

BITUMEN TESTI

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.

BITUMEN TESTING

81

Bitumen and bituminous binders

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Samplig bitumen and oil penetrometer

STANDARD

► ASTM D140 ► AASHTO T40

81-B0010 BACON SAMPLER

Used to obtain bitumen or oil samples from various levels.

Made from brass.

- Dimensions: 80 mm diameter x 250 mm long
- Weight approx.: 1.5 kg



Bitumen preparation

81-B0099/B AIR BATH

Used for softening bituminous materials before tests. The stainless steel vessel can receive up to 600 g of bitumen. Built-in thermostat. Heat protection.

- Power: 600 W
- Dimensions: 170x230x300 mm
- Weight approx.: 3 kg



81-PV0007 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.



Penetration of bituminous materials

STANDARD

► EN 1426 ► ASTM D5 ► AASHTO T49

STANDARD DIGITAL PENETROMETERS



81-B0100/D with Needle, Mirror, Glass transfer dish, Sample cup and thermometer



81-B0101/E with Needle, Mirror, Glass transfer dish, Sample cup and thermometer

MAIN FEATURES

- » Digital penetration measurement
- » Complete with micrometric vertical adjustment
- » Semi-automatic version with automatic controller and adjustable electronic timer of the fall time

- » Digital circulation water bath with cooling coil and immersion probe available.
- » The electronic timer allows the user to set up and read the fall time of the needle during testing

Available in two versions - 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. 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-PV0102 Digital circulation water bath with conditioning vessel. See Accessories.

Weight: 8.5 kg approx.

81-B0100/D

Digital standard penetrometer complete with micrometric vertical adjustment

micrometric vertical adjustment and adjustable electronic timer of the fall time, according to EN 1426, ASTM D5, AASHTO T49. 230 V, 50-60 Hz.

81-B0101/E

Digital electronic semi-automatic penetrometer complete with

81-B0101/EZ

As above but 110 V, 60 Hz, 1 ph

Accessories

Also suitable for PIVOT Automatic penetrometer (page 386)

Penetrometer needles

81-B0113

Penetration needle 2.5 ± 0.05 g. made from hardened polished stainless steel. Univocally traceable by engraved serial number. Conforming to ASTM D5 and EN 1426. Supplied with conformity certificate.

81-B0113/A

Same as above set of 3.

81-B0113/1

Verified penetrometer needle 2.5 ± 0.5 g. Fully hardened, tempered and polished stainless steel. Conforming to ASTM D5 and EN 1426. Supplied complete with official UKAS Verification Certificate

81-PV0113/AM

Magnetic penetrometer needles for PIVOT automatic penetrometer, 2.5 ± 0.05 g. Set of 3.



Sample cups

81-B0110/A

Sample cup, diameter 55x35 mm. Set of 6 pieces

81-B0110/B

Sample cup, diameter 70x45 mm. Set of 6 pieces



Glass transfer dish

81-B0109

Glass transfer dish with support, 100 mm diameter x 100 mm high



Mirror

81-B0100/1

Mirror with articulate holder. To make easy the surface contact between the needle and the sample.

Thermometers

82-B0100/6MF

IP 38 C Thermometer, range from +23 to +26°C, 0.1°C graduation, mercury free

82-B0125/2MF

ASTM 17C thermometer, range from +19 to +27°C range, 0.1°C graduation, mercury free

82-B0122/4MF

ASTM 563 C thermometer, range from -8 to +32°C range, 0.1°C graduation, mercury free

Water bath with digital thermo-regulator and immersed PT100 probe

81-PV0102

Water bath including heating controller and cooling coil, immersion temperature probe, internal support grid and connections to mains water or water chiller. Temperature range 25 to 60 ± 0.1 °C. 230 V, 50-60 Hz, 1 ph

81-PV0102/Z

As above but 110 V, 60 Hz, 1 ph

Simple water bath

81-PV0102/A

Water bath complete with internal water coil, support for specimen and water connections. To be used with external chiller series 81-PV0102/CHx

Water chiller

81-PV0102/CH

Water chiller, 7.5 l capacity, with electronic temperature controller with ± 0.1 °C accuracy and fluid temperature range between 5 and 30°C. Suitable for chilling penetrometer water baths or temperature controlled setting time tests. 350 W, 230 V, 50-60 Hz, 1 ph Overall dimensions: 415X300X420mm Weight approx.: 15 kg

81-PV0102/CHZ

As above but 110 V, 60 Hz, 1 ph

Standard penetration cone

81-B0115

Standard penetration cone conforming to ASTM D217 and EN 13880-2



81-B0100/D and 81-PV0102 thermostatically controlled water bath with thermoregulator and immersion probe



81-B0101/E Digital electronic semi-automatic penetrometer and 81-PV0102 digital water bath with thermoregulator and immersion temperature probe



81-PV0102/CH



81-B0101/E with Needle, Mirror, Sample cup and 81-PV0102/A Digital circulation water bath.



Fully Automatic Penetrometer 81-PV0103

STANDARD

- ▶ EN 1426 ▶ ASTM D5 ▶ AASHTO T49
- ▶ JIS K 2207 ▶ IP 49 ▶ DIN 52210
- ▶ AFNOR T66-004 ▶ ASTM D217



Pivot Automatic penetrometer with 81-PV0102 water bath with thermoregulator and 81-PV0102/CH chiller



PIVOT

A compact instrument, microprocessor controlled, using the latest technologies and programming tools. It includes a 6" lateral touchscreen display, intuitive and easy to use, which shows the penetration/time curve and can display and average up to 6 tests.

The instrument reaches the test start point automatically, and it is supplied with an integrated LED lamp. The device also has the possibility to recall the vertical position for repeated tests.

The test should be performed placing the penetration cup in thermostatically controlled water, using a suitable device as our water bath with thermoregulatory and immersed probe (see accessories page 385).



This is one of the many
ADVANCED products
of **CONTROLS** Group range.

To get more info visit
www.controls-group.com
or link directly to the QRCode

MAIN FEATURES

- » Fully automatic operation. The entire test cycle (rapid approach, starting point determination, penetration and return to the initial position) is automatically performed by simply pressing the start button on the touch screen display
- » Rapid approach and automatic starting point determination to eliminate any operator inaccuracy during needle position
- » Penetration measurement via contactless displacement transducer, with 0.01 mm resolution
- » Penetration range: 0 to 50 mm
- » Programmable penetration time: 0 to 9999 sec.
- » Programmable delay time: 0 to 999 sec.
- » Real time display of penetration/time curve
- » 6" color touchscreen display, easy to use thanks to the user friendly software
- » High precision vertical movement by stepper motor
- » Eight programmable reference positions for the holder assembly
- » Up to 6 tests simultaneously displayed
- » Saves time and delivers first class results

Automatic ring and ball apparatus

STANDARD

► EN 1427 ► ASTM D36 ► AASHTO T53



MAIN FEATURES

- » Microprocessor controlled
- » Full automatic testing procedure for both test with water or glycerol as heating fluid
- » Large graphic display
- » RS232 port for PC or printer
- » Memory up to 50 tests

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

Automatic ring and ball apparatus. 230 V, 50-60 Hz, 1 ph.

81-PV0143/Z

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

Accessories

82-P0172/1

RS232 cable

82-P0172/M

Serial printer 110-230V, 50-60Hz, 1 Ph

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

STANDARD

► EN 1427 ► ASTM D367 ► 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-PV0145/5** Pouring plate
- **81-PV145/6** Ring holder/assembly
- **82-D1200/1MF** Glass thermometer, -2 to +80 °C range, 0.2 °C graduations, IP61C, ASTM 15C, mercury free

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 offer three hot plate solutions:

- **10-D1402/D** Standard hot plate, 185 mm diameter, 1500 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/D 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/D

Hot plate, 185 mm diameter.
230 V, 50-60 Hz, 1 ph.
Power: 1500 W
Overall dimensions:
260 x 260 x 135 mm
Weight: 3 kg approx.

