SOIL AND ROCK

1.1 SOIL AND ROCK TESTING

1.1.1 SOIL CLASSIFICATION PAGE 9

1.1.2 PROCTOR C.B.R. PAGE 18

1.1.3 DENSITY - PERMEABILITY PAGE 36

1.1.4 ROCK MECHANICS PAGE 47

ITEMS	PAGE
C.B.R. MOULDS AND ACCESSORIES	18-20
C.B.R. TESTING MACHINES	23-33
DIRECT SHEAR ON ROCKS	50
DRY DENSITY/MOISTURE RELATIONSHIP	18
END OVER END - SHAKER	15
EUROTRONIC	29-32
EXTENSOMETER	52
IN SITU C.B.R. TEST	34-35
IN SITU DENSITY	37-39
LABORATORY CORING MACHINE	47
LAPPING MACHINE	49
LIQUID LIMIT	11-12
LOAD PROVING RINGS	28
LOAD RING PENETROMETER	16
MICRO-CORING EQUIPMENT	48
MOHS (HARDNESS SCALE)	52
MOISTURE TESTER	9
PARTICLE DENSITY-HYDROMETERS	14-15
PERMEAMETERS - PERMEABILITY	40-42

ITEMS	PAGE
PLASTIC LIMIT	13
POCKET PENETROMETERS	43
POINT LOAD	49
POWER AUGERS	17
PROCTOR/C.B.R. COMPACTION	21-22
PROCTOR PENETROMETER	16
PROFILE GAUGE (BARTON TYPE)	53
RELATIVE DENSITY	36
ROCK CLASSIFICATION HAMMER	53
SAMPLE EXTRUDERS	45-46
SAND EQUIVALENT TEST	15
SHRINKAGE LIMIT	13
SLAKE DURABILITY APPARATUS	53
SOIL CLASSIFICATION	10
SOIL SURVEYS AND SAMPLING	17
TILT TEST	52
TRIAXIAL TESTS ON ROCK	51
VANE TESTERS	43-44
WATER LEVEL INDICATORS	16

MOISTURE METERS

ASTM D 4944 BS 812

For determining rapidly and accurately the percentage of moisture in sand, aggregates, soils, etc. The test is based upon the process of calcium carbide hydration. The sample moisture reacts with the calcium carbide within an air-tight container to produce a gas (acetylene), the pressure of which is read by the manometer of the instrument.

AT 250/D

DIGITAL MOISTURE TESTER — AT 250/D

(100 g max. sample)

Supplied in a carrying case complete with balance, 4 steel balls to crush sample, tool kit, 20 ampoules of calcium carbide for as many tests, 3 ampoules for dial gauge checking.
Choice of sample weight depends on expected moisture.
Capacity: sample from 10 to 100 g.
Digital dial gauge (0.1% accuracy).
Moisture range: from -1 to 2 bar.
Complete with printer.

DIMENSIONS: 600 x 350 x 150 (h) mm.
WEIGHT: 6.5 kg

AT 250

STANDARD MOISTURE TESTER — AT 250

(100 g max. sample)

Supplied in a wooden case complete with balance, 4 steel balls to crush sample, tool kit, 20 ampoules of calcium carbide for as many tests, 3 ampoules for dial gauge checking.
Choice of sample weight depends on expected moisture.
Capacity: samples weighing from 20 to 100 g.
Analogical dial gauge (1.6% accuracy).
Moisture range: 0 - 1.6 bar.

DIMENSIONS: 530 x 350 x 150 (h) mm.
WEIGHT: 5 kg

AT 250/L

"LARGE" MOISTURE TESTER — AT 250/L

(20 g max. sample)

The principle is the same as that of the previous model but the sample weight has to be 20 g.
Moisture range 0 to 20%.
Direct moisture percentage reading gauge with 0.2% divisions.
Supplied in plastic case complete with balance, tin of calcium carbide (500 g), and usual accessories.

DIMENSIONS: 400 x 360 x 170 (h) mm.
WEIGHT: 8.4 kg.

ACCESSORIES AND SPARE PARTS

AT 250/P	**CALCIUM CARBIDE:** 13 g ampoules (40 pcs)
AT 250/R	**CALCIUM CARBIDE:** 500 g tin
AT 250/TC	**GAUGE TESTING KIT:** N° 10 ampoules (1 ml)

N.B.: Calcium Carbide is subject to limitations on methods of transport and must be shipped using homologated case.

