75-D1123/C	75-D1123/D
Capacity, L	10	4.5	10
Maximum sample weight, kg	6	2	6
Maximum aggregate size, mm	50 (2")	19.1 (¾")	50 (2")
Internal dimensions, mm (diameter x height, approx.)	280 x 186	191 x 152	273 x 337
Overall dimensions, mm (diameter x height, approx.)	300 x 450	200 x 160	300 x 360
Weight, kg (approx.)	6.7	3	5

Ordering information

75-D1122

Large, heavy duty vacuum pyknometer, 10 litre capacity.

75-D1123/C

Vacuum pyknometer, 4.5 litre capacity.

75-D1123/D

Vacuum pyknometer, 10 litre capacity.

75-D1122 with de-airing vacuum system, including Vacuum pump 86-D2003, Air drying unit 86-D2005 filled with 86-D0819 Silica gel desiccant, and two rubber tubes 86-D2064.



75-D1123/C

Accessories

Electromagnetic vibro-deaerators

15-D0407/C

Electromagnetic vibro-deaerator, complete with timer. 230 V, 50-60 Hz, 1 ph. Power: 400 W

Overall dimensions: 496 x 406 x 600 mm (w x d x h) approx.

Weight: 30 kg (approx.)

15-D0407/CZ

As above but 110 V, 60 Hz, 1 ph.

15-D0407/B1

Device for clamping pyknometers to the electromagnetic vibro-deaerator.

Vacuum pump and de-airing system

86-D2003

Vacuum pump, double stage. 230 V, 50-60 Hz, 1 ph.

(For 110 V / 60 Hz, ask for model 86-D2003/Z.)



86-D2005

Air drying unit.

86-D0819

Silica gel desiccant with indicator, 1 kg.

86-D2064

Rubber vacuum hose (two pieces required).

For more information on the vacuum pump and de-airing system see *Vacuum pumps*, page 569 and 570



75-D1122 fitted to the 15-D0407/C with the device 15-D0407/B1



75-D1123/D fitted to the 15-D0407/C with the device 15-D0407/B1



15-D0407/B1

Bottle rolling machine**Standards**

EN 12697-11

This machine is used for determining the affinity between aggregate and bitumen. The result is expressed by visual registration of the degree of coverage on un-compacted bitumen-coated mineral aggregate particles after the influence of mechanical stirring action in the presence of water.

The machine is designed to accommodate three test bottles (model 75-B0011/A1). A glass rod, 75-B0011/A2 is also required to complete the system. These items are not included and have to be ordered separately - see Accessories.

Rotating speed: adjustable up to 80 rpm

Dimensions: 380x300x160 mm (wxdxh)

Weight: 10 kg (approx.)

Ordering information**75-B0011/A**

Bottle rolling machine. 230 V, 50 Hz, 1 ph.

Accessories**75-B0011/A1**

Test bottle, Pyrex glass, 86 mm diameter x 176 mm high, 34 mm neck diameter.

75-B0011/A2

Glass rod, 6 mm diameter, one end fitted with a 30 mm long rubber tube.



75-B0011/A with 3 test bottles 75-B0011/A1



Test bottles 75-B0011/A with 75-B0011/A2 glass rod

Drainage basket**Standards**

EN 12697-18



75-B0019/A and 75-B0019/B

The drainage basket and metal tray are used for determining binder drainage of bituminous mixtures, estimating the binder drainage for different binder contents, and evaluating the effect of varying the fine aggregate quantity or anti-draining additive content.

The basket is made of stainless steel perforated plate with 3.15 mm diameter holes and has four feet.

Weights (approx.):

75-B0019/A Drainage basket 360 g;

75-B0019/B Metal tray 210 g.

Ordering information**75-B0019/A**

Drainage basket, 100 x 100 x 100 mm.

75-B0019/B

Metal tray, 160 mm sq., 10 mm deep.

Digital asphalt thermometer**Standards**

EN 12697-13

This microprocessor-controlled digital thermometer can be used for various field and laboratory applications in road and concrete testing. It is dual range (reading in both °C and °F), high resolution and is housed in a rugged ABS case. The highest and lowest temperatures measured in a test cycle can be recalled by simply pressing a button.

It is supplied without probes, which have to be ordered separately according to the requirements of the application. For asphalt temperature measurements, we recommend the following probes:

- 82-D1229/1 Penetration probe, 120 mm long, 3 mm dia.
- 82-D1229/2 Surface probe
- 82-D1229/5 Penetration probe, 220 mm long, 5 mm dia.
- 82-D1229/5S Penetration probe 300 mm long, 5 mm dia. conf. to NF
- 82-D1229/6 T bar probe, 650 mm long, conforming to BS 594

Ordering information**82-D1229**

Digital thermometer, measuring ranges -50 to +199 °C and +200 to +1350 °C resolution: 0.1 °C up to 199.9 °C and 1 °C over.



82-D1229 with probes

Asphalt Testing

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The section 76 includes some of the most important testing apparatus as the Gyratory compactors, all equipment to perform the Marshall test and related accessories. Also included some IPC specific and unique testing machines as, for example, the SERVOPAC Gyratory compactor, the PReSBOX Shear-box compactor, AUTOSAW Automated asphalt saw and Kor Bit core drilling machine.

The section 77 includes the Slab compactors, to produce samples to perform Dynamic tests and for determining the susceptibility of Hot Mix Asphalt to deformation by the Wheel tracker.

The section 80, finally, concerns the various testing apparatus to verify the road quality.

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BITUMIX

Automatic laboratory mixer



main features

- > Conforms to EN 12697-35
- > Ideal for preparing laboratory samples for mix design
- > Mixing capacity up to 30 litres
- > Mixing speed adjustable from 5 to 35 rpm
- > Mixing temperature adjustable up to 250° C
- > Stainless steel (AISI 304) mixing container
- > Temperature control with PT 100 probe
- > Digital temperature display
- > Easy unloading by motorized tilting system, total rotation up to 130°

Standards EN 12697-35

BITUMIX

The design and testing of bituminous mixtures includes various laboratory tests such as Marshall stability (EN 12697-34), Gyrotory compaction (EN 12697-31), Slabs laboratory compaction (EN 12697-33) to prepare specimens for Wheel tracking (EN 12697-22) and Determination of stiffness including Beam fatigue testing (EN 12697-26, EN 13108).

To produce samples for performing the above tests, it is essential that the preparation of a bituminous mixture is carried out at a reference temperature and within a limited time period in order to reduce mechanical degradation of the aggregates. The mixer should also be capable of entirely coating all mineral substances in not more than 5 minutes as stated by EN 12697-35.

The mixer consists essentially of a horizontal stainless steel mixing container with a helical mixing shaft. The container is thermally insulated and comes complete with a heating element and probe sensor which provide uniform temperature control. The container can be easily tilted by the electric motor for the unloading operation.

The control panel includes: a digital display to monitor mixing temperature, a digital thermo-regulator, a mixing speed controller and various commands



76-PV0077/B Detail of drum with helical mixing shaft



Ordering information

76-PV0077/B

PAVELAB BITUMIX automatic laboratory mixer, 30 litres capacity. 380-400 V, 50 Hz, 3 ph.

76-PV0077/BZ

As above but 220 V, 60 Hz, 3 ph.



76-PV0077/B Detail of aggregate loading

Technical specifications

- Mixer capacity: 30 litres
- Mixing speed: adjustable from 5 to 35 rpm
- Mixing temperature: adjustable from ambient to 250° C
- Heater: 4500 W
- Temperature control: PT 100 sensor
- Tilting angle up to 130°
- Power: 7000 W (total)
- Voltage: 380-400 V, 50 Hz, 3 ph or 220 V, 60 Hz, 3 ph
- Overall dimensions: 1350 x 650 x 1205 (w x d x h)
- Weight: approx. 320 kg



76-PV0077/B Detail of unloading. The mixing cylinder is rotated by a motorized tilting system for easy unloading. The tilting angle is adjustable to 130° to speed up the unloading operation.



76-PV0077/B

Laboratory planetary mixers



main features

- > Machine operated by a dedicated and easy to use in-built software
- > The pre-defined procedures guide the operator in mixing operations according to Standards
- > Continuously variable speed (VFD technology)
- > Whisk/Planetary speeds adjustable from 30/13 to 380/165 rpm, depending on the mix consistency
- > Micro-switch preventing the machine to be started without bowl in position

76-B0702

We propose three versions: 5, 10, and 20 litres capacity (respectively models 76-B0702, 76-B0072 and 76-B0075/B). They all feature a robust construction with a bowl and whisk that are easy to fit and to remove. When lifting the cover, a safety switch turns the mixer off for operator safety conforming to CE directives. A planetary mixing action ensures a complete and uniform mixing of the materials. All models are supplied complete with whisk.

For mixing asphalt samples, the mixers have to be fitted with the suitable Isomantle heater (see Accessories).

These mixers can also be used for other applications such as mixing sub-base soil samples (see page 32).

76-B0702 Series

Asphalt planetary mixers, 5 l cap.

A robust device for the efficient mixing of asphalt mixes, this model is a table mounted unit with planetary mixing action and a bowl and whisk that are easily fitted and removed. The front grill, when opened, automatically stops the machine for operator protection conforming to CE requirements.

The machine is supplied complete with bowl and whisk.

The machine operates with a dedicated and easy to use display and keyboard interface. Either Standard speeds or user defined speeds can be easily selected (also adjustable during mixing).



76-B00702 with Isomantle 76-B00702/HM

Accessories and spares

Isomantle heater

Used to heat the bituminous mixtures contained in the mixing bowl up to a maximum temperature of 180°C. Easy to fit to the machine bowls with a spring arrangement and supplied complete with an electronic temperature regulator.

76-B0702/HM

Isomantle heater for 76-B0702 mixer. 700 W, 230 V, 50-60 Hz, 1 ph. Weight 4.4 kg approx.

76-B0702/HMZ

As above but 110 V, 60 Hz, 1 ph.

76-B0702/2

Spare bowl for 76-B0702 mixers.

76-B0702/6S

Spare whisk for 76-B0702 mixers

Technical specifications

- Planetary speeds: user defined from 13 to 165 rpm
- Whisk speed: user defined from 30 to 380 rpm
- Bowl capacity: 5 litres
- Alphanumeric display 2 x 16 characters
- Power: 370 W
- Overall dimensions: 465 x 540 x 620 mm (l x d x h)
- Weight: 35 kg (approx.)

Ordering information

76-B0702

Laboratory planetary mixer, 5 L capacity, complete with bowl and whisk. 230 V, 50-60 Hz, 1 ph.

76-B0704

As above but 110 V, 60 Hz, 1 ph.



76-B0072, 76-B0075/B

76-B0072 and 76-B0075/B Series Asphalt planetary mixers 10/20 l cap.

A robust device for the efficient mixing of asphalt mixes, these models are table mounted units with planetary mixing action and a bowl and whisk that are easily fitted and removed. The front grill, when opened, automatically stops the machine for operator protection conforming to CE requirements.

All machines are supplied complete with bowl and whisk.

The machine operates with a dedicated and easy to use display and keyboard interface. Either Standard speeds or user defined speeds can be easily selected (also adjustable during mixing).



76-B0072/HM and 76-B0702/HM



76-B0702/6S, 76-B0072/8, 76-B0075/6



76-B0072/9, 76-B0075/9

Product code	76-B0072 76-B072/Y 76-B072/Z	76-B0075/B 76-B0075/Y 76-B0075/Z
Bowl capacity, L	10	20
Mixing capacity, L	4	8
Planetary speeds, rpm	8 positions from 50 to 150	8 positions from 50 to 150
Spindle speeds, rpm	10 positions from 115 to 400	10 positions from 180 to 540
Power, W	370	736
Overall dimensions, mm (lxdxh)	340 x 570 x 585	610 x 730 x 1180
Weight, kg	42	128



76-B0072 with 76-B0072/HM



76-B0075/B with 76-B0075/HM

Ordering information

76-B0072

Laboratory planetary mixer, 10 L capacity, complete complete with bowl and whisk. 230 V, 50 Hz, 1 ph.

76-B0072/Y

As above but 220 V, 60 Hz, 1 ph.

76-B0072/Z

As above but 110 V, 60 Hz, 1 ph.

76-B0075/B

Laboratory planetary mixer, 20 L capacity, complete complete with bowl and whisk. 230 V, 50 Hz, 1 ph.

76-B0075/BY

As above but 220 V, 60 Hz, 1 ph.

76-B0075/BZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

Isomantle heaters

Used to heat the bituminous mixtures contained in the mixing bowl up to a maximum temperature of 180°C. They are easy to fit to the machine bowls with a spring arrangement and are supplied complete with an electronic temperature regulator.

76-B0072/HM

Isomantle heater for 76-B0072 mixers. 1000W, 230 V, 50-60 Hz, 1 ph. Weight 5.5 kg approx.

76-B0072/HMZ

As above but 110 V, 60 Hz, 1 ph.

76-B0075/HM

Isomantle heater for 76-B0075/B and 76-B0075/BY mixers. 1000 W, 230 V, 50-60 Hz, 1 ph. Weight 6.4 kg approx.

76-B0075/HMZ

As above but 110 V, 60 Hz, 1 ph.

Mixing hooks

76-B0072/9

Mixing hook for 76-B0072 mixers.

76-B0075/9

Mixing hook for 76-B0075 mixers.

Spare parts

76-B0072/6

Spare bowl for 76-B0072 mixers.

76-B0075/1

Spare bowl for 76-B0075/B mixers.

76-B0072/8

Spare whisk for 76-B0072 mixers.

76-B0075/6

Spare whisk for 76-B0075/B mixers.

PreSBOX Asphalt Prism Shearbox Compactor

UNIQUE SOLUTION FOR SPECIMEN PREPARATION



main features

- > The PreSBOX produces a prismatic specimen with nominal dimensions of 450 mm (length) x 150 mm (width) x 120 to 185 mm (height)
- > Asphalt prisms prepared in the PreSBOX compactor can be sawn or cored to produce 4-6 prismatic beams or 1-4 cylindrical specimens
- > The PreSBOX can be operated by a single person
- > Produces specimens with excellent air void distribution and particle orientation
- > Designed for an easy unlocking of the compaction mould, facilitating an effortless specimen extraction at safe height, handling and user safety

The PreSBOX provides the latest in asphalt specimen preparation and mix evaluation technology. PreSBOX produces high quality asphalt prisms from which beams and cylinders with excellent air voids distribution, homogeneity and particle orientation can be cut.

The unique shearing action of the PreSBOX closely replicates the conditions under which asphalt is placed in the field and produces specimens with excellent homogeneity and volumetric properties, giving an exceptional measure of workability.

The PreSBOX also provides an accurate measure of the workability (relative effort required for compaction) of Hot Mix Asphalt (HMA) needed in the field to achieve a target void content.

The PreSBOX Shearbox Compactor features a PC interface for user entry of compaction parameters, and provides a real-time graphic display of data, e.g. specimen height, vertical stress, shear stress and air voids per cycle.

Controlling PreSBOX is IPC Global's Multi-Axis Control System (IMACS). IMACS delivers leading edge performance, unparalleled control and the ultimate in flexible data acquisition.

The PreSBOX features an ergonomic interaction of users with the testing machine

Three simple steps

PreSBOX has been designed to replicate the field properties of asphalt, in a simple and efficient manner.



Charging the compaction mould with loose asphalt

Using the distribution chute provided, pour HMA into the compaction mould. Slots in the distribution chute ensure the material is tipped uniformly into the PreSBOX. Discharge gates at the bottom allow the material to fall freely into the mould avoiding segregation.



Commencing the test

The mould is then pushed into the PreSBOX and automatically locked into place. Using IPC Global's world renowned UTS Software the user can set the required compaction parameters. The PC controlled compaction process can then be commenced.



Removing the Sample

The compaction mould is then unlocked, pulled into the ejection position and the sample is elevated to a safe height to allow for removal and cooling.

Specifications

- Shearing motion: Electromechanically driven at 4°
- Vertical stress: Pneumatic user defined up to 2 MPa
- Specimen size: 450 mm x 150 mm x 120 - 185 mm (l x w x h)
- Integrated specimen extruder
- Specimen Loading: Easy loading with included accessory kit (includes: distribution chute, levelling tool & comb)
- Compaction Frequency: 3.7 cycle/min +/- 16 s/cycle
- Mould hardness: 50 Rockwell C (minimum)
- Platen Hardness: 50 Rockwell C (minimum)
- Mould Surface: finish smoother than 1.6 µm
- Loading Platen Size: 448 mm x 149 mm (l x w)
- Loading Platen Finish: smoother than 1.6 µm

- Number of cycles: user definable (unlimited)
- Air Supply: clean dry air supply at minimum 600 kPa
- Size (h x w x d): 1540 mm x 1765 mm x 1050 mm
- Weight: 1100 kg

Ordering Information

76-PV46A02

IPC Global PReSBOX, Asphalt Prism Shearbox Compactor.
220 - 240 V, 50 - 60 Hz, 1 ph.

Accessories

76-PV71102

Pneumatic filtration kit - wall mount, 12 bar.

Perfectly Uniform Specimens

Asphalt prisms prepared in the PReSBOX compactor can be sawn using Universal Automated Asphalt Saw (Autosaw, see page 436) or cored using the Multi Core Drill (see page 434) to produce prismatic beams or cylindrical specimens suitable for testing in the Asphalt Mixture Performance Tester (AMPT), Four Point Bend Apparatus, Asphalt Standards Tester, TSRST^{plus} or UTM Systems.

Specimens cut from PReSBOX prisms have identical properties with uniform air voids distribution and particle orientation ensuring consistent and repeatable test results.

Specimens cut from the PReSBOX



- Prismatic specimen produced by the PReSBOX



- Up to four 70mm wide prismatic specimens



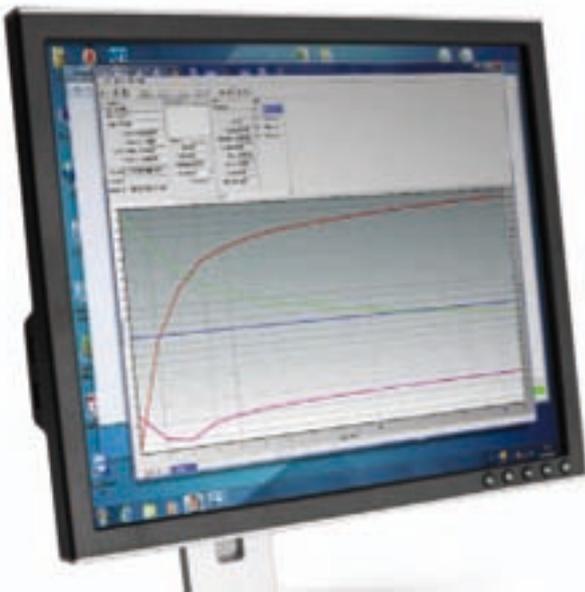
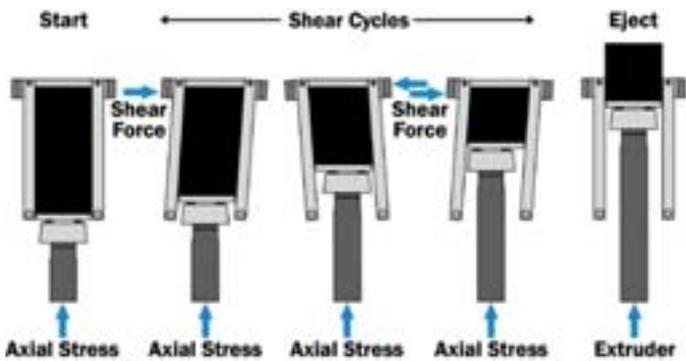
- Up to six 50mm wide prismatic specimens



- Up to four 100mm diameter cylindrical



- Up to two 150mm diameter cylindrical specimens for Texas Overlay Test specimens





GYRATORY COMPACTORS

Standards

EN 12697-10 | EN 12697-31 | ASTM D6925 | AASHTO T312 | AASHTO TP4 | SHRP* M002

*Strategic Highway Research Program

Standards specify the method for compaction of cylindrical specimens of bituminous mixtures using a gyratory compactor. Such compaction is achieved by combining a rotary shearing action with a vertical force applied by a mechanical head. The method can be used for:

- Preparation of specimens of a given height at a predetermined density, for subsequent testing of their mechanical properties;
- Derivation of a curve of density versus number of gyrations;
- Void content for a given number of gyrations.

Standards apply to bituminous mixtures (made either in laboratory or from on-site sampling), with aggregates not larger than 37.5 mm.

During operation the bituminous mixture is contained in a cylindrical mould (100 or 150 mm diameter). Compaction is achieved by the simultaneous application of a low-static compression and a shearing action, which results in the motion of the centre-line of the test piece, which generates a conical surface of revolution while the ends of the test piece remain approximately perpendicular to the axis of the conical surface.

The PAVELAB models 76-PV0251, 76-PV0251/E and the ICP Global SERVOPAC Advanced Research model 76PV20A02, also feature continuous measurement of Shear Resistance during compaction which is particularly important for research purposes.

Servopac



main features

- > User defined setting of axial stress, gyratory angle and speed of rotation:
- > Measure the shear stress during every gyratory cycle
- > Users can set the desired compaction parameters from either the optional hand-held control pendant or a Windows PC
- > Four column loading frame design provides superior stability
- > Designed for easy specimen insertion, extraction, and user safety with the integrated specimen extruder
- > Robust and reliable to withstand any laboratory environment
- > Produces large cylindrical specimen with diameters of 100mm or 150mm and heights of 50mm-170mm
- > Only requires air and power to operate

76-PV20A02 Servopac, electro-pneumatic gyratory compactor, incorporating specimen extruder

76-PV20A02

Advanced Research Gyratory Compactor

Standards

AASHTO TP4 | AASHTO T312 | ASTM D6925 | EN 12697-10 | EN 12697-31

The research specification Servopac is a fully automated, servo-controlled gyratory compactor designed to compact asphalt mixes. Compaction is achieved by the simultaneous action of static compression and the shearing action resulting from the mould being gyrated through an angle about its longitudinal axis.

The Servopac allows you to set the required axial stress, gyratory angle and speed of rotation therefore enabling it to meet all the international gyratory compaction Standards.

IPC Global's Servopac surpasses the requirements of AASHTO, ASTM, EN and AS Standards

Control

Closed loop control of variable gyratory angle from 0 to 3°
 Closed loop control of variable vertical force from 0 to 20 kN
 Closed loop control of variable rate of gyration from 3 to 60 gyrations per minute

Reliability

Designed for superior stability during compaction
 Renowned for its robust design and long service life
 Load and displacement feedback control ensures accurate force, angle and rate of gyration

Value

Produces 100 mm or 150 mm cylindrical specimens
 Designed and engineered for minimal maintenance
 Includes specimen extruder as standard

Specifications

Vertical force: 0 to 20 kN +/- 100 N (with 1000 kPa air supply)
 Gyratory angle: 0° to 3° +/- 0.02°
 Gyration rate: 3 to 60 +/- 0.1 gyrations
 Number of gyrations: 0 to 999
 Specimen height: 50 mm – 170 mm
 Air supply: clean dry air, 5 litres/second, minimum
 Operating pressure: 800 to 1000 kPa
 Size and dimensions:
 Size (HxDxW): 1970 x 776 x 450 mm
 Weight: 250 kg

Ordering information

76-PV20A02

Servopac, IPC Global advanced Research Gyratory compactor. 230 V, 50 Hz, 1 ph

76-PV20A04

Same as above but 110 V, 60 Hz, 1 ph

continued

Servopac

Axial load is applied using a digital servo-controlled pneumatic actuator. The built-in load cell and displacement transducer provide precise force and displacement control

Lower and raise the mold at a touch of a button, with the easy access buttons allowing for quick test set up and specimen removal.

Four column frame provides superior stability

Pneumatic specimen extraction unit extracts the specimen safely from the mould without manual handling.



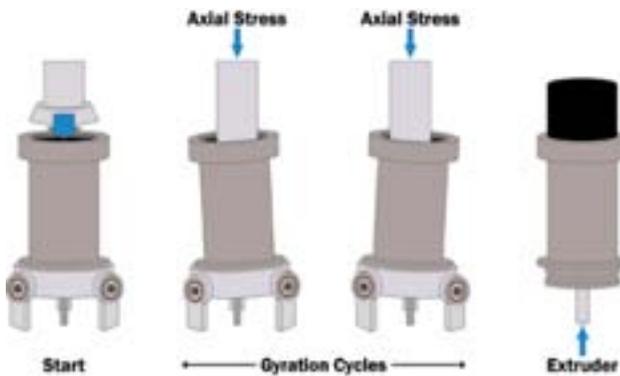
Emergency stop button immediately stops machine operation for user safety

Hand held control pendant with an integrated key-pad and liquid crystal display for easy operation.

Safety glass door with built-in interlocks completely enclose the compaction chamber for complete user safety and easy viewing

Initiate sample extraction with the easily accessible extraction button.

Included as standard the Servopac stand allows for operation at an optimal height



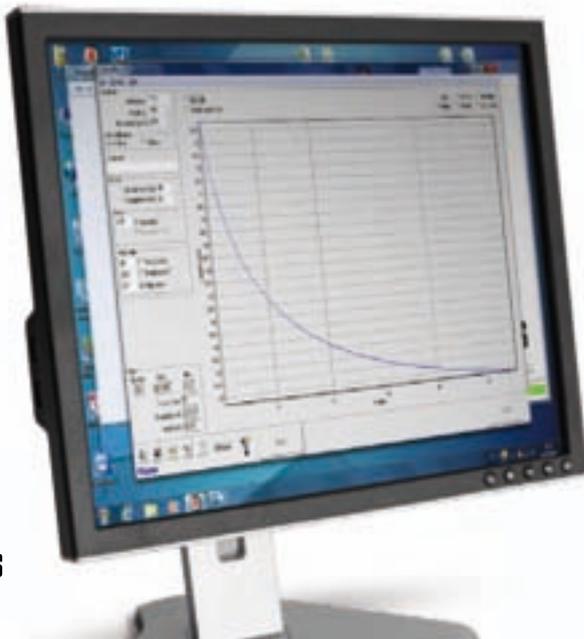
ALL PNEUMATIC GYRATORY ACTION

Three vertical closed loop servo controlled pneumatic actuators operate together in a sequential motion to apply a longitudinal gyration action to the specimen and mould. A simultaneous axial stress is gradually applied from above via a servo-controlled pneumatic actuator to compact the asphalt mix.

After compaction the mould is slid into the extruder bay where a pneumatic ram slowly extracts the specimen from the mould

INTELLIGENT CONTROL

Servopac comes standard with a handheld control pendant featuring an integrated key-pad and liquid crystal display. Servopac's intelligent controller can store data from several compaction runs, is independently calibrated, and provides a coded data interface via a dedicated serial communications port for monitoring and control purposes. Servopac also allows for PC operation. The Windows PC interface allows for user input of test parameters and will display and plot either height, density or angle against gyration cycles in real time. Test data may be stored and retrieved or transferred to other software analysis packages. The servo-controlled operation of the machine allows vertical stress, gyration angle and rate of gyration to be quickly modified from the hand held control pendant or PC.





Specimen extruder for safe and easy operation

INTELLIGENT DESIGN

Servopac has been designed and engineered for ease of use and operator safety with minimal manual exertion whilst handling hot and heavy asphalt-filled moulds. The mould may be slid from a bench directly into the compaction chamber. Then following compaction, slide to the pneumatically operated specimen extractor, eliminating heavy lifting. The compaction chamber is completely enclosed and fitted with safety glass to allow the operator to view the compaction process. The door opens and closes automatically and a safety interlock prevents the machine from operating unless it is closed. An emergency stop button is also fitted.

Accessories

76-P8000/PC

Personal computer with IPC Global UTS test software loaded

76-PV20001

Control pendant

76-PV20002

Servopac 100 mm mould assembly

76-PV20003

Servopac 150 mm mould assembly

76-PV20004

Servopac angle verification kit including dial gauge

76-PV20005

30 kN Steel proving ring

76-PV20006

Servopac calibration spacers kit including spacer 200 mm, spacer 50 mm, spacer 116.7 mm, three angle calibration spacers and three angle calibration gauges

76-PV20007

Sample Prep filter paper 100 mm

76-PV20008

Sample Prep filter paper 150 mm

76-PV71102

Pneumatic filtration kit – Wall mount 12 bar



76-PV20005



76-PV20007, 20008



76-PV20003



76-PV71102



76-PV0255 (Detailed description on page 432)



76-PV20004



76-PV20006

GYROCOMP

Gyratory compactors



The third generation of
Gyratory compactors

Hundreds of unit
successfully operating
worldwide



main features

- > Full conformity to ASTM, AASHTO and EN Standards
- > Approved by the SuperPave™ Center from USA
- > Easy and quick change of the internal gyratory angle by a factory calibrated conversion scale.
- > All models supplied complete with traceable calibration certificate (ACCREDIA)
- > Extremely rigid but lightweight structure, allows the precise calibration of the internal angle (it is a mandatory prescription of the relevant Standards)
- > Double control mode using independent touch-screen display or PC
- > User-friendly hardware and software
- > Handy, easy to use, lightweight, ideal for site and mobile laboratories

76-PV2522, with extruder 76-PV2520/15

Standards EN 12697-10 | EN 12697-31 | ASTM D6925 | AASTHO T312 | AASHTO TP4 | SHRP* M002

Operating principle

It is based on the motion of the bituminous sample which generates a conical surface of revolution, characterized by the gyratory angle. This motion produces shearing forces and, consequently, the sample compaction. See the drawing at the bottom of the page.

High stability frame

The very rigid but lightweight frame is due to the exclusive body design, resulting in high stability values exceeding the EN 12697-31 Standards

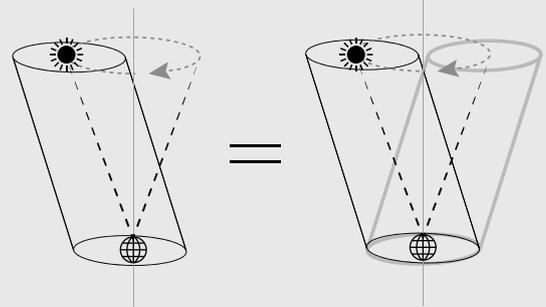
Change of internal gyratory angle

The internal gyratory angle can be easily and quickly changed to any value, between 0.7 and 1.4°, following a factory calibrated conversion scale.

Periodical verification and re-calibration

The Gyrocomp compactors can be easily verified and re-calibrated by the operator, using the ILS Internal angle measurement apparatus model 76-PV0255 (see page ...). This apparatus is verified with traceable (ACCREDIA) calibration instruments.

Representation of the gyratory motion of the Gyrocomp 76-PV2522



The operating principle of Controls' Gyrocomp 76-PV2522 is based on an ingenious system consisting on the elementary resolution of the gyratory motion conforming, to use a well known example, to the Galileo theory for which is the earth that rotates around the sun "... eppur si muove"... yet it moves. For more detailed information visit our web site.



These machines have a robust yet light high-stiffness steel mono-coque structure that incorporates a pneumatic cylinder for vertical load application and an electro-mechanical mechanism for the gyration system. The exclusive mould rotation system grants high accuracy and repeatability of test results, together with stiffness and angle stability values widely within the limits defined in EN 12697-31. The user-friendly

integrated touchscreen control panel has a large display showing the test graph in real time, and on-board firmware in 12 languages. The test can be also remotely controlled by PC software. The software language can be user-defined making the interface suitable for any user's needs. The machine is supplied complete with a height calibration tool and PC software, and can be fitted with Electromechanical or Manual extruder 76-PV2520/15 or 76-PV0252/14. See ordering information.

Available in two versions:
76-PV2522, conforming to AASHTO/ASTM Standards and
76-PV2522/E, conforming to EN standards

All models are supplied complete with ACCREDIA traceable certificates of load, displacement and internal angle. EN models are also certified for all the other parameters required by EN 12697-31 Annex C ("stability factor", "parallelism factor" and "full rotation factor").

Cylinder moulds, distance plates and air compressor are not included. See accessories.



Example of single test processing with PC software

continued

GYROCOMP

Technical specifications

- Compacted specimen sizes: 150 and 100 mm diameter
- Sample heights: 80 to 200 mm (150 mm diameter) and 50 to 125 mm (100 mm diameter)
- Consolidation pressure: 80 to 800 kPa (150 mm diameter) and 160 to 1400 kPa (100 mm diameter)
- Internal gyration angle: Adjustable from 0.70 to 1.40°
- Preset to 1.16° (76-PV2522, ASTM/AASHTO models)
- Preset to 0.82° (76-PV2522/E, EN models)
- Speed of gyration: adjustable from 15 to 60 rpm
- Number of gyrations: adjustable up to 999
- Test programmable either by number of gyrations or specimen height
- Communication with PC via RS232
- Internal memory: thousands of tests
- Power rating: 1000 W
- Dimensions (including extruder bench): 502 x 753 x 1940 mm (w x d x h)
- Dimensions: 469 x 615 x 1130 mm (w x d x h)
- Weight: approx. 100 kg

Ordering information

76-PV2522

PAVELAB GYROCOMP gyratory compactor, internal gyration angle preset to 1.16° conforming to AASHTO T312/ASTM D6925. 230-110 V, 50-60 Hz, 1 ph.

76-PV2522/E

PAVELAB GYROCOMP gyratory compactor, internal gyration angle preset to 0.82° conforming to EN 12697-31 Annex C. 230-110 V, 50-60 Hz, 1 ph.

Note: All models comply with EN 12697-10, EN 12697-31, ASTM D6925, AASHTO T312 and SHRP M-002. The only difference between the 76-PV2522 and the 76-PV2522/E versions is the angle of gyration, which is factory set for either ASTM/AASHTO or EN. This means that it is possible to modify the angle of gyration and convert one version to the other.

Calibration of internal gyratory angle with the ILS apparatus 76-PV0255. See page 432

Integrated worktop with extruder
The worktop is the perfect size for the GYROCOMP compactor and provides an ergonomic workspace for the operator. The electromechanical 550 W motor with speed reducer produces a maximum load that is also suitable for cold mix specimens.



Integrated worktop with electromechanical extruder option 76-PV2520/15

Integrated worktop with extruder

76-PV2520/15

Integrated worktop with electromechanical specimen extruder. 230 V, 50-60 Hz, 1 ph.

76-PV2520/15Z

As above but 110 V, 60 Hz, 1 ph.

76-PV2520/14

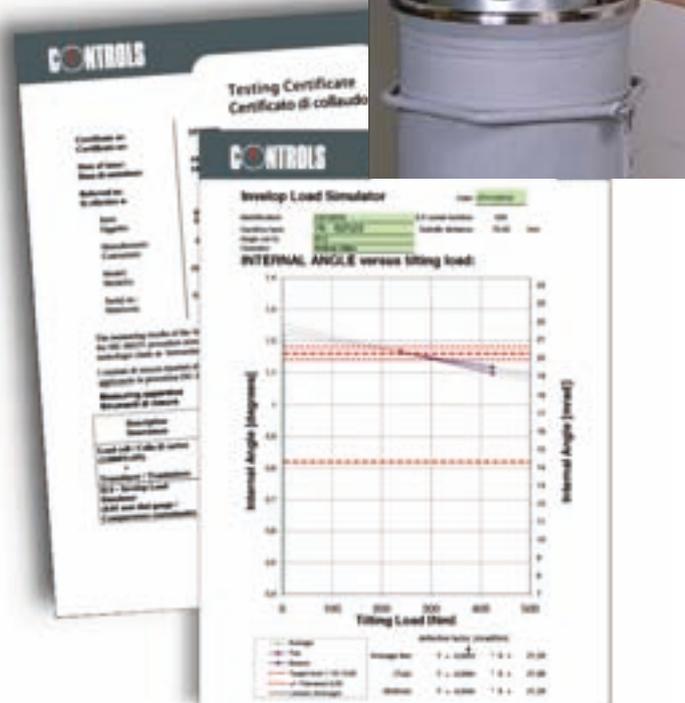
Integrated worktop with manual specimen extruder (as an alternative to the above version).

Accessories

For cylinder moulds, distance plates and air compressors, see page 432



76-PV2522 with PC (not included)



Gyratory Compactors with Shear Resistance Measurement

76-PV0251 (ASTM-AASHTO), 76-PV0251/E (EN) series



main features

- > High reliability and accuracy
- > Certified to EN and ASTM/AASHTO
- > Includes shear resistance measurement during compaction. Results displayed in real time
- > Individual control of test parameters
- > Windows® based software for data processing

Standards EN 12697-10 | EN 12697-31 | ASTM D6925 | AASHTO T312 | AASHTO TP4

With a robust bench-mounted steel structure, this machine incorporates a pneumatic cylinder for vertical load application and an electro-mechanical mechanism for the gyration system. It is PC controlled, results are displayed in real time and are processed using Windows® based software. The machine is supplied complete with a height calibration tool, air hose, operating instructions and calibration certificate. External specimen extrusion is provided by the 76-PV0251/15 Integrated worktop with electromechanical extruder. See ordering information.

All models are supplied complete with Accredia traceable certificates of load, displacement and internal angle. EN Models are also certified for all the parameters required by EN 12697-31 Annex C ("stability factor", "parallelism factor" and "full rotation factor").

Technical specifications

- Sample dia.: 150 and 100 mm diameter
- Sample heights: 80 to 200 mm (150 mm diameter) and 50 to 125 mm (100 mm diameter)
- Consolidation pressure: 80 to 800 kPa (150 mm diameter) and 160 to 1400 kPa (100 mm diameter)
- Internal gyration angle: Adjustable from 0 to 3°.
- Preset to 1.16° (ASTM/AASHTO models)
- Preset to 0.82° (EN models)
- Speed of gyration: adjustable from 15 to 60 rpm
- Number of gyrations: adjustable up to 512
- Test programmable either by number of gyrations or target specimen height
- Communication with PC RS232
- Power rating: 1000 W
- Dimensions: 600 x 650 x 1150 mm (w x d x h)
- Weight: approx. 190 kg

Ordering information

76-PV0251

PAVELAB gyrotory compactor featuring continuous shear measurement during compaction. Internal angle of gyration set to 1.16° conforming to AASHTO T312/ASTM D6925.

230 V, 50-60 Hz, 1 ph.

76-PV0251/Z

As above but 110 V, 60 Hz, 1 ph.

76-PV0251/E

PAVELAB gyrotory compactor featuring continuous shear measurement during compaction. Internal angle of gyration set to 0.82° conforming to EN 12697-31 Annex C.

230 V, 50-60 Hz, 1 ph.

76-PV0251/EZ

As above but 110 V, 60 Hz, 1 ph.

Note: all models comply with EN 12697-10, EN 12697-31, ASTM D6925, AASHTO T312 and SHRP M-002. The only difference between the 76-PV0251 76-PV0251/Z and the 76-PV0251/E 76-PV0251/EZ versions is the angle of gyration, which is factory set for either AASHTO or EN. This means that it is possible to modify the angle of gyration and covert one version to the other.



76-PV0251/15

Integrated worktop with extruder

The worktop is the perfect size for the compactor and provides an ergonomic workspace for the operator. The electro-mechanical 550 W motor with speed reducer produces a maximum load that is also suitable for cold mix specimens.

76-PV0251/15

Universal motorized extruder mounted on a working table with wheels.

230 V, 50-60 Hz, 1 ph.

76-PV0251/15Z

As above but 110 V, 60 Hz, 1 ph.

Accessories

For cylinder moulds, distance plates and air compressors, see page 432

continued

Accessories

for Gyrotory Compactors models 76-PV2522, 76-PV2522/E, 76-PV0251, 76-PV0251/E

Cylinder moulds and distance plates

CONTROLS Cylinder moulds:

- Surface hardness: 53-55 HRC
- Internal roughness Ra: less than 1µm

Fully conforming to EN 12697-31 and exceeding ASTM D6925

76-PV0250/2

Cylinder mould, 150 mm diameter, special alloy steel hardened to 53-55 HRC, internally grinded. Complete with top and bottom plates.

76-PV0250/5

Cylinder mould, 100 mm diameter, special alloy steel hardened to 53-55 HRC, internally grinded. Complete with top and bottom plates.

76-PV0250/10

Cylinder mould, 150 mm diameter, special alloy steel hardened to 53-55 HRC, internally grinded, with holes for cold mix compaction. Complete with top and bottom plates.

76-PV0250/3

Distance plate, 150 mm diameter, 50 mm high, for preparing short samples.

76-PV0250/6

Distance plate, 100 mm diameter, 38 mm high, for preparing short samples.

76-PV0250/4

Accessories for compacting 100 mm diameter specimens, including 100 mm height calibration device.



76-PV0250/7

Air compressor

10bar maximum pressure, 130 litres/min air delivery, 10 litre capacity, power rating 750 W, quiet operation (less than 59 dB, ISO 3744, r=4 m).

- Overall dimensions: 370 x 410 x 650 mm (w x d x h)
- Weight: approx. 27 kg

76-PV0250/7

Low noise air compressor. 230 V, 50 Hz.

76-PV0250/7Y

As above but 220 V, 60 Hz.

76-PV0250/7Z

As above but 110 V, 60 Hz.



76-PV0250/10, 150 mm diameter mould, with holes for cold mix compaction.



76-PV0250/6, 76-PV0250/5, 76-PV0250/4, 76-PV0250/3, 76-PV0250/2,

Internal angle measurement apparatus



Standards

EN 12697-31 Annex C | ASTM D7115 | AASHTO T344

The importance of a precise gyrotory angle has been widely noted. Measurement of the internal angle represents the most accurate method of calibration. This method involves the determination of two individual values:

- the angle between the cylinder and the top plate;
- the angle between the cylinder and the bottom plate.

The average of these two values is taken as the "internal angle". To date, measuring the internal angle of gyrotory compactors has been considered a difficult task, leading to wide variations in results even between machines of the same brand.

The 76-PV0255 ILS device fully satisfies the verification requirements of measuring the internal angle in conformance with EN 12697-31 Annex C. It can be used on any make of gyrotory compactor.

main features

- > Accurate calibration of internal angle of Gyrotory compactors and verification of frame stability, to Standard requirements
- > Quick and accurate measurement of the internal gyrotory angle: less than 30 minutes
- > No hot mix required: the device, placed into the mould, reproduces the internal shearing forces generated by the hot mix during compaction
- > The variation of the gyrotory angle (e.g. from ASTM to EN) is quick and easily verified
- > Ideal for periodic verification of the internal gyrotory angle
- > Compatible with any make of Gyrotory compactors
- > Battery operated



76-PV0255 complete set

Operating principle

The ILS apparatus is a cylindrically shaped electro-mechanical device which fit perfectly into any 150 mm diameter gyrotory mould. One short run (10 cycles) is performed to measure the internal compaction angle of the upper end plate inside the mould. The same is repeated for the bottom end plate. The overall gyrotory angle is determined from these two values. While taking measurements, the ILS generates an accurate mechanical tilting moment simulating the presence of mixture during compaction. By applying a high tilting moment level the angle response of the compaction machine allows to verify the compliance to stability frame requirement. The 76-PV0255 ILS apparatus is supplied complete with Excel Macro® for data acquisition and processing. In just 30 minutes it is possible to verify the Gyrotory compactor with high accuracy and without the need for hot mix. The apparatus consists of a structure incorporating a high precision digital gauge, housed in a steel cylinder.

Our GYROCOMP gyrotory compactor and GYROCOMP Research gyrotory compactor are verified and calibrated with the 76-PV0255 ILS apparatus.



Ordering information

76-PV0255

ILS Internal angle measurement apparatus complete set

- Battery operated
- Reproducibility is in 0.01° Class, meeting the requirements of all Standards
- Overall dimensions: 150 x 115 mm (diameter x height)
- Weight: approx. 5.6 kg



Calibration certificate obtained with the 76-PV0255 ILS apparatus, using the Macro Windows® based software.

Multi Core-Drill

Asphalt core drilling machine with clamps for prisms



main features

- > Unique sliding table which permits to core up to 3 samples of 100 mm, at regular intervals, from prisms.
Three support discs included to obtain cores geometrically regular.
- > Adaptable to core samples from cores 150 mm dia. obtained with Gyrotory compactors (see accessory 76-PV75210).
- > For coring samples for the Texas Overlay Test (150 mm dia.)

76- PV75202
with diamond bit

Laboratory asphalt core drilling machine with clamps for prisms up to 450 x 180 mm. The IPC Global Multi Core-Drill has been designed, in particular, for coring samples 100 mm dia., 150 mm high for Dynamic Modulus (AMPT, AASHTO TP79) and 30 to 75 mm high for Indirect Tensile Tests (EN 12697-24 and 26) coming, as example, from Gyrotory compactors.

Robust and rigid frame fitted with three selected motor speeds and adjustable clamps with transparent protections conforming to CE prescription.

- Overall dimensions (L x D x H): 800 x 600 x 1400 mm
- Weight approx.: 85 kg



Three cores at regular intervals from a PReSBOX prism



Detail of the support and clamping device for PReSBOX prisms included in the Multi Core-Drill



76-PV75210 clamp system for cylindrical asphalt samples up to 150 mm

Ordering Information

76-PV75202

Multi Core-Drill, laboratory asphalt core drilling machine with clamps for prisms up to 450 x 150 mm. Three speeds: 540, 1300, 1800 rpm. 2200 W, 10 A. 230 V, 50 Hz, 1 ph*

76-PV75204

Multi Core-Drill, laboratory asphalt core drilling machine with clamps for prisms up to 450 x 150 mm. Three speeds: 560, 1300, 1850 rpm. 2050 W, 16 A. 110 V, 60 Hz, 1 ph

*The 76-PV75202 model can also operate at 220V, 60 Hz. in this case the speeds are 560, 1330 and 1850 rpm.

Accessories

76-PV75210

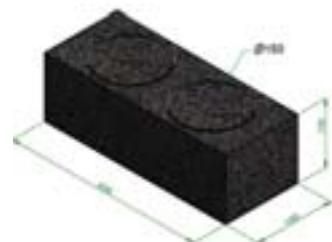
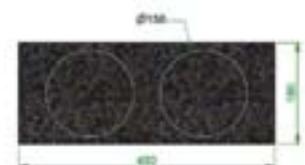
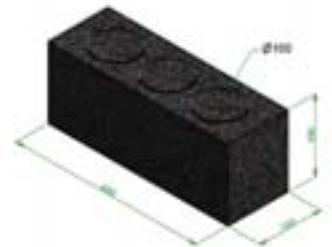
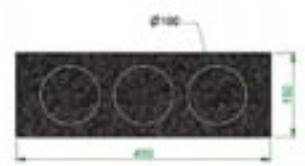
Accessory for coring machine model 76-PV75202/4 suitable for cylindrical specimens from 50mm to 150mm diameter

83-C0322

Diamond core bit to take 100 mm dia. sample. Fixed standard coupling 1 1/4"W, bit length 400 mm.

Note:

- 1) other machines and apparatus to prepare asphalt samples for, as example, dynamic tests, are shown on page 422 and 436
- 2) diamond bits are described on page 559



Specimens cored from PReSBOX prisms

KorBit

Asphalt core drilling machine with clamps for cylinders



76-PV75302 and diamond core bit 83-C0322

Asphalt core drilling machine to take samples from cores up to 150 mm dia. Robust and rigid frame fitted with a 3 selected motor speeds.

Complete with adjustable clamps for cylindrical asphalt samples up to 150 mm. Designed, in particular, for coring samples 100 mm dia., 150 mm high for Dynamic Modulus (AMPT, AASHTO TP79) and 30 to 75 mm high for Indirect Tensile Tests (EN 12697-24 and 26) coming, as example, from Gyrotory compactors. Complete with protection device conforming to CE prescriptions.

- Overall dimensions (L x D x H): 800 x 600 x 1400 mm
- Weight approx.: 85 kg



83-C0322, 83-C0323 core bits with fixed standard coupling for the best alignment, fast and easy fitting

Ordering Information

76-PV75302

KorBit, laboratory asphalt core drilling machine with clamps for samples up to 150 mm dia. Three speeds: 540, 1300, 1800 rpm. 2200 W, 10 A. 230 V, 50 Hz, 1 ph*

76-PV75304

KorBit, laboratory asphalt core drilling machine with clamps for samples up to 150 mm dia. Three speeds: 560, 1300, 1850 rpm. 2050 W, 16 A. 110 V, 60 Hz, 1 ph

*The 76-PV75302 model can also operate at 220V, 60 Hz. in this case the speeds are 560, 1330 and 1850 rpm.

Accessories

83-C0322

Diamond core bit to take 100 mm dia. sample. Fixed standard coupling 11/4"W, bit length 400 mm.

83-C0323

Diamond core bit to take 150 mm dia. sample. Fixed standard coupling 11/4"W, bit length 400 mm.



Example of specimens cored with the KorBit

Note:

- 1) other machines and apparatus to prepare asphalt samples for, as example, dynamic tests, are shown on page 422 and 436
- 2) diamond bits are described on page 559

Autosaw Automated Asphalt Saw



main features

- > Slab and prism of any shape and dimensions can be sawn without additional accessories (see table for maximum dimensions)
- > Jig for round cores, 100 or 150 mm dia, with both automatic or manual feeding of the sample, length up to 200 mm
- > Pneumatic clamping of prisms and cores
- > Unique clamping mechanism for cylindrical specimens minimizes specimen damage. Use of a sacrificial PVC tube produces a superior finish and minimizes edge chipping
- > Easy spacer system allows precise preparation of beams or cores without the need for measurement i.e. 50 x 63 mm or 70 x 70 mm or other sizes
- > Automatic advance and retraction of saw blade to home position
- > Adjustable cutting speed for optimum specimen finish and throughput
- > Numerous interlocks to ensure operator safety
- > Motor features dynamic braking to immediately stop while switched off
- > Motor mounted on twin chrome-plated steel rails with sealed bearings

The IPC Global Autosaw is an automated specimen clamping and sawing system for fast, accurate cutting of beams from asphalt prisms prepared in the PRSBOX or slab compactor and from trimming cylinders from Servopac and other gyratory compactors.

An easy-to-use spacer system sets the specimen position and allows beams or cores to be cut without the need for measurement. The saw blade advances and retracts to the home position automatically.