10-D1402/DZ

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, aluminum 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-D1200/1MF

Glass thermometer, -2 to +80 °C range, 0.2 °C graduations, IP 60C, ASTM 15C, mercury free.

82-D1200/2MF

Glass thermometer, +30 to 200 °C range, 0.5 °C graduations, IP 61C, ASTM 16C, mercury free.

Water in bitumen and bitumen emulsions

STANDARD

- 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.



81-B0155/A / 81-B0155/B

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.

STANDARD

- EN 1428 ► EN 12847 ► ASTM D244 ► NF T66 - 023 ► NLT 60 - 113

WATER IN BITUMEN EMULSIONS TEST SET

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

STANDARD

- EN 1429

RESIDUE ON SIEVING OF BITUMINOUS EMULSIONS

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

STANDARD

- EN 12848

MIXING STABILITY WITH CEMENT OF BITUMINOUS EMULSIONS

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

STANDARD

- NF T66-022

81-B0114

APPARATUS FOR THE DETERMINATION OF STORAGE STABILITY OF EMULSIONS.

- 230 V, 50-60 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-B0114

Degree of solubility of bituminous binders

STANDARD

▶ 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, fiberglass, 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.

Particle charge of emulsified asphalt

STANDARD

▶ EN 1430 ▶ ASTM D244 ▶ CNR 99
▶ NLT-194


81-B0129/E

PARTICLE CHARGE TESTER

Used to identify particle charge of emulsions. The apparatus comprises a digital 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/E

Particle charge tester. 110-230 V, 50-60 Hz, 1 ph.

Emulsified asphalt - residue by distillation

STANDARD

▶ 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 aluminum-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.

Breaking point- Fraas method

STANDARD

▶ 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-B0158/3MF

Thermometer IP 42C, mercury free. -38°C to +30°C range.



81-B0148



81-B0153



81-B0158

Settling tendency of bitumen emulsions

STANDARD

► EN 12847 ► ASTM D6930

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 389

Penetration power of bitumen emulsions

STANDARD

► 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

STANDARD

► 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 110 V, 60 Hz, 1 ph.

Accessories

82-B0150/10MF

Low distillation thermometer, -2 to +300°C range, 1 °C graduations, IP 5C, ASTM 7C, mercury-free.

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-B0150/11MF

High distillation thermometer, -2 to +400°C range, 1 °C graduations, IP 6C, ASTM 8C, mercury-free.



81-B0150/E

Breaking value of cationic bitumen emulsions: mineral filler method

STANDARD

► EN 13075-1 ► 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

81-B0139/F

Adjustable filler feeder. 110-230 V, 50-60 Hz, 1 ph.

81-B0139/3

Reference filler, 12.5 kg bag, conforming to EN 13075-1 and EN 13075-2..



81-B0139/D

Density / relative density of bitumen

STANDARD

► EN-ISO 3838

HUBBARD-CARMICK PYKNOMETERS

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-D1120

Flash and fire point by Clevelan open cup

STANDARD

► EN 22592 ► 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.



81-B0130/C

Spare parts

81-B0130/1C

Brass cup.

82-B0130/2MF

Thermometer, -6 to +400°C range, IP 28C, ASTM 11C, mercury-free.



81-B0130/C Brass cup mounted on the electric heater

Flash point by Tag open cup tester

STANDARD

► 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/A1MF

Thermometer, -38 to +42°C range, IP 20C, ASTM 33C, mercury-free.

82-B0138/A3MF

Thermometer, +90 to 170°C range, IP 59C, ASTM 35C, mercury-free.

82-B0135/1MF

Thermometer, -5 to +110°C range, IP 15C, ASTM 9C, mercury-free.

Standard Tar/Brta viscosity

STANDARD

► 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-B0122/3MF

Thermometer, 0 to 45°C range, 0.2°C graduations, IP 8C, mercury-free.

Graduated cylinder

86-D1003

Graduated cylinder, 100 ml capacity

Engler viscosity

STANDARD

► ASTM D490 ► 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-B0121/1MF

Thermometer, +18 to 28°C range, 0.2°C graduations, ASTM 23C, mercury-free.

82-B0121/2MF

Thermometer, +33 to 54°C range, 0.2°C graduations, ASTM 24C, mercury-free.

82-B0121/3MF

Thermometer, +95 to 105°C range, 0.2°C graduations, ASTM 25C, mercury-free.

82-B0121/4MF

Thermometer, +10 to 55°C range, 0.5 °C graduations, immersion 93 mm, IP 76C, mercury-free.

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-B0122/C with 86-D1003 and thermometer



81-B0120/B with thermometer and testing flask

Saybolt viscosity

STANDARD

► ASTM D88 ► ASTM D7496 ► 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) with diathermic oil.

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, withdrawal tube and diathermic oil are not included and have to be ordered separately - see Accessories.



81-B0121

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 d x h)	260 x 260 x 500	420 x 260 x 500
Weight, kg (approx.)	7	10

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-B0125/2MF

Saybolt thermometer, +19 to 27°C range, 0.1°C graduations, ASTM 17C, mercury-free.

82-B0125/3MF

Saybolt thermometer +34 to 42°C range, 0.1°C graduations, IP 23C, ASTM 18C, mercury-free.

82-B0125/4MF

Saybolt thermometer +49 to 57°C range, 0.1°C graduations, ASTM 19C, mercury-free.

82-B0125/5MF

Saybolt thermometer +57 to 65°C range, 0.1°C graduations, ASTM 20C, mercury-free.

82-B0125/6MF

Saybolt thermometer +79 to 87°C range, 0.1°C graduations, 250 mm length ASTM 21C, mercury-free.

82-B0125/7MF

Saybolt thermometer +95 to 103°C range, 0.1°C graduations, ASTM S22C, mercury-free.

Filter funnel and withdrawal tube

81-B0125/13

Filter funnel with wire mesh and clip.

81-B0125/14

Withdrawal tube.

75-B0165/5

Diathermic oil can of 18 kg

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.



81-B0121/A

Kinematic Viscosity

STANDARD

► ASTM D2170 ► AASHTO T201 ► EN 12595

81

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	Capillary No.	Approx. Constant cSt/S	Kinematic viscosity range cSt
81-B0116/1	150	0.035	7 to 35
81-B0116/2	200	0.1	20 to 100
81-B0116/3	300	0.25	50 to 250
81-B0116/4	350	0.5	100 to 500
81-B0116/5	400	1.2	240 to 1200
81-B0116/6	450	2.5	500 to 2500
81-B0116/7	500	8	1600 to 8000
81-B0116/8	600	20	4000 to 20,000

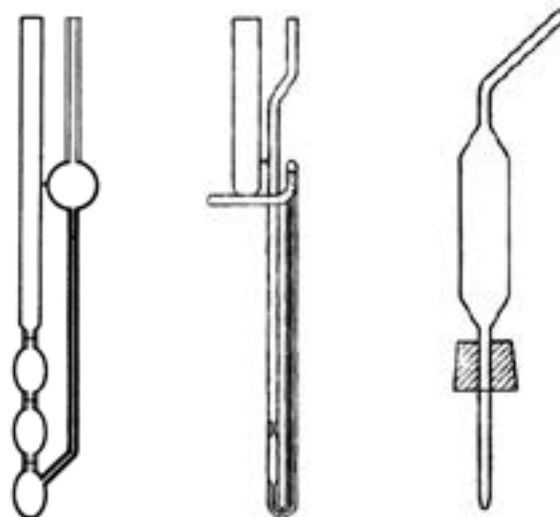
To determine the kinematic viscosity, all the above Cannon-Fenske viscometers must be placed into the 81-PV0116/F Viscometer bath using the holder 81-B0116/H1, included in PV0116/F). See accessories.

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	Capillary NO.	Approx. Constant cSt/S	Kinematic viscosity range cSt
81-B0116/10	4	0.1	20 to 100
81-B0116/11	5	0.3	60 to 300
81-B0116/12	6	1.0	200 to 1000
81-B0116/13	7	3.0	600 to 3000
81-B0116/14	8	10.0	2000 to 10000
81-B0116/15	9	30.0	6000 to 30000
81-B0116/16	10	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.