V 770/06

COMPLETE TEST KIT FOR SOILS — V 770/06

Complete, portable, mini laboratory which enables reliable soil analyses to be carried out. It contains all the required reagents and accessories for performing approximately 50 tests for each of the soil factors covered by this unit: pH value - Phosphorous - Potassium - Humus - Ammonia Nitrogen - Nitrites - Nitrates.
An instruction manual simplifies test procedure.
The kit is supplied in a case also containing a small balance, a sieve, a spatula, and a pestle.

DIMENSIONS: 470 x 330 x 200 (h) mm.
WEIGHT: 11 kg.

T 150

MUNSELL COLOUR CHARTS FOR SOIL — T 150

For soil sample evaluation by comparison with the standard colours. The booklet contains eleven 11 x 18 cm constant hue charts displaying 199 colours, and 2 gley color charts.
Besides standard classification, also included are charts for tropical, semi-tropical soils, special charts for Australia, Southeast Asia as well as for glauconitic soils.

V 770/8
V 770/9

CHLORIDE CONTENT KIT

BS 812

It is used for estimation on site of chloride content in sand and fine aggregates. The kit consists of 40 reagent strips and calibration chart.

V 770/8	KIT 1175 QUANTAB (0.005 - 0.1%) NA CL
V 770/9	KIT 1176 QUANTAB (0.05 - 1%) NA CL

V 761
Z 55/A
V 254

ORGANIC IMPURITIES IN FINE AGGREGATES

ASTM C 40

V 254	STANDARD COLOUR SCALE
	five permanent organic colour glasses
	mounted in a plastic holder
	These glasses replace the standard
	colour reference solution
V 761	GLASS BOTTLE
	500 cc
Z 55/A	SODIUM HYDROXIDE
	1 kg pack

DETERMINATION OF THE LIQUID, PLASTIC AND SHRINKAGE LIMITS (ATTERBERG LIMITS)

LIQUID LIMIT

BS 1377 UNI-CEN-ISO/TS 17892-12

Clayish soil changes from plastic to liquid or to solid state depending on its water content. In order to determine the passage from the plastic to the solid state, the standards recommend that a test with the "cone penetrometer" be carried out: a standardized cone is allowed to drop from a fixed height within a defined time, on the soil sample.
The water content (percentage) which gives a 20 mm penetration, is assumed to be the "LIQUID LIMIT".

LIQUID LIMIT CONE PENETROMETER T 100/SA

Hand-operated model with dial gauge having 0.1 mm graduations and automatic zeroing. The cast aluminium base has levelling screws, and provision is made for adjusting cone height in relation to the sample.
SUPPLIED WITHOUT ACCESSORIES.

DIMENSIONS: 260 x 240 x 530 (h) mm
WEIGHT: 6.5 kg

T 100/SA

SEMI-AUTOMATIC PENETROMETER T 101/SA

Identical to T 100/SA but with timed electronic release mechanism.
SUPPLIED WITHOUT ACCESSORIES.

POWER SUPPLY: 220-240 V, 50 Hz, single phase
WEIGHT: 8.5 kg

T 101/SA

ACCESSORIES AND SPARE PARTS:

T 100/1	PENETRATION TEST CONE IN STAINLESS STEEL with smooth surface, 35 mm long with an angle of 30°
T 100/2	CALIBRATION DISC
B 531/P	PENETRATION SAMPLE CUP IN BRASS 55 mm diameter x 35 mm deep

SULPHATE CONTENT ION-EXCHANGE APPARATUS D 850

BS 1377

Used for determination of sulphate content of ground water and aqueous soil extracts. The apparatus (in Pyrex) consists in an ion-exchange column (10 mm dia., 400 mm high) with connection and 500 ml balloon (constant head) fitted on a stand.