The Autosaw includes the multislab jig. Completed with the suitable accessory, can be used to cut also asphalt cores at the desired length. It can be fitted with 650 mm dia. blade with a maximum cutting depth of 200 mm and prism length of 500 mm (extendable to 700 mm, on request). Cutting speed is operator selectable for optimum specimen finish and throughput.

The asphalt saw allows an easy-to-use sawing systems for fast, accurate cutting of beams for asphalt prisms to be used for Four Point Bending Beam tests, Two Point Bending Beam tests, TSRST, Texas Overlay Test, Prall Test, Semi-Circular Bend Test, Wheel Tracking Tests with large and small devices.

The system allows 100 or 150 mm dia. cylindrical cores to be quickly and accurately cut to different lengths. Other diameters from 38 to 200 mm are available on request.

Complete with table and clamping device for slabs, water pump for cooling the blade and double filtering system.

Cutting blade and accessories to cut asphalt cores are not included. See accessories.

Safety and water containing system cabinet available on request.

Application

- Cutting of prisms and slabs to be used in Four Point Beam Bending tests according to EN 12697-24D and 26B and AASHTO T321
- Cutting of trapezoidal specimens to be used in Two Point Beam Bending tests according to EN 12697-24A and 26A
- Cutting AMPT cylindrical specimens round cores
- Cutting TSRST specimens according to EN 12697-46 and AASHTO TP10
- Cutting and dressing of Wheel Tracking slabs or cores according to EN 12697-22 and AASHTO T324
- Cutting Prall test specimens according to EN 12697-16
- Cutting Overlay test specimens according to TX-248-F
- Cutting Semi-Circular Bend test specimens according to EN 12697-44 (except for the notch)

Specifications

Blade diameter	650 mm
Max cutting depth	200 mm (up to 240 mm on request)
Cores	100 or 150 mm (on request from 38 to 200 mm)
Prism length	500 mm max (up to 700 mm on request)
Blade speed	1400-1680 rpm (50/60 Hz)
Air supply for clamping	700 kPa min.
Cutting advancement	Automatic speed control with variable stop and retract control sensors
Cooling	Water recirculation pump and tank (included)
Power supply	5 kW
Voltage	400 V, 50 Hz, 3 ph - 220V, 60 Hz, 3 ph
Dimensions, (LxWxH)	2000 mm, 800 mm, 1700 mm
Weight	400 kg

Ordering Information**76-PV75015**

IPC Global AUTOSAW,
Automated Asphalt Saw, complete with
asphalt Multi-slab Jig. Blade not included
400 V, 50 Hz, 3 ph.

76-PV75016

As above but 220 V, 60 Hz, 3 ph.

Accessories**76-PV47011**

Jig for round cores, 100 or 150 mm diam.,
to cut automatically samples from 10 to
200 mm length.

76-PV47013

Jig for round cores, 100 to 150 mm diam.,
to cut samples with manual feeding, from
10 to 300 mm length.

76-PV47020

Jig for trapezoidal specimens to be used
in Two Point Bending Test, according to EN
12697-24 and 26.

76-PV47025

Jig for Wheel Tracking cores according
to AASHTO T324 and for Semi-Circular
Bending Tests according to EN 12697-44
(except for the notch).

76-PV47011 or PV47013 is required.

76-PV47030

Jig for Texas Overlay Test according to
TX-248-F.

76-PV47011 or PV47013 is required.

76-PV47035

Jig for Disc Shaped Compact Tension
Sample according to ASTM D7313.

76-PV47011 or 76-PV 47013 is required.

76-PV75015/1

Diamond blade 650 mm dia.

76-PV75015/2

Sacrificial PVC tube for 100 mm dia. cores.

Upgrading**76-PV75015/UP**

Protection cabinet for IPC Global Autosaw,
Automated Asphalt Saw.

(To be specified at time of order)

**Automatic cutting mode
for cores 100 or 150 mm dia.**

Once the specimen
has been placed, the system
automatically performs
the first cut, the sample feeding
at the desired length and
the second cut without the
intervention by the operator



*Jig for slabs and prisms included in the IPC
Global Autosaw, Automated Asphalt Saw*



76-PV47011 automatic jig for cores



76-PV47013 manual jig for cores

Marshall stability, water sensitivity, indirect tensile strength and interlayer bonding.

ASTM and EN methods

These methods describe a number of tests and related apparatus which are often identical. We prefer to list all the testing equipment required for each Standard, even if there are duplications. The Standards and their relevant apparatus are summarized concisely in the following table.

Standard	Title	Test apparatus (*see note)	Page
ASTM D6926	Preparation of Bituminous Specimens Using Marshall Apparatus	76-B0072 Laboratory mixer, 10 L capacity	421
		76-B0072/HM Isomantle heater	421
		76-B0057 4" Standard compaction mould	441
		76-B4232 Marshall automatic compactor	439
		Or alternatively, 76-B4422 Marshall automatic compactor with CE safety features	439
ASTM D6927	Marshall Stability and Flow of Bituminous Mixtures	76-B0030/A Marshall stability tester	444
		76-B0033 Stability mould	445
		76-B0034 Flow meter	445
		Or alternatively, 76-B3802 Digital Marshall stability tester	446
		76-B0033 Stability mould	445
		76-B0066/A to 76-B0067/B Water bath	453
ASTM D5581	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall apparatus (6 inch Diameter Specimen)	76-B0057/S 6" diameter compaction mould assembly	441
		76-B4322 Marshall automatic compactor for 6" diameter specimens	439
		76-B0066/A to 76-B0067/B Water bath	453
		76-B0030/B Marshall stability tester, complete with 50 kN capacity load ring	444
		76-B0033/C Stability mould for 6" diameter specimens	445
EN 12697-10 EN 12697-30	Compactability of hot mix asphalt Specimen preparation by impact compactor	76-B4432 Impact automatic compactor	440
EN 12697-34	Marshall test	76-B3802 Marshall compression testing machine with digital control panel and readout unit	446
		76-B0033 Stability mould	445
EN 12697-12 EN 12697-23	Determination of water sensitivity of bituminous specimens Determination of the indirect tensile strength of bituminous specimens	76-B3802 Marshall compression testing machine with digital control panel and readout unit	446
		76-B0078/B Tensile splitting device for compacted bituminous samples 100 mm (4") diameter	447
		76-B0078/C Tensile splitting device for compacted bituminous samples up to 160 mm (6") diameter complete with loading strips for 150 mm diameter samples	447
		76-B0078/C1 Pair of loading strips for 100 mm diameter samples for use with 76-B0078/C device	447
		76-B0078/C2 Pair of loading strips for 160 mm diameter samples for use with 76-B0078/C device	447
EN 12697-48	Interlayer Bonding. Shear bond test	76-B3802 Marshall compression testing machine with digital control panel and readout unit	446
		76-B0033/E Shear test apparatus	450

*Note: these lists of test apparatus represent only the most important and specific apparatus that are required to perform the tests. The various current equipment specifications, sizes (e.g. of compaction moulds), and other possible options are not mentioned here but are described in detail on the relevant pages.

Preparation of bituminous specimens using Marshall apparatus (ASTM Standards)

ASTM Automatic Marshall compactors

Standards

ASTM D6926 | ASTM D5581

We supply three versions of Automatic Marshall compactor that conform to ASTM standards:

- **76-B4232** Standard version, conforming to ASTM D6926
- **76-B4422** Conforming to ASTM D6926, with CE protections - recommended for better operator safety
- **76-B4322** For 6" diameter specimens, conforming to ASTM D5581

A hand compaction hammer assembly is also available - see 76-B0058/AC.

These apparatus automatically compact the sample and stop after a pre-set number of blows has been completed. In the CE model (76-B4422), all moving parts are protected with a safety guard that automatically stops the compactor when opened, and the control panel is fitted with an emergency stop button, all conforming to CE directives. The compactors are supplied complete with wooden pedestal. Moulds have to be ordered separately - see Accessories.

If required, the compactors can be factory fitted in the 76-B4400/XUP Noise reduction and safety cabinet. This must be specified at the time of ordering - see Accessories.



76-B4232

Ordering information

76-B4232

Automatic Marshall impact compactor, conforming to ASTM D6926, for 4" (101.6 mm) diameter specimens. 230 V, 50 Hz, 1 ph.

76-B4233

As above but 220 V, 60 Hz, 1 ph.

76-B4234

As above but 110 V, 60 Hz, 1 ph.



76-B4322

76-B4422

Automatic Marshall impact compactor, conforming to ASTM D6926, for 4" (101.6 mm) diameter specimens, CE version with safety guards. 230 V, 50 Hz, 1 ph.

76-B4423

As above but 220 V, 60 Hz, 1 ph.

76-B4424

As above but 110 V, 60 Hz, 1 ph.



76-B4422. All moving parts are protected with a safety guard, which automatically stops the compactor when opened, and the control panel is fitted with an emergency stop button, all conforming to CE directives

76-B4322

Automatic Marshall impact compactor, conforming to ASTM D5581, for 6" (152.4 mm) diameter specimens. 230 V, 50 Hz, 1 ph.

76-B4323

As above but 220 V, 60 Hz, 1 ph.

76-B4324

As above but 110 V, 60 Hz, 1 ph.

Product code	76-B4232 76-B4233 76-B4234	76-B4422 76-B4423 76-B4424	76-B4322 76-B4323 76-B4324
Conforms to ASTM	D6926	D6926	D5581
For specimen diameter	4" (101.6 mm)	4" (101.6 mm)	6" (152.4 mm)
Power rating, W	300	800	300
Rammer weight, kg	4.54	4.54	10.2
Drop height, mm	457.2	457.2	457.2
Overall dimensions, mm	305 x 506 x 1676	385 x 470 x 1867	533 x 609 x 1651
Shipping weight, kg (approx.)	90	180	180

Preparation of bituminous specimens using impact compactor (EN Standards)



main features

- > Automatic control
- > Complete protection of operator safety in compliance with CE directives
- > Digital control console incorporating the emergency stop button in compliance with CE directives
- > Improved rammer lifting device
- > Constant height fall
- > Modern and reliable design
- > User-friendly rammer replacement system
- > Complete with concrete base
- > Compatible with Noise reduction and safety cabinet (available on request)

Ordering information

76-B4432

Automatic Marshall impact compactor, conforming to EN standards, for 101.6 mm diameter specimens. 230 V, 50 Hz, 1 ph.

76-B4433

As above but 220 V, 60 Hz, 1 ph.

76-B4434

As above but 110 V, 60 Hz, 1 ph.

Accessories

For moulds, extractors, Noise reduction cabinet etc., see page 441 and 442

Standards

EN 12697-10 | EN 12697-30

EN Automatic impact (Marshall) compactor

This version of automatic compactor is basically the same as the ASTM CE compliant Marshall automatic compactor apart from some major construction details which assure its compliance with the EN Standards.

The apparatus automatically compacts the sample and stops after pre-set number of blows. The mould is held in position by a quick and practical clamping device. The trip mechanism is arranged so that the sliding hammer falls at the same distance for every blow. The compactor includes a laminated hardwood block and a vibrated concrete base measuring 450x450x200 mm.

All moving parts are protected with a safety guard that automatically stops the compactor when opened, and the control panel is fitted with a red emergency stop button, all conforming to CE directives. If required, the compactor can be factory fitted in the 76-B400/LB Noise reduction and CE safety cabinet. This must be specified at the time of ordering - see Accessories.

Technical specifications

- Power rating: 800 W
- Blow frequency: 50 blows in 55/60 s
- Sliding mass weight: 4535 ± 15 g
- Total assembly weight: 7850 ± 50 g
- Freefall height: 460 ± 3 mm
- Laminated hardwood block: 200 x 200 x 450 mm, density 670 to 770 kg/m³
- Concrete base (included): 450 x 450 x 200 mm
- Overall dimensions: 540 x 556 x 2066 mm
- Weight: 270 kg (approx.)



76-B4432 Detail of clamping mechanism



76-B4432 Detail of lifting mechanism

Manual Marshall compactor

Standards

ASTM D6926

This version of Marshall compactor is for compacting specimens by hand and consists of a wooden compaction pedestal, a support rod to hold the hammer in a perpendicular position, a compaction hammer and mould holder. All parts can be ordered individually - see Spare parts.

Total weight: 50 kg(approx.)

Ordering information

76-B0058/AC

Manual Marshall compactor.

Spare parts

76-B0058/A

Compaction hammer for 4" samples.

76-B0059

Compaction pedestal.

76-B0059/1

Hammer guide.

76-B0056/A

Compaction mould holder.



76-B0058/AC with 76-B0057 mould

76-B0058/A

Marshall compaction moulds

Standards

ASTM D6926 | ASTM D5581 | AASHTO T245 | EN 12697-10 | EN 12697-30



76-B0057

Available in two versions, these moulds comprise a base plate, body and filling collar, all made from steel protected against corrosion. They are specially made for use with the Automatic Marshall compactors but can also be used for manual compactations conforming to ASTM D6926 (ex D1559) - see the Manual Marshall compactor.

The three parts of the compaction moulds can also be purchased individually -see Spare parts.

Ordering information

76-B0057

4" dia. (101.6 mm) Marshall compaction mould, complete with base and collar, conforming to ASTM, AASHTO and EN standards.

Mould height 87.3 mm.

Weight approx. 3.3 kg

76-B0057/S

6" dia. (152.4 mm) Marshall compaction mould, complete with base and collar, conforming to ASTM D5581 Standards.

Mould height 114.3 mm.

Weight approx. 4.5 kg



76-B0057, 76-B0057/B5, 76-B0059 with 76-B0056/A, 76-B0059

Preparation of bituminous specimens using marshall apparatus

Accessories

76-B0060

Paper discs, 101 mm (4") diameter, for placing on the mould base before introducing the mixture. Pack of 1000. Weight 0.6 kg approx.

76-B0057/B5

Extraction plate. For removing 101.6 mm (4") specimens. Weight 1.2 kg.

16-T0080

Universal specimen extruder for Proctor, CBR and Marshall specimens. For detailed information, see page 31



16-T0080

Conforming to EN 12697-30

76-B0042/1

Steel block 100 mm diameter x 50 mm high, for the initial heating of the compaction hammer. Weight 3.5 kg approx.

76-B0043/4

Storage plate with six 100 mm diameter discs, for cooling the specimens in air. Weight 10 kg approx.

Spare parts

For 76-B0057 moulds

76-B0057/1

Base plate.

76-B0057/A2

Mould body.

76-B0057/A3

Filling collar.

For 76-B0057/S moulds

76-B0057/S1

Base plate.

76-B0057/S2

Mould body.

76-B0057/S3

Filling collar.

Accessories

76-B4000/CB

Noise reduction cabinet for automatic Marshall ASTM and EN compactors

The cabinet is manufactured from sheet steel and lined internally with soundproofing material to considerably reduce the noise.

The control panel of the automatic compactor can be easily removed from the machine and placed externally on the cabinet wall as shown.

The cabinet is designed to make the operator access very easy as the compactor front protection door can be completely opened for filling and moulds removal.

- Overall dimensions (l x d x h): 850 x 670 x 2200 mm approx.
- Weight: 130 kg approx.

main features

- > The top of the cabinet can be opened for easy inspection
- > Possibility to fit the control panel to the external wall without electrical disconnection.



76-B4000/CB

Vibratory compaction

Standards

EN 12697-9 | EN 12697-10 | EN 12697-32
| EN 13266-4 | BS 1377:4 | BS 1924:2

Vibrating hammer

The hammer is used for compacting asphalt in the percentage refusal density test and for the compaction of Proctor and CBR soil specimens (for more information see page 139). Using the appropriate tamping foot it can also be used for compacting concrete cube or beam specimens. The hammer is supplied without the support frame and tamper which have to be ordered separately.

Power: 950 W

Length: 433 mm

Weight: 6.4 kg (approx.)



33-T8702 with 33-T0087/8A, 33-T0087/6 and 33-T0087/7

Ordering information

33-T8702

Vibrating hammer. 240 V, 50 Hz, 1 ph.

33-T8703

As above but 220 V, 60 Hz, 1 ph.

33-T8704

As above but 110 V, 60 Hz, 1 ph.

Accessories

33-T0087/B

Supporting frame for vibrating hammer. Weight 70 kg approx.

33-T0087/6

Small tamping foot, 102 mm diameter (head only).

33-T0087/7

Large tamping foot, 146 mm diameter (head only).

33-T0087/8 A

Shank, 300 mm long.



33-T8702 with 33-T0087/B, 33-T0087/8A, 33-T0087/7 and 76-B0088

76-B0088

PRD (Percentage Refusal Density) mould.

PRD Split mould and baseplate

Used to determine the degree of compaction of asphalt for road pavement quality control testing, this device consists of a mould, split vertically on one side, together with a clamp-attached baseplate. Both parts are plated for protection against corrosion.

Weight: 20 kg (approx.)



76-B0088

Marshall stability and flow of bituminous mixtures

Standards ASTM D6926, ASTM D5581



main features

76-B0030/A with 76-B0033 Stability mould and 76-B0034 Flow meter. The load ring is fitted with a 0.001 mm resolution dial gauge, assuring the accuracy required by the Standards

Analogue Marshall compression testers

We offer two versions of this tester, identical except for the load ring:

- **76-B0030/A** 30 kN capacity
- **76-B0030/B** 50 kN capacity

The 50 kN version is suitable for testing 4" (101.6 mm) and 6" (152.4 mm) diameter specimens. Other testing machines are available to perform the Marshall stability test, conforming to either ASTM/AASHTO or EN standards. See Marshall digital compression testers (page 446) and Multi-speed digital tester (page 448).

The compression frames are bench-mounted, with a motor and worm gear housed within the base unit. A limit switch is provided for the lower limit of travel. The machine is supplied complete with load ring, 30 or 50 kN capacity, incorporating a stem brake feature to hold the maximum reading. All the load rings are provided with a 0.001 mm high resolution dial gauge, assuring strict conformance with the Standards.

The stability mould and flow meter have to be ordered separately - see Accessories.

The tester frame only is also available (code 76-B0030) which can be completed with the suitable accessories conforming to the client requirements. See Accessories to complete the 76-B0030 frame.

Technical specifications

- Maximum capacity: 50 kN
- Load ring capacity: 30 kN (model 76-B0030/A) or 50 kN (model 76-B0030/B)
- Platen speed: 50.8 mm/min
- Ram travel: 120 mm
- Load rings: with peak hold function, complete with 0.001 mm resolution dial gauge
- Power rating: 736 W
- Overall dimensions: 392 x 560 x 1028 mm (w x d x h)
- Weight: 85 kg (approx.)

Ordering information

76-B0030/A

Analogue Marshall compression tester, 30 kN capacity, complete with 30 kN capacity load ring, 0.001mm resolution, fitted with stem brake feature to hold the maximum reading. 230 V, 50 Hz, 1 ph.

76-B0030/AY

As above but 220 V, 60 Hz, 1 ph.

76-B0030/AZ

As above but 110 V, 60 Hz, 1 ph.

76-B0030/B

Analogue Marshall compression tester, 50 kN capacity, complete with 50 kN capacity load ring, 0.001mm resolution, fitted with stem brake feature to hold the maximum reading. 230 V, 50 Hz, 1 ph.

76-B0030/BY

As above but 220 V, 60 Hz, 1 ph.

76-B0030/BZ

As above but 110 V, 60 Hz, 1 ph.

76-B0030

Marshall compression tester. 50 kN capacity. Frame only. 230 V, 50 Hz, 1 ph.

76-B0030/Y

As above but 220 V, 60 Hz, 1 ph

76-B0030/Z

As above but 110 V, 60 Hz, 1 ph



76-B0030 Frame only

Accessories to complete the 76-B0030 frame only

76-B0030 tester can be completed with the standard parts mounted in complete versions (82-T1007/F, 82-T1009/F) or, as alternative, with 82-T1007/FC and 82-T1009/FC mounting a 0,01 mm resolution dial gauge.

82-T1007/F

Load ring, 30 kN cap., fitted with gauge 0.001 mm res., complete with stem brake feature to hold the maximum reading.

Or, as alternative

82-T1009/F

Load ring, 50 kN cap., fitted with gauge 0.001 mm res., complete with stem brake feature to hold the maximum reading.

34-T0104/10

Compression device. To fit the load ring to press the stability mould

Note: load rings 30 and 50 kN cap. fitted with gauge 0.01 mm resolution, complete with stem brake feature to hold the maximum reading, are available on request.



Test accessories

For Marshall tests conforming to ASTM D6926 and ASTM D5581

76-B0033

Stability mould for 4" (101.6 mm) diameter specimens. Weight 9 kg approx.

76-B0033/C

Stability mould for 6" (152.4 mm) diameter specimens to ASTM D5581. Weight 12 kg approx.

76-B0034

Flow meter.



For Indirect tensile tests conforming to ASTM D6931 and ASTM D283

76-B0078/B

Tensile splitting device (Lottman breaking head) for 100 mm (4") diameter compacted bituminous samples. Weight 9 kg approx.

76-B0078/C

Tensile splitting device (Lottman breaking head) for compacted bituminous samples up to 160 mm (6") diameter, complete with loading strips for 150 mm diameter samples. Weight 10 kg approx.

76-B0078/C1

Pair of loading strips for 100 mm diameter samples for use with 76-B0078/C device.

76-B0078/C2

Pair of loading strips for 160 mm diameter samples for use with 76-B0078/C device. See page...



76-B0078/C with 76-B0078/C1 and 76-B0078/C2

76-B3802 with
tensile splitting
device 76-B0078/B



76-B3802 with stability
mould 76-B0033



Marshall test

Standards

EN 12697-34 | ASTM D6926 |
ASTM D5581

Water sensitivity of bituminous specimens

Standards EN 12697-12

Indirect tensile strength (idt) of bituminous specimens

Standards

EN 12697-23 | ASTM D6931 |
AASHTO T283

The **EN 12697-12** (Determination of water sensitivity of bituminous specimens), and **EN 12697-23** (Determination of the indirect tensile strength of bituminous specimens) tests require a typical Marshall tester, fitted with Indirect tensile test accessories (see 76-B0078/B and 76-B0078/C devices) and capable of producing a test graph.

Important note:

Conditioning the water temperature for the Indirect tensile test, from 5 to 25°C conforming to EN 12697-23, can be performed with the 65-D1409/A Digital circulating water bath with cooler unit, shown on page 363

The specifications of the **EN 12697-34** Marshall test correspond to those of the ASTM/AASHTO standards but, as with the above tests, also require a test graph.

The **ASTM D6931** (Determination of Indirect Tensile Strength IDT) and **AASHTO T283-03** (Resistance of compacted asphalt mixtures to moisture-induced damage) tests can also be performed with a Marshall tester fitted with the accessories 76-B0078/B or 76-B0078/C.

The 76-B3802, 76-B3803 and 76-B3804 testers fully satisfy all the requirements of the above tests as they are fitted with the 76-P60R02 Digimax data acquisition and processing system which can be connected to a PC and printer to produce a test graph and test certificate.

For the determinations of the **EN 12697-12**, **EN 12697-23**, **ASTM D6931** and **AASHTO T283** standards, as specified, the machine has to be used with the Tensile splitting devices 76-B0078/B and 76-B0078/C (see accessories) while, for the **EN 12697-34** and all **ASTM/AASHTO** standards, the machine has to be used with the Stability moulds 76-B0033 and 76-B0033/C.

Digital Marshall compression tester

This is a bench mounted compression frame, with a motor and worm gear housed within the base unit producing a platen speed of 50.8 mm/min. A limit switch is provided for the lower limit of travel. The machine is fitted with a high precision strain gauge load cell and a displacement transducer, both connected to the 76-P60R02 Digimax data acquisition and processing system which features a large display and standard software covering either the Marshall or the Indirect tensile test. For more details see PC Software, page 154

Technical specifications

- Maximum capacity: 50 kN
- Load cell capacity: 50 kN
- Displacement transducer travel: 25 mm
- Data acquisition and processing: by Digimax readout unit
- Platen speed: 50.8 mm/min
- Power rating: 736 W
- Overall dimensions: 392 x 560 x 1028 mm (w x d x h)
- Weight: 85 kg (approx.)

Ordering information**76-B3802**

Digital Marshall compression tester, 50 kN capacity. 230 V, 50 Hz, 1 ph.

76-B3803

As above but 220 V, 60 Hz, 1 ph.

76-B3804

As above but 110 V, 60 Hz, 1 ph.

Accessories

For Marshall tests conforming to ASTM/AASHTO and EN 12697-34

76-B0033

Stability mould for 4" (101.6 mm) diameter specimens.

76-B0033/C

Stability mould for 6" (152.4 mm) diameter specimens to ASTM D5581.

For Indirect tensile tests conforming to

EN 12697-12, EN 12697-23, ASTM D6931 and AASHTO T283

76-B0078/B

Tensile splitting device (Lottman breaking head) for 100 mm (4") diameter compacted bituminous samples. Weight 9 kg approx.

76-B0078/C

Tensile splitting device (Lottman breaking head) for compacted bituminous samples up to 160 mm (6") diameter, complete with loading strips for 150 mm diameter samples. Weight 10 kg approx.

76-B0078/C1

Pair of loading strips for 100 mm diameter samples for use with 76-B0078/C device.

76-B0078/C2

Pair of loading strips for 160 mm diameter samples for use with 76-B0078/C device.

Circulating water bath with cooler unit
suitable for Indirect Tensile Strength test**main features**

- > Automatically maintains the set temperature
- > Two-channel electronic thermoregulator: heating/cooling with digital display
- > Complete with re-circulating unit
- > Incorporated refrigeration compressor
- > Ideal for conditioning asphalt specimens for Marshall and Indirect tensile tests
- > A multi-purpose unit suitable for many other applications

65-D1409/A

Standards

EN 12697-34 | ASTM D6927 | ASTM D5581 | AASHTO T245 | EN 12697-12 | EN 12697-23

This multi-purpose digital unit, fitted with a cooler unit and re-circulating water system, is used to condition in-water asphalt specimens for Marshall and Indirect tensile tests.

The EN 12697-23, covering the determination of the indirect tensile strength of bituminous mixtures, requires a water conditioning temperature of 5°C, or from 5 to 25°C, both of which are obtainable with a cooling system. All the other standards require conditioning temperatures from 25 to 60 °C.

This unit can also be used for many other asphalt and cement testing applications, for curing 40x40x160 mm cement specimens in water, and for storing the hydrated samples at a temperature of 20°C (EN 196-8). For more information see page 363

Internal surfaces are polished stainless steel with a sheet steel insulated outer case. The cooler unit is located under the water bath. Complete with re-circulating unit for temperature uniformity.

Technical specifications

- Capacity: 40 L
- Power: 2000 W
- Temperature range: +5 to +60°C
- Accuracy: ±1°C
- Inside dimensions: 550 x 360 x 200 mm
- Outside dimensions: 830 x 480 x 950 mm

- Weight: 62 kg (approx.)

Ordering information**65-D1409/A**

Circulating water bath with cooler unit. 230 V, 50-60 Hz, 1 ph.

65-D1409/AZ

As above but 110 V, 60 Hz, 1 ph.



76-B0078/C with 76-B0078/C1 and 76-B0078/C2

MULTISPEED

34-V1072 | 34-V1172 Series

34-V1072 with
Marshall accessories34-V1072 with Marshall accessories to
test, in the digital mode, 6" dia. samples
conforming to ASTM D5581.
To perform the test the Digimax TS
82-P60R02 Data acquisition system is also
required, while the 34-V1172 Multispeed
Automatic has built-in the data acquisition.**MULTISPEED****Multiple application compression/flexural testers 50 kN cap.**

These digital testers are available in two versions:

MULTISPEED 34-V1072 standard
MULTISPEED Automatic 34-V1172

MULTISPEED applications

These models represent the ideal solution for major laboratories performing tests requiring displacement control, such as CBR, Marshall, Indirect tensile, Unconfined compression, Quick triaxial etc. The Multispeed standard version 34-V1072 is usually equipped with analogue measurement system but could also accept digital accessories, while Multispeed Automatic 34-V1172 is fitted with digital system only, as required by all EN Standards. In the following pages we mainly describe test accessories concerning asphalt applications. For complete description and all other possible applications see page 152

MULTISPEED**34-V1072 series**

The MULTISPEED tester features a rigid two-column structure with an upper cross beam which can be set at various heights. The load jack, DC motor and controls are housed in a specially designed base cabinet.

When fitted in digital mode, test data are acquired and processed by a Digimax or other similar device.

One of the main features of the new MULTISPEED is the control of test speed which is easily set and then shown on the display. Furthermore, the test stroke can be set at the beginning of the test with an automatic stop, avoiding overloading the machine and the specimen, thus assuring operator safety. This important feature also permits a calibration of machine speed to be performed, with micrometric manual adjustments made by the operator.

The display shows the travel direction of the lower platen and the front panel is fitted with an emergency button and two operating LEDs indicating machine on/off and travel direction.

Ordering information**34-V1072**

MULTISPEED, digital compression tester, 50kN capacity, testing speed steplessly adjustable from 0.2 to 51mm/min. 230V, 50Hz, 1ph.

34-V1073

As above but 220V, 60Hz, 1ph.

34-V1074

As above but 110V, 60Hz, 1ph.



34-V1172 Detail of the alphanumeric display

34-V1172 with
Marshall accessories


main features

common to both models

- > Closed loop speed control
- > CBR and Marshall test speed can be selected by default
- > Other testing speeds (custom) up to 51 mm/min can be easily set
- > Selection of maximum platen displacement with automatic stop
- > Rapid approach and return function to reduce the testing time
- > Speed calibration function by firmware
- > CE emergency stop button

additional features

Automatic version 34-V1172

- > Stand alone automatic digital load frame
- > Large touch-screen display for viewing real-time graph and test data
- > Four channels on board data acquisition
- > Integrated transducer calibration facility
- > Infinitely variable speed from 0.05 to 51 mm/min

MULTISPEED Automatic

34-V1172 series

The MULTISPEED Automatic, in addition to the features of the MULTISPEED standard model, includes automatic control of the test speed/travel by microprocessor. Prior to the test, the operator can set travel limits for automatically ending the test. No external transducer is required for displacement measurement. The firmware allows transducer calibrations and setting of up to 10 test profiles, saving data onboard. A real-time test graph and transducer data are displayed on the user interface touch-screen which is supplied complete with a stylus pen. The machine has built-in data acquisition with four channels: two dedicated to strain gauge load cells and two for potentiometric linear transducers - one of each can be used during the test. An important feature is provided by the processing unit that manages the speed through closed-loop control, avoiding speed calibrations and voltage fluctuation effects. The front panel is fitted with an emergency button for prompt stopping of the machine. Test data can be stored on a USB pen drive or downloaded through a LAN communication port in Controls, txt or ASCII format.

All the accessories have to be ordered separately

Ordering information

34-V1172

MULTISPEED Automatic compression tester, 50kN capacity, 4-channel built-in data acquisition and variable speed from 0.05 to 51mm/min. 230V, 50Hz, 1ph.

34-V1173

As above but 220V, 60Hz, 1ph.

34-V1174

As above but 110V, 60Hz, 1ph.

Models	34-V1072 / 34-V1073 / 34-V1074	34-V1172 / 34-V1173 / 34-V1174
Maximum capacity	50 kN	50 kN
Testing speed, adjustable from	0.2 to 51 mm/min	0.05 to 51 mm/min
Power rating	DC motor 750 W	DC motor 750W
Data download	-	By LAN port, ASCII, TXT or Controls format
USB port	-	For USB memory stick data storage
Resolution	-	132000 divisions
Display	Alphanumeric 2 x 16 characters	Touch-screen graphic 240 x 128 pixel
Sampling frequency	-	50 sec.
Horizontal clearance	270 mm	270 mm
Maximum vertical clearance (without accessories)	730 mm	730 mm
Overall dimensions (lxwxh)	392 x 495 x 1213 mm	392 x 495 x 1213 mm
Weight (approx.)	65 kg	65 kg



34-V1172 Detail of 4 input channels, Ethernet and USB

MULTISPEED

34-V1172 Series



Example of screenshots



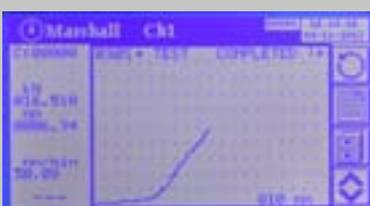
Main menu



Test menu option



Test set parameters



Marshall graph

Accessories

All the above MULTISPEED and MULTISPEED Automatic testers, with the appropriate accessories, are frequently used for road testing (CBR, Marshall, and indirect tensile etc.) which are illustrated on this page and listed on table page 452. For all other applications, see page 152

Accessories for performing Marshall tests in analogue mode

(For use with the Multispeed 34-V1072 series but also suitable for Multispeed Automatic 34-V1172).

Standards

ASTM D1559 | ASTM D5581 | ASTM 6927-06 | AASHTO T245

Accessories for performing Marshall tests in digital mode

(For use with the Multispeed 34-V1072 and suitable for Multispeed Automatic 34-V1172)

Standards

EN 12697-34* | ASTM D1559 | ASTM D5581 | ASTM 6927-06 | AASHTO T245 | BS 598-107 | NF P98-0251-2 | DIN 1996 | CNR 30

Interlayer bonding. Shear bond test (Leutner Test)

Standards EN 12697-48

For the complete list of accessories see table page 452



Marshall test in analogue mode



Marshall test in digital mode

For the complete list of accessories see table page 452

82-T1009/F

Load ring, 50kN capacity, with stembrake
Or as alternative:

82-T1007/F

Load ring, 30kN capacity, with stembrake

34-T0104/10

Compression device.

76-B0034

Flow meter.

76-B0033

Stability mould or, as alternative:

76-B0033/C

Stability mould for 6" dia. specimens conforming to ASTM 5581



76-B0033/E

Shear bond test apparatus, for subjecting 150 mm diameter samples to direct shear loading, conforming to EN 12697-48.

76-B0033/E1

Adaptor to test 100 mm diameter samples with shear bond test apparatus to EN 12697-48

Material on the basis of organic binders for road and airfield construction. (Russian Standard).

Standards

GOST 12801

For the complete list of accessories see table page 452



82-SW/CMU**PC software for CBR, Marshall, Indirect tensile and Universal tests****Standards**

EN 12697-34 | ASTM D1883 | ASTM D1559 | ASTM D5581 |
AASHTO T245 | EN 12697-12 | BS 1377:4 | NF P94-078 | AASHTO T193 | EN 13286-47 | UNI 10009 | ASTM D6927

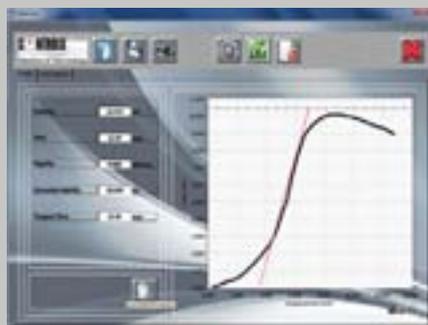
This program is written to run in MS Windows® for data acquisition and processing of CBR, Marshall, Indirect tensile and load/displacement tests in general. The software is designed to be used specifically with new Digimax 76-P60R02, and with 76-B3802, 34-V1172, 70-T1082, 70-T1182 and 70-T1192 compression testers.

main features

- > Suitable for running CBR, Marshall, Indirect Tensile and universal load/displacement tests
- > Data are presented numerically and graphically in real-time
- > Saving and management of tests through single files
- > Single and multiple test result management and printout
- > Data export to MS Excel®
- > Language selection: English, French, Spanish and Italian plus any other custom language
- > Connection to Controls machines via high speed Ethernet connection



Example of 82-SW/CMU software: test data



Example of 82-SW/CMU software: Marshall test in progress

Technical specifications

Minimum PC requirements

- Pentium 4 ® CPU 3GHz
- 1Gb of free hard disk space
- Microsoft Windows ® XP or higher operating system
- RAM memory for Windows XP or Vista: minimum 1GB; recommended 2GB for Windows 7: minimum 2GB; recommended 4GB
- CD-ROM drive
- One free RJ45 network port
- Screen resolution of 1024 x 768 pixels with color quality set to 32 bit
- MS Excel 2003 or higher (optional, for use with data analysis templates)

UNIFRAME

Universal models



For performing tests under speed/displacement and load control, including all road tests (CBR, Marshall, indirect tensile etc.), tests on concrete, cement and natural building stone, flexural testing under load control and triaxial testing.

For complete information see page 388

Accessories for performing Marshall and indirect tensile tests with Multispeed and Uniframe testers

The table below shows the type and quantity of accessories required for the various standards and suitable testers.

Accessories	Standards ⁽¹⁾ and product codes for suitable compression testers									
	Product code	Description	ASTM D6927	ASTM D5581	EN 12697-34	ASTM D6931	EN 12697-12	EN 12697-23	EN 12697-48	GOST 12801
			34-V1072*	34-V1072*	34-V1072*	34-V1072*	34-V1072*	34-V1072*	34-V1072*	70-T1082
			34-V1172	34-V1172	34-V1172	34-V1172	34-V1172	34-V1172	34-V1172	70-T1182
			70-T1082	70-T1082	70-T1082	70-T1082	70-T1082	70-T1082	70-T1082	70-T1192
			70-T1182	70-T1182	70-T1182	70-T1182	70-T1182	70-T1182	70-T1182	
			70-T1192	70-T1192	70-T1192	70-T1192	70-T1192	70-T1192	70-T1192	
82-P0375	50 kN capacity load cell	1	1	1	1	1	1	1	1	1
82-P0375/C	Adapter to fit load cell	2	2	2	2	2	2	2	2	2
82-P0322	25 mm displacement transducer	1	1	1	1	1	1	1	1	1
34-T0104/81	Adjustable transducer holder	1	1	1	1	1	1	1	1	1
34-T0104/13	Compression device extension	1	1	1	1	1	1	1	1	1
34-T0104/10	Compression device	1	1	1	1	1	1	1	1	1
76-B0033	Stability head for 4" (101.4 mm) specimens	1	-	1	-	-	-	-	-	-
76-B0033/C	Stability head for 6" (152.4 mm) specimens	-	1	-	-	-	-	-	-	-
76-B0033/D	Stability head for 71.4 mm dia. specimens	-	-	-	-	-	-	-	-	1
76-B0033/E	Shear test apparatus	-	-	-	-	-	-	1	-	-
76-B0078/B or 76-B0078/C	Tensile splitting device	-	-	-	1	1	1	-	-	-
82-P60R02	Digimax TS data acquisition system *Always required when using 34-V1072 tester	1*	1*	1*	1*	1*	1*	1*	1*	-
82-SW/CMU	PC software for CBR, Marshall, Indirect tensile and Universal tests	1	1	1	1	1	1	1	1	1

(1) Standard titles:

ASTM D6927 Marshall stability and flow of bituminous mixtures

ASTM D5581 Resistance to plastic flow of bituminous mixtures using Marshall apparatus (6" dia. specimens)

EN 12697-34 Marshall test

ASTM D6931 Indirect tensile strength of bituminous mixtures

EN 12697-12 Determination of water sensitivity of bituminous specimens

EN 12697-23 Determination of the indirect tensile strength of bituminous specimens

EN 12697-48 Interlayer bonding. Shear bond test

GOST 12801 Material on the bases of organic binders for road and airfield construction: Test methods

Water baths for Marshall and Indirect tensile specimens

Standards

EN 12697-34 | ASTM D6927 | ASTM D5581* | AASHTO T245

*with 76-B0067/C model only

These baths are used to maintain Marshall test specimens at $60 \pm 1^\circ\text{C}$ (asphalt specimens) or $37.8 \pm 1^\circ\text{C}$ (tar specimens) in water, as required by the standards. They are available in 3 different sizes and 2 versions: one standard and one fitted with a continuous recirculating water system to ensure temperature uniformity. The model 76-B0067/C also satisfies the requirements of the ASTM D5581 for 6" Marshall specimens, which need a deeper bath. (This requirement is also fulfilled by the Circulating water bath with cooler unit - see 65-D1409/A.)

All models have a digital thermoregulator, a stainless steel external and internal case and are supplied complete with perforated base shelf and cover.

Technical specifications

Product code	76-B0066/A 76-B0066/AZ 76-B0066/B 76-B0066/BZ	76-B0067/A 76-B0067/AZ 76-B0067/B 76-B0067/BZ	76-B0067/C
Capacity, l	28	56	110
Marshall specimen capacity (approx.)	12	20	30(4") 12(6")
Temperature range, °C	Ambient to 60	Ambient to 60	Ambient to 95
Accuracy, °C	± 1	± 1	± 1
Resolution, °C	0.1	0.1	0.1
Power, W	1200	1200	2500
Recirculating pump included	B0066/B and B0066/BZ only	B0067/B and B0067/BZ only	yes
Inside dimensions, mm, (w x d x h)	500 x 300 x 185	610 x 500 x 185	600 x 500 x 280
Outside dimensions, mm, (w x d x h)	640 x 340 x 240	650 x 540 x 240	816 x 547 x 600
Weight, kg (approx.)	9.5	20	30



76-B0067/C



76-B0066/A / 76-B0066/B

Ordering information

Standard models

76-B0066/A

Digital water bath, 28 litre (12 specimen) capacity. 230 V, 50-60 Hz, 1 ph.

76-B0066/AZ

As above but 110 V, 60 Hz, 1 ph.

Standard models with water circulation

76-B0066/B

Digital circulating water bath, 28 litre (12 specimen) capacity. 230 V, 50-60 Hz, 1 ph.

76-B0066/BZ

As above but 110 V, 60 Hz, 1 ph.

High capacity models

76-B0067/A

Digital water bath, 56 litre (20 specimen) capacity. 230 V, 50-60 Hz, 1 ph.

76-B0067/AZ

As above but 110 V, 60 Hz, 1 ph.

High capacity models with water circulation

76-B0067/B

Digital circulating water bath, 56 litre (20 specimen) capacity. 230 V, 50-60 Hz, 1 ph.

76-B0067/BZ

As above but 110 V, 60 Hz, 1 ph.

Extra large water circulating model

76-B0067/C

Digital circulating water bath, 110 litre capacity, also suitable for 6" diameter Marshall specimens conforming to ASTM D5581. 230 V, 50-60 Hz, 1 ph.



76-B0067/A / 76-B0067/B

Electromechanical slab compactors



main features

- > Machine control via touchscreen PC
- > Heated head and roller vibration options
- > Completely electro-mechanically operated
- > Conforms to pr EN 12697-33 method 5.3 and 7.3
- > Possibility to enter and store user-defined automatic compaction profiles for load, displacement or combined load/displacement control
- > PRO-COMPACT closed-loop system
- > One machine fits different slab sizes (500 x 400, 500 x 300, 400 x 300, 300 x 300 and 320 x 260 mm), travel selectable by software
- > Easy interchangeability of the compaction profile granted by the software
- > Compaction direction always in the longest (major) mould dimension to obtain specimens of the proper length conforming to Standard
- > Vertical sliding cover for easy access and complete three side view
- > 30 kN compaction load by vertical direct transmission
- > Load measurement by two load cells
- > Automatically compacts to target density/ height
- > Horizontal linear movement adjustable up to 300 mm/s
- > Possibility to set user defined pause at the mould inversion point
- > Ideal for producing test beams for 4-Point Bending (EN 12697-24, EN 12697-26, AASHTO T321)
- > Moulds easy to install and to remove
- > Safety systems conforming to CE Standards

77-PV40C05

Standards EN 12697-33

77-PV40C05, 77-PV40AXX series

These apparatus can compact asphalt slabs to a target density at specific loads corresponding to those of pavements rollers used in highway construction. We offer two series with different levels of sophistication and performance:

	mm slabs				
	320 x 260	300 x 300	400 x 300	500 x 300	500 x 400
Multi Size Advanced Version					
77-PV40C05	•	•	•	•	•
Standard Versions					
77-PV40A15	•				
77-PV40A25			•		
77-PV40A35				•	
77-PV40A45					•

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Application

The slabs produced can be:

- Used for wheel tracking tests (see page 460)
- Cut into beams for bending fatigue tests (see page 495, 504)
- Cored to provide specimens for indirect tensile, static and dynamic creep tests (see from page 491, 500)

Advanced electromechanical slab compactor

Standards EN 12697-33, method 5.3 and EN 12697-33 Annex A

77-PV40C05 and 77-PV40C06

The compactor features a compacting system with a 535 mm radius roller segment head. The roller segment moves freely by simple friction for improved compaction uniformity. A stepper motor moves the roller segment vertically under displacement and load control. The vertical load is applied orthogonally to the axis of the direction of travel. The horizontal movement of the mould is applied by a brushless motor with user-defined controlled linear speed. The longest (major) mould dimension corresponds to the compaction direction so it is possible to obtain specimens of the proper length conforming to Standards. The lifting machine cover allows the mould area to be easily accessed. In the "rest" position, the mould is closed to the operator while the roller segment is lifted and positioned at the back of the machine.

The machines features a customized electronic hardware integrated with a touchscreen PC.

The machine features a solid high-stiffness steel frame, with ergonomic design and safety devices conforming to CE Standards.

Note The sector head, as specified, has to be ordered separately together with the relevant mould (see page 458). The horizontal travel, conforming to the mould size, has to be adjusted by the dedicated machine device.

PRO-COMPACT Unique features

The combined load/displacement compaction procedure provides at the beginning a controlled displacement compaction, which can grant a flat surface of the compacted slab, followed by a load compaction phase, which can replicate the real compaction on the road surface.

PRO-COMPACT closed-loop.

All our slab compactors include an innovative mechanical and electronic control that combines orthogonality of the load, pendulum motion of the head and linear non-friction forward carriage movement. This results in an optimally compacted sample that features Planarity Regularity and hOmogeneity (PRO).



continued



Note The machine has to be fitted with the selected sector head and relevant mould (see accessories).

Main features of the control interface

- All in one PC with touchscreen monitor
- Setup of compaction and speed/displacement control
- Selection, customization and storage of test parameters
- Customization of compacting cycle which can be saved and recalled from the data base
- Graphic display of vertical displacement vs. load vs. number of passes
- Fully programmable PC software operating in Windows®
- Setup of the compaction mode: load, displacement or combined load/displacement
- Data processing and storage conforming to Standards

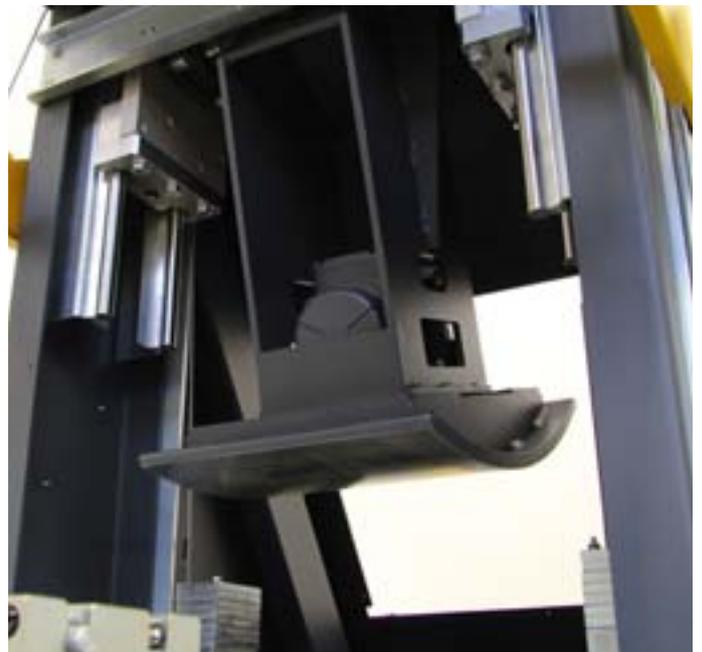
Mould dimensions:

500 x 400, 500x300, 400 x 300, 300 x 300 and 320 x 260 mm

The longer (major) mould dimension corresponds to the compaction direction, for obtaining specimens of the proper length that conform to the Standards.

Models 77-PV40C05, 77-PV40C06

Machine control	By touchscreen PC (included)
Operation	Electro-mechanical
Maximum vertical force	30 kN
Load measurement	by two load cells
Compacting device	Roller segment radius 535 mm (not included. See accessories)
Forward and backward horizontal travel	Adjustable: 300/320 mm 400 mm 500 mm
Trolley speed	Up to 300 mm/s
Mould dimensions (the first dimension correspond to the mould compaction direction)	320 x 260 mm 300 x 300 mm 400 x 300 mm 500 x 300 mm 500 x 400 mm
Compacted slab thickness	38 to 120 mm
Heated head	Yes, optional
Roller vibration	Yes, optional
Power rating	3000 W
Electrical supply	380 V, 50 Hz, 3 ph or 220 V, 60 Hz, 3 ph
Overall dimensions (lxwxh)	1300 x 800 x 2000 mm
Weight	approx. 650 kg



Detail of segment head incorporating vibration unit

Machine control

- Vertical displacement of the roller segment is measured directly by a linear transducer to verify the specimen thickness in real-time, and controlled by a stepper motor, thereby eliminating errors arising from the deformation of the machine structure.
- Real-time measurement and control of compaction load is achieved with closed-loop logic and two high-precision load cells. This dual load cell system permits the identification of possible discrepancies in the compaction due to inconsistent distribution of asphalt in the mould or any other unexpected malfunctions, and warns the operator.
- The machine is fitted with sensors to confirm that the mould is in position and to provide an automatic display of the set horizontal travel.



