

16 **Field classification**

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

SOIL Classification

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Field classification

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Augers

STANDARD

- ▶ ASTM D420 ▶ ASTM D1452
- ▶ AASHTO T86 ▶ AASHTO T202

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AUGERS

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

16-T0005/A

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

16-T0006/A

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

16-T0007/A

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

16-T0008/A

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

16-T0008/B

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

16-T0008/C

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

16-T0010/6

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

Accessories

16-T0005/1

T-handle with 1 m shaft.

16-T0005/2

Shaft extension rod, 1 m long.

16-T0005/3

Chisel, 300 mm long.



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

STANDARD

- ▶ ASTM D420 ▶ ASTM D1452
- ▶ AASHTO T86

16-T0010/G

SOIL PROSPECTING KIT

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

16-T0005/A

Hand auger head, 80 mm diameter

16-T0006/A

Hand auger head, 100 mm diameter

16-T0007/A

Hand auger head, 150 mm diameter

16-T0008/A

Spiral soil auger head, 40 mm diameter

16-T0008/B

Dutch soil auger head, Edelman model, 70 mm diameter

16-T0008/C

Gravel auger head, 150 mm diameter

16-T0010/6

Stainless steel sample tube, 38 x 230 mm (diameter x length), 6 pcs. included

16-T0010/7

Plastic end cap for sample tubes (16-T0010/6), 12 pcs. included

16-T0010/3

Jarring link

16-T0010/8

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



16-T0010/G

16-T0005/2

Six shaft extension rods, 1 m long

16-T0005/1

'T' handle with 1 m shaft

16-T0005/5

Two Stillson wrenches

- Case dimensions: 1050 x 480 x 190 mm
- Weight: 50 kg (approx.)



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



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

SAMPLING DEVICE

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

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

16-T0010

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

Accessories and spares

16-T0010/6

Stainless steel sample tube, 38 x 230 mm (diameter x length).

16-T0010/7

Plastic end cap for 16-T0010/6 sample tubes.

16-T0010/8

Hand extruder for 38 mm diameter sample tubes.

AUGER POWER HEAD

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

Two models are available:

16-T0009/L

Auger power head, 2 hp, two-stroke engine, drilling capacity up to 200 mm dia., complete with 80 mm diameter auger.

16-T0009/M

Auger power head, 4.5 hp, four-stroke engine, reverse gear, drilling capacity up to 400 mm dia. Auger not included.

Accessories

Augers and extension rods for 16-T0009/M

16-T0009/M1

Auger shaft, 100 mm diameter x 1000 mm long.

16-T0009/M2

As above but 150 mm diameter.

16-T0009/M3

As above but 200 mm diameter.

16-T0009/MEX

Extension rod 1000 mm long.

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



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

Penetrometers | Lab vanes | Water level indicators

POCKET PENETROMETERS

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

16-T0171 STANDARD POCKET PENETROMETER

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



16-T0171

Specifications

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

16-T0163 HEAVY DUTY POCKET PENETROMETER

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

Supplied complete with plastic case.

Specifications

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



16-T0163

DIAL PENETROMETERS

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

- Weight: 255 g (approx.).

16-T0160

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

16-T0161

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

16-T0162

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



16-T0160



16-T0161



16-T0162

HAND VANE TESTERS

Two versions of hand vane tester are available:

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

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

**16-T0175/A
POCKET SHEAR VANE DEVICE**

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



16-T0175/A



Spare Parts

16-T0175/1
High capacity vane adaptor 0-2 N/cm² (small version)

16-T0175/2
Sensitive vane adaptor 0-25 N/cm² (big version)

16-T0175/3
Standard vane 0-10 N/cm²

**16-T0174
FIELD INSPECTION VANE TESTER**

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

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

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

Specifications

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

Accessories and spares

16-T0174/1
Extension rod, 500 mm long. (Additional)



16-T0174

**16-T0174/A
FIELD INSPECTION KIT**

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

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



16-T0174/A

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

Specifications

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

WATER LEVEL INDICATORS

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



16-E0096, /A, /B

Specifications

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

16-E0096
Water level indicator, 50 m cable.

16-E0096/A
As above but 100 m cable.