81-B0116/1
to 81-B0116/8

81-B0116/10
to 81-B0116/16

81-B0116/20 to 81-B0116/27

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	Capillary NO.	Approx. Constant cSt/S	Kinematic viscosity range cSt
81-B0116/20	4	0.1	6 to 100
81-B0116/21	5	0.3	18 to 300
81-B0116/22	6	1.0	60 to 1000
81-B0116/23	7	3.0	180 to 3000
81-B0116/24	8	10	600 to 10000
81-B0116/25	9	30	1800 to 30000
81-B0116/26	10	100	6000 to 100000
81-B0116/27	11	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

STANDARD

► ASTM D2171 ► EN 12596

CANNON-MANNING VACUUM VISCOMETERS

Used for determining the viscosity of bitumen at 60° C. Supplied complete with calibration certificate.



Code	Capillary No.	Viscosity range
81-B0117/1	6	0.036 to 0.8
81-B0117/2	7	0.12 to 2.4
81-B0117/3	8	0.36 to 8
81-B0117/4	9	1.2 to 24
81-B0117/5	10	3.6 to 80
81-B0117/6	11	12 to 240
81-B0117/7	12	36 to 800
81-B0117/8	13	120 to 2400
81-B0117/9	14	360 to 8000
81-B0117/10	15	1200 to 24,000
81-B0117/11	16	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	Capillary No.	Viscosity range
81-B0117/15	25	42 to 800
81-B0117/16	50	180 to 3200
81-B0117/17	100	600 to 12,800
81-B0117/18	200	2400 to 52,000
81-B0117/20	400	9600 to 140,000
81-B0117/21	800	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

STANDARD

► ASTM D2171 ► EN 12596

VISCOMETER BATH

81-PV0116/F

Viscometer bath. 230 V, 50-60 Hz, 1 ph.

81-PV0116/FZ

As above, but. 110 V, 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 liters
- 5 viscometer tubes
- Weight: approx.12 kg



Accessories

Holders for using viscometers with 81-PV0116/F Viscometer bath

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 vacuum 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-B0116/40MF

Kinematic viscosity thermometer, range 58.5 to 61.5°C, type, IP 35C, ASTM 47C, mercury-free.

82-B0116/45MF

Kinematic viscosity thermometer, range 133.5 to 136.5°, type, IP 93C, ASTM 110C, mercury-free.



Ductilometers

DUCTIMETER

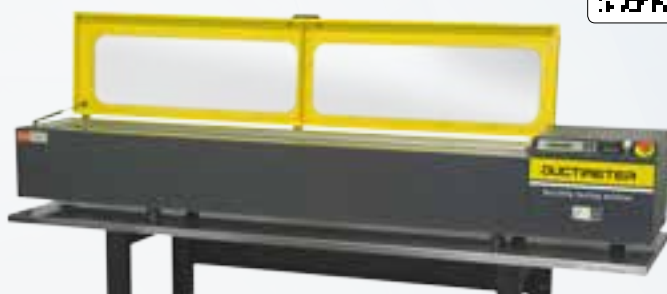
The ductility test is performed for determining the ductility of bituminous materials by measuring the elongation before breaking when two ends of briquette specimens are pulled apart at a specified speed and temperature.

We offer three different versions:

STANDARD VERSION

STANDARD

► EN 13398 ► ASTM D113 ► AASHTO T51 ► ASTM D6084



HIGH PERFORMANCE VERSION FOR FORCE DUCTILITY TEST

STANDARD

► EN 13398 ► ASTM D113 ► AASHTO T51 ► EN 13589 ► EN 13703
► ASTM D6084 ► AASHTO T300



RESEARCH VERSION FOR FORCE DUCTILITY TEST ON STANDARD AND MODIFIED BITUMEN

STANDARD

► EN 13398 ► ASTM D113 ► AASHTO T51 ► EN 13589 ► EN 13703
► ASTM D6084 ► AASHTO T300



COMMON FEATURES

- » 4 tension line (briquette capacity) x 1500 mm
- » Easy and free access to the large testing space
- » Closed-loop PID temperature control system
- » Double drive screw rod
- » Stainless steel insulated water bath
- » Exclusive in-built thermoregulation system compensating the exchange of heat and cooling, resulting in a 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

Detail of water bath. Easy and free access to the large testing space, common to all versions



ADDITIONAL FEATURES OF THE HIGH PERFORMANCE VERSION

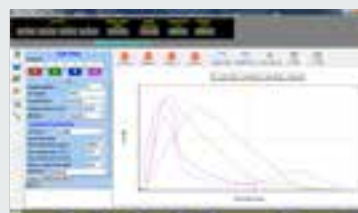
- » PC-controlled using dedicated software
- » Includes a system for measuring forces up to 1200 N (4 x 300 N, 2 x 500 N)
- » Temperature range at 25°C and from 4 to 30°C with water chiller
- » Real time load and displacement graphics via PC

ADDITIONAL FEATURES OF THE RESEARCH VERSION

- » Adjustable speed range from 1 to 200 mm
- » Temperature range from -10 to 60°C with water chiller
- » Elongation measurement by optical system
- » System for measuring forces up to 2000 N (4 x 500 N)
- » Extensive use of stainless steel for frame, cover and tank



Detail of load cells and briquette moulds of High performance and Research ductimeters



This is one of the many **ADVANCED** products of **CONTROLS** Group range.

To get more info visit
www.controls-group.com
or link directly to the QRCode

Determination of flexural creep stiffness

STANDARD

► ASTM D6648 ► AASHTO T313 ► EN14771



81-PV5902

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 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-PV059/1
Extra aluminum beam mould.

81-PV059/2
Set of 36 plastic strips for BBR moulds.

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

RTFOT Rolling thin-film oven

Determination of the resistance to hardening under the influence of heat and air

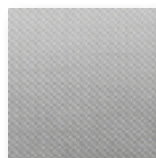
STANDARD

► ASTM D2872 ► AASHTO T240 ► EN 12607-1



MAIN FEATURES

- » Touchscreen 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

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 digital 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-PV0161/12 Di-

aphragm 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: 3000 W
External dimensions: 750 x 750 x 900 mm (w x d x h)
Weight: approx. 50 kg

Ordering information

ASTM/AASHTO versions:

81-PV1612

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

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-PV0161/12

Diaphragm pump 6 liters/min at 2.4 bar. 110-230 V, 50-60 Hz, 1 ph.

Description

Free air displacement 6 liters/min, maximum pressure 2.4 bar (when used as an air compressor).

Power: 65 W

Weight: approx. 1.9 kg

81-PV0161/13

Scraper for RTFOT bottle

81-PV0161/14

Metal rack for holding/cooling RTFOT bottles

81-PV0161/15

RTFOT bottle tong

Spares

81-PV0161/10

Spare glass container

82-PV0160/10MF

IP 47C, ASTM 13C Thermometer, +150 to +175°C, 0.5°C divisions.

Rotary evaporation apparatus for determining the resistance to hardening under the influence of heat and air: RFT method

STANDARD

► 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.

The Rotary evaporator is also used for the determination concerning ASTM D5404 and AASHTO TP2. See page 333.

Ordering information

75-PV1650

Rotary evaporation apparatus. 230 V, 50 Hz, 1 ph.

75-PV1650/Z

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

Accessories

EN 12697-3

75-B0165/5

Diathermic oil. 18 kg can

75-B0165/4

Glass flask 1 liter capacity with rubber stopper

75-B0165/3

Glass tubing with three way valve and transparent flexible hose for solution intake

86-D2003

Dual stage high vacuum pump. 230 V, 50 Hz, 1 pf. (For 110 V, 60 Hz ask model 86-D2003/Z)

86-D2004/1D

Vacuum regulator with digital gauge, 0.001 bar resolution. 230 V, 50-60 Hz, 1 ph. (For 110 V, 60 Hz ask model 86-D2004/1DZ)

86-D2064

Rubber tube for vacuum, 6.5/16.5 int./ext. mm diameter, 2 m



75-B0165

Effect of heat and air and loss on heating of oil and bituminous compounds: thin-film oven test (TFOT)

STANDARD

► 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-PV0160/10MF

IP 47C, ASTM 13C Thermometer, +150 to +175°C, 0.5°C divisions.