Ordering information

77-PV40C05

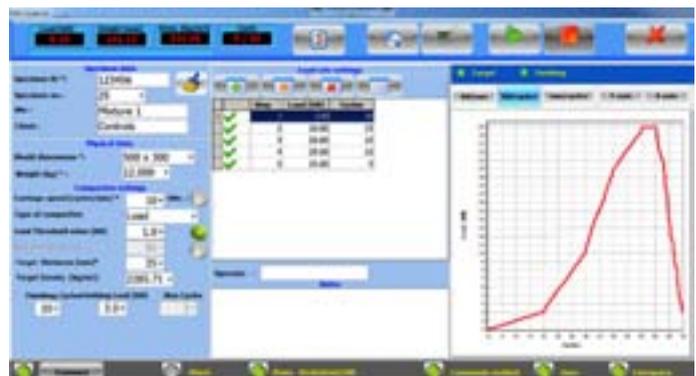
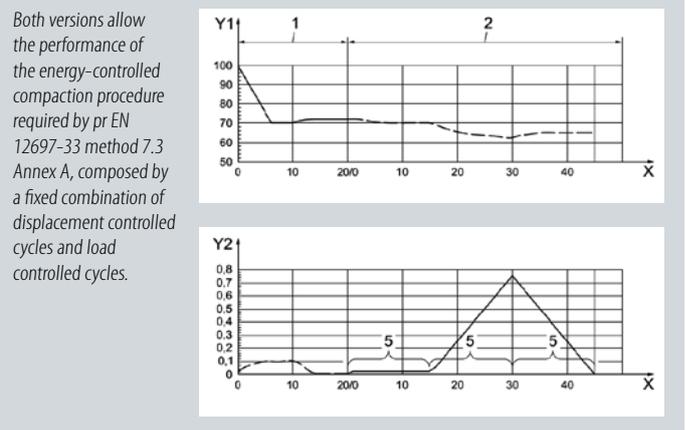
PAVELAB, Advanced multi-size electro-mechanical slab compactor. To be fitted with the selected sector head and relevant mould not included (see accessories). Controlled by touchscreen PC. 380 V, 50 Hz, 3 ph.

77-PV40C06

PAVELAB, Advanced multi-size electro-mechanical slab compactor. As above but 220 V, 60 Hz, 3 ph.



500 x 400 mm slab and lead rolled ball screw system



Typical screenshot: testing diagrams

continued

Accessories

Interchangeable sector heads, radius 535 mm

77-PV42001

Interchangeable sector head to produce slabs 320 mm long x 260 mm wide. Weight 14 Kg

77-PV43001

Interchangeable sector head to produce slabs 300 mm long x 300 mm wide. Weight 15 Kg

77-PV44001

Interchangeable sector head to produce slabs 400 mm long x 300 mm wide. Weight 19 Kg

77-PV45001

Same but 500 x 300

77-PV46001

Interchangeable sector head to produce slabs 500 mm long x 400 mm wide. Weight 30 Kg

Moulds

77-PV42002

Steel mould 320 x 260 mm. Weight 19 Kg



77-PV43002

Steel mould 300 x 300 mm. Weight 20 Kg

77-PV44002

Steel mould 400 x 300 mm. Weight 23 Kg

77-PV45002

Same but 500 x 300

77-PV46002

Steel mould 500 x 400 mm. Weight 26 Kg

Upgrading options

(must be factory installed)



Detail of interchangeable sector head

The sector head can be easily removed and replaced to produce slabs of the alternative dimensions. See accessories.



Optimally compacted sample that features planarity regularity and omogeneity (PRO)

Heated head option. Temperature control system.

To be factory installed

Heated head option

77-PV43012

Sector head temperature control system.

Interchangeable sector heads, radius 535 mm, complete with heating system.

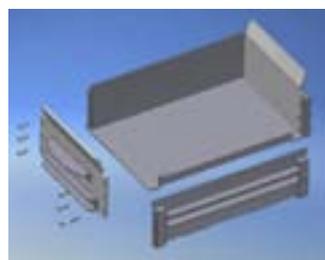
To be completed with the 77-PV43012, Temperature control system (see Heated head option).

77-PV42011

Interchangeable sector head to produce slabs 320 mm long x 260 mm wide. Complete with heating system. Weight 14.5 kg

77-PV43011

Interchangeable sector head to produce slabs 300 mm long x 300 mm wide.



Moulds. Schematic assembly layout.

Two sides only are removable, to guarantee the correct geometry.

Complete with heating system. Weight 15.5 kg

77-PV44011

Interchangeable sector head to produce slabs 400mm long x 300 mm wide. Complete with heating system. Weight 19.5 kg

77-PV45011

Same but 500 x 300

77-PV46011

Interchangeable sector head to produce slabs 500 mm long x 400 mm wide. Complete with heating system. Weight 32.5 kg



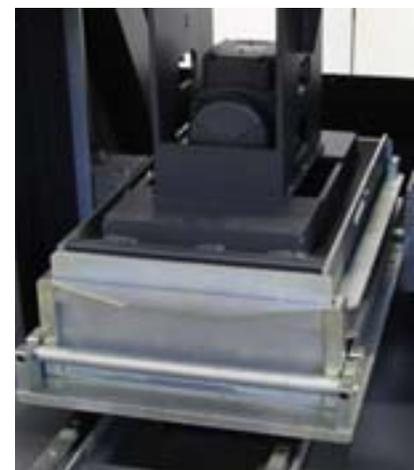
Vibrating roller option

77-PV43022

Vibrating roller for 380 V, 50 Hz, 3 ph models.

77-PV43024

Vibrating roller for 220 V, 60 Hz, 3 ph models.



Detail of segment head and mould

Standard electromechanical slab compactor



main features

- > Completely electro-mechanical operated
- > PC controlled, software included
- > Displacement controlled compaction profile
- > PRO-COMPACT* closed-loop control (see page 455)
- > Four models for preset compaction of slabs 500 x 400 mm, 500 x 300 mm and 320 x 260 mm, thickness from 38 to 120 mm on all slabs
- > Multi-size compactors, all models can be equipped with different sample size accessories.
- > Compaction direction in the longest (major) mould dimension to obtain specimens of the proper length conforming to Standard
- > Vertical sliding cover for easy access and complete three side view
- > Maximum compaction load 30 kN
- > Horizontal linear movement of the mould
- > Ideal for producing test beams for 4-Point Bending (EN 12697-24, EN 12697-26, AASHTO T321)
- > Moulds easy to install and to remove
- > Safety systems conforming to CE Standards

Standards EN 12697-33, method 5.2

77-PV40A15 to 77-PV40A46

This apparatus can compact asphalt slabs to a target density applying specific loads corresponding to those of pavements rollers used in the highway construction.

The slabs produced can be:

- Used for Wheel tacking tests.
- Cored to provide specimens for indirect tensile, static and dynamic creep tests.
- Cut into beams for bending fatigue tests.)

Different models are proposed, one preset for each slab size: 500 x 400 mm, 500 x 300 mm, 400 x 300 mm, and 320 x 260 mm slab.

All models can be fitted with heated sector head and relevant temperature control system (see upgrading options). This option has to be specified at the time of order

All versions feature a solid high stiffness steel frame, with ergonomic design and safety devices conforming to CE standards.

Software

- PC software operating in Windows® (PC not included)
- Selection, customization and storing of test parameters
- Set-up of the controls mode of the compaction: displacement compaction procedure
- Graphic display of roller vertical displacement, load vs. number of passes
- Data processing conforming to Standards

Ordering information

77-PV40A15

PAVELAB, Standard electromechanical multi-size slab compactor. Fitted with segment head to produce 320x260 mm slabs. Supplied completed with 320x260 mm mould.

380 V, 50 Hz, 3 ph

77-PV40A16

As above but 220V, 60 Hz, 3 ph

77-PV40A25

PAVELAB, Standard electromechanical multi-size slab compactor. Fitted with segment head to produce 400 x 300 mm slabs. Supplied completed with 400 x 300 mm mould.

380 V, 50 Hz, 3 ph

77-PV40A26

As above but 220V, 60 Hz, 3 ph

Models 77-PV40A05 and 77-PV40A06

Machine control	External PC (not included)
Operation	Electro-mechanical
Maximum vertical force	30 kN
Compacting device	Roller segment radius 535 mm
Trolley speed	Up to 300 mm/s
Compacted slab thickness	38 to 120 mm
Heated head	Yes, optional
Power rating	3000 W
Electrical supply	380 V, 50 Hz, 3 ph or 220 V, 60 Hz, 3 ph
Overall dimensions (lxwxh)	1300 x 800 x 2000 mm
Weight:	approx. 650 kg

77-PV40A35

PAVELAB, Standard electromechanical multi-size slab compactor. Fitted with segment head to produce 500 x 300 mm slabs. Supplied completed with 500 x 300 mm mould. 380 V, 50 Hz, 3 ph

77-PV40A36

As above but 220V, 60 Hz, 3 ph

77-PV40A45

PAVELAB, Standard electromechanical multi-size slab compactor. Fitted with segment head to produce 500 x 400 mm slabs. Supplied completed with 500 x 400 mm mould.

380 V, 50 Hz, 3 ph

77-PV40A46

As above but 220V, 60 Hz, 3 ph

Upgrading options

(must be factory installed)

Heated head option. Temperature control system.

77-PV44012UP

Sector head temperature control system including heating element for 77-PV40Axx series.

Note: for spare compacting feet and moulds see page 458.

DWT Double Wheel Trackers



77-PV32E05

main features

- > Meets and exceeds AASHTO and EN Standards and many DOT methods
- > Fully automatic test performance on two specimens or one specimen. Variable wheel speed from 20 to 30 cycles/min
- > Fixed wheel, mobile table 230 mm travel
- > Wheel load of 705 N* applied by weights
- > Temperature range from ambient to 80° C ($\pm 0.5^\circ\text{C}$)
- > Accurate temperature control ($\pm 0.5^\circ\text{C}$) for both in water and air test
- > Rut depth transducers feature 25 mm travel, 0.01 mm accuracy
- > Direct rut depth measurement system, with transducers axially mounted in alignment with the wheel's centre
- > Motorized wheel-assembly lifting system for easy removal of slabs
- > Free access to the wide testing area
- > Optional independent lifting system for the loading wheels
- > Slab mould size of 400 x 300 mm, 360 x 300 mm (for 320 x 260 mm slabs), double 150 mm gyratory compactor cylinders, 200 mm/8"/10" diameter cores
- > Slab thickness adjustable from 40 to 100 mm (in 10 mm steps)
- > Extensive use of stainless steel in the machine's construction; not limited to the parts in contact with water
- > PC and software included
- > Automatic water filling and leveling system, no need to adjust or control the water level above the specimen during the test (not included in model 77-PV31A16/5)

*1500 N upon request

Standards AASHTO T324, EN 12697-22 (small size device)

Wet and/or dry versions

The wheel tracking test is used for determining the susceptibility of Hot Mix Asphalt (HMA) to deformation under load by measuring the rut depth formed by repeated passes of a loaded wheel at a fixed temperature.

The two methods according AASHTO T324 and EN 12697-22 "small size device" are practically identical except for:

- **Test environment:** Dry and wet for EN; wet for AASHTO
- **Wheel material and size:** rubber wheel, 203 x 50 mm (diameter x width) for EN; steel wheel, 203 x 47 mm (diameter x width) for AASHTO

CONTROLS offer different models which satisfy all the above requirements. See page 463

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Machine body

Sheet steel, powder coated.
Transparent sliding cover.

Loaded wheel system

The wheel load (for both systems) is 705 N (1500 N upon request). The system includes a motorized lifting system for raising the wheel assembly at the end of the test.

Wheel tracking carriage

The wheel is moved 230 mm backwards and forwards on the top of the slab, which is fixed. The speed is adjustable via the PC from 20 to 30 cycles per minute (40 to 60 passes). The longest slab dimension is oriented to the wheel's direction of travel. Special slab moulds for circular samples obtained from coring or gyratory compactors are also available. See accessories.

Temperature control system

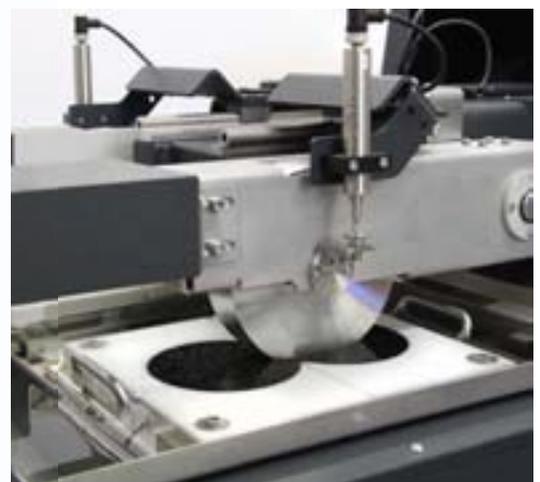
The AASHTO Hamburg type Standard states that the test must be performed in a water bath with a temperature range of 25 to 70° C±1°C, whilst the EN requires either an air or water environment. In both systems a water level of about 20 mm above the sample has to be maintained. Where a heated air environment is specified, the specimen, during testing, must be maintained at the specified temperature ±1°C. All versions fully satisfy and exceed the above requirements: the temperature accuracy is ±0.5°C.

Impression measurement system

Each wheel is fitted with RUT DEPTH transducers for measuring deformations from 0 to 25 mm ±0.01mm (rut depth).



Detail of the motorized lifting system that raises the wheel assembly at the end of the test, making the use of hoists obsolete.



Detail of the testing wheels



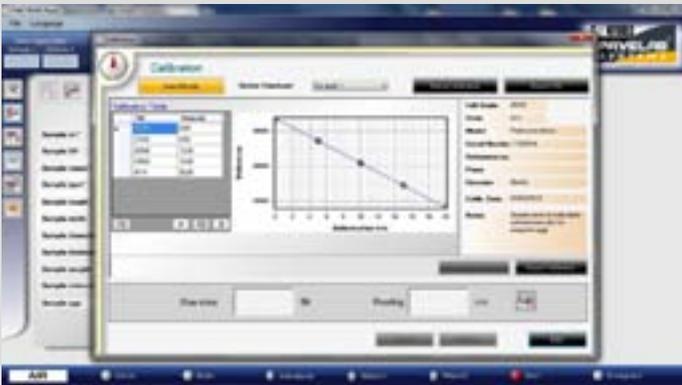
DWT Double Wheel Trackers

Testing software features

With the user-friendly Windows® software the operator can set the (fully customizable) test procedures to conform to AASHTO or EN Standards, and follow the test progress in real time, monitoring water (or air) temperature, specimen temperature, rut depth and a graph of deformation/cycles with the specimen profile, metric or imperial unit selection. Software also features exporting of test data to CSV format (Excel®), management of test data such as asphalt mix, client information, etc. and different screen background colours for water or air temperature control.

The software allows the user to select different temperature probes to monitor the two sample temperatures and/or the water or air temperature.

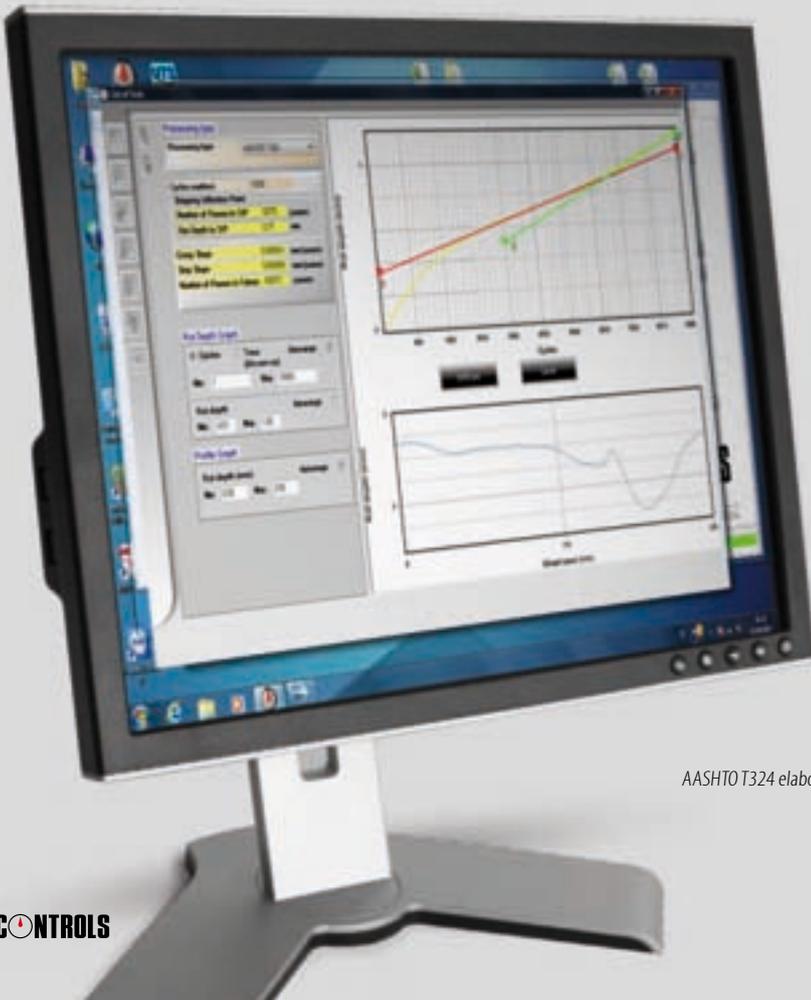
The user can select the deformation sampling frequency and the deformation length ($0 \div 230$ mm) used to calculate the mean deformation.



Typical screenshot: calibration



Typical screenshot: final test report



AASHTO T324 elaboration for stripping inflection point calculation.

Available versions

CONTROLS offer three versions which satisfy all Standards requirements

Common specifications

- Displacement motion: the arm is moving and the carriage is fixed
 - Wheel travel: 230 mm
 - Wheel speed: variable 20 to 30 cycles/min
 - Wheel load: 705 N by weights. Special models with weight increased to 1500 N available on order
 - Temperature range: ambient to 80°C, +/- 0.5°C
 - Rut depth transducer range: 25 mm, 0.01 mm accuracy
 - Moulds: not included, to be ordered separately
 - Slab thickness: adjustable from 40 to 100 mm in 10 mm steps
 - Overall dimensions (wxdxh): 1540 x 1020 x 1600 mm
 - Weight approx.: 600 kg
 - PC and Software: included
- Specific features of the three versions
See table*

Standards	AASHTO T324		EN 12697-22		AASHTO T324/ EN 12697-22
	in water		in air	in air and water	in air and water
Models 77	PV31A16 PV31A15	PV31A26 PV31A25	PV32E05	PV33E05	PV33B05 PV33B06
Descriptions	 <p>DWT Hamburg type double wheel tracker, wet conditioning version</p>		 <p>DWT double wheel tracker, dry conditioning version</p>	 <p>DWT double wheel tracker, wet and dry conditioning version</p>	 <p>DWT, Hamburg and EN type, double wheel tracker, interchangeable wheels (steel for AASHTO and rubber for EN), wet and dry conditioning</p>
Material and dimensions (diameter x width) of the two loaded wheels	Stainless steel 203 x 47 mm		Rubber tyre 203 x 50 mm	Rubber tyre 203 x 50 mm	Stainless steel 203 x 47 mm and Rubber tyre 203 x 50 mm
Temperature control method (accuracy ±0.5°C for both water and air)	Three 1500 W heaters, re-circulating pump, automatic filling and control level*		Three 1200 W electronically controlled air blowers	Air: Three 1200 W electronically controlled air blowers Water: Three 1500 W heaters, re-circulating pump, automatic feed and control level	Air: Three 1200 W electronically controlled air blowers Water: Three 1500 W heaters, re-circulating pump, automatic feed and control level
Power rating	5500 W		4600 W	5500 W	5500 W

DWT Double Wheel Tracker Hamburg type

Standards AASHTO T324

Water conditioning series

Stainless steel wheels 203 x 47 mm (dxw)

Proposed in two configurations:

Standard (77-PV31A16) and complete with clear transparent sliding door (77-PV31A26)



77-PV31A16/5 with water tank covers (77-PV3UP30)

DWT Double Wheel Tracker

Standards EN 12697-22 (Small Size Device)

Rubber tyre wheels 203 x 50 mm (diameter x width)

Proposed in two configurations:

Dry conditioning series (77-PV32E05) and Wet and Dry conditioning series (77-PV33E05)



77-PV32E05, 77-PV33E05

Dry conditioning series

77-PV32E05

PAVELAB DWT Dry double wheel tracker. Conforming to EN 12697-22 (Small Size Device).

Complete with PC, software and clear transparent sliding doors. Set of moulds to be ordered separately (see accessories).

380V, 50Hz, 3Ph.

Wet and Dry standard conditioning series

77-PV33E05

PAVELAB DWT Wet and Dry double wheel tracker.

Conforming to EN 12697-22 (Small Size Device).

Complete with PC, software and clear transparent sliding doors. Set of moulds to be ordered separately (see accessories).

380V, 50Hz, 3Ph.



77-PV31A26/5

77-PV31A16

PAVELAB DWT double wheel tracker (Hamburg type). Conforming to AASHTO T324, in-water specimen conditioning. Complete with laptop PC and software. Set of moulds to be ordered separately (see accessories).

220V, 60Hz, 3Ph.

77-PV31A15

As above but 380 V, 50 Hz, 3 ph.

77-PV31A26

Water conditioning specimens version

with transparent sliding door

PAVELAB DWT double wheel tracker (Hamburg type). Conforming to AASHTO T324,

in-water specimen conditioning. Complete with laptop PC and software and clear transparent sliding door. Set of moulds to be ordered separately (see accessories).

220V, 60Hz, 3Ph.

77-PV31A25

As above but 380 V, 50 Hz, 3 ph.

DWT Double Wheel Tracker

Universal Hamburg type and EN 12697-22

Standards AASHTO T324 and EN 12697-22 (Small Size Device)

Interchangeable Stainless steel or rubber wheels 203 x 47/50 mm (diameter x width)



77-PV33B05/06

Water conditioning series

77-PV33B05

PAVELAB DWT Wet and Dry double wheel tracker. Conforming to AASHTO T324 (Hamburg type) and EN 12697-22 (Small Size Device), in-air and in-water conditioning system. Complete with set of both stainless steel and rubber wheels, PC, software and clear transparent sliding door. Set of moulds to be ordered separately (see accessories). 380V, 50Hz, 3Ph.

77-PV33B06

As above but 220 V, 60 Hz, 3 ph.

Upgrading Options

common to all models:AASHTO and EN

Lifting system

77-PV3UP10

System for the independent lifting of the loading wheel at the rut target, continuing the test, without interruption with the other wheel.

To be specified at time of order

Additional Temperature Probes

77-PV3UP20

Additional two temperatures probes to monitor the two sample temperatures.

To be specified at time of order

Water Tank cover

77-PV3UP30

Water tank covers.

(Only for 77-PV31A16/5 models)

Accessories

(common for both versions)

Some guidelines on how you can complete the actual DWT range in different configurations:

77-PV3/001

Set of two moulds for 400x300mm samples, thickness from 40 to 100mm, recommended for test according to EN 12697-22 in water or in air.



77-PV3/002

Set of two moulds 360 x 300 mm (also suitable for 320 x 260 mm samples by using 20 mm thick plaster spacers), thickness variable from 40 to 100 mm.

For tests conforming to AASHTO T324 in water

77-PV3/005

Set of trays with handles for double 150 mm diameter cylindrical samples, conforming to AASHTO T324. 77-PV3/003 adaptors for 150 mm dia. cylindrical sample to be ordered separately (see accessories)



77-PV3/003

Set of two mould adaptors for double 150mm dia core (total 4 adaptors made of special self lubricating acetal copolymer), thickness 60 mm, fitted in 77-PV3/002 360 x 300 mm moulds (not included). For test conforming to AASHTO T324 in water

Note: Other models are available on order



DYNA-TRACK Single wheel tracker

Standards EN 12697-22, NF P98-251-1, NF P98-251-4



main features

- > Automatic test control
- > Large permanent memory to store test data and results
- > RS232 ports for connection to PC and printer
- > Real-time display of number of cycles, rut depth and temperatures
- > Tracks for a specified number of passes or to specific rut depth
- > Adjustable load cycle frequency
- > Double temperature measurement: inside the specimen and into the cabinet
- > Test temperature range from ambient to 65°C
- > Motorized loading arm for easy positioning
- > Double-glazed doors for monitoring of testing cycle
- > Testing software included for EN procedures, A and B, and user-defined

The wheel tracking apparatus consists of a loaded wheel, which bears on a sample held on a moving table. The table reciprocates with simple harmonic motion over a distance of 230 ± 5 mm with a frequency of 53 passes ($\pm 1\%$) per minute. For research purposes the test speed can be adjusted by inverter control. The wheel is fitted with a solid rubber tyre with an outside diameter of 200 mm. The wheel load under standard conditions is 700 ± 10 N. The wheel tracker is fitted with a temperature controlled cabinet with a temperature range from ambient to $65^\circ\text{C} \pm 1.0^\circ\text{C}$. The sample may be either a 200 mm diameter core or a 300 x 400 mm slab of asphalt mixture from 25 mm to 100 mm thick. A displacement transducer with a 25 mm stroke is included for monitoring rut depth in the centre of the sample to an accuracy greater than 0.1 mm.

Deformation and sample temperature are recorded by the internal data acquisition and control system and transmitted to the Windows® compatible software (included).

- Overall dimensions: 1731 x 659 x 1705 mm
- Weight: 400 kg approx.

Ordering information

77-PV3502

DYNA-TRACK, Wheel tracking machine.
230 V, 50-60 Hz, 1 ph.

77-PV3504

As above but 110 V, 60 Hz, 1 ph.

Accessories

Sample confinement frames

77-PV3502/L25

Sample confinement frame,
size 400 x 300 mm, 25 mm high.

77-PV3502/L60

Sample confinement frame,
size 400 x 300 mm, 60 mm high.

77-PV3502/L100

Sample confinement frame,
size 400 x 300 mm, 100 mm high.

Compaction mould

77-PV3600/1

Compaction mould 400 x 300 x 120 mm

Spares

77-PV3502/11

Replacement rubber tyre

Static tests on bituminous mixtures

Standards NF P98-251-1, NF P98-251-4

Duriez compression test sets

The Duriez test is performed to determine and study the physical and mechanical properties of bituminous mixtures. We produce two sets for performing the test: one for 80 mm diameter specimens and one for 120 mm. All parts are made from steel protected against corrosion.

To comply with the requirements of the standard, the specimens have to be temperature conditioned using a suitable climatic chamber (e.g. our model 10-D1429/A, see page 7) and the test has to be performed by a compression machine with a minimum capacity of 180 kN for compaction and compression.

80 mm diameter specimens can be compressed with our UNIFRAME model 70-T1292, 200 kN capacity. For more information see page 388

Ordering information

77-B0090

Test set for 80 mm diameter specimens, consisting of:

- [77-B0090/A1](#)
80 mm diameter mould
- [77-B0090/A2](#)
80 mm diameter cylindrical container
- [77-B0090/A3](#)
80 mm diameter extraction piston
- [77-B0090/A4](#)
80 mm diameter upper and lower pistons
- [77-B0090/A6](#)
80 mm diameter upper and lower engraved pistons
- [77-B0090/A5](#)
80 mm diameter set of two half spacers

77-B0091

Test set for 120 mm diameter specimens, consisting of:

- [77-B0091/A1](#)
120 mm diameter mould
- [77-B0091/A2](#)
120 mm diameter cylindrical container
- [77-B0091/A3](#)
120 mm diameter extraction piston
- [77-B0091/A4](#)
120 mm diameter upper and lower pistons
- [77-B0091/A6](#)
120 mm diameter upper and lower engraved pistons
- [77-B0091/A5](#)
120 mm diameter set of two half spacers

All the above parts can also be ordered separately.

Note: The engraved pistons 77-B0090/A6 and 77-B0091/A6 are used for cold mixes with bituminous emulsions



77-B0090

Compression testers to perform the Duriez test

The test can be performed with the following testers:

UNIFRAME, Electromechanical automatic compression testers

The UNIFRAME model 70-T1292, 200 kN capacity is the ideal machine for performing not only the Duriez test but also the other most popular road tests such as CBR, Marshall and Indirect tensile. For more information see page 388



70-T1292

UTM Series, Electromechanical universal testers

Models 70-S18B2 and 70-S19C2, 200 and 300 kN cap., fitted with the suitable accessory, can perform the Duriez test and many other compression and tension tests. For more information see page 384



70-S18B2



10-D1429/A Climatic chamber. For more information see page 7

Skid resistance tester



main features

- > New low friction release mechanism for the pendulum arm for better accuracy
- > Extremely light pointer, for high precision results
- > Slider lifting system integrated into the pendulum foot that guarantees reliable adjustment operations
- > Strong and sturdy twin column structure
- > Easy and reliable height adjustment system
- > Integrated additional scale for tests on PSV specimens
- > Complete with calibration certificate to EN 13036-4 or ASTM E303

Standards

EN 13036-4 | EN 1097-8 | ASTM E303

A skid resistance tester is used in pavement testing conforming to EN 13036-4 and ASTM E303 for determining the Skid Resistance, i.e. the required property of a surface subjected to traffic to maintain the adhesion of a vehicle tyre.

It is also used for other measurements such as:

- the determination of the Polished Stone Value (PSV) conforming to EN 1097-8
- testing Paving stones and Blocks conforming to EN 1341, EN 1342 and EN 1338

The apparatus consists of an adjustable pendulum arm and a spring loaded rubber slider (see accessories) mounted on the end of the arm. During operation the pendulum is raised and then allowed to swing freely, allowing the edge of the rubber slider to skid across the surface of the road or sample.

Two versions are available:

48-PV0190/A

conforming to the ASTM E303 standard

48-PV0190/E

conforming to EN 13036-4 and other afore-mentioned EN Standards.

The pendulum is supplied complete with:

- Additional scale for tests on Polished Stone Value specimens
- Thermometer with a range from 0 to 220° C for surface temperature measurement
- 3 rubber sliders for field use
- Washing bottle, 1 litre capacity for surface wetting
- Tool set with case for machine assembly
- Rule for sliding length verification
- Carrying case
- Traceable certificate of conformity to EN 13036-4 or ASTM E303
- Case dimensions: 790 x 760 x 320 mm
- Weight (including case): approx. 34 kg.

Ordering information

48-PV0190/A

Skid resistance and friction test set (Skid tester) conforming to ASTM E303, including: additional scale for PSV, 3 rubber sliders for field use, thermometer, washing bottle, tool set with case for machine assembly, rule, carrying case and traceable calibration certificate to ASTM E303.

48-PV0190/E

Skid resistance and friction test set (Skid tester) conforming to EN 13036-4 and EN 1097-8, including: additional scale for PSV, 3 rubber sliders for field use, thermometer, washing bottle, tool set with case for machine assembly, rule, carrying case and traceable calibration certificate to EN 1097-8.

Accessories

Rubber sliders

48-PV0190/1

Mounted rubber slider, TRL rubber, 32 mm width.

48-PV0190/2

Mounted rubber slider, TRL rubber, 76 mm width.

48-PV0190/6

Mounted rubber slider, 4S rubber, 32 mm width.

48-PV0190/7

Mounted rubber slider, 4S rubber, 76 mm width.

Base plates**48-PV0190/4**

Metal base plate to clamp the Polished Stone Value specimen.

48-PV0190/5

Metal base plate for testing surface friction properties of Natural stones (EN 1341, EN 1342) and Paving blocks (EN 1338).

Accelerated polishing Machine (PSV)**80-PV5262****Standards**

EN 1341 | EN 1342 | EN 1097-8 | EN 1343

This machine is used to measure the resistance of road stone to the polishing action of vehicle tyres on a road surface, simulating actual road conditions, and is used in conjunction with the Skid Resistance Tester to determine the Polished Stone Value (PSV).

The machine is electronically controlled by a digital unit with a 4 row x 20 character LCD display and comes complete with an emergency stop button.

It is supplied complete with road wheel, side plate, rubber rings, two tyred wheels, drive belt, abrasive feed mechanism, corn emery, flour emery, tool kit, set of two specimen moulds and two mould plates.

Technical specifications

- Electronic control of rotation speed and feed mechanism
- Digital 4-row x 20-character display
- Aluminium wheel, 406 mm diameter
- Clamping device for specimen
- Rotation speed adjustable from 315 to 325 rpm
- Two rubber tyred wheels, 200±3 mm diameter
- Lever arm and weight loading the tyred wheel on the aluminium wheel to 725±10N
- Microprocessor-controlled feed mechanism for corn emery and flour emery
- Electric motor: 750 W
- Rated power: 850 W
- Overall dimensions: 1800 x 980 x 510 mm (h x w x d)
- Weight: approx. 200 kg

Ordering information**80-PV5262****main features**

- > Fully conforms with EN 1097-8
- > Advanced digital interface for programming test steps and pauses
- > Independent control of the two feeders
- > Digital control of speed rotation
- > Full protection of all the moving part areas with safety switch
- > Removable water tank, easy refill

Accelerated polishing machine.
230 V, 50 Hz, 1 ph.

80-PV5263

Same as above but 220 V, 60 Hz, 1 ph.

80-PV5264

Same as above but 110 V, 60 Hz, 1 ph.

Accessories**80-PV0525/12**

Corn emery, 5 kg pack.

80-PV0525/13

Flour emery, 5 kg pack.

80-PV0525/14

Control stone (ungraded), 50 kg bag.

80-PV0525/15

Friction tester reference stone (Criggion stone-ungraded), 25 kg bag.



48-PV0190/A, 48-PV0190/E complete set



Rubber sliders



48-PV0190/5

Indentation penetrometer

Standards EN 12697-20 | EN 13108-6



main features

- > New weight positioning system that allows transition, in a very user-friendly and precise way, from no-load to pre-load phase, then to load phase without the need to add/remove weights from the apparatus
- > Four-column frame structure with high stiffness
- > Piston position indicator, making adaptation of the penetrometer for samples of different heights easier
- > Stainless steel water bath included, for sample conditioning
- > Water drain with drainage pipe included in the machine

80-B0163/C

Ordering information

80-B0163/C

Asphalt indentation penetrometer.

Accessories

80-B0163/1

Cube mould, 70.7 mm.

80-B0163/2

Penetration test mould, 69 mm.

86-D1408/D

Digital immersion heater-agitator. 230 V, 50 Hz, 1 ph.

The Asphalt indentation penetrometer is one of the most important machines for testing mastic and rolled asphalt and is included in the test methods described by EN 13108-6 for CE marking of mastic asphalt.

The test is used for determining the depth of indentation of mastic and rolled asphalt and can be performed both on 70 mm (approx.) cubes and Marshall samples (the steel base plate for Marshall samples is included).

The new Controls model incorporates some improved features that increase the user-friendliness and the operability of the machine, like the new weight positioning system which makes passing from the no-load to the pre-load and then to the load phase very easy and precise, without the need to add/remove weights to/from the apparatus. Other features include the four-column frame structure that enables precise weight positioning; the piston position indicator that makes adaptation of the penetrometer for samples of different heights easier (70mm cubes, Marshall specimens); and the water drain facility at the end of the test.

The Asphalt indentation penetrometer is supplied with a stainless steel water bath, 500 N weights, interchangeable 1 and 5

cm² pistons, a 30 x 0.01 mm dial gauge, steel plate with dial gauge holder, and a calibration cylinder that conforms to EN 12697-20, complete with certificate.

A range of accessories for creating 70 mm mastic asphalt cubes and controlling water temperature are available, including the Digital immersion heater-agitator 86-D1408/D that can keep water at the required testing temperature in conformance with the testing standard (22 or 40 °C). See Accessories.

Dimensions: 430 x 530 x 955 mm
(700 mm without weights)(wxdxh)
Weight: 115 kg approx.



Detail of the weight positioning system showing, from left to right, no-load phase, pre-load phase (25 N) and load phase (525 N). The system allows transition from the no-load to the pre-load phase, then to load phase in a very fast, precise and safe way: by rotating the lower part, the load conditions are accurately applied, and the operator doesn't have to add or remove any heavy weights to/from the apparatus.



86-D1408/D

80-B0163/2

80-B0185/A**MOT Straightedge****Standards** EN 13036-7

Used to measure irregularities in road pavement. Made from aluminium alloy, 3 m length. Complete with two wedges.

Weight approx. 10 kg



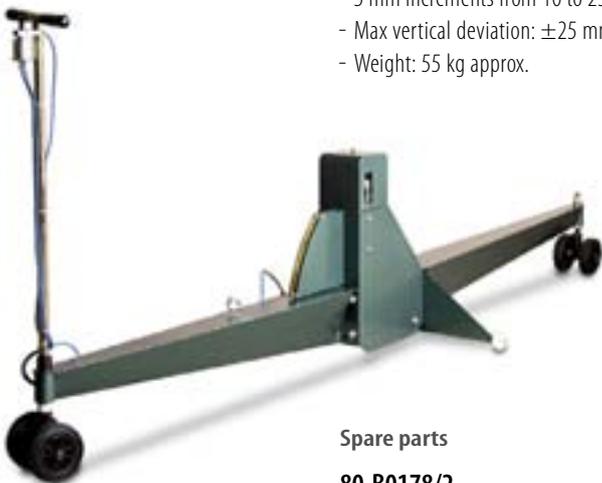
80-B0185/A

80-B0187/A**Travelling beam device with recording unit**

This apparatus is used for detecting road surface irregularities. It can be used for either concrete or asphalt pavements. The apparatus consists essentially of a beam with rigid wheels at the extremities, with a wheel in the middle that can detect any vertical deviation of the surface from the straight-line between the two wheels at the ends of the apparatus. It is supplied complete with a recording unit to obtain a graph of vertical deviations.

Technical specifications

- Beam length: 3 m
- Scale: 2 mm increments up to 10 mm;
5 mm increments from 10 to 25 mm
- Max vertical deviation: ± 25 mm
- Weight: 55 kg approx.



80-B0187/A

Spare parts**80-B0178/2**

Pack of 10 chart rolls. Each roll will provide a run of approx. 1 km.

80-B0187/3

Fibre-tipped pen.

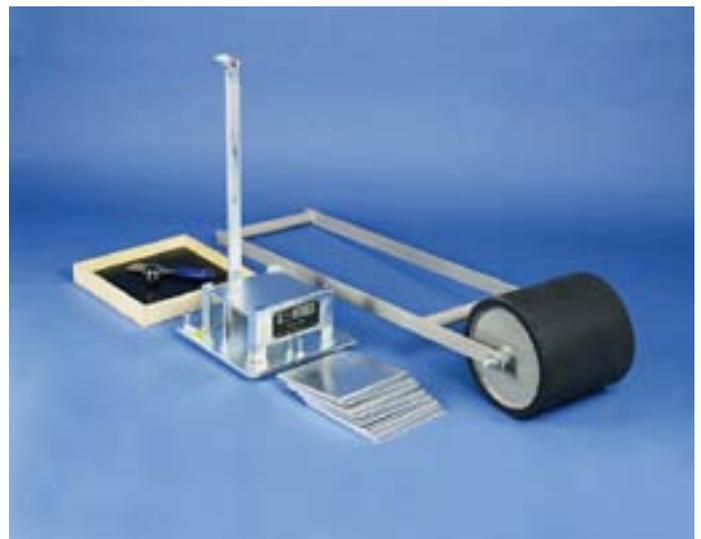
80-B0178/A**"Vialit plate" adhesion test apparatus****Standards** EN 12272-3

Used to assess the adhesion property of aggregates to bitumen. The test is performed to check how well aggregates applied to the surface of wearing course rolled asphalt will adhere.

The apparatus consists of a metal base with three vertical pointed rods to hold the test plate, a 50 cm high vertical rod with a chute at the upper end for the steel ball to drop from, a 512 g steel ball, a supply of 6 metal test plates, and a hand-operated rubber-lined roller with lead shot ballast.

The test plate, coated with bitumen on one face and spread with aggregate chippings in a standard way, is rolled by the roller and then placed on the three-point support of the base. The steel ball drops three times from the chute and the loose chippings are counted and checked.

Weight: 40 kg approx.



80-B0178/A

Spare parts**80-B0178/A1**

512 g steel ball.

80-B0178/A2

Metal test plate.

80-B0178/A3

Roller.

80-B0180

Benkelman beam apparatus

Standards AASHTO T256

This apparatus is used to measure the deflection of flexible pavements under the action of moving wheel loads.

During operation the beam is placed between the tyres of the test vehicle and in contact with the pavement. The deflection is measured as the vehicle passes over the test area.

The probe is 2440 mm long and the back extension is 1220 mm. The apparatus is manufactured from aluminium and chrome finished metals.

Weight: 15 kg approx



80-B0180 with 80-B0181

Accessories

80-B0181

Wooden carrying case.

80-B0180/1

Spare gauge with bracket.

80-B0180/2

Adjustable feet for Benkelman beam, complete with two spirit levels.

Calibration device

80-B0180/3

Calibration device for 80-B0180 Benkelman beam apparatus.

For verifying the accuracy of the apparatus. Weight 5 kg approx.



80-B0180/3
Calibration device

80-B0180/B1

Aluminium bearing plate 600mm diameter

Standards NF P94-117-1

For complete information and details see page 164



80-B0180/B1 with accessories

80-B0179

Sand patch apparatus

Standards EN 13036-1 | ASTM E965 | NF P98 216-1

The sand patch test is performed by spreading a measured volume of fine sand (ASTM) or glass spheres (EN) into a circular patch on the road surface and filling the surface depressions to the level of the peaks.

The test apparatus comprises the following parts:

- Spreader disc with rubber-covered surface
- 2 containers with screw tops and pouring holes for glass sand or glass spheres
- Three plastic measuring cylinders of 10, 25 and 50 ml capacity
- Screw-adjusted dividers
- Brass measuring cylinder
- 300 mm rule
- Brush
- Wind shield
- Kneeling pad

For NF P98 216-1

80-B0179/3

Natural sand, 315/160 µm. 10 kg bag.

Spare parts

80-B0179/30

Brass measuring cylinder.

80-B0179/31

Spreader disc, covered with rubber.

Accessories

For EN 13036-1

80-B0179/5

Solid glass spheres, 250/180 µm. 25 kg pack.

For ASTM E965

80-B0179/1

Natural sand, 300/150 µm. 10 kg bag.

80-B0179/2

Natural sand, 150/75 µm. 10 kg bag.



80-B0179

80-B0176**Rate of spread apparatus****Standards** EN 12272-1 | BS 598:108

This simple apparatus is for determining the rate of spread of binder on the surface of the road. It consists of a 300 mm square metal tray, which can be lifted by means of four chains. The chains are attached to a digital balance from which the rate of spread can be assessed. An additional tray can be ordered with the code 80-B0176/1.

Weight: 850 g approx.



80-B0176

80-B0193**Cohesion tester****Standards** ASTM D3910 | EN 12274-4

This pneumatically operated tester is for determining the proper consistency (mix design) for a slurry seal mixture. It consists of a double-acting, double-ended pneumatic cylinder fitted in a frame which houses a pressure gauge and valves. A hand torque wrench is also supplied. The tester has to be used with a suitable square mould - see Accessories.

Weight: 20 kg approx.



80-B0193

Accessories

Square moulds with four truncated conical holes to prepare the sample for testing

80-B0193/10

Square mould, 140 x 140 x 6.3 mm.

80-B0193/11

Square mould, 140 x 140 x 10 mm.

80-B0193/12

Square mould, 200 x 200 x 13 mm.

80-B0193/13

Square mould, 250 x 250 x 19 mm.

Air compressor**86-D2015**

Laboratory air compressor. 230 V, 50 Hz, 1 ph.

86-D2015/Z

As above but 110 V, 60 Hz, 1 ph.

Slurry seal mixtures test apparatus**80-B0192 series****Planetary stirrer for abrasion testing****Standards** EN 12274-5 | ASTM D3910

This machine is used for determining the resistance of slurry mixtures to abrasion. It consists of a mechanical planetary stirrer equipped with a weighted rubber hose abrasion head and has to be completed with a set of moulds - see Accessories.

Weight: 32 kg approx.

Ordering information**80-B0192**

Planetary stirrer. 380 V, 50 Hz, 3 ph.

80-B0192/Z

As above but 220 V, 60 Hz, 3 ph.

Accessories**80-B0192/1**

Set of moulds, 295 mm diameter, 6.3, 10.0, 13.0 and 19.0 mm high.



80-B0192

48-D0440**Sand absorption cone and tamper for consistency testing****Standards** EN 1097-6 | EN 12274-3

The cone and tamper are manufactured according to specifications and can also be used for determining the specific gravity and absorption of fine aggregates. See page 205

Weight: 250 g approx.



48-D0440

Asphalt permeability apparatus

80-B0093/E

Radial flow falling head permeameter

Standards EN 12697-40

Consisting of an acrylic tube with an internal diameter of 125 mm, marked from 1 to 5 litres capacity, with an internal rubber ball and rod, the permeameter is fitted on a wooden base plate with a sealing gasket.

Weight: 8 kg approx.



80-B0093/E

80-B0093

Permeameter for in situ drainability

This apparatus is for measuring the time water takes to percolate through draining pavements and comprises a graduated transparent cylinder, a metal support, a rubber gasket and a 20 kg counterweight with handles.

Weight: 21 kg approx.



80-B0093

80-B0093/A

Permeameter for in situ drainability Autostrade (Italian Highways) method

This version is for measuring the time water takes to percolate through draining pavements by the Autostrade Italian Highways method and has a transparent cylinder 150 mm diameter by 390 mm high.

Weight: 6 kg approx.



80-B0093/A

Flexibility of bituminous mixes

80-B0198

Van Asbeck apparatus for flexibility tests on hydraulic bituminous mixes

The scope of the Van Asbeck apparatus is to test and assess the flexibility and related impermeability to water under pressure of hydraulic bituminous mixes to be used in waterproofing structures of dams.

The apparatus consists essentially of a steel cylindrical cell divided in two parts. The upper part is a pressurized water container and the lower part consists of a cone with an opening in the lower end. These two parts are clamped together by two flanges (upper and lower) interposed by a steel ring of 50 cm inside diameter which contains the compacted bituminous sample. The lower conical part of the apparatus has to be filled with 2-2.5 mm diameter glass spheres which support the compacted 50 cm diameter slab when it is subjected to 3 bar water pressure. The valve of the lower conical end is then opened and the glass spheres are removed at a rate of 250 g every 15 minutes up to a total of 5 kg, thus forming a hollow space under the slab to a maximum depth of 5 cm. The water pressure is then maintained for another 5 hours. The asphalt slab should remain impervious during this flexibility test, even if fine surface cracks develop in the bottom of the slab.

Weight: 8 kg approx.



80-B0198 with air compressor

The apparatus comprises:

- Steel cylindrical cell
- Air pressure regulator
- Safety valve
- Series of inlet/outlet/water discharge/overflow valves
- Manometer
- Level indicator
- Disc mould for compacted sample preparation (a confining steel ring with shaped steel plate)
- Air/Water pressure cylinder
- Sealing material
- 20 kg of 2-2.5 mm diameter glass spheres

Overall dimensions:
700 x 1000 mm (dia. x h)
Weight: 100 kg approx.

Accessories

86-D2015

Laboratory air compressor, 10 bar maximum pressure, 8 bar for continuous use, 50 litre capacity. 230 V, 50 Hz, 1ph.

86-D2015/Y

As above but 220 V, 60 Hz, 1ph.

86-D2015/Z

As above but 110 V, 60 Hz, 1ph.

80-B0198/1

Steel spheres 2-2.5 mm diameter, 20 kg pack.



Disc mould for sample preparation

Particle loss and resistance to fuel

Standards EN 12697-17 | EN 12697-43 | EN 1097-2 | ASTM C131

Los Angeles machines for asphalt tests

The EN 12697-17 method (Cantabro test) concerns the determination of the particle loss (abrasion) of porous asphalt mixtures, whilst the EN 12697-43 concerns the determination of the resistance of a bituminous mixture or pavement to aviation fuel. Both procedures involve, along with other standard laboratory tests, abrasion in a Los Angeles tester conforming to EN 1097-2 without steel balls. Furthermore, the EN 12697-17 requires the use of a chamber or enclosure for the Los Angeles machine to maintain the temperature constant to within ± 2 °C.

This condition can be easily achieved using a noise reduction and safety cabinet 48-D0500/XUP which is also necessary to comply with CE directives. See version 48-D0502/D

The machine is available in two versions: standard, and fitted inside the noise reduction and safety cabinet conforming to CE directives. The latter version includes a switch which stops the machine when the door is opened and has the control panel mounted externally.

For a complete description see page 197

Ordering information

48-D0500/D

Los Angeles abrasion machine, 230 V, 50 Hz, 1 ph.

48-D0500/DY

As above but 220 V, 60 Hz, 1 ph.

48-D0500/DZ

As above but 110 V, 60 Hz, 1 ph.

48-D0500/CB1

see page 197

48-D0500/CB2

see page 197



48-D0500/D
(steel balls not included)



48-D0502/D

Accessories

For EN 1097-2, ASTM C131 and AASHTO T96 only

48-D0505

Set of 12 abrasive charges conforming to ASTM/AASHTO Standards.

48-D0505/A

Set of 12 abrasive charges conforming to EN standards.

Sampling materials by coring

Standards EN 12697-27

83-B0202/B

Pavement core drilling machine, 6 HP, 4-stroke petrol engine

For details see page 560



83-B0202/B

83-B0212

Trailer mounted coring machine

For details see page 560



83-B0212

Bulk density of laboratory compacted asphalt

Standards EN 12390-7 | ASTM C127 | AASHTO T85 | EN 12697-6 | ASTM D1188 | ASTM D2726 | AASHTO T166

11-D0612/B

Specific gravity frame for asphalt

This apparatus is used, together with a suitable electronic balance, for determining the specific gravity of laboratory compacted asphalt specimens, fresh and hardened concrete and aggregates. A purpose built robust frame supports the electronic balance, while the lower part of the frame incorporates a moving platform which holds the water container, allowing test specimens to be weighed in both air and water.

The balance is not included and should be selected according to the weighing range required. Any type of electronic balance fitted with an under-bench weighing facility can be used. All our balances have this feature (see Electronic balances on page 9).

The frame has to be completed with the cradle 11-D0612/A1 for holding concrete cubes or cylinders, or with a suitable density basket for use with asphalt specimens and aggregates.

Overall dimensions: 400 x 650 x 1000 mm

Weight: 25.5 kg approx.

Accessories

11-D0612

Density basket, stainless steel, 200 mm diameter x 200 mm high, 3.36 mm mesh size (No. 6 ASTM).

55-D1403

Wax melting pot. 230 V, 50-60 Hz, 1 ph.

86-D0805/G

Wax, 10 kg.