16-E0096/B
As above but 200 m cable.

Dynamic penetrometers

STANDARD

▶ ASTM D6951

16-T0012/A

TRL* DYNAMIC CONE PENETROMETER (DCP)

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

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

Dynamic cone penetrometer

16-T0012/A includes:

- 8 kg dropping weight with 575 mm drop
- 2 penetration tips 60° cone, 20 mm diameter
- clevis block
- drive road 1 m long
- vertical scale
- 2 wrenches

All contained in a carrying case.
Case dimension: 1200x350x200 mm.
Weight approx.: 30 Kg

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

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



16-T0012/A complete test set

Accessories

16-T0012/1D
Disposable 60° Conical point (Pack of 10)

16-T0012/1DA
Adaptor for disposable cone

16-T0012/2
Upper Extension Shaft M16/M12 Adaptor

16-T0012/3
Lower shaft for 16-T0012/A penetrometer used for extensions application

16-T0012/4
Extension Shaft 400 mm

16-T0012/14
4.6 kg Dropping Weight

Spares
16-T0012/1
Spare 60° Conical point

16-T0012/8
Spare hammer shaft

16-T0012/9
Spare standard shaft

16-T0012/10
Spare clevis block complete



16-T0013 assembled



16-T0013

STANDARD

▶ DIN 4094

16-T0013 LIGHTWEIGHT DYNAMIC PENETROMETER

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

Specifications

- The apparatus includes:
- Anvil with driving rod
 - 10 kg rammer, rammer fall 50 cm
 - 11 sounding rods
 - 1 grooved rod
 - 2 drive points, 90°, 500 and 1000 mm²

- Lifting device for sounding rods
- Couplings
- Case dimensions: 1160 x 370 x 220 mm
- Weight: 71 kg (approx.)

Accessories and spares

16-T0013/8
Drive conical point, 500 mm² area, 25.2 mm diameter, 90° angle.

16-T0013/9
Drive conical point, 1000 mm² area, 35.6 mm diameter, 90° angle.

16-T0013/4
Sounding rod, 22 mm diameter.

16-T0013/7
Threaded nipple to connect sounding rods.

16-T0013/10
Spare expendable conical point, 500 mm² area, 25.2 mm diameter, 90° angle

16-T0013/11
Spare expendable conical point, 1000 mm² area, 35.6 mm diameter, 90° angle

STANDARD

► DIN 4094

16-T0013/E

**MOTOR OPERATED
20-30 KG DROP WEIGHT
DYNAMIC PENETROMETER**

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

Supplied complete with carrying case for sounding rods.

Specifications

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



16-T0013/E during operation



16-T0013/E with 16-T0013/E1

Accessories and spares

16-T0013/E1

Tripod for hanging the lifting mechanism.

16-T0013/8

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

16-T0013/9

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

16-T0013/4

Sounding rod, 22 mm diameter.

16-T0013/10

Spare expendable conical point, 500 mm² area, 25,2 mm diameter, 90° angle

16-T0013/11

Spare expendable conical point, 1000 mm² area, 35,6 mm diameter, 90° angle

Sample Extruders

STANDARD

▶ EN 13286-2 ▶ EN13286-47

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Two models are available:

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

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

**16-T0083/A
MOTORIZED SOIL EXTRUDER**

230 V, 50 Hz, 1 ph.

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

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



16-T0083/A in vertical extrusion position

Specifications

- Power: 750 W
 - Maximum loading capacity: 60 kN
 - Maximum ram stroke: 900 mm
 - Maximum working ram speed: 6 mm/sec
 - Maximum external diameter of sample tubes: 160 mm
- Overall dimensions:
- Horizontal working position: 2730 x 409 x 1180 mm (wxdxh)
 - Vertical working position: 1025 x 409 x 1080 mm (wxdxh)
 - Weight: 160 kg (approx.)

Accessories

- 16-T0083/A4**
Adaptor for extruding 101.6 mm OD Shelby tubes.
- 16-T0083/A5**
Adaptor for extruding 100 mm OD Shelby tubes.
- 16-T0083/A6**
Adaptor for extruding 88.9 mm OD Shelby tubes.
- 16-T0083/A7**
Adaptor for extruding 83 mm OD Shelby tubes.