81-B0160/C



81-B0160/1 and 81-B0160/2



Pressure Ageing Vessel

81-PV2600

Long Term Ageing Conditioning
of Asphalt Binder



Vacuum Degassing Oven

81-PV2610



Pressure Ageing Vessel PAV and
Vacuum Degassing Oven VDO

PAV

STANDARD

► ASTM D6521 ► AASHTO R28 ► EN 14769



MAIN FEATURES

- » Platinum RTD temperature internal measurement to $\pm 0.1^{\circ}\text{C}$
- » Freely selectable test temperatures from 80° to 120°C , PID controlled to $\pm 0.5^{\circ}\text{C}$
- » Efficient heating system allowing the test temperature to be achieved in one hour, exceeding the Standards' specification
- » Programmable pre-heating functions (limited to 60°C to avoid accidental burns during sample rack positioning) for time optimization
- » Testing time up to 99 hours
- » Pressure monitored by transducer and controlled to $2.1 \pm 0.1\text{ MPa}$
- » User friendly software allows real time readout of vessel temperature and pressure
- » 6" color touchscreen reclining display
- » Temperature and pressure calibrations performable by the user
- » Network ready for remote monitoring of the test status from PC, tablet or smartphone
- » CE and ASME certified pressure vessel
- » Electrically locked top cover, to avoid direct exposure of the pressure vessel during the test
- » Forced ventilation cooling system allowing quick cooling of sample rack to avoid accidental burn
- » Over temperature limit switch
- » Over pressure relief valve

The Pressure Ageing Vessel (PAV) has been developed to simulate in-service ageing of asphalt binder after 5 to 10 years. The binder is exposed to high pressure and temperature for 20 or 65 hours (selectable up to 99) to simulate the effect of long-term oxidative ageing.

This conditioning process is intended to provide an evaluation of the relative resistance of asphalt binders to oxidative ageing at selected elevated temperatures and pressures. It is normally performed after an initial conditioning using a Rolling Thin Film Oven (RTFOT).

The apparatus consists of a stainless steel (AISI 304 with ASME and CE certifications) pressure vessel with encased band heaters and integral pressure and temperature controls. Data logs of both temperature and pressure are saved on USB stick or transferred to PC at the end of the test.

The user friendly software allows the operator to view the vessel temperature and pressure in real time, both as set targets and actual values, with a high rate of refresh. It is also possible to view, in real time, the temperature and pressure graphs.

Most standards also require the Vacuum Degassing Oven (VDO see next page) mandatory to remove air bubbles created during accelerated oxidative ageing to make the aged binder suitable for further tests as BBR, DSR, Penetration, Ductility etc.

81-PV2600

Pressure ageing vessel (PAV), to simulate ageing of asphalt binder. 230V, 50-60 Hz, 1 ph.

81-PV2600/Z

Same as above but 110V, 60 Hz, 1 ph.

The PAV requires a suitable compressed air tank, 2.1MPa minimum pressure. This could be for example an air compressor or commercial bottled air, depending on reference standards.

- Dimensions (lxwxh): 430 x 660 x 480 mm
- Weight approx.: 90 kg

Accessories**81-PV2600/1**

Spare sample container (TFOT pan) for PAV

81-2600/2

Spare sample rack for PAV



Pressure transducer calibration menu



Detail of inclinable touchscreen display



This is one of the many **ADVANCED** products of **CONTROLS** Group range.

To get more info visit www.controls-group.com or link directly to the QRCode

MAIN FEATURES

- » Designed to remove air bubbles created during accelerated oxidative ageing of asphalt binder by the PAV
- » Platinum RTD temperature internal measurement to $\pm 0.1^\circ\text{C}$
- » Selectable test temperature (from ambient to 200°C) controlled to $\pm 4.0^\circ\text{C}$
- » Integrated vacuum pump
- » Vacuum monitored by transducer and controlled to $15 \pm 0.1\text{ kPa}$ absolute pressure
- » Digital touchscreen 6" color display for temperature, vacuum, set points and actual values
- » Over temperature limit switch
- » Network ready for remote monitoring of the test status from PC, tablet or smartphone

The apparatus consists of a stainless steel vacuum vessel with en-cased band heaters and integral vacuum and temperature controls. The vacuum chamber can accept either eight 55x35 mm or four 70x45 mm (available as accessories) sample containers. The instrument is supplied complete with temperature traceable calibration certificate, 8 aluminum 55x35 mm sample containers, a sample holder and operator's manual.

- Dimensions (lxwxh): 430 x 440 x 480 mm
- Weight approx.: 30 kg

81-PV2610

Vacuum Degassing Oven (VDO) conforming to ASTM D6521, AASHTO R28 and EN 14769. 230 V, 50-60 Hz, 1 ph

81-PV2610/Z

as above but 110 V, 60 Hz, 1 ph

Accessories**81-PV2610/1**

Set of eight 55x35 mm sample containers for VDO

81-PV2610/2

Set of four 70x45 mm sample containers for VDO



81-PV2610/1



81-PV2610/2

Rotational viscometers

STANDARD

▶ ASTM D2196 ▶ ASTM D4402 ▶ AASHTO T316 ▶ EN 13302



81-PV0118/C Standard version



81-PV0118/B High performance version

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 between ambient temperature to 260°C. The measured relative resistance to rotation is converted, by a factor, in viscosity units, cP or mPa.s.

We offer two versions:

81-PV0118/C Standard rotational viscometer and

81-PV0118/B High performance rotational viscometer, featuring a superior level of test automation

COMMON 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 sound and visual malfunction alarm
- » AUTO-RANGE function
- » User-enabled calibration
- » 10 languages options
- » Repeatability: 0.2%
- » Accuracy 0,1% of full scale

ADDITIONAL FEATURES OF THE 81-PV0118/B VERSION

- » Display of Sample temperature, Shear rate and Shear stress (with coaxial spindles), Density (entered by the user) Step program status, Analysis and visual characteristics (flow curves), Viscosity reading: Dynamic (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

81 – PV0118/C

Rotational viscometer supplied with stand, boss head, spindle protection, spindle rack, power supply cable. 100-240V, 50-60 Hz, 1Ph

81-PV0118/B

Rotational Viscometer, high performance version, calibration certificate, USB, WIFI, Bluetooth, temperature sensor, datalogger software and power supply cable. Viscosity range 100-40 000 000 cP, rotational speed 0.01-200rpm. Conforming to ASTM D2196, ASTM D4402, AASHTO T316, EN 13302. 100-240V, 50-60 Hz, 1ph

Technical specifications	81-PV0118/C	81-PV0118/B
Viscosity range (cP)	100-13.000.000	100-40.000.000
Rotational speed range (r.p.m.)	0.3-100	0.01-200 18 selectable
Resolution: Using low viscosity adapter For lower than 10000 Equal to or above 10000	cP 0.01 cP 0.1 cP 1	cP 0.01 cP 0.1 cP 1
Repeatability	0.2%	0.2%
Thermometer features: -Thermometer margins -Resolution -Precision Type of probe	N.A.	0 to + 100°C 32°F to 212°F 0.1°C, 0.2°F ±0.1°C PT100

Elastic recovery apparatus by torsion method

Accessories for both versions

Temperature control unit

The temperature control unit consist of a heating chamber that is used to work in conjunction with rotary viscometers at high temperatures. Viscosity of solid road unfilled asphalts has to be measured at temperatures ranging from 34°C to 260°C according to the Specifications of ASTM D4402. The heater contains the container with sample in which a suitable spindle is immersed and driven by the rotary viscometer to measure viscosity. A digital microprocessor control unit grants the required accuracy of test temperature.