82-D1654/A

Vernier caliper, 0 to 200 mm x 0.01 mm.



11-D0612/B with Density basket 11-D0612 and balance



10-D1403

Asphalt Testing

79 | IPC Global Dynamic Testing Systems

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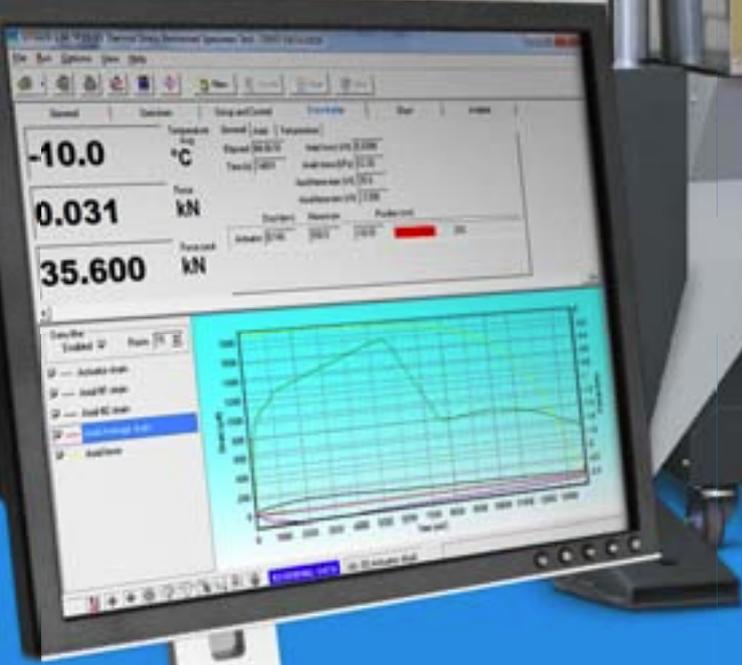
This 79 Section concern the IPC Global Servo-hydraulic and Servo-pneumatic Universal Testing Machines (UTM), designed to meet the needs of laboratories for a wide range of advanced cyclic and static tests on asphalt, unbound pavement materials, soils or other construction materials.

Supported by the world class IMACS digital controller, UTS software and extensive range of accessories for performing tests to international standards.

79 IPC Global Dynamic Testing Systems

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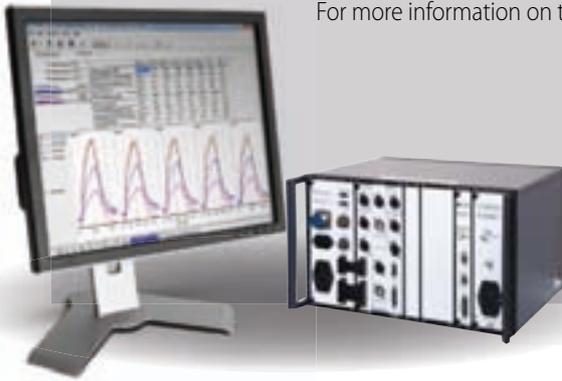


UTM Servo-Pneumatic and Servo-Hydraulic Universal Testing Machines

IPC Global's Universal Testing Machines (UTM) are precision engineered to surpass your toughest research challenges. Designed and built to IPC Global's highest standard for Civil Engineering laboratories, these systems deliver superior reliability and accuracy with proficient performance of tension, compression and dynamic loading analysis on all types of materials. IPC Global supplies a wide range of test fixtures, transducers and environmental chambers to complement its range of UTM testing systems, thus creating a complete turnkey solution that streamlines your material testing. To view the full set of accessories see page 490 to 501

IPC Global's range of Servo-Pneumatic and Servo-Hydraulic UTM systems perform load and displacement controlled tests with programmable wave shapes over a large range of frequencies up to 70 Hz, and are therefore capable of simulating real world traffic conditions. Harnessing the precision of IPC Global's renowned IMACS Digital Controller and Data Acquisition System and the powerful user-friendly UTS software you'll have absolute confidence in your materials analysis.

For more information on the IMACS digital controller and data acquisition system see page 488



kN
15

UTM-15P

Servo-Pneumatic Universal Testing System



kN
30

UTM-30

Servo-Hydraulic Universal Testing System



kN
130

UTM-130
Servo-Hydraulic Universal Testing System



kN
250

UTM-250
Servo-Hydraulic Universal Testing System

UTM-30

UTM

kN
30

main features

- > Rigid two column load frame
- > Precision engineered for high stiffness and alignment
- > Available with double acting, through-rod high precision labyrinth bearing actuator providing superior performance.
- > High performance servo valve allows sinusoidal loading frequencies up to 70 Hz
- > Hydraulic Power Supply (HPS) based on the inverter technology-oil flow control, assuring silent operation and energy saving
- > Motorized crosshead positioning
- > Hydraulic crosshead clamping
- > Fully customizable to suit a large range of testing applications
- > Quick and easy adjustment of the test space without the need for extension rods
- > Modular design for easy support and upgrade
- > Provides improved alignment regarding concentricity and axiality

UTM-30 Servo-Hydraulic Universal Testing Machines | 30 kN

Labyrinth bearing actuator

ADVANTAGES

- Excellent through zero waveform fidelity. i.e. for tests such as the Uniaxial fatigue SVECD the UTM-30 achieve the precise through zero sinusoidal wave shape required.
- Lower oil flow and therefore lower power consumption compared to sealless cylinders.
- Wave shape fidelity guaranteed even at highest frequencies
- Longer life compared to standard tie-rod cylinders



79-PV70B02 with accessory, Environmental chamber 79-PV70E12, and hydraulic power supply

High performance model

79-PV70B12

IPC Global UTM-30, Servo-Hydraulic Universal Testing Machine 30 kN cap., including Dual Axis Control & Data Acquisition System IMACS, 30kN Servo-hydraulic labyrinth bearing actuator, with high-performance servo-valve and built-in LVDT (± 50 mm) with In-Line Conditioner (ILC), load frame with motorized crosshead positioning & hydraulic crosshead clamping, hydraulic pump, load cell (± 30 kN) with ILC. 230V/50-60Hz/1ph

79-PV70B14

Same as above but 220 V, 60 Hz, 3 ph

Standard model

All dynamic and static tests conforming to international Standards, can also be performed with the following models.

79-PV70B02

IPC Global UTM-30, Servo-Hydraulic Universal Testing Machine 30 kN cap., including Dual Axis Control & Data Acquisition System IMACS, 30kN Servo-hydraulic actuator, with high-performance servo-valve and built-in LVDT (± 50 mm) with In-Line Conditioner (ILC), load frame with motorized crosshead positioning & hydraulic crosshead clamping, hydraulic pump, load cell (± 30 kN) w ILC. 230V/50-60Hz/1ph

79-PV70B04

Same as above but 220 V, 60 Hz, 3 ph.

Accessories

Testing modules
(see page 490 to 501)

Note. The various testing modules include the relevant testing software.

	Advanced	Standard
Models	79-PV70B12 79-PV70B14	79-PV70B02 79-PV70B04
Load Capacity:	± 30 kN Dynamic ± 30 kN Static	± 25 kN Dynamic ± 30 kN Static
Frequency:	Up to 70 Hz	Up to 70 Hz
Load cell:	Low profile, Pancake type	Low profile, Pancake type
Actuator type (double acting)	Labyrinth Bearing sealless	Tie-rod sealed
Stroke	± 25 mm	± 25 mm
Inbuilt displacement transducer	50 mm	50 mm
Adjustable crosshead	Motorized	Motorized
Crosshead clamping	Hydraulic	Hydraulic
Maximum vertical daylight	800 mm	800 mm
Space between columns	450 mm	450 mm
Max. working pressure	210 bar	210 bar
Low pressure adjustable	50 to 210 bar	50 to 210 bar
Max flow rate	5 l/min	5 l/min
Mains power	2.2 kW	2.2 kW
Cooling system	Air cooling	Air cooling
Oil tank cap.	45 l	45 l
Dimensions and weights:		
Frame (WxDxH) mm	660 x 560 x 1800	660 x 560 x 1800
Hydraulic power pack (WxDxH) mm	600 x 500 x 800	600 x 500 x 800
Approximate total weight	285 kg	285 kg

IPC Global's research specification environmental chambers have been designed specifically to fully conform with ALL the main ASTM, AASHTO, EN and AS reference Standards for determining the mechanical performance of asphalt mixtures.

The superior construction of these high quality chambers utilizes state-of-the-art VFD inverter technology, high-efficiency single or double compressor mechanical refrigeration, stainless steel construction, multiple fan air circulation, advanced insulation and triple-glazed door to ensure exceptional performances in term of temperature stability and homogeneity, total control over ramps and dwells, reliability over long term intensive use, accurate performing of complex tests e.g. TSRST.

Environmental chambers

IPC Global's environmental chambers use a high quality mechanical refrigeration system to enable users to analyze materials' properties at real-life working temperatures (between -50 to +80°C) for extended periods. High accuracy and total control over temperature ramps and dwells is achieved using the Programmable Digital Controller thus enabling users to easily perform complex tests e.g. Thermal Stress Restrained Specimen Test (TSRST)

Stainless steel AISI 304, 18/10 construction, triple-glazed door, fan forced ventilation, closed loop temperature controller, cooling unit complete with defrost system and internal lightning. Models with other temperature ranges are also available on request. All-in-one robust design without the need for a separate trolley.

Ordering information

79-PV70E12

Environmental chamber for UTM-30 Servo-Hydraulic Universal Testing Machine, -25°C to +60°C, 110-230V/50-60Hz/1Ph

79-PV70E22

High performance environmental chamber for UTM-30 Servo-Hydraulic Universal Testing Machine, -50°C to +80°C with capability of temperature ramps. 110-230V/50-60Hz/1Ph

Temperature measuring kit

79-PV70116

Temperature measurement kit consisting of two temperature transducers with an asphalt specimen.

Models	79-PV70E12	79-PV70E22 Advanced UTM only
Compatible UTM	79-PV70B02-04 79-PV70B12-14	79-PV70B12-14
Temperature range	-25°C to +60°C	-50°C to +80°C
Power rating	2300 W	4000 W
Dimensions (W x D x H) mm	790 x 900 x 1560	920 x 810 x 1790
Approximate weight	180 kg	220 kg

UTM-130



main features

- > Rigid two column load frame
- > Precision engineered for high stiffness and alignment
- > Double acting high precision actuator
- > High performance servo valve allows sinusoidal loading frequencies up to 70 Hz
- > Hydraulic Power Supply (HPS) based on variable displacement piston pump technology (exceeding the performance on the inverter technology), assuring energy saving and noise reduction.
- > Hydraulic crosshead positioning and clamping
- > Fully customizable to suit a large range of testing applications
- > Independent environmental chamber sits on the floor thus eliminating the transfer of mechanical vibration to testing machine

79-PV70C05 with accessory,
Environmental chamber 79-PV70E32

UTM-130 Servo-Hydraulic Universal Testing Machines | 130 kN

79-PV70C05

IPC Global UTM-130, Servo-Hydraulic Universal Testing Machine 130 kN cap., including Dual Axis Control & Data Acquisition System IMACS, 130kN Servo-hydraulic actuator, with high-performance servo-valve and built-in LVDT (± 50 mm) with In-Line Conditioner (ILC), load frame with hydraulic crosshead positioning & clamping, hydraulic pump, load cell with ILC.. 380V, 50Hz, 3ph

79-PV70C06

Same as above but 220 V, 60 Hz, 3 ph.

Note. The various testing modules include the relevant testing software.

Accessories

Testing modules
(see page 490 to 501)

Models	79-PV70C05 - 79-PV70C06
Load capacity	± 100 kN dynamic, ± 130 kN static
Frequency	Up to 70 Hz
Actuator type	Tie rod sealed - Optional labyrinth bearing
Stroke	± 50 mm
Inbuilt displacement transducer	100 mm
Adjustable cross-head	Hydraulic
Crosshead clamping	Hydraulic
Maximum vertical daylight	1000 mm
Space between columns	600 mm
Hydraulic power pack:	
- Remote starting	available
- High pressure	210 bar
- Low pressure	100 bar
- Flow rate	18 l/min
- Mains power	7.5 kW 3 phase, 208V 60 Hz or 380-415 V 50-60 Hz
- Cooling system	Water/oil heat exchanger, Optional water chiller, Optional air-cooling
- Oil tank capacity	220 l
Frame dimensions (WxDxH)	1000 x 1000 x 3000 mm
Hydraulic power pack dimensions (WxDxH)	1200 x 650 x 1200 mm
Approximate total weight	775 kg

Environmental Chambers

IPC Global's environmental chambers use a high quality mechanical refrigeration system to enable users to analyze materials' properties at real-life working temperatures (between -50 to + 100°C) for extended periods. High accuracy and total control over temperature ramps and dwells is achieved using the Programmable Digital Controller thus enabling users to easily perform complex tests e.g. Thermal Stress Restrained Specimen Test (TSRST)

Stainless steel AISI 304, 18/10 construction, triple-glazed door, fan forced ventilation, closed loop temperature controller, cooling unit complete with defrost system and internal lightning. Models with other temperature ranges are also available on request.

Model Compatible

79-PV70C05, 79-PV70C06

- Temperature range: -50 to +100°C
- Power rating: 4200 W
- Dimensions (wxdxh), 580 x 1180 x 1750 mm
- Approximate weight: 230 kg

Ordering information

79-PV70E32

High performance environmental chamber for UTM-130 servo-hydraulic Universal Testing Machine, -50°C to +100°C with capability of controlling temperature ramp. 110-230V/50-60Hz/1Ph

Accessories

Temperature measurement kit

79-PV70116

Temperature measurement kit consists of two temperature transducers with an asphalt specimen

Additional features:

- Ergonomic design provides easier access to test chamber
- Heavy duty construction
- Independent chamber sits on the floor eliminating the transfer of mechanical vibration to testing machine
- Easily repositioned with lockable wheels
- Fully adjustable temperature probe for positioning close to test specimen
- Remote control



Hydraulic Power Supply (HPS) based on variable displacement piston pump technology (exceeding the performance on the inverter technology), assuring energy saving and noise reduction.

IPC Global's research specification environmental chambers have been designed specifically to fully conform with ALL the main ASTM, AASHTO, EN and AS reference Standards for determining the mechanical performance of asphalt mixtures.

The superior construction of these high quality chambers utilizes state-of-the-art VFD inverter technology, high-efficiency single or double compressor mechanical refrigeration, stainless steel construction, multiple fan air circulation, advanced insulation and triple-glazed door to ensure exceptional performances in term of temperature stability and homogeneity, total control over ramps and dwells, reliability over long term intensive use, accurate performing of complex tests e.g. TSRST.

This model is available on request

UTM-250

Servo-Hydraulic Universal Testing Machines | 250 kN

kN
250



UTM-15P

kN
15

main features

- > Robust, high-strength and compact 2-column load frame
- > Precision engineered for high stiffness and alignment
- > Digital Servo-Pneumatic control
- > Easy and quick crosshead positioning
- > Fully customisable to suit a large range of testing applications
- > 2 axis control and 8 channel data acquisition as standard, upgradeable up to 8 axes control and 32 channel acquisition

UTM-15P Servo-Pneumatic Testing Machine | 15 kN

IPC Global's UTM Servo-Pneumatic testing systems are precision engineered to accomplish your toughest research challenges. Designed and built to IPC Global's highest standards for Civil Engineering laboratories, IPC Global's UTM Systems deliver superior reliability and accuracy with proficient performance of tension, compression and dynamic loading analysis on all types of materials.

Harnessing the precision of IPC Global's renowned IMACS Digital Controller and Data Acquisition System, and the powerful user-friendly, UTS software you'll have absolute confidence in your material analysis. For more information on the IMACS digital controller see page 488

The system has to be completed by the accessories conforming to the test to be performed. See accessories. The temperature controlled environmental chamber is offered separately. See accessories.

IMACS Digital Controller and Data Acquisition System

The Integrated Multi-Axis Control System provides the user with leading-edge performance, unparalleled levels of control and the ultimate in flexible data acquisition for servo testing machines. For more information see page 488

UTS Software

UTS Software has numerous purpose-written applications to make it easy for testing asphalt, soil, unbound granular and other construction material to international Standards. For more information see page 489

Technical specifications

- High stiffness frame, 15 kN cap., 650 mm vertical space, 339 mm space between columns.
- Double effect servo-pneumatic actuator, 30 mm stroke
- Actuator with 30 mm built-in displacement transducer
- Load cell ± 20 kN cap.
- Max. frequency 30 Hz
- Dimensions (WxDxH): 480 x 300 x 1200 mm
- Weight approx.: 200 kg

79-PV70A02

IPC Global UTM-15P, Servo-pneumatic universal testing system 15 kN capacity, including Dual Axis Control & Data Acquisition System IMACS, 15kN Servo-pneumatic actuator assembly, with High-performance servo-valve and built-in LVDT (± 15 mm) w/ In-Line Conditioner (ILC), loading frame, pneumatic reservoir assembly, load cell (± 20 kN) w/ ILC. 110-230V, 50-60Hz, 1 ph

Accessories**Testing modules**

(see page 490 to 501)

Note: the various testing modules include the relevant testing software.

Environmental chamber**79-PV70E02**

Environmental chamber for servo-pneumatic testing machine, -25°C to $+60^{\circ}\text{C}$, 110-230V/50-60Hz/1Ph
This unit is required to perform all type of tests.

Stainless steel AISI 304, 18/10 construction, triple-glazed door, fan forced ventilation, closed loop temperature controller, cooling unit complete with defrost system and internal lightning. Models with other temperature ranges are also available on request.

Specifications

- Temperature range: -25°C to $+60^{\circ}\text{C}$
- Closed loop PID temperature controller
- Power: 1800 W
- External dimensions (WxDxH): 700 x 700 x 2030 mm
- Weight approx.: 140 kg

Temperature measurement kit**79-PV70116**

Temperature measurement kit (-50°C to $+100^{\circ}\text{C}$) including two probes

Air compressor and Air treatment unit**86-D2015/A**

Air compressor, 8 bar continuous working pressure, 10 bar maximum pressure, 5,5 kW, 200 l cap. air tank. 400V, 50 Hz, 3 ph.

86-D2019

Air treatment unit for the dehumidification of compressed air including air dryer, particle filter 5M, oil filters 1M, coalescence filter 0.01M. 230V, 50-60 Hz, 1 ph

86-D2019/Z

Same as above but 110V, 60 Hz, 1 ph



Alternative version of the UTM-15P 15 kN Servo-Pneumatic Universal Testing Machine, featuring a unique cabinet including the Environmental chamber and the IMACS Digital Controller and Data Acquisition System. Contact us for more information.



This model is available on request.

IPC Global's research specification environmental chambers have been designed specifically to fully conform with ALL the main ASTM, AASHTO, EN and AS reference Standards for determining the mechanical performance of asphalt mixtures.

The superior construction of these high quality chambers utilizes state-of-the-art VFD inverter technology, high-efficiency single or double compressor mechanical refrigeration, stainless steel construction, multiple fan air circulation, advanced insulation and triple-glazed doors to ensure exceptional performances in term of temperature stability and homogeneity, total control over ramps and dwells, reliability over long term intensive use, accurate performing of complex tests e.g. TSRST.

IMACS Digital Controller and Data Acquisition System



main features

- > Low data noise performance with over-sampled data
- > Excellent waveform fidelity from the integrated acquisition and control functions
- > Flash based firmware allows onsite updates of all modules
- > Total confidence in measurements from analogue inputs that auto-calibrate on power-up
- > Acquisition and control-up to 8 axis of control and up to 32 channels of data acquisition
- > Real time digital computer control with 32 bit processing
- > Exceptional data resolution & control with up to 20 bit effective auto-ranging data acquisition

IPC Global's Integrated Multi-Axis Control System (IMACS) delivers leading edge performance, unparalleled real-time computer control and flexible data acquisition.

IPC Global's world leading IMACS digital controller and data acquisition system is at the heart of all our servo-controlled testing systems. The IMACS provides excellent waveform fidelity from integrated channel acquisition and control functions, at speeds of up to 5 Hz simultaneously on all channels.

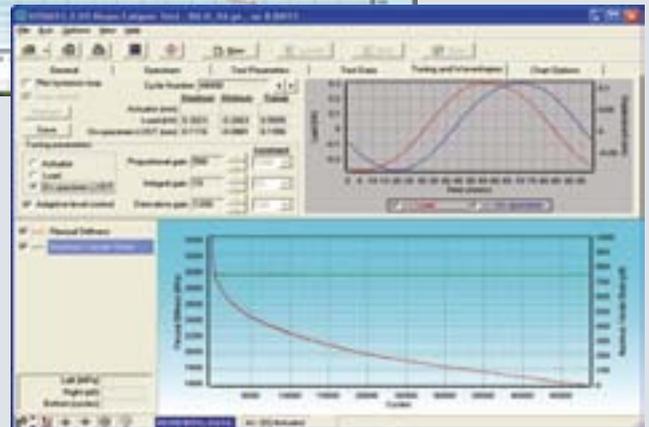
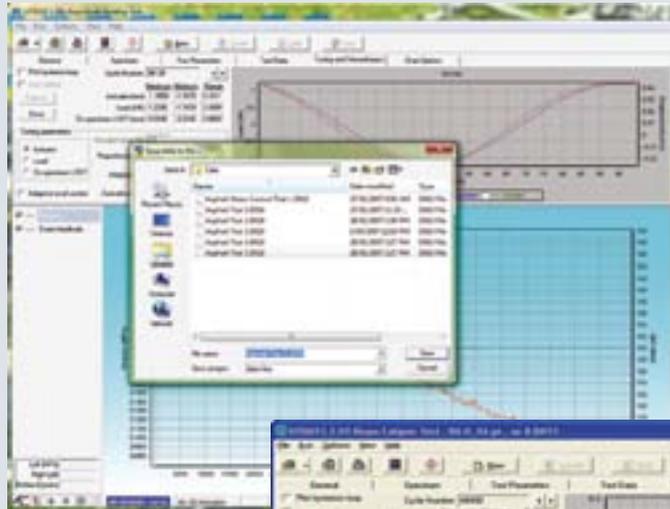
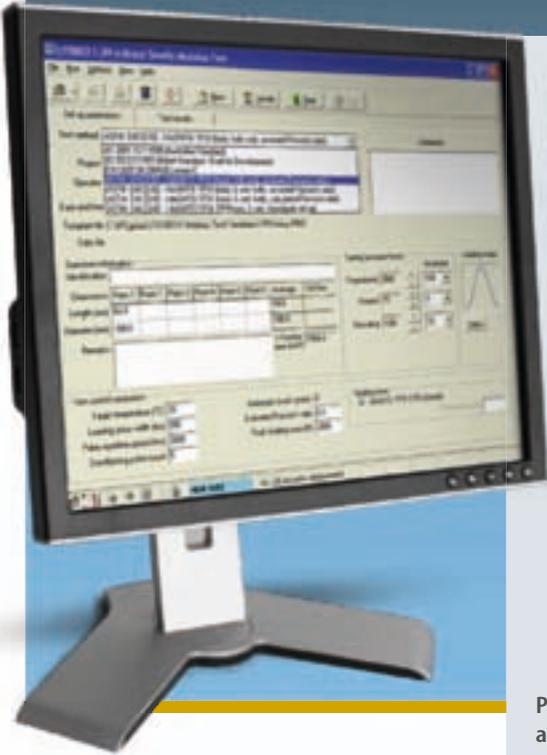
The IMACS utilizes flash-based firmware which allows updates of all modules onsite. Analogue inputs auto-calibrate on power-up.

With up to 8 expandable control axes and 32 data acquisition channels, you can have total confidence in your testing results.

Specifications

- Configuration : Fully integrated
- Real Time Digital Computer Control: 32bit Processing
- Acquisition Speeds: 5kHz (simultaneous on all channels)
- Data Over-Sampling: 4x
- Data Resolution: Up to 20 bit effective auto-ranging data acquisition
- Communication: USB 2.0: 12Mb/s
- Ethernet: 10/100Mb/s
- Firmware: Update Flash based
- Analogue inputs: Auto-calibrate on power up
- Control: Up to 8 axis control
- Acquisition: Up to 32 channels of data acquisition
- Size (WxDxH): 460 x 350 x 270 mm
- Weight : 11kg
- Mains power: 220-240V 50Hz, or 110-120V 60Hz

UTS Software



IPC Global's powerful and professional UTS Software draws upon over 25 years of advanced materials testing experience. IPC Global's test and control software is known for its simplicity in use, clarity of results and analytical power.

UTS Software is developed from expert knowledge of applications to run automated test routines and therefore speeds up testing. IPC Global's UTS Software features real-time graphs for monitoring the specimen under test; portable binary data files for sharing, reviewing & analysis; and 'live' transducer levels display.

The purpose-built UTS applications have dialogue help boxes for automated test routines and easy-to-read graphic screens for test set up and reviewing.

Purpose-written test applications

Benefit from more than 25 years of IPC Global's expert software application development. With UTS test applications written around international test Standards, you can concentrate on analyzing your materials; not on programming your testing machine.

Test templates can be saved by laboratory managers for easy recall and testing by laboratory technicians. No need to configure the machine each time you want to perform a specific test.

All test data saved in portable binary files

A powerful feature unique to UTS software. When the test is finished UTS saves in a binary file not only the data points but also all the test setup and calibration parameters. This means that at any time in the future the test can be reviewed as if it has just been performed complete with all test control, PID, specimen settings and results.

User programmable test

When you are developing a new test method or want to run a novel test, UTS User-programmable test allows you to take full control and determine all the test, control and analysis parameters.

The ultimate in clean accurate data

IMACS integrated control and data acquisition with 4x oversampling technology, auto-ranging and up to 20 bit effective data resolution

Dynamic Tests on Bituminous Mixtures

LIST OF STANDARDS

All relevant testing modules (including UTS Software) are shown and described on page: 491 to 501*

EN Standards

EN 12697-24A	Resistance to Fatigue by Two-Point Bending Test on Trapezoidal Shaped Specimens	496
EN 12697-24D	Resistance to Fatigue by Four-Point Bending Test on Prismatic Shaped Specimens	494
EN 12697-24E	Resistance to Fatigue by Indirect Tensile Test on Cylindrical Shaped Specimens	491
EN 12697-25A	Uniaxial Cyclic Compression Test on Hot-Mix Asphalt.....	494
EN 12697-25B	Triaxial Cyclic Compression Test on Hot-Mix Asphalt.....	497
EN 12697-26A	Stiffness by Two-Point Bending Test on Trapezoidal Shaped specimens	496
EN 12697-26B	Stiffness by Four-Point Bending Test on Prismatic Shaped specimens.....	494
EN 12697-26C	Stiffness by Indirect Tension to Cylindrical specimens.....	491
EN 12697-26D	Stiffness by Direct Tension-Compression Test on Cylindrical specimens	500
EN 12697-26E	Stiffness by Direct Tension on Cylindrical or Prismatic specimens	500
EN 12697-44	Crack Propagation by Semi-Circular Bending Test.....	493
EN 12697-46	Low Temperature Cracking and Properties by Uniaxial Tension Tests	501

ASTM Standards

ASTM D4123	Indirect Tension Test for Resilient Modulus of Bituminous Mixtures	491
ASTM D7313	Fracture Energy of Asphalt-Aggregate Mixtures using the Disk-Shaped Compact Tension Geometry	493
ASTM D7369	Resilient Modulus of Bituminous Mixtures by Indirect Tension Test	492
ASTM D7460	Fatigue Failure of Compacted Asphalt Concrete subjected to Repeated Flexural Bending.....	494

AASHTO Standards

AASHTO T307	Resilient Modulus of Soils and Aggregate Materials.....	497
AASHTO T321	Fatigue Life of Compacted Hot-Mix Asphalt (HMA) subjected to Repeated Flexural Bending	494
AASHTO T322	Creep Compliance and Strength of Hot-Mix Asphalt (HMA) using the Indirect Tensile Test device.....	492
AASHTO T342	Dynamic Modulus of Hot-Mix Asphalt Concrete Mixtures.....	500
AASHTO TP31	Resilient Modulus of Bituminous Mixtures by Indirect Tension	491
AASHTO TP10	Thermal Stress Restrained Specimen Tensile Strength (TSRST)	501
AASHTO TP79	Dynamic Modulus and Flow Number for Hot Mix Asphalt (HMA) using the Asphalt Mixture Performance Tester (AMPT).....	499
AASHTO TP105	Fracture Energy of Asphalt Mixtures using the Semicircular Bend Geometry (SCB)	493

NCHRP Standards

NCHRP 1-28A	Resilient modulus for Flexible Pavement Design	492
NCHRP 9-19/9-29	Dynamic modulus, Flow Time and Flow Number of Hot Mix Asphalt	499

BS Standards

BS 598:11.1	Permanent Deformation of Bituminous Mixtures subject to Unconfined Uniaxial Loading	494
BS DD213	Indirect Tensile Stiffness Modulus of Bituminous Mixtures	491

AS and other

AS 2891.12	Permanent Compressive Strain Characteristics of Asphalt - Dynamic Creep Test.....	494
AS 2891.13.1	Resilient Modulus of Asphalt—Indirect Tensile Method.....	491
AST 03:2000	Fatigue Life of Compacted Bituminous Mixes subject to Repeated Flexural Bending	494
AG:PT/T233	Fatigue Life of Compacted Bituminous Mixes subject to Repeated Flexural Bending	494
TEX-248-F	Overlay Test.....	501
SCDUF	Simplified Continuum Damage Uniaxial Fatigue.....	500
S-VECD	Simplified Viscoelastic Continuum Damage Model - Uniaxial Fatigue	500

*These recommendations are our interpretation on the equipment to undertake satisfactory the required test. However each Laboratory Manager may have his own thinking as the selection of appropriate test machine is material, temperature and frequency dependent.

Dynamic Tests on Bituminous Mixtures

Tests, Related Standards, Testing modules and application on the various UTM's and Specialized testing systems

Each testing module is supplied complete with the relevant UTS Software

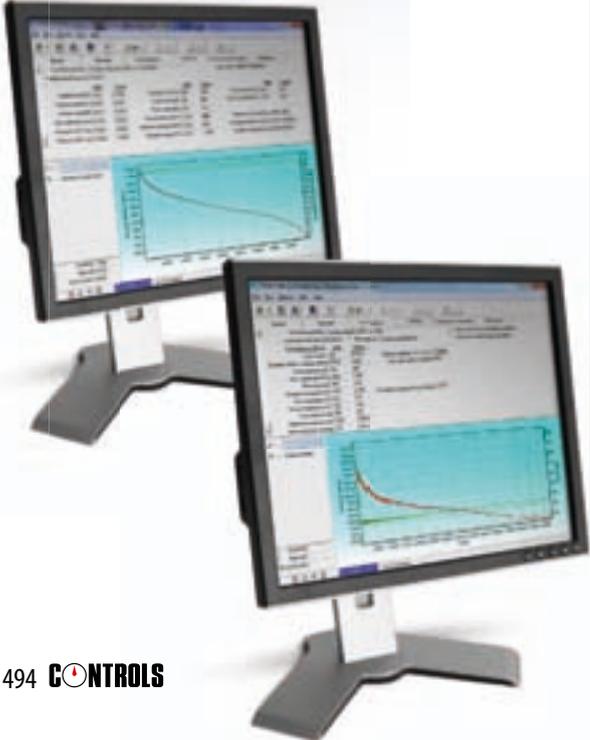
	Standards	Testing module*	For use with	
<p>Test</p> <p>Indirect Tensile Resilience Modulus Test</p> 	<p>AASHTO TP31 ASTM D4123 EN 12697-26C BS DD213 AS 2891.13.1</p>	<p>79-PV70100 Indirect tensile test jig suitable for 100 and 150 mm dia. specimens</p> <p>Or, as alternative to the 79-PV70100 jig 79-PV70110 Research indirect tensile jig for 100 and 150 mm dia. Samples</p> <p>To be completed with 79-PV70115 LVDT (± 0.06 mm) with In-Line Conditioner (ILC) 79-PV70129 LVDT Probe tips for IDT jig 79-PV70125 Asphalt proving ring 79-PV70126 100 mm diameter PVC specimen 79-PV70127 150 mm diameter PVC specimen 79-PV70128 Torque screwdriver</p>	<p>UTM-15P UTM-30 UTM-130 Asphalt Standards Tester</p>	 <p>79-PV70110 and accessories</p>
<p>Test</p> <p>Indirect Tensile Fatigue upgrade</p> 	<p>EN 12697-24E</p>	<p>79-PV70100 Indirect tensile test jig suitable for 100 and 150 mm dia. specimens</p> <p>Or, as alternative to the 79-PV70100 jig: 79-PV70110 Research Indirect Tensile Jig for 100 and 150 mm diameter specimens</p> <p>To be completed with 79-PV70122 100 mm dia. specimen LVDT mounting strip for Indirect Tensile Fatigue test 79-PV70123 150 mm dia. specimen LVDT mounting strip for Indirect Tensile Fatigue test 79-PV70120 LVDT (± 1.875 mm) Double Ball Ends with In-Line Conditioner (ILC) 79-PV70124 EN 12697-24E LVDT Strip Mounting Kit 79-PV70119 Indirect Tensile Jig Guided Platen Assembly (100 & 150 mm diameter) to EN 12697-24E (alternative to 79-PV70100)</p>	<p>UTM 15P UTM 30 UTM 130 Asphalt Standards Tester AMPT/SPT</p>	 <p>79-PV70119</p>  <p>79-PV70124</p>

Dynamic Tests on Bituminous Mixtures

Test	Standards	Testing module*	For use with
<p>Indirect tensile test upgrade with on specimen LVDTs for Resilient Modulus, Fatigue, Creep & Strength, and alternative IDT Dynamic Modulus test</p> 	<p>ASTM D7369 AASHTO T322/TP9 NCHRP 1-28A</p>	<p>79-PV70110 Research indirect tensile test jig for 100 and 150 mm dia. specimens</p> <p>Or, as alternative 79-PV70119 Indirect Tensile Jig Guided Platen Assembly (100 & 150 mm diameter) to EN 12697-24E</p> <p>To be completed with : AASHTO Standard 79-PV70165 AASHTO T322/TP9 Bi-Axis On-Specimen Indirect Tensile Upgrade Kit, including four Singer LVDTs ($\pm 0.5\text{mm}$) w ILC 79-PV70167 AASHTO T322/TP9, 100 mm target mounting jig (25 mm and 50 mm gauge length) 79-PV71402 IDT 150 mm target mounting jig (38 mm and 75 mm gauge length) 79-PV71403 IDT long target 79-PV71404 IDT short target</p> <p>ASTM Standard 79-PV70166 ASTM D7369 Bi-Axis On-Specimen Indirect Tensile Upgrade Kit, includes: four Singer LVDTs ($\pm 0.5\text{mm}$) with ILC. 79-PV70168 ASTM D7369, 152.4 mm target mounting jig (38.1, 76.2 and 152.4 gauge length). 79-PV71403 IDT long target 79-PV71404 IDT short target</p>	<p>UTM-15P UTM-30 UTM-130 Asphalt Standards Tester</p>  <p>79-PV70110 and access.</p>

	Standards	Testing module*	For use with	
<p>Test</p> <p>Semi-Circular Bending upgrade for indirect tensile jig</p> 	<p>EN 12697-44 AASHTO TP105</p>	<p>79-PV70110 Indirect tensile test jig for 100 and 150 mm dia. specimens</p> <p>Or, as alternative 79-PV70119 Indirect tensile jig with guided top loading platen</p> <p>To be completed with: EN Standard 79-PV70130 Semi-Circular Bend Test Jig for EN 12697-44</p> <p>AASHTO Standard 79-PV70131 Semi-Circular Bend Test Jig for AASHTO draft 79-PV70132 Singer LLD LVDT (± 1 mm) with In-Line Conditioner (ILC) 79-PV70133 Semi-Circular Bend LLD LVDT Mounting kit 79-PV70134 Epsilon SCB Extensometer (+2.5 mm/-1 mm) with In-Line Conditioner (ILC)</p>	<p>UTM-15P UTM-30 UTM-130 Asphalt Standards Tester</p>	 <p>79-PV70110 and access.</p>
<p>Test</p> <p>Disc-Shaped Compact Tension (DCT) Test Kit</p> 	<p>ASTM D7313</p>	<p>79-PV70602 Disk-Shaped Compact Tension Jig (ASTM D7313)</p> <p>To be completed with 79-PV70603 Epsilon Clip-On Extensometer (+0.25"/-0.05") with In-Line Conditioner (ILC) D7369</p>	<p>UTM-15P UTM-30 UTM-130</p>	

Dynamic Tests on Bituminous Mixtures

Test	Standards	Testing module*	For use with	
<p>Cyclic Compression and Permanent Deformation (Creep) Test Kit</p> 	<p>EN 12697-25A BS 598:11.1 AS 2891.12</p>	<p>79-PV70180 Creep testing jig base platen for 100 and 150 mm dia. specimens 79-PV70183 LVDT (± 5 mm) w/ In-Line Conditioner (ILC)</p> <p>To be completed with:</p> <p>BS and AS Standards 79-PV70181 Creep testing top platen for 100 mm dia. specimens 79-PV70182 Creep testing top platen for 150 mm dia. specimens</p> <p>EN Standards 79-PV70184 Permanent deformation (Indentation test) top platen for 150 mm dia. specimens to EN 12697-25A</p>	<p>UTM-15P UTM-30 UTM-130 Asphalt Standards Tester</p>	
<p>Servo-Pneumatic Four Point Bend Apparatus</p> <p>(Sharing IMACS Digital Controller and Data Acquisition System, and UTM Environmental chamber)</p> 	<p>EN 12697-26B EN 12697-24D AASHTO T321 AST 03:2000 AG: PT/T233</p>	<p>79-PV74002 Pneumatic Four Point Bend Apparatus (No IMACS) for 355.5 mm and 420 mm (span center) specimens, including Load Cell w ILC, LVDT (± 0.5mm) w ILC, Yoke Alignment Tool for 355.5 mm (outer span center) x 50 mm x 50 mm specimens</p> <p>79-PV74010 Pneumatic reservoir assembly. Optional. To be completed with: 79-PV70204 Aluminium calibration beam</p>		 <p>79-PV74002</p>

Test

Four Point Bend Jig

Standards	Testing module*	For use with
EN 12697-26B EN 12697-24D AASHTO T321 AST 03:2000 AG:PT/T233	<p>79-PV70400 Four Point Bend Jig for UTM-30 for 355.5 mm and 420 mm (outer span centres) specimens, includes: Load Cell $\pm 15\text{kN}$ with ILC, LVDT $\pm 0.5\text{mm}$ w ILC, Yoke Alignment Tool for 355.5 mm (outer span centres) x 50 mm x 50 mm specimens</p> <p>or, as alternative:</p> <p>79-PV70402 Four Point Bend Jig for UTM-15P for 355.5 mm and 420 mm (outer span centres) specimens, includes: LVDT ($\pm 0.5\text{ mm}$) w ILC, Yoke Alignment Tool for 355.5 mm (outer span centres) x 50 mm x 50 mm specimens</p> <p>To be completed with:</p> <p>79-PV70403 PVC dummy beam</p> <p>79-PV70404 Four Point Bend Apparatus reference beam assembly</p> <p>79-PV70405 Aluminium channeled reference beam</p> <p>79-PV70406 Yoke Alignment Tool for 420 mm (outer span centres) x 70 mm x 70 mm specimens</p> <p>79-PV70407 Loading shaft to suit UTM-30</p> <p>79-PV70408 Loading shaft to suit UTM-15P</p> <p>79-PV70116 Temperature measurement kit consisting of two temperature transducers with an asphalt specimen.</p>	UTM-15P UTM-30



79-PV70400

Dynamic Tests on Bituminous Mixtures

Test	Standards	Testing module*	For use with
<p>Trapezoidal Two Point Bend Jig</p> 	<p>EN 12697-24A EN 12697-26A</p>	<p>79-PV70200 Trapezoidal Two Point Bend Jig for UTM Systems, includes: Load Cell (± 2.5 kN) with ILC.</p> <p>To be completed with: 79-PV70201 25 mm Specimen Tip Platen for Two Point Bend</p> <p>79-PV70202 50 mm Specimen Tip Platen for Two Point Bend</p> <p>79-PV70203 Specimen Base Platen for Two Point Bend</p> <p>79-PV70204 Aluminum calibration beam to perform the calibration on Two Point Bend Jig as required by EN 12697</p> <p>79-PV70205 Two-Point Bend Gluing Jig (Optional)</p> <p>79-PV70206 On specimen LVDT ($\pm 0,5$ mm) with ILC</p>	<p>UTM-15P UTM- 30</p>
			 <p>79-PV70200</p>

Test

**Triaxial Cells for:
Resilient modulus on un-bound
granular materials
Dynamic Modulus
Cyclic compression
Permanent deformation
& Compression (Creep) test**

Standards	Testing module*	For use with
<p>EN 12697-25B AASHTO T307</p>	<p>79-PV70360 Triaxial cell for asphalt and unbound materials, 100 mm dia. specimens, height from 60 to 200 mm</p> <p>Or, as alternative: 79-PV70380 Advanced triaxial cell for confined dynamic modulus on 100 mm dia. specimens and triaxial test up to 150 mm dia. specimens with wire outlets for on-specimen transducers, complete with 105 mm diameter- top cap and and base pedestal</p> <p>or, as alternative: 79-PV70300 Universal Triaxial Cell (UTC) – Standard – for specimens up to 150 mm dia. x 300 mm tall</p> <p>Or, as alternative: 79-PV70330 Automatic Triaxial Cell (ATC) with automatic cell raising system (not suitable for unbound materials)</p> <p>Each one of the above four models, require the following accessories: 79-PV70301 Single axis pneumatic reservoir assembly (only required if using with a servo-hydraulic UTM) 79-PV70302 Confining cell pressure reservoir upgrade kit (only required if using a servo-pneumatic UTM) 79-PV70305 Servo valve cable</p> <p>Accessories for use with 79-PV70360 and 79-PV70380 triaxial cells only: 79-PV70304 External axial LVDT mounting kit for 79-PV70360/79-PV0380 Triaxial cells</p>	<p>UTM-15P UTM-30 UTM-130</p>



79-PV70300

Dynamic Tests on Bituminous Mixtures

	Standards	Testing module*	For use with
Triaxial Cells for: Resilient modulus on un-bound granular materials Dynamic Modulus Cyclic Compression Permanent Deformation & Compression (Creep) Test (continued)		<u>79-PV70183</u> LVDT (± 5 mm) with In-Line conditioner (ILC)	UTM-15P UTM-30 UTM-130
		Accessories for use with 79-PV70300 UTC Universal Triaxial cell and 79-PV70330 Automatic Triaxial Cell 150 mm dia. top platen	
		<u>79-PV70322</u> 110 mm dia. top loading platen	
		<u>79-PV70323</u> 110 mm dia. UTC bottom platen assembly	
		<u>79-PV70324</u> 105 mm dia. top platen	
		<u>79-PV70325</u> 105 mm dia. bottom platen assembly	
		<u>79-PV70326</u> UTC/ATC temperature probe	
		<u>79-PV70310</u> External axial LVDT mounting kit	
		<u>79-PV70303</u> Pressure transducer (600 kPa) w/ In-Line Conditioner (ILC)	
		Accessories for use with 79-PV70330 Automatic Triaxial Cell only:	
		<u>79-PV70331</u> ATC Axial LVDT holder	
		<u>79-PV70333</u> 100 mm extension rod	
		<u>79-PV70334</u> 30 mm extension rod	
	<u>79-PV70335</u> 20 mm extension rod		
	Note For triaxial cell accessories for 100 and 150 mm dia. specimens (membranes, o-rings, porous stones etc.) see section 28 page 75 to 79		



79-PV70330

Test

**Dynamic Modulus E*
Flow Number
and Flow Time Test**

Standards	Testing module*	For use with
AASHTO TP79 NCHRP Project 9-19 NCHRP Project 9-29	<p>79-PV70501 LVDT Gauge Point Fixing Jig (Hexagonal gauge points) complete with AMPT Membrane Stretcher Kit</p> <p>79-PV70324 105 mm dia. top platen</p> <p>79-PV70325 105 mm dia, bottom platen assembly</p> <p>79-PV70502 AMPT Proving Ring Assembly</p> <p>79-PV70512 Proving ring target set to AASHTO TP79/S-VECD</p> <p>79-PV70503 Target Clamp Assembly</p> <p>79-PV70504 LVDT (± 0.5 mm) with In-Line Conditioner and Lemo connector (Black)</p> <p>79-PV70505 LVDT (± 0.5 mm) with In-Line Conditioner and Lemo connector (Blue)</p> <p>79-PV70506 LVDT (± 0.5 mm) with In-Line Conditioner and Lemo connector (Green)</p> <p>79-PV70507 Consumables kit comprises: - 24 x AMPT Sample Target (Gauge points) - 1 x Selleys 5 Minute Araldite 24 ml - 1 x 9.75" / 3/32" Rubber O-Ring - 1 x 100 mm Sealing Rings (Pack of two) - 3 x 100 mm Rubber membranes</p> <p>79-PV70508 Lemo to Lemo adaptors (required for unconfined tests)</p> <p>Alternative configuration</p> <p>79-PV70509 AMPT Epsilon Gauge Point Fixing Jig (Epsilon Magnetic gauge points)</p> <p>79-PV70510 Arm for Epsilon Gauge Point Fixing Jig (Epsilon Magnetic gauge points)</p> <p>79-PV70511 Arm for AMPT Gauge Point Fixing Jig (Hexagonal gauge points)</p> <p>Note: the above configuration is for performing these tests in unconfined mode; to perform in confined mode, the above configuration will be used along with the 79-PV70300 UTC and 79-PV70330 ATC.</p>	UTM-30 UTM-130 Asphalt Standards Tester

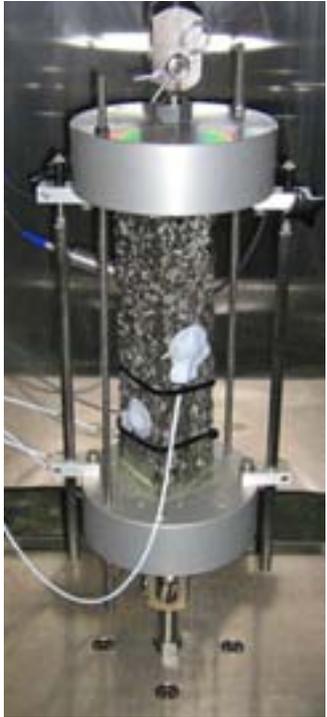


Dynamic modulus test assembly

Dynamic Tests on Bituminous Mixtures

Test	Standards	Testing module*	For use with	
<p>Dynamic Modulus Test</p> 	<p>AASHTO T342/TP62</p>	<p>79-PV70521 AASHTO T342/TP62 Guided axial LVDT mounting hardware</p> <p>To be completed with: 79-PV70522 AASHTO T342/TP62 Guided axial LVDT accessories kit 79-PV70523 LVDT (± 1 mm) with In-Line conditioner and Lemo connector 79-PV70524 AASHTO T342/TP62 LVDT Gauge Point Fixing jig Quad (Round gauge points) 79-PV70502 AMPT Proving ring assembly 79-PV70525 AASHTO TP62 Proving ring target set 79-PV70526 Guided axial LVDT mounting gauge points 79-PV70324 105 mm dia. top platen 79-PV70325 105 mm dia. bottom platen assembly 79-PV70508 Lemo to Lemo adaptors (required for unconfined tests)</p> <p><i>Note: the above configuration is for performing these tests in unconfined mode; to perform in confined mode, the above configuration will be used along with the 79-PV70300 UTC and 79-PV70330 ATC.</i></p>	<p>UTM-30 UTM-130</p>	 <p>Dynamic modulus assembly</p>
<p>Uniaxial Fatigue Tensile Test</p> 	<p>SCDUF S-VECD</p>	<p>79-PV70600 UTM tension kit</p> <p>To be completed with: 79-PV70610 Uniaxial fatigue tension platens for 100 mm dia. specimens 79-PV70611 Tension Platen Gluing Jig Single Specimen 79-PV70612 AMPT PVC Dummy Specimen for Uniaxial Fatigue Test 79-PV70613 UTM Uniaxial Fatigue Test Control LVDT Mounting kit 79-PV70614 LVDT (± 1 mm) with In-Line conditioner (ILC)</p>	<p>UTM-30 UTM-130 AMPT/SPT Asphalt Standards Tester</p>	 <p>79-PV70600</p>

	Standards	Testing module*	For use with
<p>Test</p> <p>TSRST Thermal Stress Restrained Specimen Tensile Strength Test Kit</p> 	<p>EN 12697-46 AASHTO TP10-93</p>	<p>79-PV70640 TSRST kit (AASHTO TP 10) including: - 4x Temp Transducers ($\pm 60^{\circ}\text{C}$) with ILC & Shim - 2x TSRST Rod ends - 1x TSRST Clevis yoke & pin - 2x TSRST Platens - 4x TSRST LVDT holders - 2x 300 mm invar rod</p> <p>To be completed with: 79-PV70641 LVDT (± 0.5 mm) with In-Line Conditioner (ILC) for AASHTO TP10) (Optional) 79-PV70115 LVDT (± 0.06 mm) with In-Line Conditioner (ILC) 79-PV70642 TSRST Gluing Jig Assembly 79-PV70643 Additional platens</p>	<p>UTM-30 UTM-130</p> <p>Requires high performance -50°C chamber</p>
<p>Test</p> <p>Texas Overlay Test Kit</p> 	<p>TEX-248-F</p>	<p>79-PV70680 Overlay Test Kit (for UTM systems)</p> <p>To be completed with: 79-PV70641 LVDT (± 0.5 mm) with In-Line Conditioner (ILC) 79-PV70681 Overlay Testing Specimen Plates 79-PV70682 Overlay Specimen Preparation Kit – Triple Specimen Glue Jig 79-PV70683 Overlay Specimen Preparation Kit – Single Specimen Glue Jig</p>	<p>UTM-15P UTM-30 UTM-130 Asphalt Standards Tester</p>



79-PV70640



79-PV70680



main features

- > Fully integrated Asphalt Standards Testing System
- > One testing machine to meet the requirement of many international Standards
- > Hydraulic power supply and servo-hydraulic labyrinth bearing actuator
- > Fully integrated reaction frame and triaxial confining cell (optional)
- > Fatigue rated pancake load cell
- > Environmental chamber-mechanically refrigerated, stainless steel construction with double glazed door/windows on three sides. (see accessories)
- > Hydraulic Power Supply (HPS) based on the inverter technology-oil flow control, assuring silent operation and energy saving
- > Easily reconfigured with a wide range of modular test kits
- > UTS Software and IMACS digital control
- > *Now you can perform all the most common asphalt standard tests in one compact, modular, easy to use machine.*
- > *Permanent deformation, cyclic compression, flexural stiffness, indirect tensile stiffness, flexural fatigue, indirect tensile fatigue, crack propagation, direct tension-compression, complex modulus*

Asphalt Standards Tester - Modular Servo Hydraulic Asphalt Tester

Standards

AASHTO TP79 | AASHTO T342 (TP62) | AASHTO T321 | AASHTO TP322 (TP9) | AASHTO TP31 | AASHTO TP105 |

AS2891.12 | AS2891.13.1 | AG:PT/T233 (AST 03:2000) |

ASTM D4123 | ASTM D7369 | ASTM D7460 | ASTM Reflective Cracking |

BS598-111 |

EN12697-24A | EN12697-24D | EN12697-24E | EN12697-25A | EN12697-25B | EN12697-26A | EN12697-26B | EN12697-26C | EN12697-26D | EN12697-26E | EN12697-44 | EN13108-20 |

NCHRP 9-19 | NCHRP 9-29 |

SCDUF | S-VECD | Tex-248-F

Control and data acquisition

Controlling the Asphalt Standards Tester is IPC Global's Integrated Multi-Axis Control System (IMACS). IMACS delivers leading edge performance unparalleled control and the ultimate in flexible data acquisition. For more information see page 488.