DIMENSIONS: 200 x 200 x 600 (h) mm
WEIGHT: kg 5

D 850/R	ION-EXCHANGE RESIN. 1000 g

D 850

LIQUID LIMIT

ASTM D 4318 AASHTO T 89 UNI 10014 BS 1377

T 624

CASAGRANDE LIQUID LIMIT DEVICE T 624

With ebonite base and removable brass cup.
The height of drop of the cup may be adjusted via the hand crank mechanism.
A built-in blow counter is supplied as standard.
Grooving tool is not supplied and must be ordered separately.

DIMENSIONS: 150 x 150 x 120 (h) mm
WEIGHT: 3 kg

T 624/E

MOTORISED CASAGRANDE LIQUID LIMIT DEVICE T 624/E

Same as T 624. This device is fitted with an electric motor with direct connection to the cam shaft that allows the cup to have a drop frequency of 120 blows per minute (according to Standards). In fact, the electric control panel is fitted with a screw for the correct calibration of the apparatus according to the laboratory voltage.
Grooving tool is not supplied and must be ordered separately.

POWER SUPPLY: 220-240 V, 50 Hz, single phase
DIMENSIONS OF CASAGRANDE DEVICE: 180 x 160 x 125 (h) mm
DIMENSIONS OF ELECTRIC SYSTEM: 80 x 60 x 152 (h) mm
WEIGHT: 3.5 kg.

ACCESSORIES AND SPARE PARTS:

T 624/C	GROOVING TOOL (BS)
T 624/D	GROOVING TOOL (ASTM)
T 624/AS	GROOVING TOOL (AASHTO-UNI)
T 624/A	SMOOTH BOWL
T 624/R	ROUGHENED BOWL

T 624/A

T 624/R

T 624/AS

T 624/D

T 624/C

SHRINKAGE LIMIT

BS 1377 UNI 10014 ASTM D 427 AASHTO T 92

SHRINKAGE LIMIT SET **T 625/1**

The case contains:

V 502/3	PORCELAIN EVAPORATING DISH 160 mm dia.
T 625/3	SHRINKAGE DISHES, 45 mm dia. (2 pcs)
T 625/7	GLASS CUP, 60 cc
T 625/4	PERSPEX PRONG PLATE
V 232/2	GLASS GRADUATED CYLINDER, 25 cc
DV 719	SPATULA with blade 33 x 120 mm

EACH ITEM MAY BE ORDERED INDIVIDUALLY.

DIMENSIONS: 300 x 260 x 120 (h) mm
WEIGHT: 4 kg

T 625/1

LINEAR SHRINKAGE

BS 1377

LINEAR SHRINKAGE MOULD **T 627**

Made of brass.
Semicircular section, radius 12.5 x 140 mm long.
The variation in length of the soil sample is the “linear shrinkage”.

T 627

PLASTIC LIMIT

ASTM D 4318 AASHTO T 90 BS 1377
UNI 10014 UNI CEN ISO/TS 17892-12

PLASTIC LIMIT SET **T 625/2**

The case contains:

T 668	GLASS PLATE 30 x 30 x 1 cm
V 502/3	PORCELAIN DISH, 160 mm dia.
DV 719	SPATULA with blade 33 x 120 mm
DV 790/S	ALUMINIUM **MOISTURE CANS** 83 cc, 55 mm dia. x 35 mm (6 pieces)

DIMENSIONS: 500 x 400 x 130 (h) mm
WEIGHT: 4 kg

EACH ITEM MAY BE ORDERED INDIVIDUALLY

ACCESSORIES AND SPARE PARTS:

T 668/5	Glass plate 500 x 500 x 10 (h) mm
T 625/9	Stainless steel bar 3 mm dia. x 200 mm long

T 625/2

T 659
V 232/C

T 658/2
T 626/1/2
DB 501/D
V 765
Z 31

V 638
V 638/T

V 729

SEDIMENTATION BY THE HYDROMETER METHOD

BS 1377 ASTM D 422

THERMOSTATIC BATH IN GLASS — T 659

The bath is divided into two compartments, the first measures 49 x 29 x 30 (h) cm and is where the sedimentation cylinders are placed, the second is smaller and houses the heater and the circulation pump.
The heater is preset to maintain a temperature of 20 ±1°C if the ambient temperature is lower than 20°C.

POWER: 220 V, 50 Hz, single phase, 300 W
DIMENSIONS: 600 x 300 x 390 (h) mm
WEIGHT: 12 kg

HIGH SPEED STIRRER — T 658/2

Heavy aluminium casting, complete with a removable stainless steel dispersion cup.
Speed: 10,000 rpm.