81-PV0118/T

Temperature control unit with temperature range from ambient plus 5°C to 300°C. 220-240V/50-60Hz/1ph

81-PV0118/TZ

As above but 110V/60Hz/1ph



81-PV0118/2

Aluminum disposable test chamber

81-PV0118/3

Stainless steel reusable test chamber

81-PV0118/4

Set of 4 stainless steel spindles, Viscosity ranges:

- TR8, 50-170 K,
- TR9, 250-830 K
- TR10, 500-1.7 M
- TR11, 1K-3.3 m



STANDARD

► NLT 329 ► INVIAS E 727 ► M-MMP-4-05-024 ► IRAM 6830

81-B0149

ELASTIC RECOVERY APPARATUS

Used for determining the degree of elasticity of modified asphalt used in road construction by the elastic recovery by torsion method.

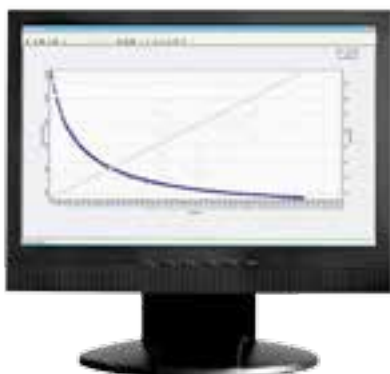
The equipment basically consists of a metal cylinder Ø 25.4 x 100 mm long, a guide support with a scale graduated from 0 to 180°, a water bath and a container for the sample.

The test consists of inducing angular deformation by means of a steel cylinder of specific dimensions, embedded into a sample of modified asphalt, in order to observe its recovery capacity

Accessories:

82-B0125/2MF

Saybolt thermometer, +19 to 27°C range, 0.1°C graduations, ASTM 17C, mercury free.



Software for High Performance Rotational Viscometer

Rheological properties of asphalt binders

81-PV6202



STANDARD

- AASHTO T315 ▸ AASHTO T316, T350 ▸ AASHTO M320
- AASHTO M332 ▸ AASHTO R29 ▸ ASTM D7175 ▸ ASTM D4402
- ASTM D7405 ▸ EN 13302 ▸ EN 13702-1 ▸ EN 13702-2
- EN 14770 ▸ EN 14896



DSR

DSR, DYNAMIC SHEAR RHEOMETER

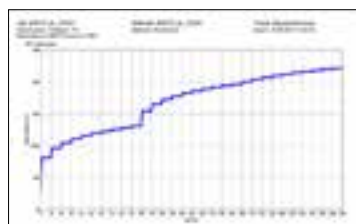
Dynamic Shear Rheometers (DSR) performs the critical rheological characterization analysis required for SuperPave Performance Grade (PG) classification of asphalt binders.

The behavior of the binder under various temperature and loading conditions is measured to predict the performance of binders at anticipated climatic conditions.

The DSR test uses a thin asphalt binder sample sandwiched between two circular plates. The lower plate is fixed while the upper plate oscillates back and forth across the sample to create a shearing action. DSR tests are conducted on unaged, RTFO aged and PAV aged asphalt binder samples. The test is largely software controlled.

81-PV6102 and **81-PV6202** are able to perform SuperPave performance grading according to AASHTO T315 and ASTM D7175, Viscosity determination of asphalt binder in according to AASHTO T316 and ASTM D4402 and determine Multi Stress Creep Recovery (MSCR) according to AASHTO T350 and ASTM D7405.

MAIN FEATURES



MSCR - Test



G* and phase angle δ

- » Performance Grade (PG) determination test.
- » Determination of deformation properties of bitumen with Multiple Stress Creep Recovery test (MSCR – Test).
- » Determination of complex shear modulus G^* and phase angle δ of road bitumen at different temperatures.
- » Precise and stable temperature control unit (Peltier unit).
- » Excellent temperature stability and accuracy.
- » Meet and exceed AASHTO, ASTM and EN Standards.
- » Simple to use.



81-PV6102

Technical Specification

Rheometer

- Torque range 0,1 to 150 mNm
- Torque resolution 0,001 mNm
- Speed range 0 to 2000 rpm
- Speed resolution 0,015 rpm
- Rotation angle range -50° to 300°
- Angle resolution 0.001°
- Frequency 0.001 to 100 Hz
- Viscosity range 0.1 to 7x10⁷ Pas
- Complex shear modulus 0.1 to 4x10⁶ kPa
- Phase angle range 0 to 90°

Temperature control unit (Peltier unit)

- Maximum temperature 180°C
- Minimum temperature -10°C
- Temperature accuracy ≤ 0.1 K, range 5°C to 90°C
- Interface USB 2.0

Software manager

- Prepared jobs for automatic and fast execution of all bitumen tests
- Automated evaluation and analysis of measuring results in accordance with AASHTO
- With estimation of Performance Grade
- Different test types for original binders, RTFO and PAV
- Grade Determination and PASS/FAIL conditions
- Bitumen Wizard

Technical Specification

Rheometer

- Torque range 0,1 to 150 mNm
- Torque resolution 0,001 mNm
- Speed range 0 to 2000 rpm
- Speed resolution 0,015 rpm
- Viscosity range 1 to 3 x 10⁹ mPa
- Complex shear modulus 0.1 to 4 x 10⁶ kPa
- Phase angle range 0 to 90°
- Frequency 0.001 to 100 Hz
- Normal force range -30 to 30 N
- Normal force resolution 0.01 N
- Automatic gap setting yes
- Gap resolution 1 μ m

Temperature control unit (peltier unit)

- Maximum temperature 180°C
- Minimum temperature -15°C
- Temperature accuracy ≤ 0.1 K, range 5°C to 90°C
- Interface USB 2.0

Software manager

- Prepared jobs for automatic and fast execution of all bitumen tests
- Automated evaluation and analysis of measuring results in accordance with AASHTO
- With estimation of Performance Grade
- Different test types for original binders, RTFO and PAV
- Grade Determination and PASS/FAIL conditions
- Bitumen Wizard



81-PV6202

Lighted chambers



Peltier unit: Peltier control unit, peltier tempered basic plate, basic plate support, adapter, exchange grip, exchangeable plate ($\varnothing$ 25mm), measuring plate P3 ($\varnothing$ 25mm), measuring plate P4 ($\varnothing$ 8mm).



Set of trimming tools, set of rubber moulds, 20 ml calibration liquid NF 5000000, interface cables, USB adapter, user manual



Software Manager for Bitumen tests



This is one of the many **ADVANCED** products of **CONTROLS** Group range.

To get more info visit www.controls-group.com or link directly to the QRCode

MEASURING Inst GENERAL LAB Apparatus

82 Measuring instruments

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 application.

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 have been grouped in this large family.

Contents

MEASURING Instruments GENERAL LABORATORY Apparatus

82

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General laboratory apparatus

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Force verification and calibration apparatus

STANDARD

- 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 Digital 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°: $\leq \pm 0.145\%$
- Reversibility: $\leq \pm 0.240\%$
- 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
- Complete with carrying case

Ordering information

82-E0100/L5

Load cell, 5 kN capacity, complete with spherical loading head.

82-E0100/L25

Load cell, 25 kN capacity, complete with spherical loading head.

82-E0100/L30

Load cell, 30 kN capacity, complete with spherical loading head.

82-E0100/5

Load cell, 50 kN capacity, complete with spherical loading head.

82-E0100/L75

Load cell, 75 kN capacity, complete with spherical loading head.

82-E0100/10

Load cell, 100 kN capacity, complete with spherical loading head.

82-E0100/30

Load cell, 300 kN capacity.

82-E0100/50

Load cell, 500 kN capacity

82-E0100/60

Load cell, 600 kN capacity, complete with spherical loading head.

82-E0100/100

Load cell, 1000 kN capacity.

82-E0100/200

Load cell, 2000 kN capacity.

82-E0100/300

Load cell, 3000 kN capacity.

82-E0100/500

Load cell, 5000 kN capacity.

82-E0100/SIT1

Official ACCREDIA calibration certificate for load cell 30 to 1000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT2

Official ACCREDIA calibration certificate for load cell 2000 to 5000 kN capacity, connected to the relevant Digital tester.