World class software application

IPC Global's UTS software is developed from expert knowledge of applications to run automated test routines and therefore speed up testing. UTS is written in powerful, professional Delphi. It has real-time graphs for monitoring the specimen under test; portable binary data files for remote reviewing, analysis and troubleshooting; 'live' transducer levels display. For more information see page 489.



Hydraulic Power Supply and Servo Hydraulic Labyrinth Bearing Actuator

- > Integral Hydraulic Power Supply for ease and simplicity, high frequency, high performance,
- > Servo-hydraulic labyrinth bearing actuator for excellent life and waveform fidelity



Specifications

- Load Capacity 13.5kN dynamic, 15kN static
- Load Cell Pancake type, high performance, fatigue rated
- Frequency Range 0.01 to 60Hz sinusoidal loading
- Actuator Stroke 30mm (± 15 mm)
- Actuator Type Labyrinth bearing
- Weight 250kg (dry, with no accessories)
- Dimensions(L x W x H):
1,100 x 630 x 1,910 mm with chamber

Environmental Chamber 79-PV72E02

- Temperature Range 2 to 60°C
- Temperature Stability $\pm 0.2^\circ\text{C}$
- Argon filled Low E double glazed on three sides, stainless steel construction
- Weight 150kg
- Dimensions (HxDxW):
1,000 x 580 x 565 mm

Ordering information

79-PV72A02

IPC Global's Servo-Hydraulic Asphalt Standard Tester, 240V, 50-60 Hz, 1 ph.

System accessories

Environmental chambers

79-PV72E02

Asphalt Standards Tester Environmental chamber, +2 to +60°C. 240V, 50 Hz, 1 ph

79-PV72E04

Same as above but 110V, 60 Hz, 1 ph

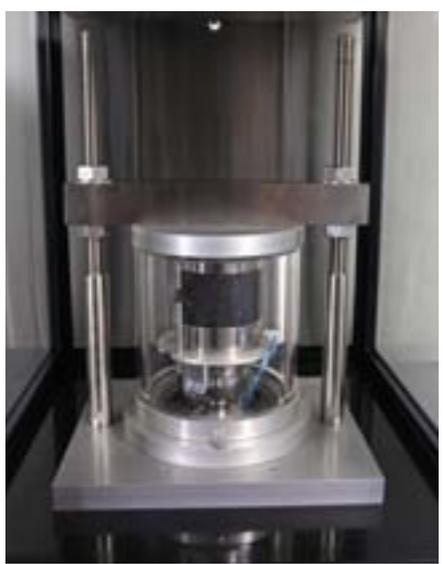
Reaction frame

79-PV72001

Asphalt Standards Tester reaction frame kit



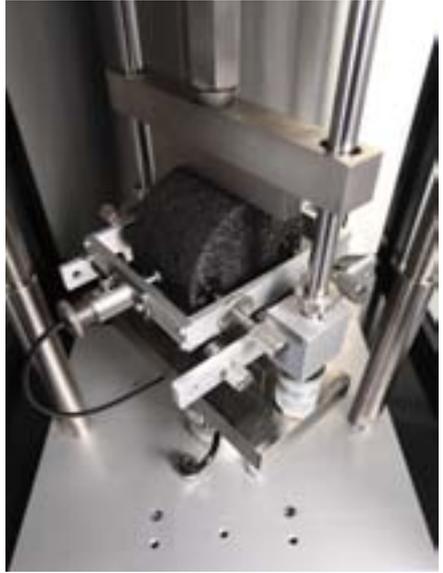
Asphalt Standards Tester

	Standards	Accessories	
Test			
Four Point Bend Jig	EN 12697-24D EN 12697-26B AASHTO T321 (TP8) AG:PT/T233 (AST 03:2000)	<p>79-PV72101 Four point bend Jig for 355.5 mm and 420 mm (outer span centres) specimens, including Yoke Alignment Tool 355 mm (outer span centres) x 50 mm x 50 mm specimens</p> <p>79-PV72102 On specimen LVDT (± 0.5 mm) with In-Line Conditioner (ILC)</p> <p>79-PV70406 Yoke alignment tool for 420 mm (outer span centres) x 70 mm x 70 mm specimens</p> <p>79-PV70403 PVC dummy beam</p> <p>79-PV70404 Four Point Bend Apparatus reference beam assembly</p> <p>79-PV70405 Aluminum channeled reference beam</p>	
Test	EN 12697-24A EN 12697-26A	<p>79-PV72201 Trapezoidal Two Point Bend Jig</p> <p>79-PV72202 On Specimen LVDT (± 0.5 mm) with In-Line Conditioner (ILC)</p> <p>79-PV70201 25 mm specimen tip platen for Two Point Bend</p> <p>79-PV70202 50 mm specimen tip platen for Two Point Bend</p> <p>79-PV70203 Specimen base platen for Two Point Bend</p> <p>79-PV70205 Two Point Bend Gluing jig – Double specimen gluing jig</p>	
Test	EN 12697-25B	<p>79-PV72301 AST Triaxial cell for 100 mm tall specimens</p> <p>79-PV72302 AST Cyclic compression hardware mounting kit</p> <p>79-PV72303 AST LVDT (± 5 mm) with In-line conditioner (ILC)</p> <p>79-PV71102 Pneumatic filtration kit – Wall mount, 12 bar</p> <p>79-PV72001 Reaction frame kit</p>	

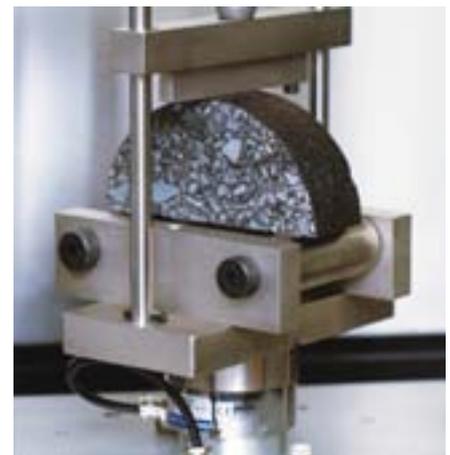
	Standards	Accessories
Test		
Direct Tension Compression / Uniaxial Fatigue Test Kit	EN 12697-26D	<u>79-PV72401</u> Direct tension compression hardware kit
	EN 12697-26E	<u>79-PV72402</u> Complex modulus LVDT (± 0.5 mm) with in-line conditioner (ILC)
	SCDUF	<u>79-PV70610</u> Uniaxial fatigue tension platens for 100 mm diameter specimens
	S-VECD	<u>79-PV70503</u> Target clamp assembly
		<u>79-PV70501</u> LVDT Gauge point fixing jig (Hexagonal gauge points) complete with membrane stretcher kit
		<u>79-PV70502</u> Proving ring assembly
		<u>79-PV70512</u> Proving ring target set to AASHTO TP 79 S-VECD
		<u>79-PV70612</u> PVC Dummy specimen for uniaxial fatigue test
		<u>79-PV73403</u> Sample target (Gauge points)
		<u>79-PV70328</u> Selleys 5 minute araldite, 24 ml
	<u>79-PV72001</u> Reaction frame kit	
Test		
Dynamic Modulus Kit	AASHTO TP79	<u>79-PV72301</u> Triaxial cell for 100 mm tall specimens
	AASHTO T342*	<u>79-PV72500</u> Dynamic modulus hardware kit
	NCHRP 9-19	<u>79-PV72402</u> Complex modulus LVDT (± 0.5 mm) with In-line conditioner (ILC)
	NCHRP 9-29	<u>79-PV70503</u> Target clamp assembly
	*Limited temperature and force range	<u>79-PV70501</u> LVDT gauge point fixing jig (Hexagonal gauge points) complete with Membrane stretcher kit
		<u>79-PV70502</u> Proving ring assembly
		<u>79-PV70512</u> Proving ring target set to AASHTO TP 79 S-VECD
		<u>79-PV70507</u> Consumable kit includes:
		- 24 x sample target (gauge points)
		- 1 x Selleys 5 minute Araldite 24 ml
	- 1 x 9.75" / 3 / 32" Rubber O-Ring	
	- 1 x 100 Sealing rings (pack of two)	
	- 3 x 100 Rubber membranes	
	- 79-PV72001 Reaction frame kit	



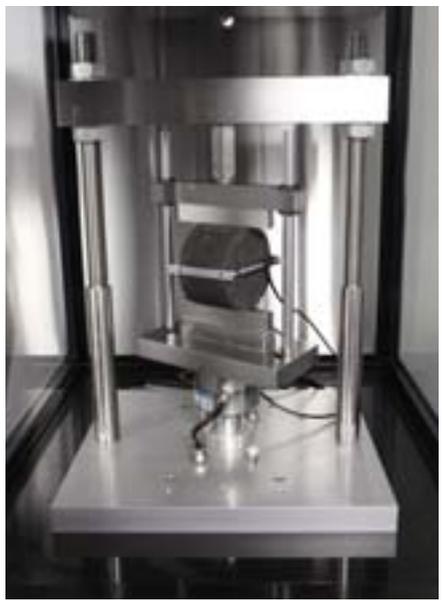
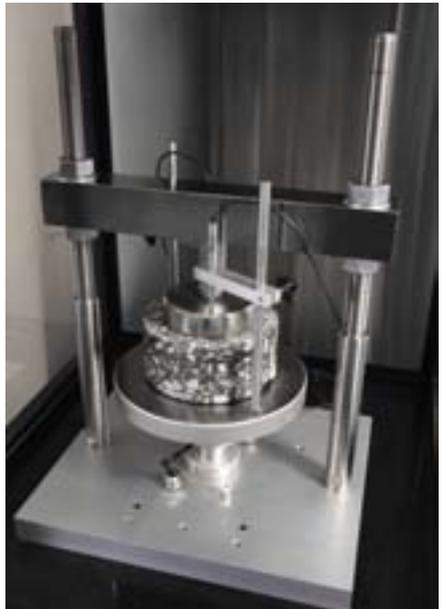
Asphalt Standards Tester

	Standards	Accessories	
Test	Tex-248-F	<p>79-PV70680 Overlay Test Kit</p> <p>79-PV72350 Overlay adaptor kit</p> <p>79-PV72402 Complex modulus LVDT (± 0.5 mm) with In-line conditioner (ILC)</p> <p>79-PV70681 Overlay testing specimen plates</p> <p>79-PV70682 Overlay specimen preparation kit – Triple specimen glue jig</p> <p>79-PV70683 Overlay specimen preparation kit – Single specimen glue jig</p> <p>79-PV72001 Reaction frame kit</p>	
Overlay Test Kit			
Test	AASHTO TP31 ASTM D4123 EN 12697-26C BS DD213 AS 2891.13.	<p>79-PV70100 Indirect tensile test jig suitable for 100 and 150 mm dia. specimens</p> <p>Or, as alternative to the 79-PV70100 jig: 79-PV70110 Research indirect tensile jig for 100 and 150 mm dia. specimens</p> <p>To be completed with 79-PV70115 LVDT (± 0.06 mm) with In-Line Conditioner (ILC)</p> <p>79-PV70129 LVDT Probe tips for IDT jig</p> <p>79-PV70125 Asphalt proving ring</p> <p>79-PV70126 100 mm diameter PVC specimen</p> <p>79-PV70127 150 mm diameter PVC specimen</p> <p>79-PV70128 Torque screwdriver</p> <p>79-PV72001 Reaction frame kit</p>	
Indirect Tensile Resilience Modulus Test Kit			

	Standards	Accessories
<p>Test</p> <p>Indirect Tensile Test upgrade with LVDT on specimen for Resilient Modulus, Fatigue, Creep & Strength, and alternative IDT Dynamic Modulus test</p>	<p>ASTM D7369</p> <p>AASHTO T322/TP9</p> <p>NCHRP 1-28A</p>	<p>79-PV70110 Research indirect tensile test jig for 100 and 150 mm dia. specimens</p> <p>Or, as alternative 79-PV70119 Indirect Tensile Jig Guided Platen Assembly (100 & 150 mm diameter) to EN 12697-24E</p> <p>To be completed with : AASHTO Standard 79-PV70165 AASHTO T322/TP9 Bi-Axis On-Specimen Indirect Tensile Upgrade Kit, includes: four Singer LVDT's (± 0.5 mm) with ILC, 100mm target mounting jig (25 mm & 50mm gauge length), 150 mm target mounting jig (38 mm & 75 mm gauge length), four long targets and four short targets</p> <p>ASTM Standard 79-PV70166 ASTM D7369 Bi-Axis On-Specimen Indirect Tensile Upgrade Kit, including four Singer LVDT's (± 0.5 mm) with ILC, 101.6mm target mounting jig (25.4 mm, 50.8 mm and 101.6 mm gauge length), 152.4 mm target mounting jig (38.1 mm, 76.2 mm and 152.4 mm gauge length), four long targets and four short targets</p> <p>79-PV72001 Reaction frame kit</p>
<p>Test</p> <p>Semi-Circular Bending upgrade for indirect tensile jig</p>	<p>EN 12697-44</p> <p>AASHTO TP105</p>	<p>79-PV0110 Indirect tensile test jig for 100 and 150 mm dia. specimens</p> <p>Or, as alternative 79-PV70119 Indirect tensile jig with guided toploading platen</p> <p>To be completed with 79-PV70130 Semi-Circular Bend Test Jig for EN 12697-44 79-PV70131 Semi-Circular Bend Test Jig for AASHTO draft 79-PV70132 Singer LLD LVDT (± 1 mm) with In-Line Conditioner (ILC) 79-PV70133 Semi-Circular Bend LLD LVDT Mounting kit 79-PV70134 Epsilon SCB Extensometer (+2.5 mm/-1 mm) with In-Line Conditioner (ILC) 79-PV72001 Reaction frame kit</p>



Testing modules

	Standards	Accessories	
Test Indirect Tensile Fatigue upgrade Kit	EN 12697-24E	79-PV70100 Indirect tensile test jig suitable for 100 and 150 mm dia. specimens To be completed with 79-PV70122 100 mm dia. specimen LVDT mounting strip for Indirect Tensile Fatigue test 79-PV70123 150 mm dia. specimen LVDT mounting strip for Indirect Tensile Fatigue test 79-PV70120 LVDT (± 1.875 mm) Double Ball Ends with In-Line Conditioner (ILC) 79-PV70110 Heavy Duty Indirect Tensile Jig and Platen Assembly (100 and 150 mm diameter samples) 79-PV70124 EN 12697-24E LVDT Strip Mounting Kit 79-PV70119 Indirect Tensile Jig Guided Platen Assembly (100 & 150 mm diameter) to EN 12697-24E 79-PV72001 Reaction frame kit	
Test Cyclic Compression and Permanent Deformation (Creep) Test	EN 12697-25A BS 598:111 AS 2891.12	79-PV70180 Creep testing jig base platen for 100 and 150 mm dia. specimens 79-PV70183 LVDT (± 5 mm) with In-Line Conditioner (ILC) To be completed with: BS-AS Standards. 79-PV70181 Creep testing top platen for 100 mm dia. samples 79-PV70182 Creep testing top platen for 150 mm dia. samples EN Standard. 79-PV70184 Permanent deformation (Indentation test) top platen for 150 mm dia. specimens to EN 12697-25A 79-PV72001 Reaction frame kit	

Servo-Pneumatic Four Point Bend Apparatus



main features

- > Digital servo-controlled pneumatic actuator provides accurate control of loading waveshape
- > Innovative "floating straight-edge" on-specimen transducer eliminates errors due to frame compliance
- > Backlash free rotation and translation on all load and reaction points
- > Sinusoidal or haversine controlled strain or controlled stress loading
- > Controlled force, motorised specimen clamping
- > Non-linear regression data fitting ensures reliable determination of phase and modulus

Standards

EN 12697-24D | EN 12697-26B | AASHTO T321 | AST 03:2000

IPC Global's Servo-Pneumatic Four Point Bend Apparatus features a pneumatic actuator which is digitally controlled by a pneumatic servo-valve to provide accurate loading in both stress and strain control modes. In addition, the Servo-Pneumatic Four Point Bend Apparatus features a beam cradle which has been designed to subject an asphalt beam specimen to four point bending with backlash free rotation and horizontal translation of all load reaction points

Controlling the Four Point Bend Apparatus is IPC Global's Integrated Multi-Axis Controls and Data Acquisition System (IMACS).

For further details see page 488



IMACS digital controller and data acquisition system.

Specifications

- Loading frequency: up to 60 Hz (Load limitations apply at higher frequencies)
- Load capacity: up to 5 kN dynamic
- Actuator stroke: 10 mm
- Specimen size: 70 max (H) x 80 max (W) x 380 min (L) mm
- Yoke alignment tool for specimens:
 - 50 (H) x 50 (W) x 355.5 (outer span centers) mm
 - 70 (H) x 70 (W) x 420 (outer span centers) mm
- Air supply: Clean, dry air at 800-900 kPa, 5 l/s min.
- Dimensions/Weight apparatus- (L x W x H): 460 x 230 x 600 mm / 35 kg
- IMACS-(L x W x H): 450 x 360 x 270 mm / 11 kg

Ordering information

79-PV74A02

IPC Global Servo-Pneumatic Four Point Bend Apparatus including IMACS digital control and data acquisition system. 230 V, 50-60 Hz, 1 ph

Environmental chamber

79-PV70E02

Environmental chamber for servo-pneumatic testing machine, -25°C to +60°C. 110-230 V, 50-60 Hz, 1 ph

AMPT/SPT Asphalt Mixture Performance Tester



main features

- > Control and data acquisition by IPC Global's Integrated Multi-Axis Control and data acquisition system (IMACS)
- > Streamlined operation: IPC Global employs a high specification triaxial cell which doubles as an environmental chamber
- > The ultimate in HMA testing tools: the system's software and controller accurately and automatically control the confining pressure and the other test parameters
- > The crystal clear acrylic triaxial cell allows unimpeded (360°) view of the specimen without special lighting. It is raised and lowered by the unit's air compressed air system with a two button safety interlock
- > Temperature range is 0 to 70°C *
- > Rapid temperature gradient down to minimum from ambient (e.g. 21°C) in less than 1 hour
- > Hydraulic Power Supply (HPS) based on VFD inverter technology-oil flow control, assuring silent operation and energy saving
- > Easy transducer type interchangeability e.g. standard to lose-core
- > AASHTO Semi-Circular Bend (SCB) jig instrumented and non-instrumented
- > PC temperature control
- > Automated QC production testing software

*When ambient temperature is between +15°C to +27°C

Standards NCHRP 9-19/9-29 | AASHTO TP79

To perform:

- > **Dynamic Modulus E* (AASHTO TP79)**
- > **Flow Number (NCHRP 9-19)**
- > **Flow Time (NCHRP 9-29)**

The Asphalt Mixture Performance Tester (AMPT) is the culmination of two National Cooperative Highway Research Program (NCHRP) projects. IPC Global have been involved in these projects from the beginning with development work done on IPC Global's equipment. IPC Global's AMPT has been evaluated successfully by NCHRP.

Benefits

- Complete confidence in your data and results: IPC Global AMPT is tried, tested and proven
- Saves you time and is easy to use
- Amazing value for money: fully integrated and robust, the AMPT has everything you need
- Complies with NCHRP 9-19 and 9-29, AASHTO TP79, Superpave Performance Tests for Asphalt Mixtures Characterization Test
- User friendly UTS Software

79-PV71A02

IPC Global AMPT/SPT Asphalt Mixture Performance Tester including IMACS control and data acquisition system. 208-230 V, 50-60 Hz, 1 ph

Specifications

- Load capacity: Static 15 kN, Dynamic 13.5 kN
- Frequency range: 0.01 to 60 Hz sinusoidal loading
- Actuator stroke: 30 mm (± 15 mm)
- Specimen size: dia. 100 x 150 mm high
- Dimensions (HxDxW): 1330 x 630 x 1100 mm
- Weight (excluding oil): 250 kg

Test accessories to perform:

Dynamic Modulus E*, Flow Number and Flow Time Test

Standards

AASHTO TP79, NCHRP Project 9-19, NCHRP Project 9-29

See page 499

Uniaxial fatigue

Standards

SCDUF, S-VECD

See page 500

Texas Overlay test

Standards

TEX-248-F

See page 501

Note: the test accessories to perform the above tests are similar to that ones used with the UTM.

Standards

AASHTO T342/TP62

with additional hardware

Quick and easy to use



Indirect tensile test upgrade with on specimen LVDT for Resilient Modulus, Dynamic Modulus test

79-PV71401

AMPT Indirect Tensile (IDT) Kit, including AMPT Indirect Tensile jig (150mm dia samples only), IDT LVDT ($\pm 0.5\text{mm}$) (Red) w/In-Line Conditioner (ILC), IDT LVDT ($\pm 0.5\text{mm}$) (Black), IDT LVDT ($\pm 0.5\text{mm}$) (Blue), IDT LVDT ($\pm 0.5\text{mm}$) (Green), AMPT IDT LVDT Mounting Kit

79-PV71402

AMPT IDT 150mm Target Mounting Jig (38 mm & 75 mm Gauge Length)

79-PV71403

AMPT IDT Long Target

79-PV71404

AMPT IDT Short Target

Note: the test accessories to perform the above determination are for use with the AMPT/SPT tester only.

Other accessories available with additional hardware and relevant test kit

Uniaxial Fatigue Kit

The Uniaxial Fatigue Kit allows the AMPT to perform tension tests, including the Simplified Continuum Damage Uniaxial Fatigue (SCDUF) test and Dr. Richard Kim's Simplified Viscoelastic Continuum Damage (S-VECD) test.

Overlay Test Kit

The Overlay Test Kit enables the AMPT to conduct the Overlay Test for fatigue cracking which can be incorporated into Mechanistic-Empirical design system for flexible pavements. The Overlay test investigates both crack propagation and crack initiation

Indirect Tensile Jig

The Indirect Tensile Jig is precision Engineered to perform indirect tensile tests within the AMPT, including Dynamic Modulus and Resilient Modulus analysis.

- Others:
- Small sized specimen kit
- Semicircular bend kit
- AASHTO T342/TP62 kit





main features

- > Save time: with three stations for simultaneous tests on multiple specimens
- > Save money: with the Servo-pneumatic actuators and mechanical refrigeration
- > Easy expansion: with the option of starting with one test station expandable to three
- > Less variability: by testing three specimens simultaneously under exactly the same conditions
- > Increased productivity
- > Fully integrated : with IPC Global's digital control and data acquisition system (IMACS)
- > Hydraulic Power Supply (HPS) based on the inverter technology-oil flow control, assuring silent operation and energy saving

79-PV75A02, with three reaction frame 79-PV75000

TSRSTplus, Thermal Asphalt Multi-Test System

Standards

EN 12697-46 | AASHTO TP10-93

(TSRST-Thermal Stress Restrained Specimen Test, UTST-Uniaxial Tension Stress Test, TCT-Tensile Creep Test and RT-Relaxation Test)

To perform:

- > **Thermal Stress Restrained Specimen Test (TSRST)**
- > **Uniaxial Tension Stress Test (UTST)**
- > **Tensile Creep Test (TCT)**
- > **Relaxation Test (RT)**

Control and Data Acquisition

Controlling TSRSTplus is IPC Global's Integrated Multi-Axis Control and Data Acquisition System (IMACS). IMACS delivers leading edge performance, unparalleled control and the ultimate in flexible data acquisition. For more information see page 488.

Transducers

Load Cells Pancake type, high performance, fatigue rated (1 per station)
Displacement Transducers Range: $\pm 0.5\text{mm}$ LVDTs, Resolution: $<1\mu\text{m}$, Accuracy: $\pm 0.1\%$ full scale

Environmental Chamber

Mechanical Refrigeration Range: -40°C to $+60^{\circ}\text{C}^*$

Liquid Nitrogen Temperature Range: -50°C to $+60^{\circ}\text{C}$

Temperature Ramp : -10°C per hour down to -30°C with mechanical refrigeration, -10°C per hour down to -50°C with liquid nitrogen (LN2) assistance

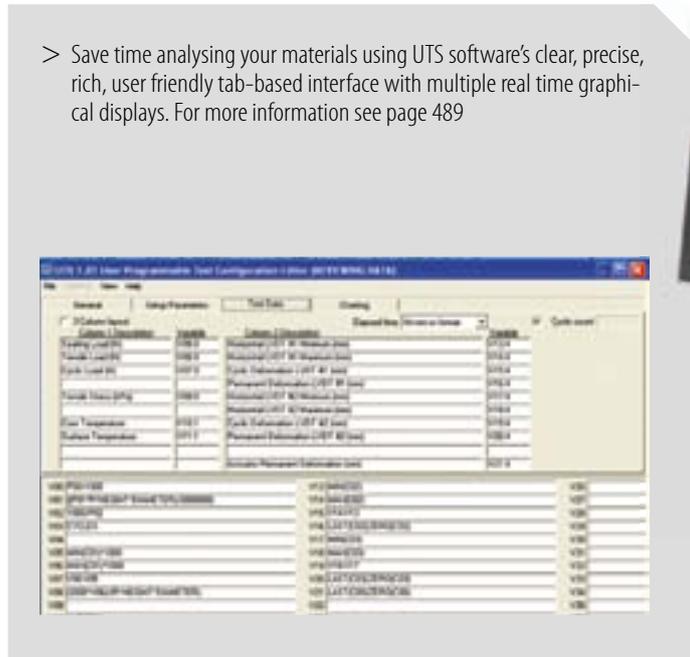
Temperature Stability : $\pm 0.5^{\circ}\text{C}$

**Minimum achievable temperature (without LN2) below ambient is 60°C (i.e. for ambient of 20°C , minimum achievable is -40°C)*

World-Class Software

Application Powerful professional Delphi software

- > Save time analysing your materials using UTS software's clear, precise, rich, user friendly tab-based interface with multiple real time graphical displays. For more information see page 489



Specifications

- Load Capacity 22.5kN*
- Actuator Stroke 30mm (±15mm)
- Actuator Type Custom Dual
- Pneumatic Actuator
- Approximate weight: 600kg approx.
- External Dimensions (HxDxW): 2260 x 760 x 1100mm

*Air pressure of 1,000kPa is required. Optional pressure intensifier available if necessary.

Ordering information

79-PV75A02

IPC Global TSRST^{plus} Thermal Asphalt Multi-Test System with one, two or three test stations.
208-240 V, 50-60 Hz, 1 ph

Accessories

79-PV75000

Reaction frame kit, including IMACS Dual Axis expansion module assembly, TSRST^{plus} reaction frame, servo-pneumatic actuator assembly, pneumatic servo valve, actuator built-in LVDT (± 15 mm) with ILC, load cell (± 22.5 kN) with ILC, two rod ends, two clevis yokes and pins, two platens, four LVDTs hadders and two 300 mm inver rods.

Note: one to three reaction frame kits can be supplied.

79-PV75001

TSRST Temp transducers (± 60°C) w/ In-line conditioner (ILC) & shim

79-PV70641

LVDT (± 0.5 mm) w/ In-line conditioner (ILC) for AASHTO TP10



Detail of specimen mounting kit

79-PV75002

LVDT (± 2.5 mm) with In-line conditioner (ILC), for EN 12697-46

79-PV70115

LVDT (± 0.06 MM) with In-line conditioner (optional)

79-PV75003

TSRST^{plus} Cryogenic kit

79-PV70642

TSRST Gluing jig assembly

79-PV70643

Additional TSRST platens

Bitumen

81 | Bitumen and bituminous binders

Bituminous materials, a by-product of the oil distillation process, look set to remain as a constituent material of road paving for some considerable time to come, being used to withstand the flexural and compressive stresses caused by traffic. Due to the ever increasing intensity of today's traffic conditions there is a demand for higher levels of performance from asphalt.

This section includes a wide range of testing equipment to fulfill all Standard requirements.



81 Bitumen and bituminous binders

Bacon sampler	516
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Ring and ball apparatus	520
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Test set for determination of solubility	522
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Pressure ageing vessel	540
Dynamic Shear Rheometer (DSR)	541





Sampling Bitumen And Oil

Standards EN 58 | ASTM D140 | AASHTO T40 | CRR 81 | CNR 98

81-B0010

Bacon sampler, 1 litre capacity

Used to obtain bitumen or oil samples from various depths within storage containers. Made from brass.

Dimensions: 80 x 250 mm (dia. x h)
Weight: 1.5 kg approx.



81-B0010

Bitumen preparation

81-B0099/B

Air bath

The bath is used for softening bituminous materials before tests and has a built-in thermoregulator, heat protection and a stainless steel vessel that can receive up to 600 g of bitumen. 230 V, 50-60 Hz, 1 ph.

Power: 600 W
Dimensions: 170 x 230 x 300 mm
Weight: 3 kg approx.



81-B0099/B

81-B0007

Laboratory mixer-emulsifier

Ideal for the laboratory preparation of polymer modified bitumen samples and for emulsifying, homogenizing, disintegrating and dissolving. Complete with 5 L capacity bowl and mantle heater. 230 V, 50-60 Hz, 1 ph.

Power: 250 W (mixer), 600 W (heater)
Overall dimensions: 350 x 500 x 940 mm (w x d x h)
Weight: 30 kg approx.



81-B0007

Penetration of bituminous materials



main features

- > Digital penetration measurement
- > Complete with vertical adjustment micrometer
- > Semi-automatic version with automatic controller
- > Compatible with the Digital circulation water bath with cooling unit that eliminates the need to use tap water for cooling

81-B0100/D with Needle 81-B0113, Mirror 81-B0100/1, Glass transfer dish 81-B0109, Sample cup and Thermometer 82-B0100/6

Standards EN 1426 | ASTM D5 | AASHTO T49

Standard digital penetrometers

Available in two models - digital and digital semi-automatic - the penetrometer has a cast iron base with levelling screws, a 0.01 mm precision digital penetration measurement gauge and release button, and an automatic zeroing function. The semi-automatic model 81-B0101/E is supplied complete with a controller which automatically releases the plunger using a magnetic device. Both models are fitted with a vertical adjustment micrometer device. Needles, cups, thermometer and mirror are not included and have to be ordered separately - see Accessories.

Tests should be performed with the penetration cup placed in thermostatically-controlled water, using a device such as the 81-B0102/C Digital circulation water bath with conditioning vessel. See Accessories.

Weight: 8.5 kg approx.

Ordering information

81-B0100/D

Standard digital penetrometer complete with vertical adjustment micrometer.

81-B0101/E

Semi-automatic digital electronic penetrometer complete with vertical adjustment micrometer and electronic timer to set the fall time. 230 V, 50-60 Hz, 1 ph.

81-B0101/EZ

As above but 110V, 60 Hz, 1 ph.

Accessories

Penetrometer needles

81-B0113

Penetrometer needle, 2.5 ± 0.05 g.

81-B0113/A

Penetrometer needles, 2.5 ± 0.05 g. Pack of 3.

81-B0113/1

Verified penetrometer needle 2.5 ± 0.05 g. Complete with test certificate issued by the National Physical Laboratory.



Digital circulation water bath with cooling unit

Thermostatically controlled digital water bath with cooling system and conditioning vessel. Provides water at the required temperature ($25 \pm 0.1^\circ\text{C}$) to perform the penetration test. The apparatus consists of a water bath fitted with a heater, water cooler, digital thermoregulator, cylindrical vessel with cooling coil and connections.

Temperature range: from $+15$ to 30°C , $\pm 0.1^\circ\text{C}$
 Power: 350 W
 Overall dimensions: 480 x 380 x 275 mm
 Weight: 20 kg approx.

Ordering information

81-B0102/C

Digital circulation water bath with cooling unit. 230 V, 50-60 Hz, 1 ph.

81-B0102/CZ

As above but 110 V, 60 Hz, 1 ph.

81-B0101/E with Needle 81-B0113, Mirror 81-B0100/1, Glass transfer dish 81-B0109, Sample cup 81-B0110/A and Thermometer 82-B0100/6

Sample cups

81-B0110/A

Sample cups, 55 mm diameter x 35 mm height. Pack of 6.

81-B0110/B

Sample cups, 70 mm diameter x 45 mm height. Pack of 6.

Mirror

81-B0100/1

Mirror with articulated holder. Makes surface contact between the needle and the sample easier.

Glass transfer dish

81-B0109

Glass transfer dish with support, 100 mm diameter x 100 mm height.

Thermometers

82-B0100/6

Thermometer, $+23$ to 26°C range, 0.1°C graduations, IP 38C.

82-B0125/2

EN thermometer, $+19$ to 27°C range, 0.1°C graduations, ASTM 17C.

82-B0122/4

EN thermometer, -8 to $+32^\circ\text{C}$ range, 0.1°C graduations, ASTM 63C.

Standard penetration cone ASTM D217, EN 13880-2

81-B0115

Standard penetration cone conforming to ASTM D217 and EN 13880-2.



81-B0101/E with Needle 81-B0113, Mirror 81-B0100/1, Sample cup 81-B0110/A and 81-B0102/C Digital circulation water bath with cooling unit. The apparatus does not require tap water for cooling purposes

Automatic penetration

Standards EN 1426 | ASTM D5 | AASHTO T49 | AFNOR T66-004 | ISO 3997 | DIN 52210 | IP 49



main features

- > Built-in user friendly software
- > 2 separate keyboard: parameters entry / measurement operation
- > Stepper motor for penetration depth as low as 0.01 mm
- > Programmable Penetration time between 0 and 999 min
- > Position recall for routine tests can be set
- > Automatic approach for conductive samples
- > Optoelectronic detection of depth penetration
- > Optional automatic level detection device for bitumens

81-B0103/B

Automatic penetrometer

This compact instrument uses the latest technologies and user interface tools and is supplied complete with a kit for determining penetration of bituminous materials that includes a needle, holder, 50 g weight and 10 containers.

The test should be performed with the penetration cup placed in thermostatically-controlled water, which can be achieved with a device such as the 81-B0102/C Digital circulation water bath with conditioning vessel.

Overall dimensions: 260 x 320 x 540 mm
Weight, approx.: 23 kg

Ordering information

81-B0103/B

Electronic automatic penetrometer. 230 V, 50-60 Hz, 1 ph

81-B0103/BZ

Same as above but 115 V, 60 Hz, 1 ph

Accessories and spares

Penetrometer needles

81-B0113

Penetrometer needle, 2.5 ± 0.05 g.

81-B0113/A

Penetrometer needles, 2.5 ± 0.05 g.
Pack of 3.

81-B0113/1

Verified penetrometer needle 2.5 ± 0.5 g.
Complete with test certificate issued by the National Physical Laboratory.

81-B0103/2

Needle holder $47.5 \text{ g} \pm 0.05 \text{ g}$

81-B0103/3

50 g weight

Sample cups

81-B0110/A

Sample cups, 55 mm diameter x 35 mm height. Pack of 6.

81-B0110/B

Sample cups, 70 mm diameter x 45 mm height. Pack of 6.

Various

81-B0103/6

Bitumen automatic level device

81-B0102/C

Digital circulation water bath with cooling unit. 230 V, 50-60 Hz, 1 ph.

For more information see page 517

81-B0102/CZ

Same as above but 110 V, 60 Hz, 1 ph.

Softening point of asphalt

Standards EN 1427 | ASTM D36 | AASHTO T53



Automatic ring and ball apparatus

This advanced microprocessor controlled automatic tester is used to determine the softening point of bitumen using water or glycerol as heating fluid. The softening point is taken by two suitably positioned light barriers and the temperature is measured by a PT100 sensor placed in a central position. During operation a magnetic stirrer with adjustable speed assures temperature uniformity in the vessel. The temperature gradient is strictly maintained throughout the test by the electronic system which conforms with the Standards.

Safety features

The hot plate is automatically turned off at the end of the test. The apparatus is also fitted with an emergency stop button. The test is automatically interrupted if the probe fails or is not correctly positioned. The hot plate will not be damaged or affected by accidental leakages of water or glycerol, or if the beaker breaks.

Specifications

The apparatus comprises the following parts:

- Heater and magnetic stirrer with speed control
- Temperature probe
- Glass beaker, test rings and ball support
- Application and centering device for steel balls
- Light barrier system
- Microprocessor system and large graphic display with membrane keyboard
- RS232 port for PC or printer

Firmware

- Main menu:
- Test on boiled distilled or deionized water for softening point between 30 and 80° C
- Test on glycerol for softening point above 80 and up to 150° C
- Test configuration set-up
- File management
- Date and time
- Operator name, test number, general notes
- Language selection
- Test parameters conforming to the type of test: up to 80° C or above 80 up to 150° C, hot plate pre-heating temperature thermocouple calibration
- Magnetic stirrer speed adjustment from 0 to 150 rpm
- Baud rate selection 38400 for PC and 9600 for printer

Physical specifications

- Power: 750 W
- Overall dimensions: 530 x 300 x 280 mm (w x d x h)
- Weight: approx. 16 kg

Ordering information

81-PV0143

PAVELAB, Automatic ring and ball apparatus. 230 V, 50-60 Hz, 1 ph.

81-PV0143/Z

As above but 110V, 60 Hz, 1 ph.

Accessories

82-P0172/1

RS232 cable

Spares

81-PV0145/1

Brass ring

81-PV0145/2

Steel ball

81-PV0145/3

Ball centering guide

81-PV0143/1

600 ml beaker

Softening Point Of Asphalt

Standards EN 1427 | ASTM D36 | AASHTO T53

81-B0145/A

Standard ring and ball apparatus

This set of equipment is used for determining the softening point of bituminous materials and comprises:

- 81-PV0145/1 Two brass rings
- 81-PV0145/2 Two 9.5 mm diameter steel balls
- 81-PV0145/3 Two ball centering guides
- 81-PV0143/1 Glass vessel
- 81-B0145/5 Pouring plate
- 81-B0145/6 Ring holder/assembly
- 82-D1200/1 Glass thermometer, -2 to +80 °C range, 0.2 °C graduations, ASTM 15C

Total weight: 1 kg approx.

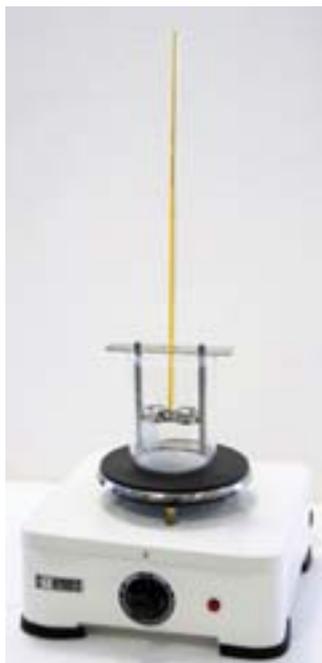
Note: all the above items can also be purchased individually.

The test has to be performed using specific liquids and a suitable hot plate selected from the listed accessories. We propose three hot plate solutions:

- 10-D1402/A Standard hot plate, 160 mm diameter, 1000 W. The most economical solution, conforming to ASTM standards.
- 81-B0145/C1 Hot plate with centering/protection device for 81-B0145/A Ring and Ball apparatus. A more professional solution.
- 81-B0145/D Hot plate with magnetic stirrer, conforming to both ASTM and EN standards which require the water to be stirred for better temperature uniformity



81-B0145/A



81-B0145/A with 10-D1402/A Hot plate, conforming to ASTM standard



81-B0145/A with 81-B0145/C1 Hot plate with centering/protection device, conforming to ASTM standard



81-B0145/A with 81-B0145/D Hot plate with magnetic stirrer, conforming to EN and ASTM standards

Ordering information

81-B0145/A

Ring and ball apparatus, including ring holder/assembly, two brass rings, two brass ball centering guides, two steel balls, pouring plate, glass vessel and glass thermometer.

Accessories

Hot plates

10-D1402/A

Hot plate, 160 mm diameter, bi-metallic thermostat. 230 V, 50-60 Hz, 1 ph.
Power: 1000 W
Overall dimensions: 260 x 260 x 135 mm
Weight: 3 kg approx.

10-D1402/AZ

As above but 110 V, 60 Hz, 1 ph.

81-B0145/C1

Hot plate with centering/protection device. 230 V, 50-60 Hz, 1 ph.
Power: 700 W
Overall dimensions: 170 x 320 x 130 mm
Weight: 2.3 kg approx.

81-B0145/C1Z

As above but 110 V, 60 Hz, 1 ph.

81-B0145/D

Hot plate with magnetic stirrer. Electronic stirrer adjustment from 100 to 1200 rpm, aluminium plate. 230 V, 50-60 Hz, 1 ph.
Power: 700 W
Overall dimensions: 170 x 230 x 150 mm
Weight 3 kg approx.

Spare parts

81-PV0145/1

Brass ring.

81-PV0145/2

Steel ball, 9.5 mm diameter.

81-PV0145/3

Ball centering guide.

81-PV0143/1

Glass vessel, 600 ml.

82-D1200/1

Glass thermometer, -2 to +80 °C range, 0.2 °C graduations, ASTM 15C.

82-D1200/2

Glass thermometer, +30 to 200 °C range, 0.5 °C graduations, ASTM 16C.

Water in bitumen and bitumen emulsions

Standards ASTM D95 | ASTM D244 | AASHTO T55 | AASHTO T59 | IP 74/77 | NLT 123 | CNR 101

Water in bituminous materials test set (Dean-Stark)

Used for determining the water content of bituminous and petroleum materials by distillation with a water immiscible, volatile solvent. The set comprises:

- 10 ml glass still
- Glass receiver
- Glass condenser
- Electric heater with thermoregulator

Power: 250 W
Weight: 4 kg approx.

Ordering information

81-B0155/A

Water in bituminous materials test set (Dean-Stark). 230 V, 50-60 Hz, 1 ph.

81-B0155/AZ

As above but 110 V, 60 Hz, 1 ph.

Spares

81-B0155/1

Glass still, 10 ml.

81-B0155/2

Glass receiver, 500 ml.

81-B0155/3

Glass condenser.



81-B0155/A / 81-B0155/B

Water in bitumen emulsions test set

Standards EN 1428 | EN 12847 | ASTM D244 | NFT66 - 023 | NLT 60 - 113

Identical to the model 81-B0155/A except for the glass still which has a 25 ml capacity with 0.1 ml graduations.

Ordering information

81-B0155/B

Water in bitumen emulsions test set. 230 V, 50-60 Hz, 1 ph.

81-B0155/BZ

As above but 110 V, 60 Hz, 1 ph.

Spares

81-B0155/B2

Glass still, 25 ml.

Residue on sieving and mixing stability

Residue on sieving of bituminous emulsions

Standards EN 1429

The test is performed using the following sieves:

15-D7595

Stainless steel test sieve, 75 mm diameter, 0.16 mm openings.

15-D7545

Stainless steel test sieve, 75 mm diameter, 0.5 mm openings.

15-D7504

Pan and cover for 75 mm diameter sieves.

Weight of each sieve: 100 g approx.



15-D7545, 15-D7595 and 15-D7504

Mixing stability with cement of bituminous emulsions

Standards EN 12848

The test is performed using the following sieves:

15-D7595

Stainless steel test sieve, 75 mm diameter, 0.16 mm openings.

15-D7585

Stainless steel test sieve, 75 mm diameter, 2 mm openings.

15-D7504

Pan and cover for 75 mm diameter sieves.

Weight of each sieve: 100 g approx.

Storage stability of asphalt emulsions

Standards NFT66-022

81-B0114

Apparatus for the determination of storage stability of emulsions.

- 230 V, 50 Hz, 1 ph

The test is based on settlement measurement conforming to NF T66-022 Standard. It consists of a 12 V current source, vessel, cylindrical electrode and holder.

-Overall dimensions: 200x200x520 mm

-Weight approx.: 4 kg



81-B0144

Degree of solubility of bituminous binders

Standards EN 12592 | ASTM D2042

Test set for the determination of solubility

The set is available in two versions:

81-B0148

Test set for the determination of solubility conforming to ASTM D2042, comprising:

86-D1044
Filter flask, 500 ml capacity
86-D1189
Funnel for Gooch crucible
86-D1188
Gooch crucible
86-D1188/1
Rubber ring for Gooch crucible
86-D1188/2
Filter discs, fibreglass, 25 mm diameter, pack of 100
Weight: 0.6 kg approx.

81-B0148/A

Test set for the determination of solubility conforming to EN 12592, comprising:

86-D1044
Filter flask, 500 ml capacity
86-D1189
Funnel for Gooch crucible
86-D1188/3
Gooch crucible porosity 4 septum filter
86-D1188/1
Rubber ring for Gooch crucible
86-D1188/4
Glass powder, 1 kg
Weight: 1.6 kg approx.



81-B0148

Particle charge of emulsified asphalt

Standards EN 1430 | ASTM D244 | CNR 99

Particle charge tester

Used to identify particle charge of emulsions. The apparatus comprises a milliammeter, a variable resistor and two stainless steel electrodes.

Overall dimensions: 140 x 200 x 270 mm
Weight: 2.2 kg approx.

Ordering information

81-B0129

Particle charge tester. 230 V, 50-60 Hz, 1 ph.

81-B0129/Z

As above but 110 V, 60 Hz, 1 ph.



81-B0129

Emulsified asphalt - residue by distillation

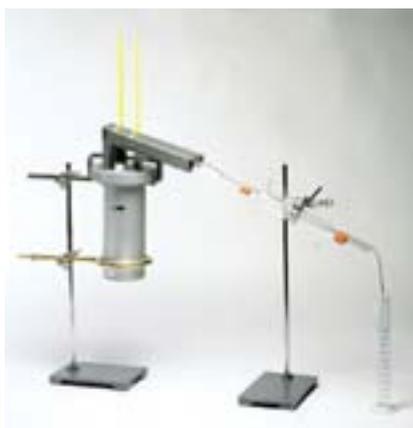
Standards EN 1431 | ASTM D244 | AASHTO T59 | CNR 100

81-B0153

Emulsified asphalt distillation apparatus

This apparatus is used to examine asphalt emulsions composed principally of a semi-solid or liquid asphaltic base, water and an emulsified agent. It consists of an aluminium-alloy still with ring burner, a glass connecting tube with water-cooled condenser, a 100 ml capacity graduated cylinder, support stands, holders and two thermometers with -2 to +300°C range.

Weight: 9 kg approx.



81-B0153

Breaking point-Fraas method

Standards EN 12593

81-B0158

Breaking point apparatus

The apparatus is for determining the Fraas breaking point of solid and semi-solid bitumen. This breaking point is the temperature at which bitumen first becomes brittle, as indicated by the appearance of cracks when a thin film of the bitumen on a metal plaque is cooled and flexed in accordance with specified conditions.

The apparatus consists of a bending device, a plaque measuring 41x20x0.15 mm made of flexible stainless steel, a cooling device, a thermometer IP 42C, a plate and a stand.

Weight: 3 kg approx.

Accessories

70-C9902/2

Dry ice maker.

Spares

81-B0158/1

Spare stainless steel plaques. Pack of 10.

82-B0158/3

Thermometer IP 42C.



81-B0158

Settling tendency of bitumen emulsions

Standards EN 12847 | IP 485

81-B0134

Stoppered glass graduated cylinder

Used for determining settling tendency of bitumen emulsions.

600 ml capacity, with one division mark at 500 ml. Complete with two closeable side tubes.

Weight: 1 kg approx.

Note: To perform the test the 81-B0155/B Water in bitumen emulsions test set is also required. See page 521

Penetration power of bitumen emulsions

Standards EN 12849 | IP 487

81-B0136

Glass tube with fused-on glass filter

Used for determining the penetration power of bitumen emulsions.

41.5 mm inside diameter, approx. 115 mm total height, fitted with glass filter disc pore size between 160 and 250 µm

Weight: 1 kg approx.



81-B0136

81-B0134

Distillation of cut-back asphaltic products

Standards ASTM D402 | AASHTO T78 | NF T66-003 | UNE 7072 | UNE 7112

Apparatus for distillation of cut-back asphalt

This apparatus is used for the examination of cut-back asphaltic materials by the distillation test. It consists of:

- Distillation flask
- Condenser
- Adapter
- Shield
- Shield and flask support
- Electric heater with thermoregulator
- Cylinder receiver
- Thermometer, -2 to +400°C range

Weight: 6 kg approx.

Ordering information

81-B0150/E

Apparatus for distillation of cut-back asphalt. 230 V, 50-60 Hz, 1 ph.