**16-T0082/A
HAND OPERATED VERTICAL SOIL EXTRUDER**

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

Specifications

- Maximum loading capacity: 60 kN (6000 kgf)
- Maximum ram stroke: 480 mm
- Dimensions: 1140 x 300 x 370 mm
- Weight: 50 kg (approx.) (without accessories)



16-T0082/A

Accessories

- 16-T0082/1**
Adaptor for extruding 35, 38, 101.6, 106 and 152.4 mm diameter samples. Total length 280 mm (approx.).
- 16-T0082/3**
Adaptor for extruding 38 mm diameter samples only.
- 16-T0082/4**
Frame and adaptor only for extruding three 38 mm diameter tubes from a U4 tube.
- 16-T0082/5**
106 mm adaptor for extruding a soil sample from U4 tubes.
- 16-T0082/A16**
Extension for extruding samples up to 450 mm long.

16-T0083/A during operation



16-T0082/1



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

Sample Extruders | Pestle and Mortar | Color Charts

STANDARD

- ▶ ASTM D1883 ▶ ASTM D698
- ▶ BS 1377:4 ▶ BS 1924:2
- ▶ BS 598

**16-T0080
UNIVERSAL SPECIMEN
EXTRUDER**

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

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

Specifications

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



16-T0080

MELTING POT

Used to melt wax to seal the ends of soil samples and other materials, the melting pot can also be used to melt the capping compound for concrete cylinders, as specified on page 236.

55-D1403

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

55-D1403/Z

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

SPECIFICATIONS

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



55-D1403

STANDARD

- ▶ ASTM D421 ▶ BS 1924:1 ▶ BS 1337:2

PESTLE AND MORTAR

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

86-D1180/1

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

16-D1179/A

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



16-D1860/B

SOIL COLOR CHARTS

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

Specifications

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

Laboratory planetary mixers

16



76-B0702, 5L capacity



B0075/B



76-B0072

We offer three versions: 5, 10, and 20 liters capacity (respectively models 76-B0702, 76-B0072 and 76-B0075/B). They all feature a robust construction with a bowl and whisk that are easy to fit and remove. When lifting the cover, a safety switch turns the mixer off for operator safety conforming to CE directives. A planetary mixing action ensures a complete and uniform mixing of the materials. All models are supplied complete with whisk.

For mixing asphalt samples, the mixers have to be fitted with the suitable Isomantle heater (see page 347).



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



76-B0072/9, 76-B0075/9

Note: for more detailed information see page 347

Ordering information

76-B0702

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

76-B0704

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

76-B0072

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

76-B0072/Y

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

76-B0072/Z

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

76-B0075/B

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

76-B0075/BY

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

76-B0075/BZ

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

Accessories and spares

76-B0702/9

Mixing hook for 76-B0702 mixers.

76-B0072/9

Mixing hook for 76-B0072 mixers.

76-B0075/9

Mixing hook for 16-B0075/B mixers.

76-B0702/2

Spare bowl for 76-B0702 mixers.

76-B0072/6

Spare bowl for 76-B0072 mixers.

76-B0075/1

Spare bowl for 76-B0075/B mixers.

76-B0702/6

Spare whisk for 76-B0702 mixers

76-B0072/8

Spare whisk for 76-B0072 mixers.

76-B0075/6

Spare whisk for 76-B0075/B mixer

STANDARD

▶ NF P94-093

16-T0004

SOIL CUTTER

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

Specifications

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



Soil Lathes | Trimmers | Cutters and Tools

16-T0028/B

SOIL LATHE/TRIMMER AND EXTRUDER FOR SOIL SAMPLES
from 35 to 110 mm diameter

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

Specifications

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



16-T0028/B

Accessories

16-D1689

Open wire saw.

16-D1690

Wire saw.

16-D1691

Trimming knife.



16-D1689, 16-D1690, 16-D1691



16-T0026/A with cutter

SOIL DIE-CUTTER/SAMPLER

16-T0026/A

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

Specification Cutters

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

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

Carbide Meters

MOISTURE DETERMINATION BY CARBIDE METERS

We offer two series of carbide moisture meters:

UNIVERSAL AND SPEEDY

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

UNIVERSAL CARBIDE METERS 19-T0019 SERIES

Four versions are available - the specifications are detailed in the table below.