82-E0100/SIT3

Official ACCREDIA 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/L25	25	57x117*	1.5
82-E0100/L30	30	82x149*	4.2
82-E0100/5	50	82x149*	4.2
82-E0100/L75	75	82x149*	4.2
82-E0100/10	100	82x149*	4.2
82-E0100/30	300	129x200	10
82-E0100/50	500	129x200	12
82-E0100/60	600	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

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 110V, 60 Hz, 1 ph.

Accessories

82-P0172/M

24-column serial printer. 110-230 V, 50-60 Hz, 1 ph.

82-P0800/C

Carrying 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

STANDARD

► EN 12390-4

STRAIN GAUGED COLUMN AND TESTER FOR LOAD TRANSFER VERIFICATION

To verify:

- Accuracy of force indication
- Self alignment of the upper machine plate
- Alignment of the 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.

For detailed information please visit our web site



82-P0804/E with 82-E0105/1 and printer

Ordering information

82-E0105/1

Strain gauged column/load cell 3000kN capacity

82-P0804/E

Force transfert digital tester. 230V, 50-60 Hz, 1 ph.

82-P0804/EZ

Same as above but 110V, 60 Hz, 1ph 1 ph.

CONTROLS		VERIFICA MACCHINA DI COMPRESSIONE COMPRESSION TESTING MACHINES				
Cliente Client		CONTROLS UK		Indirizzo Site address		
				CERTIFICATO N° - CERTIFICATE No : 1661/2019		
Pressa - Compression machine		Flessimetro - Strain gauge		Indicatore Digitale - Digital indicator		
Costruttore - Manufact. CONTROLS		Costruttore - Manufact. CONTROLS		Costruttore - Manufact. CONTROLS		
Tipo - Type C47200		Tipo - Type E105/P1		Tipo - Type E 105		
Matricola - Serial no 19004074		Matricola - Serial no 9111N361		Matricola - Serial no ARE		
		Certificato n° - Certificate no : K031534				
		Emesso da - Issued by : LNE 01-apr-2009				
Verificata secondo - Conform to :		ISC E105 rev.2				
		(rif. EN 12390-4:2002)				
RISULTATI DI STABILITA' - STABILITY RESULT						
		Fronte - Front	Retro - Back	Sinis. - Left	Destra - Right	Limiti - Limit
Media rapporto di carico - Mean strain ratio		-0,04	0,03	-0,02	0,03	± 0,10
Max diff. rapporto di carico - Max change in ratio		0,07	0,07	0,08	0,08	0,10
		Fronte / Retro - Front - Back	Sinis. / Destra - Left / Right	Limiti - Limit		
Diff. rapp. di carico - Diff. strain ratio /mm 200kN		0,03	0,05	0,06		
Diff. rapp. di carico - Diff. strain ratio /mm 2MN		0,03	0,04	0,04		
Data verifica - Verification date 12-giu-19		Firma collaudatore - Operator signature		Verificato da - Verified by		



Load cell (from 300 kN up to 5000 kN), digital tester 82-P0801/E and printer 82-P0172/M

Automatic calibration and force verification procedure

In order to perform automatic calibration of our compression machines, our external digital readout units (82-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.

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.

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).



82-P0375 / 82-P0375/C

Technical specifications

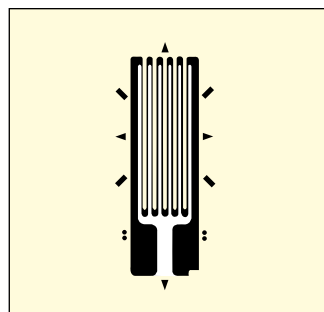
Product code	Capacity (kN)	Top and lower connection thread	Dimensions (mm, dia. x h)	Weight (kg, approx.)
82-P0370	2.5	M20 x 1.5	57 x 80	1.5
82-P0373	10	M20 x 1.5	57 x 80	1.5
82-P0375	50	M20 x 1.5	57 x 80	1.5
82-P0376	100	M30 x 2	82 x 110	4.45

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/C 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 Multitest and AUTOMAX PRO-M control unit.

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 page 416



82-P0399/C



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/C

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 model are made from special alloy steel, they are supplied in three versions: analog dial gauge 0.01 mm, analog dial gauge 0.001 mm and digital dial gauge 0.001 mm. All supplied complete with calibration chart.

All models can be fitted with T1000/F (see accessories), a special stem brake unit which maintains the maximum reading after the failure of the specimen.

Load ring can be directly connected to the adapter fit on the crosshead of triaxial frames. Using the 28-WF1049 connector (see accessories) they can be adapted to our complete range of triaxial cells.

Accessories

28-WF1049

Connector for load rings in triaxial applications.

82-T1000/9

Adapter to connect the load rings, 0.5 to 10 kN capacity, to the crosshead of CBR/Marshall, Multispeed and Uniframe 50-100 kN testers.

82-T1000/F

Stem brake unit for load rings.



82-T1000/50M



82-T1000/30M, 82-T1000/F

Ordering information

Capacity [kN]	Analog Dial Gauge 0.01	Analog Dial Gauge 0.001	Digital Dial Gauge 0.001
0.5	82-T1000/05C	82-T1000/05M	82-T1000/05D
1	82-T1000/1C	82-T1000/1M	82-T1000/1D
2	82-T1000/2C	82-T1000/2M	82-T1000/2D
3	82-T1000/3C	82-T1000/3M	82-T1000/3D
5	82-T1000/5C	82-T1000/5M	82-T1000/5D
10	82-T1000/10C	82-T1000/10M	82-T1000/10D
15	82-T1000/15C	82-T1000/15M	82-T1000/15D
20	82-T1000/20C	82-T1000/20M	82-T1000/20D
30	82-T1000/30C	82-T1000/30M	82-T1000/30D
40	82-T1000/40C	82-T1000/40M	82-T1000/40D
50	82-T1000/50C	82-T1000/50M	82-T1000/50D
60	82-T1000/60C	82-T1000/60M	82-T1000/60D
100	82-T1000/100C	82-T1000/100M	82-T1000/100D

Pressure and displacement 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/A to 28-WF6302/A are mainly used for triaxial tests. See page 79

Technical specifications

- Accuracy: $\pm 0.5\%$
- Resolution: infinite
- Operating temperature range: -40 to $+100^{\circ}\text{C}$
- Sensitivity: 2mV/V applied (nominal)
- Full scale output: 20 mV nominal
- Cable: 4 core PVC insulated, 1 m length
- Connection thread: $\frac{1}{4}$ BSP
- Weight: 150 g approx.

Ordering information

28-WF6300/A

Pressure transducer, 0 - 10 bar range.

28-WF6301/A

Pressure transducer, 0 - 20 bar range.

28-WF6302/A

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, Pilot and AUTOMAX 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).

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.

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.



82-P0349/ELT, suitable for Smart-Line, Automax Multitest control consoles and Compact-Line Wizard, Pilot and AUTOMAX compression machines

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, 700 bar 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: 10 V DC
- Resolution: infinite
- Linearity: 0.30%
- Connector: 6-pin

Ordering information

82-P0331/A

High precision LVDT displacement transducer, 2 mm travel.

82-P0331/B

High precision LVDT displacement transducer, 5 mm travel.

82-P0331/C

High precision LVDT displacement transducer, 10 mm travel.

82-P0331/G

High precision LVDT displacement transducer, 20 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



82-P0331/2

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: 2 V

Measuring capacity: 5 (3 to 8) mm

Sensitivity: 1000×10^{-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 210 for complete information.

82-P0331/E1

Spare fixing jigs for 82-P0331/E. 10 pieces.



82-P0340/100, 82-P0340/5



82-D1261/10C with 82-D1261/LINK

LTD STRAIN GAUGE TRANSDUCERS

Technical specifications

- Supply voltage: 10 V
- Resolution: $< 1 \mu\text{m}$
- 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-D1262/B

Digital dial indicator, 25.4×0.001 mm with output for PC connection

82-D1261/50C

Digital dial indicator, 50×0.01 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 includes a rear mount.