81-B0150/EZ

As above but 110V, 60 Hz, 1 ph.

Accessories

82-B0150/10

Low distillation thermometer, -2 to +300°C range, 1 °C graduations, ASTM 7C.

81-B0150/12

Crow receiver, 25 ml capacity.

81-B0150/13

Crow receiver, 50 ml capacity.

81-B0150/14

Crow receiver, 100 ml capacity.

Spares

81-B0150/1

Distillation flask.

82-B0150/11

High distillation thermometer, -2 to +400°C range, 1 °C graduations, ASTM 8C.



81-B0150/E

Breaking value of cationic bitumen emulsions: mineral filler method

Standards EN 13075 | IP 494

81-B0139

Test set for the determination of the breaking value of cationic bitumen emulsions

The breaking value is a dimensionless number corresponding to the amount of reference filler, in grams, needed to coagulate 100 g of bitumen emulsions. The test is performed with a set of items comprising:

- Feeding pan
- Two enamel dishes
- Nickel spatula
- Support base and clamp

The above set corresponds to the basic "Equipment for manual procedure" described by the EN 13075-1 standard.

To perform the test conforming to the "Semi-automatic procedure", the set has to be used with a Stirrer motor (81-B0139/D) and an Adjustable filler feeder (81-B0139/F) - see Accessories.

Weight: 1.5 kg approx.



81-B0139

Accessories

81-B0139/D

Electric stirrer complete with stirring paddle, adjustable rotating speed up to 1300 rpm, complete with support base. 110-230 V, 50-60 Hz, 1 ph.

81-B0139/C

Stainless steel metal can, 500 ml capacity.

81-B0139/F

Adjustable filler feeder. 110-230 V, 50-60 Hz, 1 ph.

81-B0139/1

Reference filler, 25 kg bag.



81-B0139/F



81-B0139/D

Density / relative density of bitumen

Standards EN-ISO 3838

Hubbard-Carmick pycnometers

Used for determining the density or relative density of bitumen.

86-D1115

Hubbard-Carmick specific gravity bottle, 24 ml capacity. Weight: 20 g approx.

86-D1120

Hubbard-Carmick specific gravity bottle, 25 ml capacity. Weight: 20 g approx.



86-D1115, 86-D1116

Flash and fire point by Cleveland open cup

Standards EN 2592 | ISO 2592 | ASTM D92 | AASHTO T48 | IP36

81-B0130/C

Cleveland flash tester

Used for determining the flash and fire point of petroleum products, this tester consists of a brass cup mounted on an electric heater with a temperature controller. Conforming to the CE European directives, it is supplied complete with double line-fuse, hot plate control system and a thermometer with -6 +400°C range. 230 V, 50-60 Hz, 1 ph.

Power: 600 W
Weight: 5 kg approx.

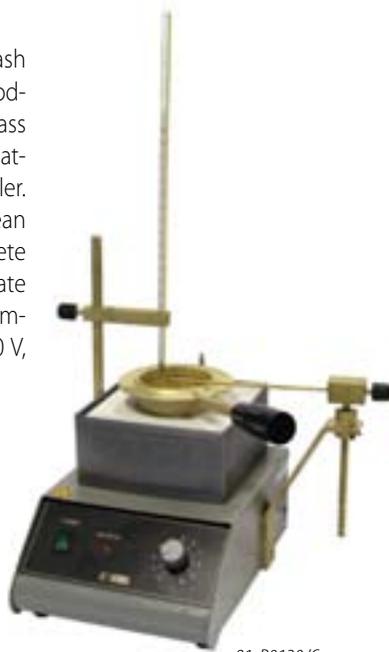
Spare parts

81-B0130/1C

Brass cup.

82-B0130/2

Thermometer, -6 to +400°C range, IP 28C.



81-B0130/C



81-B0130/C Brass cup mounted on the electric heater

Flash point by Tag open cup tester

Standards ASTM D1310 | ASTM D3143

81-B0138/A

TAG open cup flash point tester

Used for determining the flash point of volatile flammable materials. The tester conforms to CE requirements and consists of:

- Electric furnace with electronic control of heating power
- Flame rotating ignition device (LPG supply is required)
- Glass cup
- Insulating plate
- Support and clamp for thermometer
- Gauge
- Stainless steel frame
- Double line-fuse

Thermometers are not included - see Accessories. 230 V, 50-60 Hz, 1 ph.

Power: 600 W
Dimensions: 250 x 170 x 400 mm (wxdxh)
Weight: 4 kg approx.



81-B0138/A

Accessories

82-B0138/A1

Thermometer, -38 to +42°C range, ASTM 33C.

82-B0135/1

Thermometer, -5 to +110°C range, ASTM 9C.

82-B0138/A3

Thermometer, +90 to 170°C range, ASTM 35C.

Standard Tar/Brta viscosity

Standards EN 12846 | EN 13357 | NF T66-005 | IP 484

Standard Tar viscometers

Used for determining the viscosity of cut-back bitumen and road oil. The apparatus, housed in a stainless steel case, consists of a tank fitted with a thermostat, a rheostat, an agitator, an immersion heater to take the water to the required temperature and a cooling coil for connection to the water supply. The temperature is checked by a 0-45°C thermometer. The apparatus is supplied with a metal cup cover and stopper holder.

Cups have to be ordered separately - see Accessories. (EN 13357 requires the 4 and 10 mm cups, EN 12846 requires the 2, 4 and 10 mm cups.)

Power: 300 W

Overall dimensions: 262 x 262 x 550 mm

Weight: 10 kg approx.

Ordering information

81-B0122/C

Digital standard tar viscometer. 230 V, 50-60 Hz, 1 ph.

81-B0122/CZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

Cups

81-B0122/B2

Cup, 10 mm diameter.

81-B0123/B2

Cup, 4 mm diameter.

81-B0124/B2

Cup, 2 mm diameter.

Go/No go gauges

81-B0122/B1

Go/No go gauge for 10 mm orifice.

81-B0123/B1

Go/No go gauge for 4 mm orifice.

81-B0124/B1

Go/No go gauge for 2 mm orifice.

Thermometer

82-B0122/3

Thermometer, 0 to 45°C range, 0.2°C graduations, IP 8C.

Graduated cylinder

86-D1003

Graduated cylinder, 100 ml cap.



81-B0122/C with 86-D1003

Engler viscosity

Standards ASTM D940 | ASTM D1665 | AASHTO T54 | BS 2000 | NF T66-020 | CNR 102

Engler viscometers

Used to determine the specific viscosity of tars and their products. It includes a contact thermoregulator and stirring device.

The thermometer is not included - see Accessories.

Power: 300 W

Dimensions: 262 x 262 x 550 mm

Weight: 10 kg approx.

Ordering information

81-B0120/B

Engler digital viscometer.

230 V, 50-60 Hz, 1 ph.

81-B0120/BZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

Thermometers

82-B0121/1

Thermometer, +18 to 28°C range, 0.2°C graduations, ASTM 23C.

82-B0121/2

Thermometer, +39 to 54°C range, 0.2°C graduations, ASTM 24C.

82-B0121/3

Thermometer, +95 to 105°C range, 0.2°C graduations, ASTM 25C.

82-B0121/4

Thermometer, +10 to 55°C range, 0.5 °C graduations, immersion 93 mm, IP 76C

Flask and strainer

81-B0120/2

Kohlraush calibration flask, 200 ml capacity.

81-B0120/4

Strainer No. 50 ASTM.

81-B0120/1

Testing flask, 50 ml capacity.



81-B0120/B with thermometer and testing flask

Saybolt viscosity

Standards ASTM D88 | AASHTO T72

Saybolt viscometers

This test is for taking an empirical measurement of the Saybolt viscosity of petroleum products at specified temperatures between 21.1 to 98.9°C (70 to 210°F).

The viscometers, available in two versions - single and two-tube - include a bath, Furol and Universal orifices, key, control box, stirring device, cooling coil, 60 ml flask and digital thermoregulator. The funnel, thermometers and withdrawal tube are not included and have to be ordered separately - see Accessories.



81-B0121

Ordering information

81-B0121

Saybolt digital viscometer. 230 V, 50-60 Hz, 1 ph.

81-B0121/Z

As above but 110 V, 60 Hz, 1 ph.

81-B0121/A

Saybolt two-tube digital viscometer. 230 V, 50-60 Hz, 1 ph.

81-B0121/AZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

Thermometers

82-B0125/2

Saybolt thermometer, +19 to 27°C range, 0.1°C graduations.

82-B0125/3

Saybolt thermometer +34 to 42°C range, 0.1°C graduations.

82-B0125/4

Saybolt thermometer +49 to 57°C range, 0.1°C graduations.

82-B0125/5

Saybolt thermometer +57 to 65°C range, 0.1°C graduations.

82-B0125/6

Saybolt thermometer +79 to 87°C range, 0.1°C graduations, 250 mm length.

82-B0125/7

Saybolt thermometer +95 to 103°C range, 0.1°C graduations.

Filter funnel and withdrawal tube

81-B0125/13

Filter funnel with wire mesh and clip.

81-B0125/14

Withdrawal tube.

Spares

81-B0125/1

Saybolt viscosity flask, 60 ml capacity.

81-B0125/10

Universal orifice for Saybolt viscometer.

81-B0125/11

Furol orifice for Saybolt viscometer.

Product code	81-B0121 81-B0121/Z	81-B0121/A 81-B0121/AZ
Model	Single tube	Two tubes
Power, W	300	500
Dimensions, mm (w x dxh)	260 x 260 x 500	420 x 260 x 500
Weight, kg (approx.)	7	10



81-B0121/A

Kinematic Viscosity

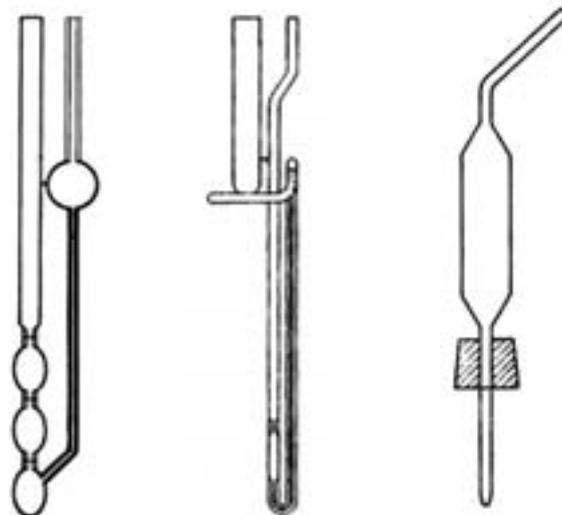
Standards ASTM D2170 | AASHTO T201 | EN 12595

Cannon-Fenske opaque viscometers

Used for the determination of kinematic viscosity of liquid asphalts (bitumen) and road oils at 60° C, and distillation residue of liquid asphalts and asphalt cements at 135°C. Cannon-Fenske Opaque models are suitable for opaque liquids. Supplied complete with calibration certificate.

Code 81-	Approx. Constant cSt/S	Kinematic viscosity range cSt
<u>B0116/1</u>	0.035	7 to 35
<u>B0116/2</u>	0.1	20 to 100
<u>B0116/3</u>	0.25	50 to 250
<u>B0116/4</u>	0.5	100 to 500
<u>B0116/5</u>	1.2	240 to 1200
<u>B0116/6</u>	2.5	500 to 2500
<u>B0116/7</u>	8	1600 to 8000
<u>B0116/8</u>	20	4000 to 20,000

To determine the kinematic viscosity, all the above Cannon-Fenske viscometers must be placed into the 81-PV0116/F Viscometer bath using the holder 81-B0116/H1. See accessories.



81-B0116/1
to 81-B0116/8

81-B0116/10
to 81-B0116/16

81-B0116/20 to 81-B0116/27

Zeitfuchs cross-arm viscometers

Used for the determination of kinematic viscosity of liquid asphalts (bitumen), road oil and distillation residues of liquid asphalts and asphalt cements at 135°C. Supplied complete with calibration certificate.

Code 81-	Approx. Constant cSt/S	Kinematic viscosity range cSt
<u>B0116/10</u>	0.1	20 to 100
<u>B0116/11</u>	0.3	60 to 300
<u>B0116/12</u>	1.0	200 to 1000
<u>B0116/13</u>	3.0	600 to 3000
<u>B0116/14</u>	10.0	2000 to 10000
<u>B0116/15</u>	30.0	6000 to 30000
<u>B0116/16</u>	100.0	20000 to 100000

For determining the kinematic viscosity, all the above Zeitfuchs viscometers must be placed into the 81-PV0116/F Viscometer bath using the holder 81-B0116/H2. See accessories.

BS U-Tube modified reverse flow viscometers

Used for the determination of kinematic viscosity of liquid asphalts (bitumen), road oil and distillation residues of liquid asphalts and asphalt cements at 135°C. Supplied complete with calibration certificate.

Code 81-	Approx. Constant cSt/S	Kinematic viscosity range cSt
<u>B0116/20</u>	0.1	6 to 100
<u>B0116/21</u>	0.3	18 to 300
<u>B0116/22</u>	1.0	60 to 1000
<u>B0116/23</u>	3.0	180 to 3000
<u>B0116/24</u>	10	600 to 10000
<u>B0116/25</u>	30	1800 to 30000
<u>B0116/26</u>	100	6000 to 100000
<u>B0116/27</u>	300	18000 to 300000

For determining the kinematic viscosity, all the above BS U-Tube viscometers must be placed into the 81-PV0116/F Viscometer bath using the holder 81-B0116/H3. See accessories.

Dynamic Viscosity

Standards ASTM D2171 | EN 12596

Cannon-Manning vacuum viscometers

Used for determining the viscosity of bitumen at 60° C. Supplied complete with calibration certificate.



Code 81-	Viscosity range
B0117/1	0.036 to 0.8
B0117/2	0.12 to 2.4
B0117/3	0.36 to 8
B0117/4	1.2 to 24
B0117/5	3.6 to 80
B0117/6	12 to 240
B0117/7	36 to 800
B0117/8	120 to 2400
B0117/9	360 to 8000
B0117/10	1200 to 24,000
B0117/11	3600 to 80,000

To determine the dynamic viscosity, the Cannon-Manning viscometers must be placed into the 81-PV0116/F Viscometer bath using the holder 81-B0117/H1. A pressure regulator and vacuum manifold is also required. See accessories

Asphalt Institute vacuum viscometers

Used for determining the viscosity of bitumen at 60° C. Supplied complete with calibration certificate.



Code 81-	Viscosity range
B0117/15	42 to 800
B0117/16	180 to 8200
B0117/17	600 to 2800
B0117/18	2400 to 52,000
B0117/20	9600 to 1,400,000
B0117/21	38,000 to 5,800,000

To determine the dynamic viscosity, the Asphalt Institute viscometers must be introduced into the 81-PV0116/F Viscometer bath using the holder 81-B0117/H2. A pressure regulator and vacuum manifold is also required. See accessories



Viscometer bath

Standards ASTM D2171, EN 12596

81-PV0116/F

Viscometer bath. 230 V, 50-60 Hz, 1 ph.

81-PV0116/FZ

As above, but. 110V, 60 Hz, 1 ph.

It is used in the determination of both the kinematic and dynamic viscosity. Used to maintain the capillary type viscometers at a uniform temperature. The bath consists of a cylindrical glass vessel with a stainless steel cover with 50.8 mm diameter holes, motor stirrer, refrigerating coil with water connections, heating system, contact thermometer, external protection and insulating base.

Thermometers and viscometers are not included.

- Temperature: room temp. +5°C to 150° C
- Power: 2000 W
- Temperature stability: +/-0.03°C
- Temperature sensor: PID
- Jar capacity: approx.20 litres
- 5 viscometer tubes
- Weight: approx. 12 kg

Accessories

Holders for using viscometers with 81-PV0116/F Viscometer bath

81-B0116/H1

Holder for Cannon-Fenske viscometers

81-B0116/H2

Holder for Zeitfuchs Cross-Arm viscometers

81-B0116/H3

Holder for U-Tube viscometers

81-B0117/H1

Holder for Cannon-Manning viscometers

81-B0117/H2

Holder for Asphalt Institute viscometers

Pressure regulator and Vacuum manifold (for Dynamic viscometers)

81-B0116/B

Viscometer pressure regulator. Used for precise pressure control. 230 V, 50-60 Hz, 1 ph.

81-B0116/C

Vacuum manifold. Used for applying a vacuum to the viscometers placed in the bath.

Kinematic and Dynamic viscosity thermometers

82-B0116/40

Kinematic viscosity thermometer, range 58.5 to 61.5°C, type ASTM 47C.

82-B0116/45

Kinematic viscosity thermometer, range 133.5 to 136.5°, type ASTM 110C

Rotational Viscometers



Standards ASTM D2196 | ASTM D4402 | AASHTO T316 | EN 13302

81-PV0118 SERIES

Apparent viscosity of unfilled asphalt is evaluated by a rotational viscometer which measures the torque generated by a calibrated spindle rotating at a selected speed into a bitumen sample heated at precise temperature in the range from ambient to 260° C. The measured relative resistance to rotation is converted, with a factor, into viscosity units, cP or mPa.s.

We offer two versions of viscometer:

81-PV0118

Rotational viscometer, standard version

81-PV0118/A

Rotational viscometer, high performance version

The high performance version features a superior level of test automation as further described.

81-PV0118

Rotational viscometer standard version

Technical specifications

- Viscosity range: 100-13,000,000cP
- Rotational speed range: 0.3-100 rpm
- Selectable speeds: 18
- Precision: $\pm 1\%$ of full scale
- Resolution:
- Using low viscosity adapter: 0.01cP
- For viscosity lower than 10,000cP: 0.1cP
- For viscosity equal to or above 10,000cP: 1cP

main features

- > Data displayed:
 - Selected speed
 - Selected spindle
 - Viscosity reading
 - Percentage of full scale
 - Relative and absolute viscosity
- > Unit converter SI to CGS
- > AUTO-TEST with visual and audible malfunction alarm
- > AUTO-RANGE function
- > User-enabled calibration
- > High resolution
- > Repeatability: 0.2%



Set of 4 spindles included in the rotational viscometers

Spindle models	Viscosity ranges (mPa·s) with model 81-PV0118	Viscosity ranges (mPa·s) with model 81-PV0118/A
TR8	50 - 170 k	20 - 500 k
TR9	250 - 830 k	100 - 2.5 m
TR10	500 - 1.7M	200 - 5 m
TR11	1K - 3.3 m	400 - 10 m

- Repeatability: 0.2%
- Shipping weight: approx. 8 kg

Accessories

81-PV0118/2

Aluminium disposable test chamber

81-PV0118/3

Stainless steel reusable test chamber

Rotational Viscometers



main features

- > 12-key touchpad keyboard
- > Direct readout on a graphic display
- > Data displayed:
 - Selected speed
 - Selected spindle
 - Viscosity reading
 - Percentage of full scale
 - Sample temperature
 - Shear rate (with coaxial spindles)
 - Shear stress (with coaxial spindles)
 - Density (entered by the user)
 - Step program status
 - Analysis and visual characteristics (flow curves)
- Viscosity reading: dynamic viscosity (cP or mPa·s) or kinematic viscosity (cSt)
- > Program features:
 - Time to torque: target torque pre-setting device
 - Time to stop: target time pre-setting device
 - 10 working memories
 - Customizable options
 - Programmable
 - Multistep
 - Ramp
- > AUTO-TEST with visual and audible malfunction alarm
- > AUTO-RANGE function
- > Temperature reading
- > User-enabled viscosity and temperature calibration
- > 10 language options



Standards ASTM D2196 | ASTM D4402 | AASHTO T316 | EN 13302

81-PV0118/A

Rotational viscometer High Performance version

Technical specifications

- Viscosity range: 100–40,000,000 cP
- Rotational speed range: 0.01–250 rpm
- Selectable speeds: 2600
- Resolution:**
 - Using low viscosity adapter: 0.01 cP
 - For viscosity lower than 10,000 cP: 0.1 cP
 - For viscosity equal to or above 10,000 cP: 1cP
- Repeatability: 0.2%

Thermometer features:

- Temperature range: 0 to 100°C; 32 to 212°F
- Resolution: 0.1°C; 0.1722°F
- Precision: ±1°C; ±2°F
- Shipping weight: approx. 8 kg

Ordering information

81-PV0118

Rotational viscometer, standard version, supplied complete with stand, boss head, spindle protection, spindle rack and power supply cable. 100–240 V, 50–60 Hz, 1 ph.

81-PV0118/A

Rotational viscometer, high performance version, supplied complete with stand, boss head, spindle protection, spindle rack, calibration certificate, USB cable, Datalogger software and power supply cable. 100–240 V, 50–60 Hz, 1 ph.

Accessories

(for both versions)

81-PV0118/1

Temperature control unit, temperature range from 5 to 300°C. Complete with set of 4 spindles. 220–240 V, 50–60 Hz, 1 ph.

81-PV0118/1Z

Same as above but 110 V, 60 Hz, 1 ph.

81-PV0118/2

Aluminium disposable test chamber

81-PV0118/3

Stainless steel reusable test chamber

Description

The control unit consists of a heating chamber that works in conjunction with rotary viscometers at high temperatures. According to the specifications of ASTM D4402, viscosity of solid road unfilled asphalts has to be measured at temperatures ranging from 34 to 260°C. The heater

holds the container with the sample, into which a suitable spindle is immersed and driven by the rotary viscometer to measure viscosity. A digital microprocessor control unit assures that the required temperature is maintained.



81-PV0118/A with 81-PV0118/1

DUCTIMETER

Determination of ductility

81-PV10A02

Standard version

81-PV10B02

High performance version

81-PV10C12

Research version

The ductility test is performed for determining the ductility of bituminous materials by measuring the elongation before breaking when two ends of briquette specimens are pulled apart at a specified speed and temperature.

- 81-PV10A02 Standard version complies and exceeds the ASTM D113, D6084, AASHTO T51 and EN 13398 Standards which require the test to be performed in water at a temperature of $25^{\circ} \pm 0.5^{\circ}\text{C}$ (ASTM/AASHTO) or $25^{\circ} \pm 0.2^{\circ}\text{C}$ (EN) at a constant speed of 50 mm/min.
- 81-PV10B02 High performance version also satisfy EN 13589 and EN 13703 which require the test to be performed from 4° to $30^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ at a testing speed adjustable up to 100 mm/min, and the determination of the tensile properties of modified bitumen.
- 81-PV10C12 Research version exceeds all the above mentioned Standards requirements, and it is fully dedicated to research (see page 535).



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main features

- > 4 tension lines (briquette capacity) x 1500 mm
- > Easy and free access to the large testing space
- > Closed-loop PID temperature control system
- > Stainless steel insulated water bath
- > Exclusive in-built thermoregulation system compensating the exchange of heat and cooling, resulting in very strict temperature control, optimized by the connection to chiller (optional)
- > Adjustable speed range from 5 to 100 mm/min
- > High carriage return speed of 500 mm/min for greater productivity
- > Elongation measurement by encoder read on display

Standards ASTM D113 | ASTM D6084 | AASHTO T51 | EN 13398 | EN 13589 | EN 13703

81-PV10A02

Ductility testing machine

Standard version

This model fully satisfies and exceeds ASTM D113, ASTM D6084, AASHTO T51 and EN 13398 requirements. To obtain the required 25°C with $\pm 0.2^\circ\text{C}$ tolerance, circulation of cold water is necessary. A water chiller (see accessory 81-PV1002) is ideal for this and may already be available in the laboratory but mains water can also be used. If the ambient temperature goes over 25°C, as in tropical areas, and cold mains water is not available, the use of a water chiller is mandatory.



Detail of the stainless steel water bath with the protection for the lateral driving screw rods, by stainless steel too.

Water bath

Insulated stainless steel water bath with a heating system located over the entire base surface and a cooling coil (for connection to water mains or chiller) distributed over the three side walls assuring temperature uniformity without water turbulence inside the bath. All parts in contact with water are made of stainless steel.

Carriage displacement

Double-screw rods and mobile carriage enable test speeds from 5 to 100 mm/min. The system also permits the fast return of the carriage at the end of the test (500 mm/min) to reduce dead time and increase productivity. The carriage return is automatic so manual intervention is not required.

Temperature control

- A closed-loop PID system assures constant temperature within $\pm 0.2^\circ\text{C}$.
- Plate-type base heaters give better temperature uniformity.
- The thermoregulation system is based on controlling the

heater (which increases the temperature of the bath) and the flow rate of the cooling coil (which decreases the temperature). This important feature assures control of the temperature within strict limits and permits the use of suitable standard water chillers.

Machine control and elongation measurement

Control panel with digital display to set the testing speed: 5 to 100 mm/min, with the carriage return function. Elongation measurement by encoder.

Optional transparent cover

The machine can be completed with a transparent cover.

Ordering information

81-PV10A02

PAVELAB DUCTI-Meter Ductility testing machine. 4-briquette capacity, 1500 mm carriage travel, 5 to 100 mm/min adjustable testing speed. 230 V, 50-60 Hz, 1 ph. 81-PV10A04 As above but 110 V, 60 Hz, 1 ph.

Upgrading option

81-PV10030

Transparent machine cover

For technical specifications see page 536

DUCTIMETER Determination of ductility



main features

- > 4 tension lines (briquette capacity) x 1500 mm
- > Easy and free access to the large testing space
- > Double drive screw rod
- > Closed-loop PID temperature control system
- > Stainless steel insulated water bath
- > Exclusive in-built thermoregulation system compensating the control, optimized by the connection to chiller (optional)
- > High carriage return speed of 500 mm/min for greater productivity
- > Adjustable speed range from 5 to 100 mm/min
- > PC-controlled using dedicated software
- > Includes a system for measuring forces up to 4x300 N with load cells (see accessories)
- > Temperature range at $25 \pm 0.2^\circ\text{C}$ and from 4 to $30 \pm 0.2^\circ\text{C}$
- > Elongation measurement system by encoder
- > Real-time load and displacement graphics via PC

81-PV10B02

Force-ductility

High performance version

Machine control

By PC (not included).

Water bath

Insulated stainless steel water bath with a heating system located over the entire base surface and a stainless steel cooling coil (for connection to water mains or chiller) distributed over the three side walls assuring temperature uniformity without water turbulence inside the bath. All parts in contact with water are made of stainless steel.

Carriage displacement

Double-screw rods and mobile carriage enable test speeds from 5 to 100 mm/min. The system also permits the fast return of the carriage at the end of the test (500 mm/min) to reduce dead time and increase productivity. The carriage return is automatic, manual intervention is not required.

Temperature control

- A closed-loop PID system assures constant temperature of $25 \pm 0.2^\circ\text{C}$.

-Temperature range from 4 to $30^\circ\text{C} \pm 0.2^\circ\text{C}$ with a water chiller (see accessories).

-Stainless steel cooling coil

-Plate-type base heaters give better temperature uniformity.

-The thermoregulation system is based on control of the heater (which increases the temperature of the bath) and the control of the flow rate of the cooling coil by an electro-valve. This important feature assures control of the

temperature within strict limits and permits the use of suitable standard water chillers.

Load and elongation measurement

Automatic measurement of the elongation by a encoder and of the test load of the four testing lines.

Testing software

- Selection of test parameters (speed, temperature etc.) by PC. The test temperature, however, can be set in advance using the control panel of the machine.
- Test control by PC: Start-Stop-Carriage return
- Specimen failure recognition
- Real-time display of load/elongation graph with advanced visualization options (single or multi-graph).
- Data acquisition and processing conforming to Standards
- Function for multiple test data comparison
- Storage of test data

Water cooling

This model is proposed without a chiller (81-PV1002-04) for use with a suitable cooling system that could be available in the laboratory. It is important however, that this unit is capable of delivering a flow rate of 6 litres/min, 1 bar, at the minimum temperature of 2°C .

See-through cover

Essential for better temperature control of the bath.

Ordering information

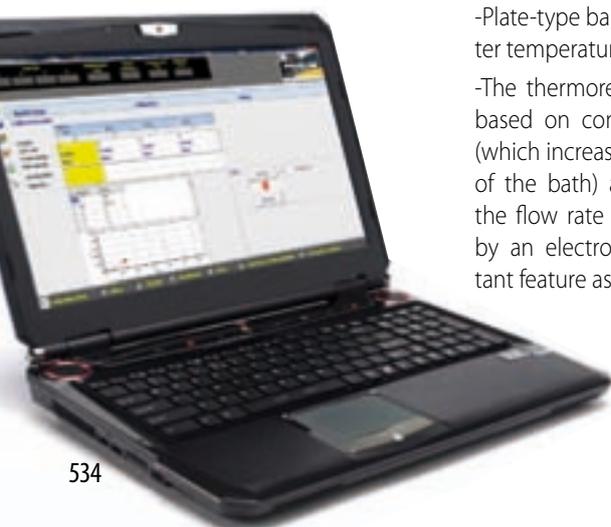
81-PV10B02

PAVELAB DUCTI-Meter High Performance Ductility testing machine.

PC controlled, 4-briquette capacity, 1500 mm carriage travel, adjustable testing speed from 5 to 100 mm/min, thermostatically controlled water bath at $25^\circ\text{C} \pm 0.2^\circ\text{C}$ and from 4° to $30^\circ \pm 0.2^\circ\text{C}$, force measurement facility up to 300 N per line. 230 V, 50-60 Hz, 1 ph.

81-PV10B04

As above but 110 V, 60 Hz, 1 ph.



Typical screenshot of the machine software

For technical specifications see page 536



Additional main features

- > Includes a system for measuring forces up to 2000 N (4x500 N) with load cells (see accessories)
- > Temperature range from -10 to $60 \pm 0.2^\circ\text{C}$
- > Speed range adjustable from 1 to 200 mm/min
- > Extensive use of stainless steel for frame, cover and tank

81-PV10C12

Force-ductility Research version

This research version further increases the high performance of the 81-PV10B02 model by more advanced specifications concerning temperature control, speed range and max. tension force,

together with an extended use of stainless steel: frame, tank, cooling coil and cover. These features make this version ideal for research purposes. See specifications on page 536

As the high performance version 81-PV10B02, this research model is PC controlled using dedicated software.



Typical screenshot of the machine software

Detail of water bath.
Easy and free access
to the large testing
space, common
to all versions



Ordering information

81-PV10C12

PAVELAB DUCTI-Meter
Research Ductility testing machine.
PC controlled, 4-briquette capacity, 1500 mm carriage travel, adjustable testing speed from 1 to 200 mm/min, thermostatically controlled water bath from -10° to $60^\circ \pm 0.2^\circ\text{C}$, force measurement facility up to 500 N per line. 230 V, 50-60 Hz, 1 ph.

81-PV10C14

As above but 110 V, 60 Hz, 1 ph.

Note: Briquette moulds, Load cells and Water cooling system are not included and should be ordered separately. See accessories.



Detail of 81-PV10B02 and PV10C12 with four 81-PV10020 load cells and briquette moulds

Technical Specifications

Models	81-PV10A02 81-PV10A04	81-PV10B02 81-PV10B04	81-PV10C12 81-PV10C14
Conforms to Standards	EN 13398 ASTM D113 ASTM D6084 AASHTO T51	EN 13398 EN 13589 EN 13703 ASTM D113, ASTM D6084, AASHTO T51	EN 13398 EN 13589 EN 13703 ASTM D113, ASTM D6084, AASHTO T51
Machine control by	Digital display panel	PC with dedicated Software (PC not included)	PC with dedicated Software (PC not included)
Thermostatically controlled water bath temperature:	at 25±0.2°C	at 25±0.2°C and from 4 to 30±0.2°C with water chiller (see accessories)	from -10 to 60 ±0.2°C with water chiller (see accessories). PID closed-loop control.
Temperature control system	Heater and cooling coil for connection to cold water or water chiller	Heater and cooling coil for connection to cold water or water chiller	Heater and cooling coil for connection to cold water or water chiller
Structure	Stainless steel tank	Stainless steel tank	Extensive use of stainless steel for frame, tank, cooling coil and cover
Briquette capacity	4		
Max carriage travel	1500 mm		
Testing speed	Adjustable from 5 to 100 mm/min	Adjustable from 5 to 100 mm/min	Adjustable from 1 to 200 mm/min
Elongation measurement by	Encoder (Linear scale)	Encoder (Optical system)	Optical system
Max. load and tension load measurement	--	1200 N (4 x 300 N) by load cells (500N capacity.) (Cells not included. See accessories.)	4 x 500 N by load cells (2000 N in total). (Cells not included. See accessories.)
Tension load/elongation graph	--	Real-time graphs by PC	Real-time graphs by PC
Carriage return speed	500 mm/min		
Power rating (approx.)	1200 W		
Transparent cover	not included	included	included
Overall dimensions	(l x d x h) 2434 x 412 x 385 mm		
Weight (approx.)	100 Kg		

Accessories

Ductility briquette molds

81-B0141

Briquette mould conforming to EN 13389

81-B0141/A

Briquette mould conforming to ASTM D6084 and EN 13589



Briquette moulds

81-B0141/B

Briquette mould conforming to ASTM D113 and AASHTO T51

81-B0142

Ductility mould plate

Water chillers

Specifications

Pump water flow (maximum): 6 litres/min
Dimensions: 450 x 450 x 825 mm

(w x d x h)

Weight: approx. 35 kg

81-PV1002

(for 81-PV10B02)

Water chiller, flow rate 6 litres/min, 2°C minimum temperature. 1200 W, 230 V, 50-60 Hz, 1 ph.

81-PV1004

(for 81-PV10B04)

Water chiller, same as above but 110 V, 60 Hz, 1 ph.

81-PV1012

(for 81-PV10C12)

Water chiller, flow rate 6 litres/min, -20°C minimum temperature. 1200 W, 230 V, 50-60 Hz, 1 ph.

81-PV1014

(for 81-PV10C14)

Water chiller, flow rate 6 litres/min, -20°C minimum temperature. 1200 W, 110 V, 60 Hz, 1 ph.

Load cells

(for use with 81-PV10B02, 81-PV10B04, 81-PV10C12 and 81-PV10C14 versions only)

81-PV10020

High precision strain gauge load cell 0-500 N capacity.

Machine base

81-PV10010Support base for ductility machine, stainless steel table
Dimensions (l x d x h):
2370 x 600 x 670 mm
Weight: approx. 50 kg

81-PV1002

Determination of flexural creep stiffness



Main features

- > Durable, corrosion-resistant construction
- > Computerized control, data acquisition and analysis
- > PID temperature controller with digital display
- > Two independent platinum RTDs for precise temperature control
- > Mechanically-refrigerated cooling bath with environmentally-safe non-CFC coolant
- > Integral LVDT and temperature compensated load cell for accurate test results
- > Includes complete calibration kit with carrying case
- > Includes ASTM/AASHTO-compliant specimen moulds
- > PC and software included

81-PV5902

Standards ASTM D6648 | AASHTO T313 | EN14771

81-PV5902

Bending Beam Rheometer (BBR)

The BBR System consists of a fluid bath base unit, a three-point bending test apparatus which is easily removed from the base unit for specimen loading and unloading, an external cooling unit with temperature controller, and a calibration hardware kit with carrying case. The system is supplied complete with PC and testing software.

Ordering information

81-PV5902

Bending Beam Rheometer (BBR).
230 V, 50-60 Hz, 1 ph.

81-PV5904

As above but 115V, 50-60 Hz, 1 ph.

Spares

81-PV59/01

Extra aluminium beam mould.

81-PV59/02

Silicone rubber mould, 2-gang.

Technical specifications

- Load frame: integral stainless steel frictionless construction
- Loading shaft: in-line stainless steel with blunt point
- Load cell: 500 g (temperature-compensated)
- Mechanical overload protection: standard
- Test cycle times: cycle times for pre-load, recovery and test load are completely operator-adjustable
- Test weights: calibrated and traceable
- Sample supports: 25 mm (0.98 in.) diameter stainless steel spaced 101.6 mm (4.00 in.) apart
- LVDT displacement transducers: 6.35 mm (0.25 in.) calibrated range to provide 2 µm resolution throughout testing and verification range
- Cooling unit: included (non-CFC refrigerant)
- Recommended cooling bath fluid: non-flammable ethylene glycol mixture
- Operating temperature: ambient to -40 °C (-40°F)
- Temperature measurement: Platinum RTD
- Compressed air requirement: 0.34 MPa (50 psi) clean, dry air supply required

Test load

- Variable test range from 0 to 200 g standard
- System maintains required test load to within ±0.5 g throughout the test cycle

Testing software

- Display of load, displacement and bath temperature provides ease of setup and operation
- Real-time displacement, loading, and temperature graphs are displayed during the test cycle and can be re-scaled as needed for easy viewing

Shipping weight: 115 kg approx.



Sample supports (moulds) and Calibration kit

Determination of the resistance to hardening under the influence of heat and air: Rolling thin-film oven



main features

- > Touch-screen display with 4.5" color control panel, including timer function, visual warnings and digital air flow indicator.
- > Full conformity to temperature specifications (time to reach target temperature after switch on, target temperature adjustment after samples insertion) from the standards
- > Carousel rotation with closed-loop controlled speed
- > Safety features: Automatic over-temperature switch, door switch, pilot lamp and alarm for door open with fan still running; magnetothermic switch
- > High quality stainless steel structure, internal and external
- > Door with double-glazed window
- > Door locking system allowing easy opening also with busy hands



Detail of external stainless lining "linen patterned" resistant to scratches and shocks

Standards ASTM D2872 | AASHTO T240 | EN 12607-1

Bitumen ovens for rolling thin-film oven test (RTFOT)

Two versions are available:

- 81-PV1612 conforming to ASTM/AASHTO standards
- 81-PV1622 conforming to EN standard

The only difference between the two models is the inside dimension of the testing chamber.

These ovens are used for measuring the effect of heat and air on a moving film of semi-solid bituminous materials. The internal chamber is made from stainless steel, insulated with fiberglass or similar, with an external frame made from engine-turned stainless steel and a door with a centrally located window. Special attention has been given to the safety features which conform to CE requirements. The oven is supplied complete with flow meter, ASTM 13C thermometer and 8 heat resistant glass containers (64 mm high x 140 mm diameter). The oven must be connected to a compressed air source supplying 2 bar maximum pressure. If not available in the laboratory we recommend the 81-PV0161/11 Dia-

phragm pump. See accessories.

The ASTM and EN versions are basically identical except for a small difference of the internal dimensions of the testing chamber.

Power: 3000W
External dimensions: 600 x 600 x 900 mm (w x d x h)
Weight: approx. 50 kg

Ordering information

ASTM/AASHTO versions:

81-PV1612

PAVELAB RTFOT, Bitumen oven for rolling thin film oven test. ASTM version. 230 V, 50 Hz, 1 ph.

81-PV1613

As above but 220 V, 60 Hz, 1 ph.

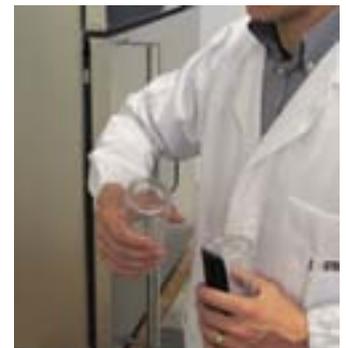
81-PV1614

As above but 110 V, 60 Hz, 1 ph.

EN version:

81-PV1622

PAVELAB RTFOT, Bitumen oven for rolling thin film oven test. EN version. 230 V, 50 Hz, 1 ph.



Door locking system allowing easy opening also with busy hands



Accessories

Diaphragm pump

81-PV0161/11

Diaphragm pump 6 litres/min at 2.4 bar. 230 V, 50 Hz, 1 ph.

81-PV0161/11Z

As above but 110 V, 60 Hz, 1 ph.

81-PV0161/11Y

As above but 220 V, 60 Hz, 1 ph.

Description

Free air displacement 6 litres/min, maximum pressure 2.4 bar (when used as an air compressor), ultimate vacuum 100 mbar (when used as a vacuum pump). Complete with needle valve. Power: 65 W
Weight: approx. 1.9 kg

Spares

81-PV0161/10

Spare glass container

82-PV0160/10

ASTM 13C Thermometer, +155 to +170°C, 0.5°C divisions.

Rotary evaporation apparatus for determining the resistance to hardening under the influence of heat and air: RFT method

Standards EN 12607-3

RFT test method description

100 g of bituminous binder is introduced into the 1000 ml rotating flask of the rotary evaporator. When the test temperature reaches 165°C a flow of air at ambient temperature is introduced into the rotating flask. The air flow hardens the sample and the hardening effect is evaluated by measuring penetration, softening point and dynamic viscosity of the treated bituminous binder sample.

General description

The rotary evaporator is equipped with a distillation flask, a variable speed motor capable of rotating the distillation flask at a rate adjustable from 20 to 270 rpm, a condenser, solvent recovery flask, and a heated oil bath. The angle of the distillation flask from the horizontal to the bath is approximately 15°. Supplied complete with a 1000 ml distillation flask.

Ordering information

75-B0165

Rotary evaporation apparatus. 230 V, 50 Hz, 1 ph.

75-B0165/Z

As above but 110 V, 60 Hz, 1 ph.

Accessories

75-B0165/4

Glass evaporating flask, 1 litre capacity.

81-PV0161/11

Diaphragm pump, 6 L/min at 2.4 bar. 230 V, 50 Hz, 1 ph.

Detailed information on page 538

75-B0161/8

Flow control device to monitor the air flow rate.

86-D1445

Support base 200 x 130 mm with rod.

86-D1450

Double sleeve clamp.

86-D1453

Clamp, large size.

86-D1111

300 mm diameter desiccator complete with plate.

86-D0819

Silica gel, 1 kg.



75-B0165

Effect of heat and air and loss on heating of oil and bituminous compounds: thin-film oven test (TFOT)

Standards EN 12607-2 | EN 13303 | ASTM D6 | ASTM D1754 | AASHTO T47 | AASHTO T179 | BS 2000 | NF T66-011 | UNE 7110 | CNR 50

TFOT bitumen oven

Used for determining the loss in mass (exclusive of water) of oil and bituminous compounds and the effect of heat and air on a film of semi-solid bituminous material. The oven has to be used with the correct accessory depending on which testing standard is being followed:

- For EN 13303, ASTM D6, AASHTO T47, BS 2000, NF T66-011, CNR No. 50 select accessory 81-B0160/1;
- For EN 12607-2, ASTM D1754, AASHTO T149, UNE 7110 select accessory 81-B0160/2.

See Accessories.

Technical specifications

- Internal chamber made from stainless steel
- Insulation with fiberglass or similar
- External frame made from enameled steel
- Temperature control by contact thermometer
- Door with double panel window
- Power: 1300 W
- Inside dimensions: 330 x 330 x 330 mm
- Outside dimensions: 500 x 500 x 900 mm
- Weight: 35 kg approx.

Ordering information

81-B0160/C

TFOT bitumen oven. 230 V, 50 Hz, 1 ph.

81-B0160/CY

As above but 220 V, 60 Hz, 1 ph.

81-B0160/CZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

81-B0160/1

Rotating shelf with 9 containers measuring 55 mm diameter x 35 mm height.

81-B0160/2

Rotating shelf, 250 mm diameter.

82-B0160/10

Loss on heat thermometer, +155 to 170°C, 0.5°C graduations, ASTM 13C. Conforms to all standards.



81-B0160/C



81-B0160/1 and 81-B0160/2

Accelerated long term ageing conditioning by a Pressure Aging Vessel (PAV)



main features

- > Large touch screen controller
- > View data charts and graphs right on the screen
- > Network ready
- > When connected to a network, access the PAV screen with an APP and operate remotely from a Smart Phone, Tablet, iPad, iPhone, or other PC
- > USB port on the front to download test data and perform software upgrades
- > Slanted screen design for improved visibility
- > Greater temperature range: 80 to 115°C
- > English, Spanish, French; German, Russian, Italian, Mandarin, and Arabic language option

Ordering information

81-PV2602

Pressure aging vessel. 230-240 V, 50-60 Hz, 1 ph.

81-PV2604

As above but 110V, 60 Hz, 1 ph.



PAV App for smart-phone

81-PV2602

Standards ASTM D6521 | AASHTO R28 | EN 14769

This apparatus is designed to simulate in-service oxidative aging of asphalt binder by exposure to elevated temperatures in a pressurized environment. This improved PAV model simplifies the running and documenting of asphalt binder aging operations.

The apparatus includes:

- Touch screen controller with front panel user interface with easy to use step-thru operation
- Bench top unit with integral vessel/oven design with top opening door
- CE certified vertical stainless steel pressure vessel with encased band heaters and integral pressure measurement control
- Thermo-regulation: Proportional control with integral and derivative function
- Network ready with remote capabilities: view and control the PAV with an APP designed for smart phones, tablets, iPads, iPhones, or other PCs
- Set time and date for automatic preheat functions
- Platinum RTD temperature measurement
- Includes 10 AASHTO T179 specimen pans
- Precision anodized aluminium sample rack
- Hex socket wrench, ½ in. drive, with 4 in. extension
- Includes Specimen Loading/Unloading Tool
- Dimensions: approx. 760 x 460 x 762 mm (hxdxw)
- Shipping weight: approx. 200 kg

Vacuum Degassing Oven for PAV - Pressure Ageing Vessel

The ASTM D6521 and AASHTO R28 make degassing of the PAV-aged asphalt samples mandatory. This vacuum degassing oven conforms fully with these Standards.



Stainless steel construction, holds up to 4 specimen containers, self contained automatic vacuum system, high precision controller featuring a digital display indicating time, temperature and the current stage of each process, maintains temperature up to 170° C with an accuracy of $\pm 5^{\circ}\text{C}$.

Dimensions: approx. 610 x 406 x 304 mm (w x d x h)

Shipping weight: approx. 85 kg

Ordering information

81-PV0260/1

Vacuum degassing oven. 230 V, 50 Hz, 1 ph.

81-PV0260/1Z

As above but 110V, 60 Hz, 1 ph.

Rheological properties of asphalt binders



main features

- > Designed specifically for Asphalt Testing
- > Optimized for high throughput
- > Meets and exceeds AASHTO T315 and all ASTM requirements
- > Simple to use, proven design
- > Precise and stable temperature control (patented)
- > Rapid sample equilibrium to set temperature
- > Significant reduction in need for regular re-calibration of temperature
- > Pre set gaps for AASHTO tests - no zeroing necessary
- > Automatic Expansion Compensation keeps gap constant with temperature
- > Compact, integrated unit with small footprint
- > Dedicated AASHTO specification software package including:
 - Pass/Fail medium temperature original binder test (T315-11)
 - Pass/Fail high temperature RTFO binder(T315-11)
 - Pass/Fail high temperature PAV binder(T315-11)
 - Linearity test (T315-12) - Grade determination test (R29-02)
- > Optional research grade software

81-PV6002

81-PV6002

Dynamic Shear Rheometer

Standards AASHTO T315 | ASTM D7175 | ASTM D7405 | EN14770

The DSR Rheometer is used for the determination of the elastic and viscous behavior of a bituminous binder.

Compact integrated unit designed specifically for ease of use and robustness in high throughput asphalt binder test environments. Air bearing and mechanical bearing options to provide robust and cost-effective measurement platforms for any industrial laboratory or remote field testing location.

- Integrated fluid immersion cell specifically based on patented principle for temperature control of highly thermally-sensitive asphalt or bitumen samples.

- Rapid thermal equilibration and elimination of thermal gradients in the sample - essential for consistent and reliable data, and optimized sample throughput.
- Excellent temperature stability and accuracy, with a resolution of $\pm 0.01^\circ\text{C}$.
- Rapid, robust manual gap set, with pre-set gaps for AASHTO tests for simplicity of use.
- Active thermal mode to ensure constant gap is maintained for all temperature test points.
- Plate measuring systems (both upper and lower plates) designed to comply with industry Standards (AASHTO).
- Dedicated AASHTO specification QC software package (TruGrade) available.

Specifications

- Torque range: 10 μNm to 10 mNm
- Torque range (mechanical bearing model): 50 μNm to 10 mNm.
- Torque resolution: 1 μNm
- Position resolution: 1 μrad
- Frequency range: 10 μHz to 100 Hz
- Temperature control range (total immersion cell): 5 $^\circ\text{C}$ to 95 $^\circ\text{C}$ (range can be extended depending on circulator fluid)
- Temperature accuracy (total immersion cell): better than $\pm 0.1^\circ\text{C}$.
- Dimensions (with temperature control unit): 60cm (H) x 23cm (W) x 35cm (D).
- Weight (with temperature control unit): 18 kg.
- Nominal operating voltage: 110 V or 220 V
- Operating temperature: 15 $^\circ\text{C}$ – 40 $^\circ\text{C}$
- Operating humidity: 35% - 80% non-condensing.

Ordering information

81-PV6002

DSR Dynamic Shear Rheometer. 110-220 V, 50-60 Hz, 1 ph

Accessories

81-PV6000/1

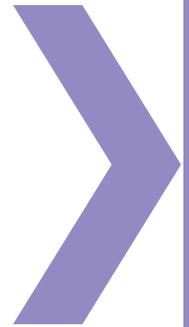
Kit for multiple stress creep recovery (MSCR) test to ASTM D7405

81-PV6000/2

Two silicone rubber moulds for DSR

General equipment

- 82 | Measuring instruments**
- 83 | Core drilling equipment**
- 86 | General laboratory apparatus**



Testing equipment for the construction industry includes a large number of items that cannot be located in a specific application field such as concrete, cement, asphalt etc. but are for general use or for more than one applications. Furthermore, the ISO 9000 standards concerning Quality Assurance Systems require a number of measuring instruments to be used in central or field laboratories to check the testing equipment and environmental conditions. All these items, along with core drilling equipment and mobile laboratories, have been grouped in this large “General” family.

82 Measuring instruments

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83 Core drilling equipment

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86 General laboratory apparatus

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Verification of force transfer

Standards EN 12390-4

The EN 12390-4 concerning specifications for compression testing machines, describes procedures for Verification of force transfer, including:

- Accuracy of force indication
- Self-alignment of upper machine plate
- Restraint of movement of the upper plate

These verifications can be performed using the 82-E0105/1 strain gauged cell connected to the 82-P0804/E tester. The data can be processed automatically on a PC with the testing software. The verification of load measurement accuracy may be limited to the Accuracy of force indication using the appropriate load cell (82-E0100/L5 to 82-E0100/500) with a suitable tester such as our model 82-P0804/E. A detailed description of these items follows.