Accessories

19-T0019/1
Moisture tester reagent ampules. Pack of 100.

19-T0019/2
Calibration kit for Universal carbide meters, including manometer and accessories.

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



19-T0019



19-T0019/F



19-T0019/H



19-T0019/G

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

Carbide Meters | Desiccators

SPEEDY MOISTURE METERS

We offer two models:

- 47-T0024/A**, 6 g capacity, 0-20% humidity measuring range,
- 47-T0023/A**, 20 g capacity, 0-20% humidity measuring range.

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

Specifications

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

47-T0023/A

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

47-T0024/A

As above but 6 g capacity.

Accessories and spares

47-T0020/B

Speedy calibration kit.

19-T0019/1

Moisture tester reagent ampules (pack of 100)

as alternative

47-T0021

Moisture tester reagent powder. 0.4 kg box.



47-T0024/A with 47-T0021



47-T0023/A and 47-T0021



47-T0020/B

Important note

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

DESICCATOR CABINET

19-D1113/A

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



86-D1113/A

Accessories

(for glass desiccators and cabinet)

86-D0819

Silica gel (desiccator salts), 1000 g bottle.

19-D0602/B

Moisture determination balance, 160 g capacity, 1 mg resolution. 230 V, 50-60 Hz, 1 ph. (for more details and information see page 10)



19-D0602/B

DESICCATORS

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

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

Glass desiccators

86-D1110

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

86-D1110/A

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

86-D1111

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



86-D1110

Gas Jars | Pyknometers | Hydrometers

PARTICLE DENSITY

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

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

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

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

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

STANDARD

▶ BS 1377:2

GAS JAR METHOD

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

22-D0445

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

22-D1132

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

STANDARD

- ▶ EN 1097-7 ▶ BS 1377:2
- ▶ ASTM D854 ▶ AASHTO T100
- ▶ NF P94 054

SMALL PYKNOMETER METHOD

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

86-D1125

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

86-D1126

As above but 50 ml capacity.

86-D1127

As above but 100 ml capacity.

86-D1128

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



86-D1125, 86-D1126, 86-D1127



22-D1132



22-D0445 with 2 glass jar 22-D1132

STANDARD

▶ BS 177:3 ▶ BS 812

PYKNOMETER METHOD

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

48-D0441/A

Large glass pyknometer, 1 liter capacity, complete with non-corrodible metal cone and rubber seal. Weight: 500 g (approx.).



48-D0441/A

Accessories

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

86-D1110

Glass desiccator, 200 mm diameter. Complete with plate



86-D1112/A, 86-D1110

86-D1110/A

As above but 250 mm diameter.

86-D1111

As above but 300 mm diameter.

86-D1112

200 mm diameter with vacuum attach. and plate

86-D1112/A

As above but 250 mm diameter.

86-D1113

As above but 300 mm diameter.

Safety cage for desiccators

86-D1113/1

Safety cage conforming to BS 1377:2. Weight: 2 kg(approx.).

86-D0819

Silica gel (desiccating salts), 1000 g bottle.



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

STANDARD

▶ EN 1097-7 ▶ BS 1337:2

WATER BATH

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

76-B0066/B

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

76-B0066/BZ

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

For full description and specifications, see page 343

Accessories

76-B0066/1

Cover with cooling coil, for connection to mains water.

76-B0066/2

Adjustable tray.



76-B0066/B



76-B0066/1

STANDARD

▶ ASTM D422 ▶ AASHTO T88

PARTICLE SIZE DISTRIBUTION BY THE HYDROMETER METHOD.

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

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

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



22-T0059/A set

22-T0059/A

ASTM Hydrometer test set 230 V, 50-60 Hz version

22-T0059/Z

Same as above but 110 V, 60 Hz

This set includes:

22-D1006/A - Six hydrometer cylinders

22-T0060/31 - Rubber bung for cylinders 22-D1006/A

22-T0060/A* - Soil hydrometer, 151 H, 0.995 to 1.038 g/ml

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

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

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

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

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

86-D0802 - Sodium hexametaphosphate, 1000 g

86-D1073 - Beaker, 250 cc

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

All the above components can be purchased individually.