Weight: 150 g approx.

Ordering information

82-D1250/A

Dial gauge, 5×0.001 mm.

82-D1252

Dial gauge, 10×0.002 mm.

82-D1255

Dial gauge, 10×0.01 mm.

82-D1257

Dial gauge, 30×0.01 mm.

82-D1259/B

Dial gauge, 50×0.01 mm.

Accessories

82-D1260

Magnetic holder for dial gauges/indicators.



Dial gauges



82-D1260 with dial gauge

DATALOG 8**Data acquisition equipment**

82



Data acquisition unit DATALOG 8 model 82-P9008. Laboratory version

DATALOG 8 is a stand-alone data logger for general purpose acquisition, processing and data storage for laboratory applications.

DATALOG 8 records and monitors in real time the measurements requested by different tests, for example:

- Elastic modulus determination with Uniaxial and Triaxial testing systems without in-built channels (rock, concrete, others)
- Determination of axial and circumferential deformations of concrete and rock specimens under compression loading
- Rock shear box apparatus
- Plate bearing test apparatus (Battery operated version)
- In-situ determination of stress, deformability and resistance of masonry walls with flat jacks (Battery operated version)
- ... and many other tests

Available in two versions:

82-P9008

Datalog 8, stand-alone multipurpose data logger, Laboratory version. 110-230 V, 50-60 Hz, 1 ph.

- Dimensions approx lxdxh [mm]:
290x195x100 (Display close);
290x195x241 (Display open)
- Weight: approx. 2.5 kg

Data acquisition unit DATALOG 8 model 82-P9008 and 82-P9008/F - Live readings of the 8 channels

**82-P9008/F**

Battery operated version for field applications

- Internal rechargeable sealed battery 12V, 7.2 Ah and built-in battery charger 110-230 V, 50-60 Hz, 1 ph. Power cable is included
- Battery life: 8 hours in continuous use
- Dimensions approx lxdxh [mm]:
265x171x223
- Weight: approx. 6 kg

MAIN FEATURES

- » Number of channels: 8
- » Network mode: Up to 8 units (Laboratory version only)
- » Sampling rate: Up to 10 readings per second per channel via USB, up to 500 readings per second per channel via LAN,
- » Real resolution: 131,000 points
- » Communication port: LAN / Ethernet
- » Data storage on removable USB pen drive
- » Excitation (VEXC): from 1 V to 10 V for each couple of channels (up to 4)
- » Input signal : 0-10 V; 0-20 mA
- » Software: Not included, P9008/SOF



Data acquisition unit DATALOG 8 model 82-P9008/F- Battery operated version designed for in-field applications

82-P9008. Adjustable 6" touchscreen color graphic display



Data acquisition unit DATALOG 8 both versions. Main menu



Data acquisition unit DATALOG 8 model 82-P9008/F - Detail of removable USB pen drive



Data acquisition unit DATALOG 8 model 82-P9008/F - Detail of the 6" touchscreen color graphic display



Data acquisition unit DATALOG 8 model 82-P9008/F Detail of complete set

Accessories (for both versions)

Cables (mandatory)

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) and GEODATALOG 8 (30-WF6008)

82-P0398 (needed for strain gauge use)

Compensation device for up to 4 Wheatstone bridges with 1/4 or 1/2 bridge setup.

26-WF4645

LAN HUB with 8 ports

82-P9008/SOF

DATACOMM 2 data acquisition software and LAN cable for PC connection of DATALOG 8 (82-P9008).

- Up to 8 datalogger (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

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-D1695

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 diameter 200 mm long.

82-D1229/5S

Penetration probe, 5 mm diameter, 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-D1208/5



82-D1215

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-D1215/1

Glass laboratory thermometer, -35 to +50°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-D1199 to 82-D1204

IP AND ASTM MERCURY FREE THERMOMETERS

Weight: 50 g approx.

Product code	IP ref.	ASTM ref.	Range (°C)	Graduation (°C)	Immersion depth (mm)
82-B0100/6MF	38C	-	+23 to +27	0.1	Total
82-B0121/4MF	76C	-	+10 to +55	0.5	93
82-B0122/3MF	8C	-	0 to +44	0.2	65
82-B0158/3MF	42C	-	-38 to +30	0.5	250
82-B0150/10MF	5C	7C	-2 to +300	1	Total
82-B0150/11MF	6C	8C	-2 to +400	1	Total
82-B0135/1MF	15C	9C	-5 to +110	0.5	57
82-B0135/2MF	16C	10C	+90 to +370	2	57
82-B0130/2MF	28C	11C	-6 to +400	2	Total
82-PV0160/10MF	47C	13C	+150 to +175	0.5	Total
82-D1200/1MF	60C	15C	-2 to +80	0.2	Total
82-D1200/2MF	61C	16C	+30 to +200	0.5	Total
82-B0125/2MF	-	17C	+19 to +27	0.1	Total
82-B0125/3MF	23C	18C	+34 to +42	0.1	Total
82-B0125/4MF	-	19C	+49 to +57	0.1	Total
82-B0125/5MF	-	20C	+57 to +65	0.1	Total
82-B0125/6MF	-	21C	+79 to +87	0.1	Total
82-B0125/7MF	-	S22C	+95 to +103	0.1	Total
82-B0121/1MF	-	23C	+18 to +28	0.2	90
82-B0121/2MF	-	24C	+33 to +54	0.2	90
82-B0121/3MF	-	25C	+95 to +105	0.2	90
82-B0138/A1MF	20C	33C	-38 to +42	0.2	50
82-B0138/A3MF	59C	35C	+90 to +170	0.2	50
82-B0116/40MF	35C	47C	+58.6 to +61.4	0.05	Total
82-B0137/A1MF	-	57C	-20 to +50	0.5	Total
82-B0122/4MF	63C	S63C	-8 to +32	0.1	Total
82-B0116/45MF	93C	110C	+133.6 to +136.4	0.05	Total
82-D1200/3MF	89C	113C	-1 to +175	0.5	Total

Note: others models available on request.

Temperature, conductivity and time measurement

82-D1220/A 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: -20 to +199.9°C
- Resolution: 1°C
- Accuracy: $\pm 2^\circ\text{C}$, $\pm 2\%$
- Display: 20 mm hi-contrast LCD display
- Maximum value: retained for 15 seconds
- Battery type: 9 V battery
- Dimensions: 143x80x38 mm
- Weight: 320 g approx.

Note: a traceable ISO 9000 certificate of calibration is available on request.



82-D1220/A

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

82-D2220/A PORTABLE THERMO-HYGROMETER FOR HUMIDITY AND TEMPERATURE MEASUREMENT

Battery operated

Measuring range:

- RH, 5 to 95%
- Temperature: 0 to + 50°C

Resolution:

- RH, 0.1%
- Temperature, 0.1°C



Accuracy:

- RH $\geq 70\%$, $\pm 3\%$, $+1\%\text{RH}$
- RH $< 70\%$, $\pm 3\%\text{RH}$
- Temperature, $\pm 0.8^\circ\text{C}$

Dimensions: 177 x 78 x 45 mm

Weight: 490 g approx..

82-D2220/A

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-D1230



82-D1240



82-D1231

Meteorological equipment

82-D3000/A RAIN GAUGE

Made from stainless steel.
Dimensions: 115 mm diameter 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°C
Measuring range: from 2 to 150 km/h
Dimensions: 65 mm diameter 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°C (-22 to +158°F)
 - Indoor: -10 to +60°C (+14 to +140°F)
 - Humidity 1 to 99%
- Batteries: (display station) 3x1.5V AA; (transmitter) 3x1.5 V 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°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°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

General Laboratory Apparatus

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.

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.

Pyknometers, 27 mm mouth, with stopper

86-D1040

Pyknometer, 500 ml capacity.

86-D1041

Pyknometer, 1000 ml capacity.

86-D1042

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.



Glass measuring cylinder, 86-D1000 to 86-D1007



Conical flasks, 86-D1030 to 86-D1034



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 diameter.

86-D1106/1

Watch glass (beaker cover), 125 mm diameter.