Can be performed with the following equipment:

Strain gauge load cell

The device consists of a 3000 kN capacity strain gauged column, 100mm diameter x 200mm high, with hardness and tolerances conforming to Standard. The column is gauged with temperature-compensated electrical resistance strain gauges. Four complete bridges are applied, each centered at one of the ends of a pair of orthogonal diameters half-way up the cylinder.

Each bridge consists of two elements measuring axial strain and two measuring circumferential strain.

The column is supplied complete with auxiliary platen and spacers for easy and precise placing of the column either centrally or 6 mm displaced from the centre.

It must be used with a dedicated strain measuring apparatus such as, for example, our model 82-P0804/E.

The column can also be used as a standard load cell to test the accuracy of force indication.

Specifications

- Non linearity and hysteresis: $\pm 0.1\%$ FS
- Repeatability: 0.03%
- Uncertainty: 0.05%
- Dimensions: 100 mm diameter x 200 mm height
- Weight approx.: 17.5 kg

Ordering information

82-E0105/1

Strain gauged column/load cell, 3000 kN capacity



82-P0804/E with 82-E0105/1 Strain gauged column and 82-P0172/M 24 column printer. The strain gauged column is supplied complete with auxiliary platen and spacers for an easy and precise placing of the column either centrally or 6 mm displaced from the centre. It can also be used as a 3000 kN load cell for force verification.



82-E0105/1. Strain gauged column. Carrying case included.

Digital tester for Force Transfer verification

This tester, when connected to the 82-E0105/1 column and to a PC and printer using the specific software 82-P0804/E1 and 82-P0804/E2,



Force Transfer verification certificate. The complete document includes another 3 certificates for upper plate self-alignment, alignment and restraint of movement.



provides completely automatic data acquisition, processing and printing of the verification test certificates concerning either the accuracy of force indication or the force transfer verifications. Whilst operating, acquired data are displayed on the graphic screen and then downloaded via the serial port to the PC and printer. The system can also be connected to a 24-column serial printer (e.g. our model 82-P0172/M) or download the test results for further processing using programs developed by the user.

Supplied complete with carrying case that can also contain the 82-P0172/M printer.

Specifications

- Four channels
- Effective resolution:
 - 1/128,000 used with 82-E0105/1 strain gauged column
 - 1/256,000 used with load cells
- Large permanent memory to store data and test results
- Graphic display 240 x 128 pixel
- Bridge impedance: 350 ohm
- Dimensions: 250 x 220 x 150 mm
- Weight approx.: 2 kg

Ordering information

- 82-P0804/E**
Force transfer digital tester. 230 V, 50-60 Hz, 1 ph.
- 82-P0804/EZ**
Same as above but 110 V, 60 Hz, 1 ph.

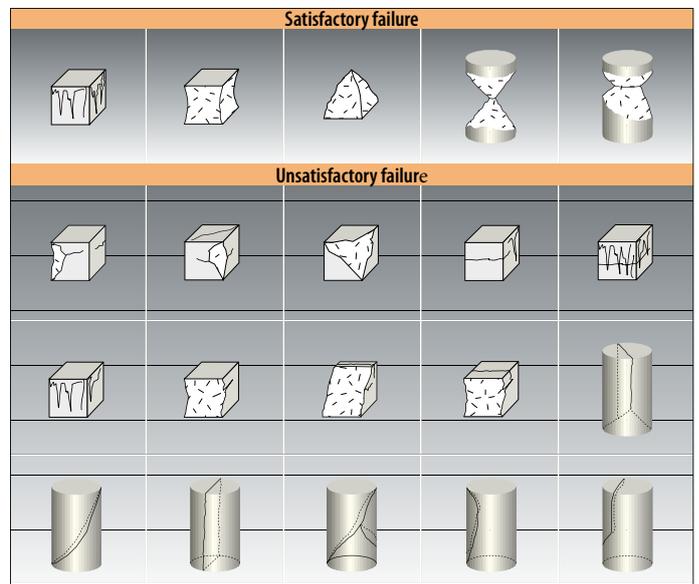
Accessories

- 82-P0804/E1**
Testing software for the automatic data acquisition and processing of the plate self-alignment and restraint of movement verification (stability) of compression testers.
- 82-P0804/E2**
Testing software for the automatic data acquisition and processing of force measurements for calibration of compression testers.
- 82-P0804/E3**
Force transfer verification MS Excel spreadsheet
- 82-P0804/E4**
Force calibration verification MS Excel spreadsheet
- 82-P0172/M**
24-column serial printer. 110-230 V, 50-60 Hz, 1 ph.
- 82-P0172/1**
Serial cable for connection of 82-P0172/M printer
- 82-Q0800/3**
RS 232 serial cable and RS 232 to USB adapter

Importance of the verification of force transfer

The result of a compression test on a cube or cylinder specimen is affected to a considerable extent by a non-uniform application of load on the surface of the sample – this results in an exceptional force being applied to the material causing premature failure. For this reason the calibration certificate for the force measurement instrument mounted on the machine does not guarantee the accuracy of the strength result.

Usually a non-uniform application of load leads to unsatisfactory failures, as shown below, which cannot be related to a known loss of strength. EN 12390-4 includes a testing procedure which verifies the self-alignment of machine components and the restraint on movement of the upper platen using a special strain gauged column (e.g. 82-E0105/1) connected to a suitable data acquisition and processing system (e.g. 82-P0804/E).



Force verification and calibration apparatus

Standards EN 12390-4, EN ISO 376, ASTM C39, ASTM E4

The procedures detailed in these Standards can be performed with the following equipment:

- Load cell, to be selected according to the maximum capacity of the compression and/or flexural tester. See models 82-E0100/L5 to 82-E0100/500.
- Digital tester for force verification. See model 82-P0801/E with optional accessories.

Load cells

These high performance cells have been specially designed to meet the stringent requirements of EN, ISO and ASTM standards for calibration of compression testing machines. The cells must be connected to a suitable Digital tester such as the Digimax Plus (82-P0801/E).

Load cells connected to the Digi-

tal tester can be supplied complete with an official or traceable calibration certificate.

Specifications

- Accuracy: Class 1 EN ISO 376
- Linearity: $\leq \pm 0.05\%$ F.S.
- Hysteresis: $\leq \pm 0.05\%$ F.S.
- Repeatability:
0°, 120°, 240°: $\leq \pm 0.145\%$ F.S.
- Reversibility: $\leq \pm 0.240\%$ F.S.
- Zero: $\leq \pm 0.030\%$ F.S.
- Zero balance: $\leq \pm 1\%$ F.S.
- Supply voltage: 10 V
- Material: stainless steel
- Connector type: MIL-C-5015 7 poles male

Ordering information

82-E0100/L5

Load cell, 5 kN capacity, complete with spherical loading head and carrying case.

82-E0100/L30

Load cell, 30 kN cap., complete with spherical loading head and carrying case.

82-E0100/5

Load cell, 50 kN capacity, complete with spherical loading head and carrying case.

82-E0100/10

Load cell, 100 kN capacity, complete with spherical loading head and carrying case.

82-E0100/30

Load cell, 300 kN capacity, complete with carrying case.

82-E0100/50

Load cell, 500 kN capacity, complete with carrying case

82-E0100/100

Load cell, 1000 kN capacity, complete with carrying case.

82-E0100/200

Load cell, 2000 kN capacity, complete with carrying case.

82-E0100/300

Load cell, 3000 kN capacity, complete with carrying case.

82-E0100/500

Load cell, 5000 kN capacity, complete with carrying case.

82-E0100/SIT1

Official ACCREDIA (ex SIT) calibration certificate for load cell 30 to 1000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT2

Official ACCREDIA (ex SIT) calibration certificate for load cell 2000 to 5000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT3

Official ACCREDIA (ex SIT) calibration certificate for load cell 5 kN capacity, connected to the relevant Digital tester.

82-E0100/TRC

Traceable calibration certificate for load cells from 5 kN to 5000 kN capacity, connected to the relevant Digital tester.

Note: Load cells of other capacities are available on request.

Model	Capacity kN	Dimensions, mm (dia. x height)	Weight approx., kg
82-E0100/L5	5	57x117*	1.5
82-E0100/L30	30	82x149*	4.2
82-E0100/5	50	82x149*	4.2
82-E0100/10	100	82x149*	4.2
82-E0100/30	300	129x200	10
82-E0100/50	500	129x200	12
82-E0100/100	1000	129x200	14
82-E0100/200	2000	129x200	16
82-E0100/300	3000	129x200	18
82-E0100/500	5000	168x200	35

*Including spherical loading head



Load cells from 5 kN to 100 kN complete with spherical loading head



Load cells from 300 kN to 5000 kN



Digital tester for force verification

This system, when connected to any strain gauge load cell, provides data for the force verification of the testing machine. Data can be printed by a standard serial printer such as our model 82-P0172/M, using a serial cable (82-P0172/1, see accessories). Alternatively, data can be downloaded to the PC for processing and, using the relevant MS Excel template (82-P0804/E4, see accessories), for producing a test certificate conforming to the relevant Standard; for example the EN 12390-4 or ASTM C39 for concrete compression testers.

The tester, connected to one of our load cells 82-E0100/L5 to 82-E0100/500 (see Load cells), can be supplied complete with an official or traceable calibration certificate. See ordering information. Each cell must be calibrated separately and the certificate refers to one cell only.

Main features

- High effective resolution: 256,000 points (less than 0.05% of full scale)
- Large graphic display: 240 x 128 pixels
- Language selection
- Large permanent memory
- Two RS 232 serial ports for PC and printer
- Remote control
- MS EXCEL Template available for producing calibration certificates
- Clock calendar chip
- Dimensions: 250 x 220 x 150 mm
- Weight approx.: 2 kg

Load cell (from 300 kN up to 5000 kN), digital tester 82-P0801/E and printer 82-P0172/M

Ordering information

82-P0801/E

Digimax Plus, calibration tester, for use with load cells or transducers, 256,000-point effective resolution. 230 V, 50-60 Hz, 1 ph.
82-P0801/EZ
 Same as above, but 110 V, 60 Hz, 1 ph.

Accessories

82-P0172/M

24-column serial printer. 110-230 V, 50-60 Hz, 1 ph.

82-P0800/C

Carring case for DIGIMAX Plus and printer

82-P0172/1

Serial cable for connection of 82-P0172/M printer

82-Q0800/3

RS 232 serial cable and RS 232 to USB adapter

82-P0804/E4

Force calibration verification MS Excel spreadsheet



Load cell (from 5 kN up to 100 kN)

Automatic calibration and force verification procedure

In order to perform automatic calibration of our compression machines, our external digital readout units (P0801/E or 82-P0804/E) can be directly connected on one side to the serial port of the PC controlling the machine via DATAMANAGER software and on the other side to a suitable reference load cell. The software displays the true force both in divisions (bits) and in engineering units (kN). The operator may enter a sequence of load levels and, once the true force levels are reached by reading on the dedicated software window, the corresponding electronic value in divisions will be saved, thus filling automatically the calibration table and creating the calibration curve.

In addition, once the calibration is performed, it's also possible to carried out the calibration verification. For the Automax E-Modulus control console, by editing a table of load target values, the machine will reach them automatically and will store all the corresponding values in divisions calculating the errors in comparison with true force. This operation can be repeated for up to three cycles so that a complete calibration certificate will be ready to be print out being saved in Controls excel format.



Final Force calibration certificate. The complete document includes another two certificates for the data recording and processing.

Load and deformation measurement

Strain gauge load cells, 2.5 to 100 kN capacity

These load cells provide a very accurate electrical signal that is strictly proportional to the applied load. They can be used for various test applications with low capacity universal testers.

Two versions are available: standard, and complete with a traceable certificate of calibration.



82-P0375 / 82-P0375/C

Ordering information

82-P0370

Strain gauge load cell, 2.5 kN capacity.

82-P0373

Strain gauge load cell, 10 kN capacity.

82-P0375

Strain gauge load cell, 50 kN capacity.

82-P0376

Strain gauge load cell, 100 kN capacity.

Note: all models can be supplied, on request, with a traceable calibration certificate. For ordering, add 'C' after the relevant product code (e.g. 82-P0370/C).

Technical specifications

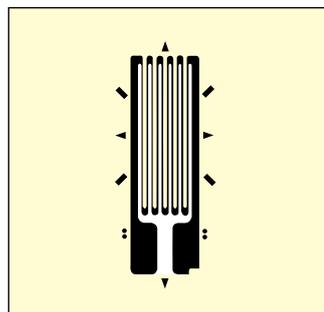
Product code	Capacity (kN)	Top and lower connection thread	Dimensions (mm, dia. x h)	Weight (kg, approx.)
82-P0370	2.5	M20 x 1.5	57 x 80	1.5
82-P0373	10	M20 x 1.5	57 x 80	1.5
82-P0375	50	M20 x 1.5	57 x 80	1.5
82-P0376	100	M30 x 2	82 x 110	4.45
82-P0379	200	M42 x 3	82 x 150	5

Strain gauges

Strain gauges provide a very accurate electrical signal which is directly proportional to the deformation of a rock or concrete specimen submitted to an application of load. The gauges can be applied to the specimen surface using a special adhesive-catalyst agent and other accessories, which are all included in the 82-P0399/B Strain gauge application kit.

Up to four ¼ bridge strain gauges and eight ½ bridge gauges can be connected, via one or two 82-P0398 interfaces, to the AUTOMAX E, MCC Multitest and ADVANTEST control consoles.

Strain gauges can also be connected, via one or two 82-P0398 interfaces, to a suitable data logger such as the Datalog 82-P9008. For more information see pages 552



82-P0399/B



82-P0398

Technical specifications

Product code	82-P0390	82-P0391	82-P0392	82-P0393	82-P0396
Gauge width, mm	0.9	1.2	2.3	1	1
Gauge length, mm	10	20	30	60	120
Resistance, ohm	120	120	120	120	120
Bridge	¼	¼	¼	¼	¼
No. of gauges per pack	10	10	10	10	10

Ordering information

82-P0390

Strain gauges, 10 mm gauge length. Pack of 10.

82-P0391

Strain gauges, 20 mm gauge length. Pack of 10.

82-P0392

Strain gauges, 30 mm gauge length. Pack of 10.

82-P0393

Strain gauges, 60 mm gauge length. Pack of 10.

82-P0396

Strain gauges, 120 mm gauge length. Pack of 10.

82-P0399/1

Connecting terminals, 50-pair sheet.

82-P0399/B

Strain gauge application kit comprising: conditioner, neutralizer, acetone, two tweezers, adhesive and catalyst agent, 100m of bipolar cable, solder, electric welder and carrying case.

82-P0398

Compensation device for up to 4 Wheatstone bridge gauges with ¼ or ½ bridge setup.

Accessories

82-P0399/P22

Adhesive and catalyst agent for gluing strain gauges to the specimen. (Part of kit 82-P0399/B.)

Load measuring rings

Load rings can be used for load measurement and for calibration of testing machines. All models are made from special alloy steel and are supplied complete with a 5 x 0.001 mm dial gauge. Repeatability is within 0.2% and accuracy is held within ±1% over the upper 80% of the full range.

The load rings can be supplied in different versions depending upon the application and the machine to be used, as shown in the table below.

Models with the suffix "/F" are fitted with a special stem brake unit which maintains the maximum reading after the failure of the specimen.

All load rings are supplied with a calibration chart.

Accessories

28-WF1049

Connector for load rings in triaxial applications.

82-T1000/9

Adapter to connect the load rings, 1 to 10 kN cap., to the crosshead of CBR/Marshall, Multispeed and Uniframe 50-100 kN testers.

82-T1050

Suspension ball seat for load rings.



27-WF1003/ST



82-T1009

Technical specifications

Product code	Load ring capacity (kN)	Application	Dial gauge resolution (mm)	Weight (kg, approx.)
28-WF6450	1	Triaxial	0.001	1.2
28-WF6451	2		0.001	1.4
28-WF6452	5		0.001	1.7
28-WF6453	10		0.001	2.2
27-WF1002/ST	2	Shear	0.001	1.4
27-WF1003/ST	3		0.001	1.7
82-T1007/FC⁽¹⁾	30	CBR/Marshall testers	0.01	3.5
82-T1007/F⁽¹⁾	30		0.001	3.5
82-T1009	50		0.001	3.9
82-T1009/C	50		0.01	3.9
82-T1009/F⁽¹⁾	50		0.001	3.9
82-T1009/FC⁽¹⁾	50		0.01	3.9

(1) Fitted with a stem brake



82-T1007/F

Dimensions: 182 mm diameter x 214-230 mm height.

Pressure and deformation measurement

Pressure transducers

These provide a very accurate electrical signal that is strictly proportional to the pressure of the hydraulic circuit of the testing machine or apparatus. The transducers use a full Wheatstone bridge circuit and feature fully sealed stainless steel pressure chambers and diaphragms. The 50-Q50/PT model, mainly used for compression testing frames, is supplied complete with U-shaped metal protection. Models 28-WF6300 to 28-WF6302 are mainly used for triaxial tests. See page 87

Technical specifications

- Accuracy: $\pm 0.5\%$
- Resolution: infinite
- Operating temperature range: -40 to +100°C
- Sensitivity: 2mV/V applied (nominal)
- Full scale output: 20 mV nominal
- Cable: 4 core PVC insulated, 1 m length
- Connection thread: ¼ BSP
- Weight: 150 g approx.

Ordering information

28-WF6300

Pressure transducer, 0 - 10 bar range.

28-WF6301

Pressure transducer, 0 - 20 bar range.

28-WF6302

Pressure transducer, 0 - 35 bar range.

82-P0050

Pressure transducer, 0 - 50 bar range.



50-Q50/PT, 700 bar pressure transducer complete with protection

82-P0100

Pressure transducer, 0 - 100 bar range.

82-P0200

Pressure transducer, 0 - 200 bar range.

82-P0350

Pressure transducer, 0 - 350 bar range.

82-P0500

Pressure transducer, 0 - 500 bar range.

82-P0700

Pressure transducer, 0 - 700 bar range.

50-Q50/PT

Pressure transducer, 0 - 700 bar range complete with U-shaped metal protection.

82-P0349/ELT

Connecting cable for pressure transducer. Suitable for Smart-Line, Sercomp, MCC, Advantest control consoles and Compact-Line Wizard, Digimax and Pilot compression machines.

Note: all models can be supplied, on request, with a traceable calibration certificate. For ordering, add '/C' after the relevant product code (e.g. 82-P0700/C).



82-P0349/ELT, suitable for Smart-Line, Automax E, MCC, Advantest control consoles and Compact-Line Wizard, Digimax and Pilot compression machines

Linear potentiometric transducers

These provide an electrical signal that is proportional to the displacement of the linear shaft, which is housed in a non-corrodible metal case. The extremely low spring force on the shaft and the excellent linearity make these transducers ideal for laboratory use.

Two versions are available: standard, and complete with a traceable certificate of calibration.

Other models are available for use in triaxial tests. See page 89

Technical specifications

- Input voltage: 10 V DC
- Output: from 0 to 10 V DC
- Repeatability: better than 0.002 mm
- Accuracy: better than 0.002 mm
- Connector: 6-pin
- Weight: 150 to 220 g approx.

Ordering information

82-P0320

Linear potentiometric transducer, 10 mm travel.

82-P0322

Linear potentiometric transducer, 25 mm travel.

82-P0324

Linear potentiometric transducer, 50 mm travel.

82-P0326

Linear potentiometric transducer, 100 mm travel.

Note: all models can be supplied, on request, with a traceable calibration certificate. For ordering, add '/C' after the relevant product code (e.g. 82-P0320/C).



82-P0700, 700bar pressure transducer with 82-P0349/ELT connection cable



82-P0324

Linear LVDT transducers

These high-precision displacement transducers are controlled by the position of a magnetic core which provides an output of voltage that is proportional to the position of the transducer stem.

Two versions are available: standard, and complete with a traceable certificate of calibration.

Technical specifications

- Input voltage: 10V DC
- Resolution: infinite
- Linearity: 0.30%
- Connector: 6-pin

Ordering information

82-P0331/A1

High precision LVDT displacement transducer, 2 mm travel.

82-P0331/B1

High precision LVDT displacement transducer, 5 mm travel.

82-P0331/C1

High precision LVDT displacement transducer, 10 mm travel.

Note: all models can be supplied, on request, with a traceable calibration certificate. For ordering, add 'C' after the relevant product code (e.g.82-P0331/C1C).



82-P0331/C

Accessories

82-P0331/2

Electronic averaging device for 2 or 3 series 82-P0331/A, B, and C displacement transducers

Clip gauge transducer

Technical specifications

- Supply voltage: 2V
- Measuring capacity: 5 (3 to 8) mm
- Sensitivity: 1000x10⁻⁶ strain/mm

82-P0331/E⁽¹⁾

High precision transducer for measuring crack tip and crack mouth opening displacement.

(1)To perform tests on FRC-FRP concrete. See page 267 for complete information.

82-P0331/E1

Spare fixing jigs for 82-P0331/E.20 pieces.



82-P0340/100, 82-P0340/5

Strain gauge transducers

Technical specifications

- Supply voltage: 10V
- Resolution: <1µm
- Linearity: 0.10 % F.S.
- Connector: 6-pin

Ordering information

82-P0340/100

High precision strain gauge displacement transducer, 100 mm travel.

82-P0340/50

High precision strain gauge displacement transducer, 50 mm travel.

82-P0340/10

High precision strain gauge displacement transducer, 10 mm travel.

82-P0340/5

High precision strain gauge displacement transducer, 5 mm travel.

Digital dial indicators

58 mm diameter dial, complete with rear mount and serial output connection with serial cable for PC connection (serial cable to be ordered separately). See accessories.

Ordering information

82-D1261/10C

Digital dial indicator, 10x0.01 mm with output for PC connection

82-D1261/12M

Digital dial indicator, 12.5x0.001 mm with output for PC connection

82-D1261/50C

Digital dial indicator, 50x0.01 mm with output for PC connection

Accessories

82-D1261/LINK

Serial cable for PC connection.

82-D1260

Magnetic holder for dial gauges/indicators.

Mechanical dial indicators

58 mm diameter dial with clockwise rotation and include a rear mount.

Weight: 150 g approx.

Ordering information

82-D1250

Dial gauge, 5x0.001 mm.

82-D1252

Dial gauge, 10x0.002 mm.

82-D1255

Dial gauge, 10x0.01 mm.

82-D1257

Dial gauge, 30x0.01 mm.

82-D1259/B

Dial gauge, 50x0.01 mm.

Accessories

82-D1260

Magnetic holder for dial gauges/indicators.

82-D1258

Non-return device for dial gauges.



Dial gauges



82-P0331/2



82-D1261/10C with 82-D1261/LINK



82-D1260 with dial gauge

DATALOG 8 Data acquisition equipment



main features

- > Adjustable 5.7" touch screen color graphic display
- > 8 independent input channels
- > Numerical and graphical display of readings
- > Compatible with load cells, pressure transducers, strain gauges, LDT / LVDT / potentiometric displacement transducers.
- > Effective resolution: 131000 points
- > Unlimited storage capacity with USB pen drive
- > Up to 8 instruments can work in a network creating a modular system with up to 64 independent channels.
- > Contemporaneous data sampling of all channels in accordance to the programmable logging mode.
- > LAN / Ethernet connection to PC via dedicated software (Optional)

82-P9008

DATALOG 8, 8 channel multipurpose data logger

This latest version of our multi-purpose data logger has been developed for a number of laboratory and site applications. In fact DATALOG 8 records and monitors in real time the measurements requested by different tests, for example:

- Elastic modulus determination with Uniaxial and Triaxial test systems without in-built channels
- Determination of axial and circumferential deformations of concrete and rock specimens under compression loading
- Digital bearing plate apparatus
- Rock shear box apparatus
- In-situ determination of stress, deformability and resistance of masonry walls with flat jacks

Technical specification

- Stand alone unit with 5.7" touch screen color display
- Number of channels: 8
- Local storage mode via USB pen drive
- Sampling rate: up to 10 readings/second per channel via USB, up to 500 readings/second per channel via LAN
- Real resolution: 131000 points
- Communication port: LAN / Ethernet
- Excitation (VEXC): from 1 V to 10 V for each couple of channels (up to 4)
- Network mode: Up to 8 units
- Datalogger input: 0-10 V; 0-20 mA
- Software: Optional, DATA COMM 2 (82-P9008/SOF)
- Dimensions approx lxdxh [mm]: 290x195x241
- Weight approx [kg]: 2.5 kg
- Power supply: 110-220V, 50-60 Hz, 1ph

Accessories

Set of four cables for connecting sensors to DATALOG 8 (82-P9008) and GEODATALOG 8 (30-WF6008)

Note: for fully compatibility DATALOG 8 should be always proposed complete with at least one set of 4 Lumberg-to-PS2 adaptor cables



Rear panel of DATALOG 8 (82-P9008)



Detail of the adjustable 5.7" touchscreen color graphic display



Battery packs for in-situ use

82-P9008/BAT1

Inverter, 300 W, for connecting the 82-P9008 Multilogger to a car battery for field applications. 230 V, 50 Hz. Dimensions: 190 x 91 x 58 mm



82-P9008/BAT 1

82-P9008/BAT2

Mobile independent power supply featuring:

- 230 VAC, max. 300 W real sinus output voltage
- 12 VDC output socket max. 10 A
- With high-quality AGM 12 V/20 Ah rechargeable battery
- With charging status indication
- Dimensions: 240 x 145 x 215 mm
- Weight: 10.4 kg



82-P9008/BAT2



82-P9008/SOF

DATA COMM 2 Software

Data acquisition software compatible with Windows 7/8 - 32/64 bit. Allows connection between the PC and Datalog 8 via the high speed LAN port. One can connect up to 8 instruments in a network using a hub and obtain a modular system up to 64 channels.

The software manages the acquisition of the analog channels that can be organized into groups created by the operator. Each group consists of any channel of the data loggers connected to a PC. The acquisition data of each group is an independent task and therefore can be started / stopped independently with dedicated acquisition mode. Returns data in ASCII format.

It is also possible to manage calibrations files with functions for saving, uploading and downloading.



Temperature measurement

Digital thermometers

The proposed standard models (82-D1226 to 82-D1228), cover all applications in the construction industry as specified in the table.

The Multipurpose 82-D1229 microprocessor-controlled model is for professional use and, fitted with the suitable probe (see Accessories), can be used for monitoring the temperature of asphalt, concrete mortar etc. This high resolution model is dual range and is housed in a rugged ABS case.

Technical specifications

Standard pocket models, 82-D1226 to 82-D1228

Product code	82-D1226	82-D1226/A	82-D1227	82-D1228
Temperature range, °C	-50 to +150	-50 to +150	-50 to +170	-40 to +550
Resolution, °C	0.1	0.1	0.1 1	1
Accuracy, °C	±0.3 -0.5	±0.3 -0.5	±0.3 ±0.4	±2
Probe size, mm (dia. x h)	3 x 105	3 x 160 (1 m cable)	5 x 125	3 x 130 for penetration
Dimensions, mm	66 x 50 x 25	106 x 58 x 19	175 x 41 x 23	175 x 41 x 23
Weight, g	50	80	65	92
Applications	Liquid, air, semi-solids, frozen and granular material	Liquid, air, semi-solids, frozen and granular material. Ideal for concrete	Ideal for industrial applications. Liquid, air, semi-solids	Liquid, air, semi-solids. Ideal for bitumen.



82-D1229 with probes



82-D1226, 82-D1227, 82-D1228 and 82-D1226/A

Multipurpose dual range model, 82-D1229

- Ranges: (A) from -50 to +199.9°C; (B) from +200 to +1350°C
- Resolution: (A) 0.1°C; (B) 1°C
- Accuracy: ±0.2% full scale
- Waterproof
- Type of probe: Thermocouple K, (not included)
- Battery type/life: 3 x 1.5 V AA / approx. 1600 hours
- Automatic switch-off
- Dimensions: 150 x 80 x 36 mm
- Weight: 235 g

The 82-D1229 Digital thermometer is supplied without probes, which have to be selected and ordered separately – see Accessories.

Vernier calipers, steel rules and tapes

82-D1652

Vernier caliper 0-150 mm x 0.1 mm

82-D1654/A

Vernier caliper 0-200 mm x 0.01 mm

82-D1655/A

Vernier caliper 0-300 mm x 0.01 mm

82-D1694

Steel rule, 500 mm long, metric

82-D1652

Steel tape, 2 m long

Accessories

Probes for 82-D1229 Digital thermometer

82-D1229/1

Penetration probe, 3 mm diameter, 120 mm long.

82-D1229/2

Surface probe.

82-D1229/3

Air probe.

82-D1229/5

Penetration probe, 5 mm dia. 220 mm long.

82-D1229/5S

Penetration probe, 5 mm dia., 300 mm long. Conforming to NF. . . .

82-D1229/6

"T" bar probe, 660 mm long, conforming to BS 594.

82-D1229/7

Sword probe, 500 mm long.

82-D1229/10

K-type thermocouple, 5 m long, complete with coupling unit.

Temperature measurement

Dial thermometers

Technical specifications

Product code	Range (°C)	Dial dia. (mm)	Stem dimensions (mm, dia. x h)	Weight (g, approx.)
Standard models				
82-D1210	0 to +60	50	3 x 200	35
82-D1211	0 to +100	50	3 x 200	35
82-D1212	0 to +200	50	3 x 200	35
82-D1213	0 to +260	50	3 x 200	35
Pocket size models				
82-D1206	+50 to +260	45	4 x 150	40
82-D1207	-30 to +60	45	4 x 150	40
Long stem model				
82-D1208/5	+50 to +250	100	12 x 750	700
Surface model				
82-D1214	0 to +200	50	-	35



82-D1210 to 82-D1213



82-D1206 / 82-D1207



82-D1214

82-D1215

Max/Min thermometer. Range: -30 to +50°C. Weight: 50 g approx.

82-D1215 /1

Max/Min thermometer, double scale -20 to +50°C and 10 to 130°F.



82-D1215



82-D1208/5

Glass thermometers for general laboratory use

Weight: 50 g approx.

82-D1199

Glass laboratory thermometer, 0 to +50°C, 0.5°C graduations.

82-D1200

Glass laboratory thermometer, -10 to +110°C, 1°C graduations.

82-D1201

Glass laboratory thermometer, 0 to +150°C, 1°C graduations.

82-D1203

Glass laboratory thermometer, 0 to +250°C, 1°C graduations.

82-D1204

Glass laboratory thermometer, 0 to +360°C, 1°C graduations.

82-D1216

Armoured glass thermometer 0 to +60°C, 1°C graduations.



82-D1199 to 82-D1204

IP and ASTM thermometers

Weight: 50 g approx.

Product code	IP ref.	ASTM ref.	Range (°C)	Graduation (°C)	Immersion depth (mm)
82-B0100/6	38C	-	+23 to +27	0.1	Total
82-B0121/4	76C	-	+10 to +55	0.5	93
82-B0122/3	8C	-	0 to +44	0.2	65
82-B0158/3	42C	-	-38 to +30	0.5	250
82-B0150/10	5C	7C	-2 to +300	1	Total
82-B0150/11	6C	8C	-2 to +400	1	Total
82-B0135/1	15C	9C	-5 to +110	0.5	57
82-B0135/2	16C	10C	+90 to +370	2	57
82-B0130/2	28C	11C	-6 to +400	2	Total
82-B0160/10	47C	13C	+150 to +175	0.5	Total
82-D1200/1	60C	15C	-2 to +80	0.2	Total
82-D1200/2	61C	16C	+30 to +200	0.5	Total
82-B0125/2	-	17C	+19 to +27	0.1	Total
82-B0125/3	23C	18C	+34 to +42	0.1	Total
82-B0125/4	-	19C	+49 to +47	0.1	Total
82-B0125/5	-	20C	+57 to +65	0.1	Total
82-B0125/6	-	21C	+79 to +87	0.1	Total
82-B0121/1	-	23C	+18 to +28	0.2	90
82-B0121/2	-	24C	+33 to +54	0.2	90
82-B0121/3	-	25C	+95 to +105	0.2	90
82-B0138/A1	20C	33C	-38 to +42	0.2	50
82-B0138/A3	59C	35C	+90 to +170	0.2	50
82-B0116/40	35C	47C	+58.6 to +61.4	0.05	Total
82-B0137/A1	-	57C	-20 to +50	0.5	Total
82-B0122/4	63C	63C	-8 to +32	0.1	Total
82-B0116/45	93C	110C	+133.6 to +136.4	0.05	Total
82-D1200/3	89C	113C	-1 to +175	0.5	Total

Temperature, conductivity and time measurement

82-D1220

Infrared non-contact thermometer

This stick type infrared thermometer measures surface temperatures without touching the object being measured. The closer the instrument is to the object being measured, the smaller the spot size becomes. This can be as small as 5 mm at a distance of 65 mm.

Technical specifications

- Measuring range: -10 to +300°C
- Resolution: 1°C
- Accuracy: $\pm 2^\circ\text{C}$
- Display: 20 mm hi-contrast LCD display
- Maximum value: retained for 15 seconds
- Battery type: 9V battery
- Dimensions: 143x80x38 mm
- Weight: 300 g approx.

Note: a traceable ISO 9000 certificate of calibration is available on request.



82-D1220

82-D2220

Portable thermo-hygrometer for humidity and temperature measurement

This device provides readings with 98% precision in a very short time for both relative humidity (RH) and temperature.

- Range: (RH) 10.0 to 95%; (°C) 0.0 to 60.0; (°F) 32 to 140
- Resolution: (RH) 0.1%; (°C) 0.1; (°F) 1
- Accuracy: (RH) $\pm 2\%$; (°C) ± 0.4 ; (°F) ± 1
- Battery type/life: 1x9 V/approx. 100 hours of continuous use
- Dimensions: 185x82x45 mm
- Weight: 315 g approx.



82-D2220

82-D2230

Multirange conductivity meter

Ideal for quick measurements of conductivity in soils from 0 to 199.9 $\mu\text{S}/\text{cm}$.

Measuring ranges:

- $\mu\text{S}/\text{cm}$: 0.0 to 199.9, resolution 0.1
- $\mu\text{S}/\text{cm}$: 0.0 to 1999, resolution 1
- $\mu\text{S}/\text{cm}$: 0.0 to 19.99, resolution 0.01
- Accuracy: $\pm 1\%$ full scale
- Temperature compensation: Automatic
- Battery type/life: 1x9 V/ approx. 100 hours of continuous use
- Dimensions: 185x82x45 mm
- Weight: 355 g approx.



82-D2230

Watches, Stopwatches and Timers

82-D1230

Stopwatch, nickel chromium case, 0-60 seconds with 0.2 second graduations. Weight 100 g approx.

82-D1231

Digital stopwatch, 1/100th seconds stopwatch. Display of hours, minutes, seconds, actual time and date. Weight 50 g approx.

82-D1240

Digital clock/timer. Time, stopwatch and alarm plus functions to count time up or down to/from 24 hours. Weight 100 g approx.

82-D1241

Two-channel digital clock timer. Dual large digital display with alarm. Weight 300 g approx.



82-D1230



82-D1241, 82-D1240



82-D1231

Meteorological equipment

82-D3000/A

Rain gauge

Made from stainless steel.
Dimensions: 115 mm dia.x300 mm height
Weight: 1 kg approx.



82-D3000/A

82-D3005

Association rain gauge

Consisting of a zinc container with metal filter.
Supplied complete with graduated cylinder.
Funnel dia.: 226 mm
Surface: 400 cm²
Height: 300 mm
Weight: 3 kg approx.



82-D3005

82-D2024/A

Hand anemometer

Large and easy-to-read display with polyethylene protection foam that makes the unit comfortable to hold.
Range: Instant, maximum and average wind speed (3 s to 24 h)
Display: LCD with backlight.
Propeller: 54 mm
Units: km/h, m/s, fps, knots and bft
Resolution: (≤ 99.9) 0.1; (≥ 100) 1
Precision: $\pm 3\%$ from -10 to $+50^\circ\text{C}$
Measuring range: from 2 to 150 km/h
Dimensions: 65 mm dia. x155 mm height
Weight: 235 g approx.



82-D2024/A

82-D3146

Weather station

Display of:

- Outdoor temperature and humidity (wireless up to 3 transmitters max. 100 m)
- Indoor temperature and humidity
- Comfort level
- Max-min function
- Weather forecast
- Tendency of atmospheric pressure
- Relative atmospheric pressure
- History for the past 24 hours
- Date
- Moon phase

Radio controlled clock with alarm and snooze function
LED backlight
Measuring ranges:
- Outdoor: -30 to $+70^\circ\text{C}$ (-22 to $+158^\circ\text{F}$)
- Indoor: -10 to $+60^\circ\text{C}$ ($+14$ to $+140^\circ\text{F}$)
- Humidity 1 to 99%
Batteries: (display station) 3x1.5V AA; (transmitter) 3x1.5V AA
Dimensions: 230x118x30 mm
Weight: 545 g approx.



82-D3146

82-D3260

Wet and dry bulb hygrometer

This is a simple unit designed for general purpose use. Two identical thermometers are mounted on a printed plastic scale. Between the thermometers is an independent slide with a pointer, which allows relative humidity to be easily read. The scale is housed in a plastic case, which also holds a reservoir with an anti-frost device.

Accuracy: $\pm 5\%$ to 20% RH
Thermometers: scale length 140 mm, range -5 to $+50^\circ\text{C}$, 1°C graduations
Dimensions: 340x82x45 mm
Weight: 225 g approx.



82-D3260

82-D3281

Thermohygrograph

This device simultaneously records temperature and humidity. Supplied complete with 100 charts, 2 pens, and instruction manual.

Temperature range: -35 to $+45^\circ\text{C}$
Humidity range: 0 to 100%
Time scale: 24 hours or 7 days
Overall dimensions: 375x290x230 mm
Weight: 5 kg approx.

Spare parts

82-D3281/1

Spare charts, pack of 50.

82-D3281/2

Spare pens for Thermohygrograph 82-D3281. Pack of 5.



82-D3281

Universal core drilling machine

This robust, versatile machine is ideal for site work where it is necessary to core at any angle. The extension columns (see Accessories) permit the corer to be secured within a maximum vertical or horizontal opening of 3850 mm. The rack feed (drilling excursion) is 1000 mm long.

The core bits, strap wrench and extension columns are not part of the machine and have to be ordered separately - see Accessories below and Core bits and accessories on page 559. The listed core bits have a fixed standard coupling, assuring the best alignment, plus fast and easy fitting and disassembling.

Technical specifications

- Coring angle: 0 to 360°
- Rack feed: 1000 mm
- Shaft thread: UNC 1¼-7
- Power: 2200 W at 230 V; 1800 W at 110 V
- Full load speed: 670/1140/1580 rpm
- Coring diameter range: 20/160 mm
- Dimensions: 470 x 785 x 1630 mm approx.
- Weight: 80 kg approx.

Ordering information

83-C0301/D

Universal core drilling machine, three speed motor. 230 V, 50-60 Hz, 1 ph.

83-C0301/DZ

As above but 110 V, 60 Hz, 1 ph.

Accessories

83-C0301/1

Extension columns up to 3850 mm.

83-C0300/1

Extension rod, 228 mm long.

83-C0300/2

Strap wrench for fitting and removal of core bits.



83-C0301/D with 83-C0301/1 and core bit

Portable universal core drilling machine

The machine is composed of three main parts: an electric motor speed reducer, a light alloy base with wheels and adjustable feet, and a support column. These three parts can be easily assembled and disassembled for transportation.

The sliding motor bracket is mounted on rollers and ball bearings on the steel support column, which can be angled with respect to the base. The aluminium base can be easily secured on site using anchors, a suitable extension column, or by vacuum using the appropriate accessory (see Accessories). The machine can be used horizontally, at any angle, using the appropriate fixing method and making sure that the flushing water does not drop directly onto the motor.

For internal use we suggest the machine is fitted with a water collector system (see Accessories, 83-C0350/5 - Water collecting ring).

Core bits, strap wrench and extension column are not included and have to be ordered separately - see Core bits and accessories on page 559.

Technical specifications

- Shaft thread: UNC 1¼-7
- Power: 2200 W at 230 V; 1800 W at 110 V
- Full load speed: 670/1140/1580 rpm
- Coring diameter range: 35/150 mm
- Dimensions: 451 x 290 x 860 mm approx.
- Weight: 36 kg approx.

Ordering information

83-C0350

Portable universal core drilling machine, three speed motor. 230 V, 50-60 Hz, 1 ph.

83-C0350/Z

As above but 110 V, 60 Hz, 1 ph.



83-C0350 with core bit

Accessories

Vacuum system

83-C0350/1

Attachment kit for vacuum pump. Fits the opening in the centre of the base. Comprises: connection plate with gasket, vacuum gauge and base gasket. Vacuum pump not included - see 83-C0365.

83-C0365

Vacuum pump with reservoir. 230 V, 50-60 Hz, 1 ph. Provides a vacuum for securing the base. To be used with the kit 83-C0350/1. Supplied complete with a very useful reservoir that maintains a suitable vacuum level for some time to avoid the machine falling or disconnecting from the wall if the power is interrupted. Weight: 11.5 kg approx.

83-C0365/Z

As above but 110 V, 60 Hz, 1 ph.

Water collector

83-C0350/5

Water collecting ring for core bits up to 150 mm diameter. Confines waste water to the surface. It has to be connected to a suitable electric pump.

Generator

83-C0350/6

Portable electric generator for universal core drilling machines. 230 V, 50 Hz, 1 Ph.



Strap wrench 83-C0300/2 and Core extractor 83-C0312/2

Core bits and accessories for all coring machines

All the bits are thin wall diamond type, with bronze welded sectors suitable for both concrete and asphalt. A fixed standard coupling assures the best alignment, plus fast and easy fitting and disassembly. The bit length is approximately 400 mm. The core extractor is offered as an optional accessory and simplifies removal of the core sample from the hole.

83-C0300/1

Extension rod, 228 mm long.

83-C0300/2

Strap wrench for fitting and removal of core bits.

Portable water pressure tank

83-D2020

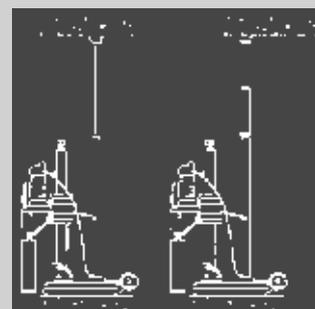
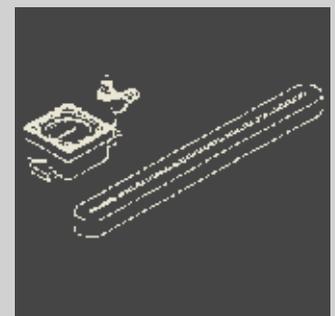
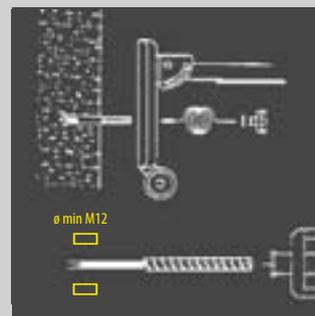
Portable water pressure tank, 10-15 L capacity. Useful when tap water is not available.

Core bit product code	To take core diameter (mm)	Weight (kg, approx.)	Suitable core extractor product code
83-C0320	50	2.2	83-C0310/2
83-C0321	75	2.8	83-C0311/2
83-C0322	100	3.7	83-C0312/2
83-C0323	150	5.4	83-C0313/2
83-C0324	200	7.5	83-C0314/2



83-C0322 and 83-C0323 Core bits with fixed standard coupling for the best alignment, plus fast and easy fitting and disassembling

Fixing methods



Pavement core drilling machines

83-B0202/B

Pavement core drilling machine, 6 HP, 4-stroke petrol engine

This simple but rugged machine is a portable unit that can be easily carried in a pick-up truck. The powerful 6 HP engine is more than adequate for all types of work and materials. The machine's relatively heavy weight (110 kg) contributes to its stability during coring.

Core bits and other accessories are not included and have to be ordered separately. See Core bits and accessories on page 559

Coring range: up to 200 mm diameter depending upon the type of asphalt

Screw feed

4 stabilizing feet

Weight: 110 kg approx



main features

- > 6 HP, 4-stroke high quality petrol engine
- > Coring range up to 200 mm diameter
- > Robust, compact and portable
- > Vertical screw feet
- > Complete with strap wrench and spanner
- > Wide range of coring bits with fixed standard coupling available

83-B0202/B with core bit

83-B0212

Trailer mounted coring machine

This coring machine, mounted on a lightweight trailer, is ideal for taking road core samples up to 150 mm diameter. The trailer is supplied complete with a 150 litre capacity water reservoir, which incorporates a hand pump to pressurize the tank in order to supply water during the coring operation.

During transportation the coring column can be easily tilted inside the trailer to avoid possible obstacles.

Core bits and other accessories are not included and have to be ordered separately. See Core bits and accessories on page 559

Technical specifications

- 6 HP, 4-stroke petrol engine
- Coring range: up to 150 mm diameter
- Water reservoir capacity: 150 L
- Stabilizing bars
- Helical springs and hydraulic shock absorbers
- Telescopic front wheel
- Ball coupling: 50 mm
- Trailer capacity: 305 kg
- Overall dimensions: 2000 x 1200 x 690 mm
- Weight: 680 kg approx.



Chemicals

A comprehensive range of laboratory chemicals and reagents is available. Hazardous materials often require special handling and documentation. Controls cannot accept any responsibility for delays in delivery due to special delivery requirements.

Product code	Description	Hazard class	UN No.	Q.ty
86-D0815	Barium chloride	6.1	1564	1000 g
86-D0800	Calcium chloride "AnalaR"	N/A	-	1000 g
86-D0811	Distilled water	N/A	-	25 L
86-D0806	Glycerine	N/A	-	1000 ml
86-D0808	Hydrochloric acid	8.0	2031	1000 ml
86-D0809	Nitric acid	8.0	2031	1000 ml
86-D0805/G	Paraffin wax	N/A	-	10 kg
86-D0823	Potassium bichromate	N/A	-	1000 g
86-D0819	Silica gel with indicator	N/A	-	1000 g
86-D0820	Silicone grease, tube	N/A	-	100 g
86-D0814	Silver nitrate	N/A	-	500 ml
86-D0802	Sodium hexametaphosphate	N/A	-	1000 g
86-D0801	Sodium hydroxide	8.0	1823	1000 g
86-D0825	Sodium sulphate	N/A	-	1000 g
86-D0810	Sulphuric acid	8.0	1830	1000 ml
86-D0845	Water repellent grease	N/A	-	1000 g



Glassware

Glass measuring cylinders

Graduated with pouring spout

86-D1000

Glass measuring cylinder, 10 ml capacity.

86-D1001

Glass measuring cylinder, 25 ml capacity.

86-D1002

Glass measuring cylinder, 50 ml capacity.

86-D1003

Glass measuring cylinder, 100 ml capacity.

86-D1004

Glass measuring cylinder, 250 ml capacity.

86-D1005

Glass measuring cylinder, 500 ml capacity.

86-D1006

Glass measuring cylinder, 1000 ml capacity.

86-D1007

Glass measuring cylinder, 2000 ml capacity.

Conical flasks

Erlenmeyer, borosilicate glass, wide mouth

86-D1030

Erlenmeyer conical flask, 100 ml capacity.

86-D1031

Erlenmeyer conical flask, 300 ml capacity.

86-D1032

Erlenmeyer conical flask, 500 ml capacity.

86-D1033

Erlenmeyer conical flask, 1000 ml capacity.

86-D1034

Erlenmeyer conical flask, 2000 ml capacity.



Glass measuring cylinder, 86-D1000 to 86-D1007

Pyknometers

Borosilicate glass pyknometers

Conforming to EN 1097-6: Tests for mechanical and physical properties of aggregates.

86-D1037

Pyknometer, 500 ml capacity.

86-D1038

Pyknometer, 1000 ml capacity.

86-D1039

Pyknometer, 2000 ml capacity.



Conical flasks, 86-D1030 to 86-D1034

Pyknometers, 27 mm mouth, with stopper

86-D1040

Pyknometer, 500 ml capacity.

86-D1041

Pyknometer, 1000 ml capacity.

86-D042

Pyknometer, 2000 ml capacity.

Pyknometers, 50 mm mouth, with stopper

86-D1040/S

Pyknometer, 500 ml capacity.

86-D1041/S

Pyknometer, 1000 ml capacity.

86-D1042/S

Pyknometer, 2000 ml capacity.



Pyknometers, 86-D1040 to 86-D1042, right, 86-D1037 to 86-D1039



Pyknometers, 86-D1040/S and 86-D1041/S

Filter flasks**86-D1044**

Filter flask, 500 ml capacity.

86-D1044/1

Perforated bung with glass tube, for 86-D1044.

86-D1045

Filter flask, 1000 ml capacity.

Volumetric flasks

Unstoppered and stoppered

86-D1051

Volumetric flask, unstoppered, 500 ml capacity.

86-D1052

Volumetric flask, unstoppered, 1000 ml capacity.

86-D1058

Volumetric flask, stoppered, 50 ml capacity.

86-D1059

Volumetric flask, stoppered, 100 ml capacity.

86-D1060

Volumetric flask, stoppered, 250 ml capacity.

86-D1061

Volumetric flask, stoppered, 500 ml capacity.

86-D1062

Volumetric flask, stoppered, 1000 ml capacity.

86-D1063

Volumetric flask, stoppered, 2000 ml capacity.

Glass beakers

borosilicate glass, with pouring spout

86-D1072

Beaker, 100 ml capacity.

86-D1073

Beaker, 250 ml capacity.

86-D1074

Beaker, 600 ml capacity.

86-D1075

Beaker, 1000 ml capacity.

86-D1075/1

Beaker, 2000 ml capacity.

Reagent bottles**86-D1092**

Reagent bottle, 1000 ml capacity.