STANDARD

▶ NF P94-057 ▶ BS 1377:2

NF-BS HYDROMETER ITEMS (BASIC COMPONENTS)

22-D1007/A

Hydrometer cylinder, 2500 cm³ capacity, 85 ±5 mm diameter, graduated at 500, 1500 and 2000 cm³ (only NF P94-057). Weight: 1 kg (approx.)

22-T0062/A

Soil hydrometer. 0.995 to 1.030 g/ml.

22-D1007/A1

Hand stirrer, 600 mm long (only NF P94-057).



76-B0066/2 with two 86-D1127



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

Pipettes | Cone penetrometers

STANDARD

▶ BS 1377:2

22

PARTICLE SIZE DISTRIBUTION BY THE PIPETTE METHOD

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

22-T0062/1

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

22-T0062/2A

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

22-T0062/3

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

22-T0058/A

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

22-T0058/AZ

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

22-T0062/5

Conical beaker 1000 ml.



22-T0062/1, 22-T0062/2A, 22-T0062/3, 22-T0058/A

SOIL INDEX PROPERTIES

Types of index tests include:

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

STANDARD

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

LIQUID LIMIT: CONE PENETROMETER METHOD

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

Two versions are available:

22-T0029/D

Digital liquid limit penetrometer with micrometric vertical adjustment.

22-T0029/E

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

22-T0029/EZ

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

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



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

MAIN FEATURES

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

Accessories

Penetration cones

22-T0029/1

Penetration cone 30° tip and 80g of weight, to EN 17892-12, CEN ISO/TS 17892-6 and -12 and BS 1377-2

22-T0029/4

Penetration cone 30° tip and 60g of weight, to EN 17892-12, CEN ISO/TS 17892-6 and -12

22-T0029/7

Penetration cone 30° tip and 100g of weight, to CEN ISO/TS 17892-6

22-T0029/8

Penetration cone 30° tip and 400g of weight, to CEN ISO/TS 17892-6

Cone test gauges

22-T0029/2

Cone test gauge 2.5 mm thickness for 30° tip angle to EN 17892-12

22-T0029/5

Cone test gauge 1 mm thickness for 60° tip angle to EN 17892-12, CEN ISO/TS 17892-6 and -12

22-T0029/9

Cone test gauge 1.75 mm thickness for 30° tip angle to BS 1377-2, CEN ISO/TS 17892-6 and -12

Cups

22-T0029/3

Penetration sample cup. 55 mm diameter, 40 mm deep

86-D1332

Penetration sample cup. 75 mm diameter, 50 mm deep



Casagrande apparatus

**LIQUID LIMIT:
CASAGRANDE METHOD**

STANDARD

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

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

Weights:

- Hand operated versions: 2 kg (approx.)
- Motorized versions: 4 kg (approx.)



22-T0030/AE



22-T0031/AE

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CASAGRANDE Liquid limit models		
Hand operated	Motorized	Standards
22-T0030/AE	22-T0031/AE (230V,50Hz,1ph)	EN 17892-12
	22-T0031/AEY (220V,60Hz,1ph)	ASTM D4318
	22-T0031/AEZ (110V,60Hz,1ph)	AASHTO T89
22-T0030/E	22-T0031/E (230V,50Hz,1ph)	UNI 10014
22-T0030/G	22-T0031/G (230V,50Hz,1ph)	UNE 7377
		BS 1377-2
		NF P94-051

GROOVING TOOL			
Plastic type (pack of 10)	Steel type	Curved type	Standards
22-T0032/AP	22-T0032/AE	22-T0033	EN 17892-12 ASTM D4318 AASHTO T89 UNI 10014 UNE 7377
22-T0032/P	22-T0032	Not required	BS 1377-2
22-T0032/AP	22-T0032/A	Not required	NF P94-051



22-T0032/AP



22-T0032/P



22-T0033, 22-T0034/1



22-T0032/AE

Accessories and spares

22-T0034

Spare brass cup conforming to EN, ASTM, BS, NF, UNI and UN

22-T0034/1

Brass cup, roughened version

Shrinkage | Plastic limit

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STANDARD

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

SHRINKAGE LIMIT

22-T0035

Shrinkage limit test set, including carrying case.