DESICCATORS

Made from glass, complete with desiccator plate. Safety cage for vacuum desiccators are also available - see 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-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-D1112**

Desiccator, 200 mm diameter with vacuum attachment and plate.

86-D1112/A

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.

86-D1174

Evaporating dish, 245 mm diameter, 55 mm high.



Specific gravity bottles, 86-D1125, 86-D1126, 86-D1127, 86-D1115, 86-D1120



Measuring pipettes 86-D1150 to 86-D1154, 86-D1157



Glass funnels, 86-D1163/A to 86-D1164/1



Round bottomed flasks 86-D1135 to 86-D1136

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 150 mm diameter 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 liter capacity.

86-D1502

Stacking plastic box, 580x330x 250 mm, 46 liter capacity.

86-D1503

Stacking plastic box, 660x400x 300 mm, 72 liter capacity.

BUCKETS**86-D1510**

Graduated plastic bucket, 7 liter capacity.

86-D1511

Graduated plastic bucket, 11 liter capacity.

86-D1512

Graduated plastic bucket, 15 liter capacity.

86-D1516

Plastic bucket, 9 liter 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 liter capacity.

86-D1526

Polythene bottle, 10 liter 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 liter capacity.

86-D1528

Airtight plastic container, 15 liter 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



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, 50x90 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, 0.5 mm thick**86-D1308/1**

Stainless steel pan with handles 200x140x45 mm

86-D1308/2

Stainless steel pan with handles 250x190x50 mm

86-D1308/3

Stainless steel pan with handles 300x220x55 mm

86-D1308/4

Stainless steel pan with handles 320x320x55 mm

86-D1308/5

Stainless steel pan with handles 350x260x60 mm

86-D1308/6

Stainless steel pan with handles 360x360x60 mm

86-D1308/7

Stainless steel pan with handles 400x280x65 mm

86-D1308/8

Stainless steel pan with handles 450x320x85 mm

86-D1308/9

Stainless steel pan with handles 500x360x93 mm

86-D1308/10

Stainless steel pan with handles 600x400x95 mm

Mixing trays, steel nesting type**86-D1305/2**

Steel mixing tray, nesting type, 460x460x50 mm

86-D1305/5

Steel mixing tray, nesting type, 610x610x63 mm

86-D1306/3

Steel mixing tray, 910x910x76 mm

86-D1306/4

Steel mixing tray, 1040x1040x76 mm

Aluminum pan**86-D1322/M¹**

Aluminum pan, 600x400x100 mm
¹ Ponts et Chaussées model



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-D1308/1 - 86-D1308/10



Aluminum pan,
86-D1322/M



Mixing trays, 86-D1305/2

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), aluminum.

86-D1330/A

Moisture content tins, 55 x 35 mm (dia. x h), aluminum, pack of 6.

86-D1331

Moisture content tin, 55 x 65 mm (dia. x h), aluminum.

86-D1331/A

Moisture content tins, 55 x 65 mm (dia. x h), aluminum, pack of 6.

86-D1332

Moisture content tin, 75 x 50 mm (dia. x h), aluminum.

86-D1332/A

Moisture content tins 75 x 50 mm (dia. x h), aluminum, pack of 6.

ALUMINUM FIELD CANS

86-D1341

Aluminum field can, 3 liter capacity.

86-D1342

Aluminum field can, 5 liter capacity.

LEVER LID TINS

86-D1345

Lever lid tin, 0.5 liter capacity.

86-D1346

Lever lid tin, 1 liter capacity.

86-D1347

Lever lid tin, 2.5 liter capacity

86-D1348

Lever lid tin, 5 liter capacity.

86-D1349

Lever lid tin, 10 liter capacity.

SLIP-ON LID TIN (BISCUIT)

86-D1355

Slip-on lid tin, 212x225x120 mm.

SCOOPS

Aluminum scoops, round

86-D1601

Round aluminum scoop, 245x80 mm, 325 ml capacity.

86-D1602

Round aluminum scoop, 335x120 mm, 1000 ml capacity.

86-D1603

Round aluminum scoop, 420x160 mm, 2600 ml capacity

Aluminum scoops, flat

86-D1605/1

Flat aluminum scoop, 210x70 mm, 140 ml capacity.

86-D1605/2

Flat aluminum scoop, 290x105 mm, 440 ml capacity.

86-D1605/3

Flat aluminum scoop, 350x120 mm, 675 ml capacity. Conforming to EN 12697-27.

86-D1612

Flat aluminum 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-D1341, D1347, D1346



Aluminum scoops, 86-D1601 to 86-D1603



86-D1625, 86-D1622, 86-D1620 and 86-D1621



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.



Moisture content tins, 86-D1330 to 86-D1332



Aluminum scoops, 86-D1605/1 to 86-D1605/3



Rigid spatulas, 86-D1641

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.



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



86-D1686, 16-D1691



86-D1646



86-D1699



86-D1645

GENERAL TOOLS**86-D1699**

General purpose tool kit.
Weight 7 kg approx.

86-D1645

Shovel.

86-D1646

Pick mattock.

16-D1691

Trimming knife

86-D1692

Absorbent cloths, 750x450 mm, pack of 3.



86-D1680, D1670, D1673/G, D1671

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 use. Shelf size: 400x800 mm, total height 870 mm.

Weight: 15 kg approx.

86-D1705

Wheelbarrow with pneumatic wheel



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 432

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. 110-230 V, 50-60 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. Pyknometers) 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
- Dessicant 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 color 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	-	-	P	P	-	P
86-D2004/5	Vacuum gauge with valve	-	-	P	-	P	-
86-D2064	Rubber tubes	● (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.

Ordering information

86-D2015

Laboratory air compressor, 10 bar maximum working pressure, 8 bar for continuous use. 50 liter 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.

86-D2015/A

Laboratory air compressor, 10 bar maximum working pressure, 8 bar for continuous use. 200 liter capacity. 400 V, 50 Hz, 3 ph.

86-D2015/AZ

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

86-D2018

Laboratory air compressor, 14 bar maximum working pressure. 8 liter capacity. 230 V, 50 Hz, 1 ph.

86-D2018/Z

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

86-D2018/1

Auxiliary reservoir for 86-D2018 air compressor, 50 liter capacity, 14.5 bar maximum pressure.

76-PV0250/7

Low-noise air compressor, 10 bar maximum working pressure, 10 liter capacity. 230 V, 50 Hz, 1 ph.

76-PV0250/7Y

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

76-PV0250/7Z

As above but 110 V, 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. 230 V, 50-60 Hz, 1 ph.
Dimensions: 220 x 560 x 460 mm
Weight: 24 kg

86-D2019/Z

As above but 110 V, 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-D2018 with 86-D2018/1



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 liters 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 1x150 mm diameter medium grade. Pack of 100

86-D1801

Whatman paper (or equivalent) No 5x150 mm diameter medium grade. Pack of 100

86-D1802

Whatman paper (or equivalent) No 40x150 mm diameter medium grade. Pack of 100

86-D1803

Whatman paper (or equivalent) No 44x110 mm diameter medium grade. Pack of 100

86-D1805

Whatman paper (or equivalent) No 50x110 mm diameter medium grade. Pack of 100

86-D1806

Whatman paper (or equivalent) No 54x150 mm diameter medium grade. Pack of 100

86-D1809

Whatman paper (or equivalent) No 54x400 mm diameter medium grade. Pack of 100

86-D1810

Whatman paper (or equivalent) No 5, 270 mm diameter with 33 mm diameter hole at centre. Pack of 100

86-D1801/A

Whatman paper (or equivalent) No 5x400 mm diameter medium grade. Pack of 100

86-D1801/B

Whatman paper (or equivalent) No 5x450 mm diameter medium grade. Pack of 100

86-D1801/C

Whatman paper (or equivalent) No 5x100 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 (wx 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:

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 Gyratory compactor.

Design Service

CONTROLS can design the mobile laboratory conforming to your requirement. We give here some examples of the mobile laboratory recently produced. Please feel free to ask



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.

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