POWER: 220 V, 50 Hz, single phase
DIMENSIONS: 170 x 190 x 500 (h) mm
WEIGHT: 4.6 kg

ACCESSORIES AND SPARE PARTS:

R 658/112	Stainless steel cup
R 106/667	Anti-splash frame for cup
V 232/C	1000 cc graduated glass cylinder
DB 782/1	Glass thermometer (-30 + 50°C)
T 626/1	Soil hydrometer type 152 H (ASTM, AASHTO) Range, - 5 to + 60. Lead ballasted with graduated stem (1 g divisions)
T 626/2	Soil hydrometer type 151 H (ASTM, AASHTO) Range 0.995 - 1,038. Lead ballasted with graduated stem (0.001 g divisions)
V 765	Graduated glass beaker, 600 cc
Z 31	Sodium hexametaphosphate, 1 kg
DB 501/D	Digital stop-watch (0.01”), 59 minutes, 59 seconds
V 729	Stainless steel hand stirrer for 1-2 litre cylinders
AD 225/002	Software “Grain size and sedimentation”
T 626/4	Hydrometer ASTM C88. Graduated: 1,150-1,200
T 626/5	Hydrometer ASTM C88. Graduated: 1,250-1,300
T 626/BS	BS 1377-2 hydrometer. Range 0.995 - 1.030 g/ml (0.005 g divisions)

GAS JAR — V 638

Complete with rubber bung and glass cover.
Capacity 1000 cc.

DIMENSIONS: diameter 75 x 300 mm

V 638/T RUBBER BUNG FOR CYLINDERS V 638

SAND EQUIVALENT TEST SET T 641

EN 933-8 ASTM D 2419

The apparatus (contained in a carrying case), consists of 4 graduated plastic cylinders, rubber stopper, irrigator tube, weighted foot assembly, syphon assembly, rubber tubing, measuring tin, funnel and bottle of special concentrated solution (250 ml).

DIMENSIONS: 350 x 550 x 130 (h) mm
WEIGHT: 6.5 kg

T 641

ACCESSORIES AND SPARE PARTS:

T 641/S	**SOLUTION READY FOR USE** (250 ml) Concentrated liquid (to be diluted for test solution) containing formaldehyde, glycerol analar and calcium chloride in proportions as foreseen by Standards.
T 641/S1	**CONCENTRATED SOLUTION:** same as T 641/S but in 1 litre bottle
T 615/B	**PLASTIC BOTTLE** (5 litres)
T 641/C	**GRADUATED PERSPEX CYLINDER**
Z 87	**CALCIUM CHLORIDE** (1000 g)
Z 78	**GLYCEROL ANALAR** (bottle 2.5 l)
Z 89	**FORMALDEHYDE**, 37% solution, 2.5 litres
SA 004/75	**STAINLESS STEEL SIEVE** 200 mm dia. frame. With calibrated 4.75 mm mesh (ASTM N. 4)
T 641/T	**METAL BASE WITH ROD AND BOTTLE SUPPORT**
T 641/1	**SIPHON ASSEMBLY**
T 641/2	**IRRIGATOR TUBE WITH TAP**
T 641/3	**WEIGHED FOOT (EN)**

T 641/T

ELECTRIC SAND EQUIVALENT SHAKER T 642

EN 933-8 ASTM D 2419

A robust frame ensures stability of the machine, which is completely automatic.
Stroke 203 mm - Rate 175 strokes/min. The cycles are set according to the Standards.
A timer stops the machine at the end of the test. Safety guard, complete with microswitch, is included as standard.

POWER SUPPLY: 220 V, 50 Hz, single phase, 0.18 kW
DIMENSIONS: 895 x 350 x 465 (h) mm
WEIGHT: 30 kg

T 642

PARTICLE DENSITY

BS 1377/2

Carried out on soil containing up to 10% of particles, retained on a sieve, opening 37.5 mm.

ELECTRIC "END OVER END" SHAKER T 638

Heavy steel frame supporting the electric motor gear unit.
Rotating at approximatively 50 rpm.
Control panel. Housing for 2 cylinders.