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

22-T0035/1

Two shrinkage dishes, 45 mm diameter x 12.7 mm high

22-T0035/2

Crystallizing dish, 57 mm diameter x 31 mm deep

22-T0035/3

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

86-D1171

Evaporating dish

86-D1630

Flexible spatula

86-D1001

Graduated cylinder, 25 ml
Supplied complete with a plastic carrying case.

All the above items can also be purchased individually.

Specifications

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



22-T0035

STANDARD

- ▶ BS 1377:2

LINEAR SHRINKAGE

22-T0037

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

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



22-T0037

STANDARD

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

PLASTIC LIMIT

22-T0041/A

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

The set comprises:

22-T0040/1

Glass plastic limit plate, 300 x 300 mm

22-T0040/2

Stainless steel rod, 3 mm diameter

86-D1171

Mixing dish, 120 mm diameter

86-D1630

Flexible spatula

86-D1329/A

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

All contained in a plastic case.
All above items can also be purchased individually.

Specifications

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



22-T0041/A

Chemical tests

WATER TESTING KITS

24-D1870/A Acidity test kit

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

Case dimensions: 250 x 120 x 55 mm
Weight: 480 g (approx.)

24-D1870/B Chloride test kit

For determining, by titration, the chloride content in water and waste water.
Case dimensions: 190 x 120 x 60 mm
Weight: 445 g (approx.)

24-D1870/C Hardness test kit

For determining the total hardness of water.
Case dimensions: 190 x 120 x 60 mm
Weight: 424 g (approx.)

24-D1870/E Alkalinity test kit

For determining the total alkalinity of water.
Weight: 1.5 kg (approx.)



24-D1870/B

24-D1870/A

24-D1870/E



24-D1870/C

STANDARD

► BS 812:117 ► BS 1377:3

CHLORIDE CONTENT: RAPID METHOD

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

48-D0543

Quantab chloride titrator, range 0.005% to 0.1% NaCl. Pack of 40 strips.

48-D0543/A

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



48-D0543, 48-D0543/A

STANDARD

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

SULPHATE CONTENT: RAPID METHOD

Sulphate test strips, detection range 200 to 1600 mg/l. Pack of 100. Useful for the preliminary assessment of sulphate ions in aqueous solutions.
Weight: 10 g (approx.)



24-D0852

STANDARD ► BS 1377:3

SULPHATE CONTENT: LABORATORY METHOD

24-D1840 Ion exchange apparatus

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

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

Accessories

24-D1840/1

Ion exchange resin, 500 g.



24-D1840

Chemical tests

STANDARD

► ASTM D1067 ► BS 1377:3

PH METERS

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

24-D1847

Pocket digital pH meter, battery operated.

Specifications

- pH range: 0.00 to 14.00
- Resolution: pH 0.01
- Accuracy at 20°C: +/- 0.2 pH
- pH calibration: manual, 2 points
- Battery life , 3000 hours use approx.
- Dimensions: 66 x 50 x25 mm
- Weight approx.: 70 g

Accessories

24-D1847/7

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



24-D1847



24-D1848 Complete set

24-D1848

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

Specifications

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

Accessories

24-D1845/2

Combination pH electrode

24-D1845/3

pH 4.00 buffer solution, 500 ml

24-D1845/4

pH 7.00 buffer solution, 500 ml

24-D1845/5

pH 9.18 buffer solution, 500 ml

24-D1845/7

Electrode storage solution, 500 ml

24-D1845/8

Electrode cleaning solution, 500 ml

24-D0448

Magnetic stirrer

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

MAGNETIC STIRRERS

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

24-D0448

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

24-D0448/B

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

81-B0145/D

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

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



81-B0145/D



24-D0448

PAPERS

24-D1858/1

pH strips 1 to 11 pH. 5 meter dispenser

24-D1858/2

pH indicator papers 0 to 14 pH. 5 meter dispenser

24-D1859/1

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



pH Papers



24-D1848