86-D1093

Reagent bottle, 500 ml capacity.

86-D1094

Reagent bottle, 250 ml capacity.

Dropping bottle**86-D1096**

Dropping bottle, 100 ml capacity.

Weighing bottles**86-D1100**

Weighing bottle, 50 x 30 mm (dia. x h).

86-D1101

Weighing bottle, 25 x 40 mm (dia. x h).

86-D1102

Weighing bottle, 70 x 40 mm (dia. x h).

86-D1103

Weighing bottle, 40 x 60 mm (dia. x h).

Petri dish, watch glasses (beaker covers) and test tubes**86-D1105**

Petri dish, 100 mm diameter.

86-D1108

Test tube, 16 x 160 mm (dia. x h).

86-D1106

Watch glass (beaker cover), 100 mm dia.

86-D1106/1

Watch glass (beaker cover), 125 mm dia.

Desiccators

Made from glass, complete with desiccator plate. Safety cage for vacuum desiccator - see also Accessories. For an alternative to the standard desiccators see the Desiccator cabinet.

Standard non-vacuum desiccators**86-D1110**

Desiccator, 200 mm diameter, complete with plate.

86-D1110/A

Desiccator, 250 mm diameter, complete with plate.

86-D1111

Desiccator, 300 mm diameter, complete with plate.



Filter flasks 86-D1044 with 86-D1044/1



Volumetric flasks, 86-D1051 to 86-D1063



Glass beakers, 86-D1072 to 86-D1075/1

Desiccators with vacuum attachment**86-D1110/A**

Desiccator, 200 mm diameter with vacuum attachment and plate.

86-D1112

Desiccator, 250 mm diameter with vacuum attachment and plate.

86-D1113

Desiccator, 300 mm diameter with vacuum attachment and plate.

Accessories**86-D1113/1**

Safety cage for vacuum type desiccators.

86-D0819

Silica gel with indicator. 1000 g.

19-D1113/A

Desiccator cabinet, 450x480x450 mm, complete with 2 shelves.

For more information see page 35



Reagent bottles, 86-D1092 to 86-D1094, top right, Dropping bottle 86-D1096



Weighing bottles, 86-D1100 to 86-D1103



Petri dish, 86-D1105



Desiccators, 86-D1113 and 86-D1110



Desiccator cabinet, 19-D1113/A



86-D1113/1 with desiccator

Specific gravity bottles

Hubbard-Carmick specific gravity bottles, conforming to ASTM D70, EN ISO 3838

86-D1115

Specific gravity bottle, Hubbard-Carmick cylindrical type, 24 ml capacity

86-D1120

Specific gravity bottle, Hubbard-Carmick conical type, 25 ml capacity.

Gay Lussac specific gravity bottles

86-D1125

Gay Lussac specific gravity bottle, 25 ml capacity.

86-D1126

Gay Lussac specific gravity bottle, 50 ml capacity.

86-D1127

Gay Lussac specific gravity bottle, 100 ml capacity.

86-D1128

Gay Lussac specific gravity bottle, 250 ml capacity.

Round bottomed flasks

86-D1135

Round bottomed flask, 500 ml capacity.

86-D1136

Round bottomed flask, 1000 ml capacity.

Pipettes and burettes

Measuring pipettes, Mohr type, graduated

86-D1151

Measuring pipette, 5 ml x 0.1 ml divisions.

86-D1152

Measuring pipette, 10 ml x 0.1 ml divisions.

86-D1153

Measuring pipette, 25 ml x 0.1 ml divisions.

86-D1154

Measuring pipette, 50 ml x 0.1 ml divisions.

Bulb pipette

86-D1157

Bulb pipette, 100 ml capacity.

Burettes, graduated

86-D1160

Graduated burette, 25 ml capacity x 0.1 ml divisions.

86-D1161

Graduated burette, 50 ml capacity x 0.1 ml divisions.

86-D1162

Graduated burette, 100 ml capacity x 0.1 ml divisions.

Glass funnels

86-D1163/A

Glass funnel, 25 mm diameter.

86-D1163/1

Glass funnel, 50 mm diameter.

86-D1163

Glass funnel, 100 mm diameter.

86-D1164

Glass funnel, 150 mm diameter.

86-D1164/1

Glass funnel, 200 mm diameter.

Glass marking pencils

86-D1165

Glass marking pencils, pack of 12.

Glass stirring rods

86-D1190

Glass stirring rods, 8 x 250 mm (dia. x h). Pack of 6.

Porcelain

Evaporating dishes

Evaporating dishes, porcelain, low form with pouring spout

86-D1170

Evaporating dish, 100 mm diameter, 25 mm high.

86-D1171

Evaporating dish, 120 mm diameter, 32 mm high.

86-D1172

Evaporating dish, 160 mm diameter, 40 mm high.

86-D1173

Evaporating dish, 210 mm diameter, 60 mm high.



Specific gravity bottles, 86-D1125, 86-D1126, 86-D1127, 86-D1115, 86-D1120



Measuring pipettes 86-D1150 to 86-D1154, 86-D1156



Glass funnels, 86-D1163/A to 86-D1164/1



Round bottomed flasks 86-D1135 to 86-D1136

86-D1174

Evaporating dish, 245 mm diameter, 55 mm high.

Evaporating dishes, porcelain, shallow form with pouring spout

86-D1170/A

Evaporating dish, 100 mm diameter, 40 mm high.

86-D1171/A

Evaporating dish, 120 mm diameter, 50 mm high.

86-D1172/A

Evaporating dish, 168 mm diameter, 58 mm high.

86-D1173/A

Evaporating dish, 206 mm diameter, 64 mm high.

86-D1174/A

Evaporating dish, 250 mm diameter, 80 mm high.

Silica evaporating dish

86-D1169

Silica evaporating dish, 100 mm diameter, 25 mm high.



Evaporating dishes, 86-D1170 to 86-D1174



Evaporating dishes, 86-D1170/A to 86-D1174/A



Silica evaporating dish, 86-D1169

Pestle and mortars**Iron mortar****86-D1176**

Iron mortar with pestle.

Porcelain pestle and mortars**86-D1180/1**

Soil mortar, 125 mm diameter.

16-D1179/A

Rubber headed pestle for soil mortar conforming to ASTM D421, BS 1377:2 and BS 1924:1.

86-D1180/A

Pestle and mortar, porcelain, 125 mm diameter.

86-D1181/B

Pestle and mortar, porcelain, 175 mm diameter.

86-D1181/C

Pestle and mortar, porcelain, 200 mm diameter.

Funnels and crucibles**Funnels****86-D1182**

Buchner funnel, size N° 5 for use with 110 mm diameter filter paper, complete with rubber bung to fit filter flask 86-D1045.

86-D1183

Filter funnel, 90 mm inside diameter, for use in particle analysis test conforming to BS1377.

Crucibles**86-D1184**

Platinum crucible, 20 ml capacity.

86-D1185

Silica crucible, 25 ml capacity.

86-D1187

Porcelain crucible complete with lid, 25 ml capacity.

86-D1188

Gooch crucible, top diameter 40 mm, bottom diameter 35 mm.

Accessories**86-D1189**

Filter funnel tube for 40 mm crucible diameter.

86-D1189/1

Perforated rubber bung for 86-D1189 funnel.

86-D1188/1

Rubber ring for 86-D1188 Gooch crucible.

86-D1188/2

Filter discs, fiberglass, 25 mm diameter. Pack of 100.

Plasticware**Stacking plastic boxes****86-D1501**

Stacking plastic box, 380x280x 200 mm, 20 litre capacity.

86-D1502

Stacking plastic box, 580x330x 250 mm, 46 litre capacity.

86-D1503

Stacking plastic box, 660x400x 300 mm, 72 litre capacity.

Buckets**86-D1510**

Graduated plastic bucket, 7 litre capacity.

86-D1511

Graduated plastic bucket, 11 litre capacity.

86-D1512

Graduated plastic bucket, 15 litre capacity.

86-D1516

Plastic bucket, 9 litre capacity.

Storage bottles**Polythene****86-D1520**

Polythene storage bottle, 250 ml capacity, 36 mm diameter mouth.

86-D1521

Polythene storage bottle, 500 ml capacity, 36 mm diameter mouth.

86-D1522

Polythene storage bottle, 1000 ml capacity, 50 mm diameter mouth.

86-D1523

Polythene storage bottle, 2000 ml capacity, 50 mm diameter mouth.

86-D1525

Polythene bottle, 5 litre capacity.

86-D1526

Polythene bottle, 10 litre capacity.



Iron mortar, 86-D1176



Pestle and mortars, 86-D1180/A



Pestle and mortars, 86-D1180/1 with 16-D1179/A



86-D1187, 86-D1182



Buckets, 86-D1510 to 86-D1517



Stacking plastic boxes, 86-D1501 to 86-D1503



Storage bottles, 86-D1520, D1522, 86-D1528, 86-D1525



Plastic wash bottles, 86-D1535 - 86-D1538, 86-D1545, 86-D1547

Plastic wash bottles**86-D1535**

Plastic wash bottle, 100 ml capacity.

86-D1536

Plastic wash bottle, 250 ml capacity.

86-D1537

Plastic wash bottle, 500 ml capacity.

86-D1538

Plastic wash bottle, 1000 ml capacity.

Plastic containers with airtight lid and handles

86-D1527

Airtight plastic container, 5 litre capacity.

86-D1528

Airtight plastic container, 15 litre capacity.

Plastic funnels

Standard and wide mouth

86-D1539

Plastic funnel, 65 mm diameter.

86-D1540

Plastic funnel, 100 mm diameter.

86-D1541

Plastic funnel, 140 mm diameter.

86-D1542

Plastic funnel, 210 mm diameter.

86-D1545

Wide mouth plastic funnel, 80 mm diameter x 15 mm mouth.

86-D1546

Wide mouth plastic funnel, 120 mm diameter x 30 mm mouth.

86-D1547

Wide mouth plastic funnel, 150 mm diameter x 35 mm mouth.

Plastic measuring cylinders

Plastic measuring cylinders, tall form with pouring spout

86-D1020

Plastic measuring cylinder, 25 ml capacity.

86-D1021

Plastic measuring cylinder, 50 ml capacity.

86-D1022

Plastic measuring cylinder, 100 ml capacity.

86-D1023

Plastic measuring cylinder, 250 ml capacity.

86-D1024

Plastic measuring cylinder, 500 ml capacity.

86-D1025

Plastic measuring cylinder, 1000 ml capacity.

86-D1026

Plastic measuring cylinder, 2000 ml capacity.

Plastic measuring cylinders, short form with pouring spout

86-D1022/A

Plastic measuring cylinder, 100 ml capacity.

86-D1023/A

Plastic measuring cylinder, 250 ml capacity.

86-D1024/A

Plastic measuring cylinder, 500 ml capacity.

86-D1025/A

Plastic measuring cylinder, 1000 ml capacity.

86-D1026/A

Plastic measuring cylinder, 2000 ml capacity.

Miscellaneous

Burner, tripods and laboratory tongs

Burner

86-D1420

Bunsen burner, universal.

Tripods

86-D1430

Tripod, 100 mm ID x 150 mm high.

86-D1431

Tripod, 150 mm ID x 230 mm high.

Iron wire gauzes

86-D1440

Iron wire gauze with ceramic centre, 150 mm square.

86-D1441

Iron wire gauze with ceramic centre, 200 mm square.

Laboratory tongs

86-D1455

Stainless laboratory tongs.

86-D1456

Small tongs.



Plastic funnels, 86-D1539



Measuring cylinders, 86-D1020 to 86-D1026 86-D1180/A



Measuring cylinders, 86-D1020/A to 86-D1026/A



Support stands, 86-D1445, D1446



Sleeves and clamps, 86-D1450, D1451, D1453

Support stands, sleeves and clamps

Support stands

86-D1445

Support stand, 200x130 mm with rod 10 mm diameter, 500 mm long.

86-D1446

Support stand 310x 200 mm with rod 12 mm diameter, 800 mm long.

Sleeves and clamps

86-D1450

Double sleeve metal/metal.

86-D1451

Double sleeve metal/glass.

86-D1452

Clamp, small size.

86-D1453

Clamp, large size.



Laboratory tongs, 86-D1456, D1455, D1430, D1431, D1441, D1440, D1422, D1420

Gloves**86-D1529**

High-temperature resistant gloves, up to 450°C.

86-D1530

Heat resistant gloves.

86-D1531

Neoprene gloves.

86-D1532

Cotton gloves.

86-D1533

Soft leather gloves

86-D1534

Rubber PVC gloves.

Sample bags**86-D1550**

Heavy-duty plastic sample bag, 40x70 cm.

86-D1551

Heavy-duty plastic sample bag, 25x45 cm.

86-D1552

Heavy-duty plastic sample bag, 15x30 cm.

86-D1553

3-ply paper sack, 30x19x86.5 cm.

86-D1554

Heavy-duty polythene sack, 50x 90 cm.

Laboratory hardware**Mixing bowls**

Mixing bowls, stainless steel

86-D1290

Stainless steel mixing bowl, 145 mm diameter.

86-D1291

Stainless steel mixing bowl, 225 mm diameter.

86-D1292

Stainless steel mixing bowl, 255 mm diameter.

Mixing bowls, stainless steel, hemispherical, with handles

86-D1300

Stainless steel, hemispherical mixing bowl, 160 mm diameter.

86-D1301

Stainless steel, hemispherical mixing bowl, 240 mm diameter.

86-D1302

Stainless steel, hemispherical mixing bowl, 300 mm diameter.

Stainless steel pans with handles

Steel thickness 0.6 mm

86-D1323

Stainless steel pan with handles, 300x220x60 mm.

86-D1324

Stainless steel pan with handles, 350x260x65 mm.

86-D1325

Stainless steel pan, 400x280x70 mm.

Aluminium pans**86-D1320**

Aluminium pan, 310x260x65 mm.

86-D1321

Aluminium pan, 370x270x65 mm.

86-D1322/M

Aluminium pan, 600x400x100 mm, Ponts et Chaussées model.

Mixing trays

Mixing trays, steel, nesting type

86-D1305

Steel mixing tray, 254x254x38 mm.

86-D1305/1

Steel mixing tray, 306x306x38 mm.

86-D1305/2

Steel mixing tray, 460x460x50 mm.

86-D1305/3

Steel mixing tray, 500x400x120 mm.

86-D1305/4

Steel mixing tray, 610x305x50 mm.

86-D1305/5

Steel mixing tray, 610x610x63 mm.

Mixing trays, steel

Mixing trays, steel, heavy duty

86-D1311

Steel mixing tray 500x400x120 mm.

86-D1312

Steel mixing tray 300x250x80 mm.



Gloves, 86-D1529



Gloves, 86-D1530



Gloves, 86-D1531



Sample bags, 86-D1550



Mixing bowls, 86-D1290 to 86-D1292



Mixing bowls, 86-D1300 to 86-D1302



Stainless steel pans, 86-D1323 - 86-D1325/D1529



Aluminium pans, 86-D1320, D1321



Aluminium pans, 86-D1322/M



Mixing trays, 86-D1305



Mixing trays, 86-D1311, 86-D1312

Moisture content tins

86-D1329

Moisture content tin, 75 x 30 mm (dia. x h).

86-D1329/A

Moisture content tins, 75 x 30 mm (dia. x h), pack of 6.

86-D1330

Moisture content tin, 55 x 35 mm (dia. x h), aluminium.

86-D1330/A

Moisture content tins, 55 x 35 mm (dia. x h), aluminium, pack of 6.

86-D1331

Moisture content tin, 55 x 65 mm (dia. x h), aluminium.

86-D1331/A

Moisture content tins, 55 x 65 mm (dia. x h), aluminium, pack of 6.

86-D1332

Moisture content tin, 75 x 50 mm (dia. x h), aluminium.

86-D1332/A

Moisture content tins 75 x 50 mm (dia. x h), aluminium, pack of 6.

Aluminium field cans

86-D1341

Aluminium field can, 3 litre capacity.

86-D1342

Aluminium field can, 5 litre capacity.

Lever lid tins

86-D1345

Lever lid tin, 0.5 litre capacity.

86-D1346

Lever lid tin, 1 litre capacity.

86-D1347

Lever lid tin, 2.5 litre capacity

86-D1348

Lever lid tin, 5 litre capacity.

86-D1349

Lever lid tin, 10 litre capacity.

Slip-on lid tin (biscuit)

86-D1355

Slip-on lid tin, 212x225x120 mm.

Scoops

Aluminium scoops, round

86-D1601

Round aluminium scoop, 245x80 mm, 325 ml capacity.

86-D1602

Round aluminium scoop, 335x120 mm, 1000 ml capacity.

86-D1603

Round aluminium scoop, 420x160 mm, 2600 ml capacity

Aluminium scoops, flat

86-D1610

Flat aluminium scoop, 210x70 mm, 165 ml capacity.

86-D1611

Flat aluminium scoop, 310x110 mm, 450 ml capacity.

86-D1612

Flat aluminium scoop, 400x155 mm, 1550 ml capacity.

Trowels

86-D1619

Trowel, 90x115x165 mm, conforming to EN 12350-4.

86-D1620

Trowel 60x140 mm.

86-D1621

Trowel, 100 mm, pointed type.

86-D1622

Cement trowel.

86-D1625

Rectangular trowel, 120x250 mm.

Spatulas

Stainless steel flexible spatulas

86-D1630

Stainless steel flexible spatula, 100 mm blade length.

86-D1631

Stainless steel flexible spatula, 160 mm blade length.

86-D1632

Stainless steel flexible spatula, 200 mm blade length.

86-D1633

Stainless steel flexible spatula, 280 mm blade length.



Moisture content tins, 86-D1329 86-D1529



Moisture content tins, 86-D1330 to 86-D133286-D1529



86-D1341, D1347, D1346



Aluminium scoops, 86-D1601 to 86-D1603



Aluminium scoops, 86-D1610 to 86-D1612



86-D1625, 86-D1622, 86-D1620 and 86-D1621



Rigid spatulas, 86-D1641



Stainless steel flexible spatulas, 86-D1630 to 86-D1633

Rigid spatulas

86-D1640

Rigid spatula, 20 mm blade width.

86-D1641

Rigid spatula, 50 mm blade width.

86-D1642

Rigid spatula, 70 mm blade width.

86-D1643

Rigid spatula, 100 mm blade width.

BRUSHES

86-D1670

Wire brush, No. 26 gauge.

86-D1671

Fine wire brush.

86-D1672

Soft hair brush, 3 mm diameter, conforming to BS 812.

86-D1673/G

Brass sieve brush.

86-D1673/G1

Double-ended brass/nylon sieve brush.

86-D1675

Round bristle brush, 33 mm diameter.

86-D1680

Flat bristle brush, 60 mm wide.

86-D1685

Nylon sieve brush 33 mm diameter.

86-D1685/G

Double ended nylon sieve brush.

86-D1686

Table brush.

General tools

86-D1699

General purpose tool kit.
Weight 7 kg approx.

86-D1645

Shovel.

86-D1646

Pick mattock.

86-D1691

Trimming knife

86-D1692

Absorbent cloths, 750x450 mm, pack of 3.

Trolleys / carts

86-D1700

Sample cart.
Useful for handling concrete samples or moulds in the laboratory. Constructed from steel with rubber wheels mounted on bearings.
Base size: 610x910x860 mm
Weight: 18.6 kg approx.

86-D1701

Laboratory trolley.
Useful for general laboratory purposes.
Shelf size: 400x800 mm, total height 870 mm.
Weight: 15 kg approx.



86-D1685, D1675, D1672, D1673/G1, D1685/G



86-D1686, 16-D1691



86-D1699



86-D1646

86-D1645



86-D1680, D1670, D1673/G, D1671



86-D1700



86-D1701

Vacuum pumps and air drying system

Vacuum pumps

Vacuum pumps are used for a number of applications, primarily in systems requiring de-aired water.

If water vapour is present in the air being sucked by the vacuum pump, it mixes with the pump oil, producing an emulsion which, in notable concentrations, may cause serious damage to the pump. For this reason it is important, for water de-airing applications, to use a suitable drying system such as the Air drying unit 86-D2005 filled with Silica gel desiccant 86-D0819.

The pumps can be fitted with a Vacuum gauge with a pin regulating valve and bleed valve, such as our model 86-D2004/5 (see Accessories), unless the equipment to be connected already has a similar gauge (for example the Large size pyknometer 75-D1122).

For more details about de-airing systems see Typical system configurations on page 570

We offer two vacuum pump models: 86-D2001 and 86-D2001/Z (110 V), for ultimate vacuum of 0.1 mbar 86-D2003 and 86-D2003/Z (110 V), for ultimate vacuum of 0.01 mbar

Ordering information

86-D2001

Portable vacuum pump, free air displacement 75 L/min, ultimate vacuum 0.1 mbar. 230 V, 50-60 Hz, 1 ph.

86-D2001/Z

As above but 110 V, 60 Hz, 1 ph.

86-D2003

Portable vacuum pump, free air displacement 75 L/min, ultimate vacuum 0.01 mbar. 230 V, 50-60 Hz, 1 ph.

86-D2003/Z

As above but 110 V, 60 Hz, 1 ph.



Vacuum pumps, 86-D2001 and 86-D2003

Technical specifications

Product code	86-D2001 86-D2001/Z	86-D2003 86-D2003/Z
Free air displacement, L/min	75	75
Ultimate vacuum, mbar	0.1	0.01
Power, W	180	240
Dimensions, mm (approx.)	300 x 150 x 240	300 x 150 x 240
Weight, kg (approx.)	8.5	9.5

Vacuum gauges

There are two models available: 86-D2004/5- 80 mm diameter dial, complete with pin regulating valve and sintered filter, suitable for direct connection to the on top of the vacuum pump as illustrated.

86-D2004/3- 60 mm diameter dial in glycerine bath, with base, complete with pin regulating valve.

Ordering information

86-D2004/5

Vacuum gauge, range 0-100 kPa, complete with pin regulating valve and bleed valve. For direct connection to the top of the pump. Resolution 0,01 bar Weight 0.4 kg.

86-D2004/3

Vacuum gauge, range 0-760 mm/hg (0-1 bar), with base, complete with pin regulating valve. Resolution, 10mm/hg (0,02 bar) Weight 0.5 kg.

Oil and rubber tubes

86-D2001/1

Special oil for vacuum pumps. 500 cc can.

86-D2064

Rubber tube, ID 6.5 mm x OD 16.5 mm, 2 m length.



86-D2004/5



86-D2004/3



86-D2004/5 fitted on top of the pump



86-D2064

Outlet mist filter

86-D2001/3

Outlet mist filter.

Optional. To collect oil vapour coming from the oil reservoir during operation. Recommended in case of heavy continuous use.

Digital vacuum regulator

Fine regulation and monitoring of vacuum are required by certain tests, such as Binder recovery by rotary evaporation conforming to EN 12697-3, to ensure that the requirements of the Standard are satisfied. See the Typical system configurations table.

The regulator consists of a metal case housing a high precision vacuum regulator valve and digital display unit. Range of regulation: 0 to 760 mm/hg Resolution of digital display: 0.001 bar Overall dimensions: 250 x 250 x 280 (h) mm Weight: 7 kg approx.

Ordering information

86-D2004/1D

Digital vacuum regulator complete with digital display unit, 0.001 bar resolution. 230 V, 50-60 Hz, 1 ph.

86-D2004/1DZ

As above but 110 V, 60 Hz, 1 ph.



86-D2001 with 86-D2001/3



86-D2004/1D

86-D2005

Air drying unit

This unit can be installed between the vacuum pump and the apparatus to be de-aired (e.g. Pycnometers) to avoid/limit water vapour mixing with the oil in the pump, which, in significant concentrations, may cause serious damage to the pump. The unit has to be filled with a suitable desiccant (e.g. Silica gel desiccant 86-D0819).

- Plastic frame with acrylic cylinder
- Desiccant capacity: 500 g approx.
- Overall dimensions: 185x300(h) mm approx.
- Weight: 1 kg approx. (empty)



86-D2005 with 86-D0819

Accessories

86-D0819

Silica gel desiccant, 1000 g bottle. The desiccant changes colour when saturated. It can be recovered by drying it in an oven.



Typical application of 86-D2005 during the determination of the maximum density of bituminous mixtures using the large size pycnometer 75-D1122

Typical de-airing system configurations

The following table summarizes the most common tests that require de-airing systems and vacuum apparatus. These recommendations are our interpretation of the most efficient way to perform the test. If in doubt we are at your disposal to give you all the necessary information.

Test no.	Standards	Test / determination
1)	ASTM, BS, EN, NF	De-airing water system for triaxial tests
2)	ASTM, BS, EN, NF	Falling head permeability (cell 38-T0185/1)
3)	EN 12697-4	Recovery of binder by the fractionating column method
4)	EN 12697-3	Binder recovery by rotary evaporation
5)	EN 12697-1, BS 598:102	Binder recovery by vacuum pump method
6)	ASTM D2041	Specific gravity and density of bituminous mixtures



86-D2010

86-D2010

Aspirator pump
Used with flowing water to produce a moderate vacuum. It can be used in all water pressures from approx. 0.7 kg/cm².
Weight: 100 g approx.

Product code	Description	Test no.					
		1)	2)	3)	4)	5)	6)
86-D2001	Vacuum Pump, Single stage	✓	✓	-	-	✓	-
86-D2003	Vacuum pump, Double stage	-	-	✓	✓	-	✓
86-D2004/5	Vacuum gauge with valve	-	-	✓	-	✓	-
86-D2064	Rubber tubes	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)	✓ (2)
86-D2005	Air drying unit	✓	✓	-	-	-	✓
86-D0819	Silica gel desiccant	✓ (2)	✓ (2)	-	-	-	✓ (2)
86-2004/1D	Vacuum regulator	-	-	-	✓	-	-

Air compressors and accessories

We offer several different models which should satisfy all requirements relating to the different applications in soil, concrete and asphalt fields.

Product Code	86-D2015	86-D2015/A	86-D2018*	76-PV0250/7
Continuous/max. pressure, bar	8/10	8/10	14	10
Capacity, L	50	200	8	10
Air delivery, L/min	230	550	87	130
Power, W	1500	4000	600	750
Dimensions, mm	850x355x675(h)	1600x520x1050 (h)	510x270x400(h)	370x410x650(h)
Weight, kg	44	125	21	27

*The capacity can be increased using the 86-D2018/1 Auxiliary 50 L reservoir.



86-D2018 with 86-D2018/1

Ordering information

86-D2015

Laboratory air compressor, 10 bar maximum working pressure, 8 bar for continuous use. 50 litre capacity. 230V, 50 Hz, 1 ph.

86-D2015/Y

As above but 220V, 60 Hz, 1 ph.

86-D2015/Z

As above but 110V, 60 Hz, 1 ph.

86-D2015/A

Laboratory air compressor, 10 bar maximum working pressure, 8 bar for continuous use. 200 litre capacity. 400V, 50 Hz, 3 ph.

86-D2015/AZ

As above but 220V, 60 Hz, 3 ph.

86-D2018

Laboratory air compressor, 14 bar maximum working pressure. 8 litre capacity. 230V, 50 Hz, 1 ph.

86-D2018/Z

As above but 110V, 60 Hz, 1 ph.

86-D2018/1

Auxiliary reservoir for 86-D2018 air compressor, 50 litre capacity, 14.5 bar maximum pressure.

76-PV0250/7

Low-noise air compressor, 10 bar maximum working pressure, 10 litre capacity. 230V, 50 Hz, 1 ph.

76-PV0250/7Y

As above but 220V, 60 Hz, 1 ph.

76-PV0250/7Z

As above but 110V, 60 Hz, 1 ph.

Accessories

28-WF2016/2

Air filter/water trap for air compressors.

86-D2019

Air treatment unit for the dehumidification of air, comprising air dryer, 5 µm particle filter, 1M oil filter and 0.01M coalescence filter. 230V, 50-60 Hz, 1 ph. Dimensions: 220 x 560 x 460 mm Weight: 24 kg

86-D2019/Z

As above but 110V, 60 Hz, 1 ph.

Rubber tubes and stoppers

86-D2060

Rubber tube, 5 mm ID x 13 mm OD, 2 m long.

86-D2062

Rubber tube 8 mm ID x 12 mm OD, 6 m long.

86-D2064

Rubber tube for vacuum, 6.5 mm ID x 16.5 mm OD. 2 m long.

86-D2070

Rubber stopper set: from 15/10 to 60/50 mm.



86-D2015



86-D2015/A



86-D2064, 86-D2062 and 86-D2060



76-PV0250/7



86-D2070



28-WF2016/2



28-D2019

86-D2104**Water still**

Water still, producing 7.5 litres per hour. Used to prepare distilled water for laboratory use. An automatic device keeps the water at a constant level. If there is a shortage of water an automatic switch cuts off the current and switches it on again when the level returns to normal.

- 230 V, 50-60 Hz, 1 ph.
- Capacity: 7.5 L/hour
- Power: 6 kW
- Overall dimensions: 260x260x610 mm
- Weight: 16 kg approx.

Filter paper**86-D1800**

Whatman paper (or equivalent) No.1, 150 mm diameter, medium grade. Pack of 100.

86-D1801

Whatman paper (or equivalent) No.5, 150 mm diameter, medium grade. Pack of 100.

86-D1802

Whatman paper (or equivalent) No.40, 150 mm diameter, medium grade. Pack of 100.

86-D1803

Whatman paper (or equivalent) No.44, 110 mm diameter, medium grade. Pack of 100.

86-D1805

Whatman paper (or equivalent) No.50, 110 mm diameter, medium grade. Pack of 100.

86-D1806

Whatman paper (or equivalent) No.54, 150 mm diameter, medium grade. Pack of 100.

86-D1809

Whatman paper (or equivalent) No.54, 400 mm diameter, medium grade. Pack of 100.

86-D2250**Electric generator**

Portable petrol engine driven single-phase generator.

Ideal for site use with electrically operated core drilling machines and other apparatus when mains current is not available 5 kVA, 230 V, 50 Hz.

Main features

- Low oil level cut out device
- 2 x 230 V – 50 Hz, single-phase Schuko outlets protected by circuit breaker
- 1 x 12V DC battery charger outlet protected by fuse

Technical specifications

- AC Generator 50 Hz, synchronous, Single-phase, 5 kVA, 230 V
- Petrol engine – 3000 RPM
- Air cooling system
- Manual recoil starting system
- Fuel tank capacity: 6 L
- Fuel consumption @ 75%: 2.2 L/hour
- Dimensions: 720 x 480 x 515 mm (w x d x h)
- Weight: 63 kg approx.

UPS**(Uninterruptible power supply)****86-D2300**

UPS interactive system

A UPS is used to protect electrical items from fluctuations in the power supply and to provide emergency power for a limited time when the mains power source fails. 2000 VAi. 230 V, 50-60 Hz, 1 ph.

Specifications

- Input voltage: 230 Vac
- Input frequency: 50/60 Hz
- Output voltage: 230 Vac
- Dimensions: 147x 234 x 360 mm (w x d x h)
- Weight: 16 kg approx.



86-D2104



86-D1800 to 86-D1809



86-D2250



86-D2300

Mobile laboratories

In many cases, the mobile laboratory is the first equipment to arrive on the job-site and a smart, efficient, well equipped unit is the best introduction for a contractor. Controls manufactures a complete line of mobile laboratories designed to meet all possible requirements for rugged use in distant and isolated areas in cold or tropical weathers. Each model is available in both standard and tropicalized versions. A wide range of accessories makes the laboratory completely independent and self-sufficient.

The range of Controls mobile laboratories covers mainly three types:

Design Service

Controls can design the mobile laboratory conforming to your requirement. We give here some example of the mobile laboratory recently produced. Please feel free to ask

Autolab, van mounted

used where extreme mobility and manoeuvrability are requested.



Trailab, trailer mounted

specially recommended for survey over large areas, such as road construction projects.



Example of AUTOLAB for road testing. On the left our Gyrotory compactor.

Contalab, container mounted

used for long term testing at one site, as well as for road construction.



Example of CONTALAB trailer mounted



Example of CONTALAB trailer mounted

CONTALAB mobile laboratory for Cement and Concrete testing. Internal view with Automatic concrete testing system for compression and flexural tests, Mortar mixer etc.



CONTALAB mobile laboratory for Cement and Concrete testing. Internal view with Cement mixer, Automatic Vicat apparatus, Sand equivalent shaker, Water bath and cabinets.

Standards index

List of Standards included in this Catalogue

The following is an index of National Standards which appear throughout this catalogue. For further information regarding sets of equipment in accordance to the various standards please request a copy of our separate Buyer's Guide.

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Legend

AASHTO = American Association of State Highway and Transportation Officials. USA
 API = American Petroleum Institute
 ASTM = USA Standard
 BS = British Standard
 CEN = European Committee for Standardization. EU
 CNR = Italian National Research Council
 CSA = Canadian Standard
 DIN = German Standard
 EN = European Standard (Mandatory)
 pr EN = Draft European Standard
 EURONORM = European Norm. EU
 IP = Institute of Petroleum. USA
 ISO = International Organization for Standardization
 ISRM = International Society of Rock Mechanics
 JIS = Japanese Standard Associations
 LCPC = Laboratoire Central des Ponts et Chaussées. France
 MPW = Belgian standard
 NCAT = American National Centre for Asphalt Technology
 NF = French Standard
 NF (AFNOR) = French Standard
 NLT = Spanish "Norma de Laboratorio Transporte"
 NT = Scandinavian Nord test method
 RAV = Dutch standards
 RILEM = International Union of Laboratories and Experts in Construction Materials, Systems and Structures
 SHRP = Strategic Highway Research Program. USA
 SNV = Swiss Standards
 TP BF = German technical test code
 TRL = Transport Research Laboratory (formerly T.R.R.L.). UK
 UNE = Spanish Standard
 UNI = Italian Standard

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Conversion factors

The italic symbols are those concerning the "SI" units.

FORCE

1 N	= 0.10197 kgf = 0.224809 lbf
1 kN	= 1000 N = 101.971 kgf = 224.809 lbf = 0.101971 t
1 kgf	= 9.80665 N = 2.20462 lbf

MASS

1 kg	= long: 0.01968413 cwt; short: 0.02204622 cwt = 2.20462 lb
1 g	= 0.03527 oz
1 t	= 1000 kg = long: 0.984221 ton; short: 1.102311 ton
1 cwt	= long: 50.802424 kg; short: 45.35929 kg
1 lb	= 0.45359 kg
1 oz	= 28.349 g

CAPACITY, VOLUME

1 m ³	= 1.30795 yd ³
1 dm ³ (litre)	= 0.03531 ft ³ = 1.7605 pint = 0.21997 imp gal = 0.2642 US gal
1 cm ³ (ml)	= 0.06102 in ³ = 0.0352 fl oz
1 yd ³	= 0.76455 m ³
1 ft ³	= 28.3168 dm ³
1 in ³	= 16.3871 cm ³
1 imp gal	= 4.54609 dm ³
1 US gal	= 3.78541 dm ³
1 pint	= 0.56826 dm ³
1 fl oz	= 28.4131 cm ³

LENGTH

1 m	= 1.0936 yard = 3.281 ft = 39.370 in
1 km	= 0.6214 mile
1 yard	= 0.9144 m
1 ft	= 30.48 cm
1 in	= 25.4 mm
1 mile	= 1.6094 km

PRESSURE, STRESS

1 Pa (N/m ²)	= 0.01 mbar = 0.000145 lbf/in ² (psi)
1 kPa (kN/m ²)	= 0.01 kgf/cm ² = 10 mbar = 20.885 lbf/ft ² = 0.2953 in Hg
1 MPa	= 10.2 kgf/cm ²
1 lbf/in ² (psi)	= 0.07031 kgf/cm ² = 6.89476 kPa
1 lbf/ft ²	= 47.8803 Pa
1 tonf/ft ²	= 1.094 kgf/cm ² = 107.252 kPa
1 bar	= 100 kPa = 14.5038 lbf/in ²
1 mbar	= 100 Pa = 2.0885 lbf/ft ²
1 atm	= 101.325 kPa = 14.6959 lbf/in ²
1 mm Hg (torr)	= 133.322 Pa
1 mm H ₂ O	= 0.01934 lbf/in ² = 9.80665 Pa

DENSITY

1 kg/m ³	= 1.686 lb/yd ³
1 g/cm ³	= 62.4280 lb/ft ³
1 ton/yd ³	= 1328.94 kg/m ³
1 lb/yd ³	= 0.593 kg/m ³
1 lb/in ³	= 27.6799 g/cm ³

ENERGY

1 MJ	= 0.277778 kWh
1 J	= 0.737562 ft lbf
1 kgf m	= 9.80665 J
1 Btu	= 1.05506 kJ

General conditions of Sale

1 General

- 1.1 "The Company" shall mean CONTROLS or its Proprietor subsidiary or any associated Company.
- 1.2 "The goods" shall mean the equipment or services which are the subject of this Contract.
- 1.3 "The Customer" shall mean the person firm or Company who contracts to purchase in full or in part the goods from the Company.
- 1.4 Any contract entered into by the Company for the supply of goods is subject to these conditions. Any writing on or attached to any purchase order form, document or correspondences shall not be included or implied unless previously agreed upon in writing and signed by an authorised officer of the Company.
- 1.5 No order for supply arising from a quotation or otherwise shall be deemed to be accepted or constitute a legally enforceable contract with the Company until accepted in writing by the Company or until delivery of the goods, whichever shall be the earlier.
- 1.6 No responsibility is accepted by the Company for any inaccuracy or error in orders given by telephone.

2 Descriptions and Specifications

The descriptions, specifications and illustrations contained in catalogues, price lists and other leaflets or descriptive matter produced by the Company shall not form part of the contract and shall not be binding on the Company. Names, addresses and trademarks on illustrations indicate ownership of the artwork and must not be taken at necessarily indicating the manufacturers. Any description given of the goods is by way of identification only and does not constitute a sale by description or sample.

3 Delivery time

Any date quoted by the Company for despatch is given in good faith by way of estimate only. While the Company will endeavour to deliver within the period stated, such date is not to be of the essence of the contract and the Customer shall be bound to accept the goods when they become available. The Company shall not be liable for any loss or damage or delays in transit or consequential losses or losses including loss of profit resulting in any way in respect of late delivery howsoever caused even in such cases as the Company has expressly agreed in writing a delivery date, nor shall such failure to deliver on the date or within the period named by the Company be deemed to be a breach of contract.

4 Price

- 4.1 All prices and terms quoted by the Company or shown in any of the Company's price lists, catalogues etc are subject to alteration without notice.
- 4.2 All quoted and printed prices for goods are ex-warehouse and exclusive of VAT, packing, freight charges, postage, insurance, port rates, installation, commissioning and other costs unless expressly specified to the contrary.
- 4.3 The Company reserves the right at any time prior to delivery of the goods to adjust the price to take account of any increase in the cost of raw materials, labour or services or any currency

fluctuations, increases of taxes or duties or any other matters affecting the cost to the Company in complying with the contract.

- 4.4 Amendments to any order will only be accepted by prior agreement. Orders cancelled before delivery will be subject to a cancellation fee. For orders cancelled after delivery, the Company reserves the right to impose a handling charge of not less than 15% on returned goods save in circumstances where the goods are returned by reason of defects or shortages which it is the Company's duty under the terms of the Agreement to rectify.
- 4.5 Installation and commissioning will be quoted only against the specific request of the Customer.
- 4.6 The Company reserves the right to amend any accidental errors and omissions in quotations and invoices.

5 Payment

- 5.1 Time for payment shall be of the essence.
- 5.2 The Customer shall have no right of set off, Statutory or otherwise.
- 5.3 The Company reserves the right at any time at its discretion to demand security for payment before continuing with or delivering any order.
- 5.4 All accounts are payable in full cash with order or cash on delivery unless expressly agreed in writing by the Company.
- 5.5 For all credit accounts approved by the Company in writing for:
 - 5.5.1 Domestic Customers: orders should include two trade references and a bankers reference. Delivery of goods on an initial order of this type will be effected after the references have been cleared and a credit limit established. All invoices are to be paid in full by the last day of the month following date of invoice.
 - 5.5.2 Overseas Customers: payment must be made by an irrevocable letter of credit, payable at sight and confirmed by a first class Bank, unless other terms have been agreed in writing by the Company.
- 5.6 Where the goods are delivered in instalments or in the course of two or more separate deliveries any failure to make such payments due on or before the due date will entitle the Company at its option to treat the contract of sale as voided by the Customer and in such event the Company reserves all rights thereon which may be accrued to the Company prior to such termination.
- 5.7 In the event of non-payment, late payment or other default by the Customer the Company shall be entitled to recover all legal costs thereby incurred together also with interest on outstanding money, calculated at 1/2% per calendar month or part month compounded monthly.

6 Passing of Property and Risk

- 6.1 Risk in goods shall pass on to the Customer when the goods are delivered to or collected by the Customer or its carrier.
- 6.2 Title in the goods remains vested in the Company and shall only pass to the Customer upon full payment being made by the Customer of all sums due to the Company. The Customer shall not resell, assign or constitute as surety the purchased goods without having first paid the full price to the Company. Any executory process taken by third parties which may effect such goods shall

immediately be notified to the Company. Nothing herein shall constitute that the Customer is the Agent of the Company for the purposes of any resale.

- 6.3 The Customer agrees that whilst any such sums are due as aforesaid the Company may at any time enter upon the Customers premises and remove the Goods therefrom and that prior to such payment the Customer shall keep such Goods separate and identifiable for this purpose.

7 Inspection

- 7.1 The Customer is under a duty to inspect the goods on delivery or on collection as the case may be.
- 7.2 Claims for damage in transit or shortage in delivery of the goods will only be considered if the carriers and the Company receive written notification of such damage within 3 working days of delivery or in the event of loss of goods in transit within 8 working days of the date of consignment.
- 7.3 In all cases where defects or shortages are complained of, the Company shall be under no liability in respect thereof unless an opportunity to inspect the goods is afforded to the Company before any use is made thereof or any alteration or modification is made thereto by the Customer.

8 Property rights

- 8.1 The Company warrants that it has title to sell the goods. Such warranty specifically includes the Company's ownership of the necessary patent rights and copyright sufficient to enable the Customer to use the Goods for the purpose stated. However nothing in this Contract shall be deemed to grant to the Customer the right to manufacture or in any way reproduce the goods or reproduce or use any intellectual property rights of the Company or its agents.

9 Warranty and responsibility

- 9.1 No representation or warranty is given as to the suitability of the goods for any particular purpose and the Customer shall satisfy himself in this respect and shall be totally responsible therefor.
- 9.2 Unless otherwise notified all goods supplied shall have a 12 month warranty. Subject to the compliance to all installation, use, storage, maintenance and operating instructions, the Company will repair or replace any goods manufactured by itself in respect of defects arising solely from faulty materials or workmanship, providing they are returned carriage paid to the Company. Other details of such warranty may be obtained from the Company at any time and will be adequately stated in the Company's brochures, manuals, quotations or invoices. In the circumstances where alternative notification is given to the Customer, such alternative details shall prevail over any other warranty details.
- 9.3 In the case of any goods not manufactured by the Company but supplied by them or incorporated within the Company's goods, the Company is unable to provide any warranty but will assign to or pass on to the Customer the benefit of any such warranty that the Company shall itself have received from its own supplier.

10 Insurance

General conditions of Sale

Where goods are insured by the Company at its discretion or at the request of the Customer charges will be made on the invoice. The Company's liability under the insurance shall be limited to the amount received by them or the value of the goods, whichever is the less, and the Company shall be under no liability to take proceedings for the recovery of loss or damage but where goods are insured under the Company's Open Cover Cargo Policy the rights in such policy shall be assigned where possible to the consignee/Customer and any claims shall be administered by them in accordance with ICC (A) 1.1.82.

11 Packing

- 11.1 Unless otherwise expressly stated in writing the contract packing is not included in the contract price and will be the subject of an additional charge by the Company. The Company does not give warranty as to the fitness of any packing for storage purposes or any other purpose other than the transport of the goods to this named contract destination.
- 11.2 In all cases containers, bottles, packages and packing materials are not returnable.

12 Liability

- 12.1 Nothing herein shall be deemed to exclude or restrict the Company's liability for death or personal injury resulting wholly from the negligence of the Company.
- 12.2 The Company shall not be liable for any consequential or indirect loss suffered by the Customer whether this loss arises from a breach of duty in contract or in any other way including loss arising from the Company's negligence. Non-exhaustive illustrations of consequential or indirect loss would be:
- 12.2.1 loss of profits
- 12.2.2 loss of contracts
- 12.2.3 damage to property of the Customer or anybody else
- 12.2.4 personal injury to the Customer or anybody else (except so far as such injury is wholly attributable to the Company's negligence).
- 12.3 The Customer hereby agrees to indemnify the Company against all claims made against the Company by any of the Customers employees, Customers or any other person for which liability would have been excluded by this clause if the claim had been made against the Company by the Customer.
- 12.4 The Company shall not be liable in any way for any damages direct or consequential as a result of use of the equipment for any purpose other than that agreed nor for any use not stated and agreed in the Company's specifications nor for any fault or defect arising from the Customers failure to disclose relevant and pertinent information to the Company. Where the purpose of the goods is misrepresented or omitted the Company shall be under no obligation in any manner and responsibility and liability shall pass to the Customer.
- 12.5 The Company shall not be liable in any way for any damage direct or consequential arising as a result of the failure by the Customer to comply with the terms of the operating manual supplied with the goods or by reason of a failure by the Customer to comply with the specified requirements for maintenance and calibration of the goods.
- 12.6 The Customer acknowledges that the proper use of the goods can only be made by appropriately trained operatives. Training in the use of the equipment provided by the Company is available on a chargeable basis. Accordingly the Company shall not be liable in any way for any damage direct or consequential, arising as a result of the use of the goods by inadequately experienced or inadequately trained operatives.

13 Repairs

The Company is not responsible for damage to goods sent for repair or examination nor for incidental damage to glass, apparatus and delicate instruments in the course of repair. Time involved in the preliminary examination of an article may be charged in the event of no repair being ordered. Goods returned for repair should be sent, carriage paid and be clearly labelled with the senders name and address. Before the goods are sent advice shall be sent by fax to the Company clearly indicating method of despatch, description of goods and value for customs. At the same time a letter should be sent detailing the work required.

14 Drawings and Sketches

The Company reserves the right to charge for the preparation of all drawings or sketches prepared either for the submission of quotations or any execution of orders. All such drawings remain the property of the Company.

15 Force Majeure

- 15.1 The company shall not be liable for any failure to deliver the goods arising from circumstances outside the Company's control.
- 15.2 Non-exhaustive illustrations of such circumstances would be Acts of God, war, riot, explosion, abnormal weather conditions, fire, flood, strikes, lockouts, Government action or regulations, delay by suppliers, accidents, shortage of materials, labour or manufacturing facilities.
- 15.3 Should the Company be prevented from delivering in the above circumstances it shall give the Customer written notice of this fact as soon as reasonably practicable after discovering it.
- 15.4 If the circumstances preventing delivery are still continuing six months after the Customer receives the Company's notice then either party may give written notice to the other cancelling the contract.
- 15.5 If the contract is cancelled in this way, the Company will refund any payment which the Customer has already made on account of the price (subject to deduction of any amount the Company is entitled to claim from the Customer) but the Company will not be liable to compensate the Customer for any further loss or damage caused by the failure to deliver.

16 Export

- 16.1 The Customer shall be solely responsible for ensuring that any import or other regulations of any country or district to which the goods are to be exported are complied with and the Company shall be under no liability whatsoever should the goods subsequently fail to fulfil the requirements of such regulations.
- 16.2 The Customer shall inform the Company of any intended further transhipment of the goods to third parties and their proposed use so that the Company may ensure that the contract is in compliance with any export restrictions or embargoes laid down from time to time by European governments. In the event that such restrictions prevent the Company from complying with its contractual obligations the contract will be treated as being subject to Force Majeure and dealt with in accordance with clause 15. If a Customer knowingly or not, provides misleading information to the Company the Customer shall indemnify the Company against any penalties, fines or other expenses incurred as a result.

17 Cancellation

- 17.1 If the Customer shall fail to pay the contract price to the Company on the due date or if any distress or execution is levied upon the Customers property or assets or if the Customer shall offer to make any scheme or arrangement with creditors or commit any act of bankruptcy or, being a Company, has a receiver appointed for any part of its undertaking or assets or if a resolution for winding up shall be passed, then the Company may treat all sums due or to become due on any delivery as immediately payable or suspend or cancel further deliveries or require payment in advance therefor or recover any goods which are unsold wheresoever they are stored or treat the contract as repudiated by the Customer but without prejudice to any other rights of the Company.
- 17.2 Cancellation of the order by the Customer for whatever reason shall entitle the Company to payment of all costs expenses and losses of the Company arising therefrom. Such notification of cancellation by the Purchaser shall not be deemed to have been accepted by the Company in the absence of specific agreement by the Company in writing to that effect. In all cases the Company reserves to itself any rights that it may have in law.

18 Poisons

The sale of poisons is regulated by the Pharmacy and Poisons Act 1933, The Poisons List, and the Poisons Rules. Poisons will only be supplied to persons requiring them for use in scientific education or research and to authorised users and sellers. For the purpose of all poisons a written order on the purchasers official order form is required, signed by the purchaser, stating his name, address, trade, business or profession and the purpose for which the poison is required. No poison will be supplied for cash sales, only for invoicing against accredited accounts.

19 Notices

Any notice to be given hereunder shall be in writing and shall be deemed to have been duly given if sent or delivered to the party concerned at its address specified overleaf or such other address as that party may from time to time notify in writing and shall be deemed to have been served, if sent by post, forty-eight hours after posting.

20 Assignment

Neither the Company nor the Customer shall assign or transfer or purport to assign or transfer the contract or the benefits thereof to any other person without the prior consent of each other.

21 Proper Law and jurisdiction

The contract shall be governed and interpreted according to the Italian law and the Italian Courts shall have non exclusive jurisdiction in respect of any dispute arising in relation thereto. The Customer irrevocably agree to be subject to the jurisdiction of the Italian courts, should the Company refer any dispute thereto.

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Testing Equipment for the construction industry

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