POWER: 220 V, 50 Hz, single phase, 150 W
DIMENSIONS: 600 x 500 x 500 (h) mm
WEIGHT: kg 20

T 638

TP 098

LOAD RING PENETROMETER — TP 098

Simple and light instrument for measuring static penetration resistance. The thrust force is provided directly by the operator who, by pushing on the T handle, forces the cone into the soil. The encountered resistance is measured on the fitted load ring. Testing is only possible in soils with good consistency and for short depths.

SPECIFICATIONS:

- 3 cones with 30° cone angle and 1 sq. inch sectional area
- 3 threaded extension rods 300 mm long graduated every 150 mm
- 1 kN (100 kgf) load ring with stem brake unit for max. force reading and dial gauge (0.001 mm resolution)
- Supplied with Tecnotest laboratory calibration certificate and conversion charts
- Carrying case

DIMENSIONS: 300 x 100 x 1000 (h) mm
WEIGHT: 8 kg

LOAD RING PENETROMETER — TP 099

Identical to TP 098 but provided with official laboratory certificate of the load ring.

T 646

PROCTOR PENETROMETER — T 646

ASTM D 1558

Designed for comparative checking of soil compaction.
It may also be used for evaluating moisture/density relationship, determined in the laboratory, on an analogous soil sample.
Supplied complete with 9 interchangeable needles: 1" - 3/4" - 1/2" -1/3" - 1/5" - 1/10" - 1/20" - 1/30" - 1/40" and carrying case.
Graduations 0-40 kg. (division 1 kg)

DIMENSIONS: 450 x 160 x 70 (h) mm
WEIGHT: 4.5 kg

D 100/A

WATER LEVEL INDICATOR (100 m cable) — D 100/A

Consisting of a strong winch and 100 m of 4.7 mm dia. cable marked at centimetre intervals.
Visual and sonic indicator.
Probe 10 mm dia.

DIMENSIONS: 250 x 180 x 350 (h) mm
WEIGHT: 4 kg

WATER LEVEL INDICATOR (50 m cable) — D 100/B

Same as the D 100/A above, but with 50 m cable.

KIT FOR SOIL SURVEYS AND SAMPLING T 682/C

This kit contains a range of selected items for boring and sampling up to a diameter of 150 mm.

The kit consists of:

T 682/C1	1 SOIL AUGER 100 mm DIAMETER
T 682/C2	1 SOIL AUGER 150 mm DIAMETER
T 682/C3	1 DUTCH AUGER 50 mm DIAMETER
T 682/C4	1 AUGER FOR GRAVEL 150 mm DIAMETER
T 682/C5	10 EXTENSION RODS EACH 1 m LONG
T 682/C6	2 STILLSON WRENCHES
T 682/C7	1 STEEL HANDLE
T 682/C8	1 CHISEL
T 682/D1	10 SAMPLE TUBES 38 mm DIAMETER x 230 mm LONG
T 682/D2	2 ADAPTORS
T 682/D3	1 JARRING LINK

T 682/C

BOX DIMENSIONS: 1190 x 250 x 310 (h) mm
WEIGHT: 40 kg

Each item may be ordered individually.

POWER AUGERS MAX. BORING DEPTH OF 1 m

Electronic ignition; 2-stroke motor. Membrane type carburettor. Centrifugal clutch. Rope starting.
Fulfills CE requirements.

MODELS:

Features	T 678	T 679
Motor	2 hp - 48 cc	6 hp - 81 cc
Tank: litres	1	3
Reverse gear	NO	YES
Holes dia. (mm)	from 60 to 200	from 100 to 500
Weight (kg)	8.5	30
Auger ø 80 mm	T 678/080	
Auger ø 100 mm	T 678/100	T 679/100
Auger ø 150 mm	T 678/150	T 679/150
Auger ø 200 mm	T 678/200	T 679/200
Auger ø 250 mm		T 679/250
Auger ø 300 mm		T 679/300
Auger ø 350 mm		T 679/350
Auger ø 400 mm		T 679/400
Auger ø 450 mm		T 679/450

T 679

DRY DENSITY/MOISTURE RELATIONSHIP

Rammers and moulds made of galvanized steel

T 619/4

T 619/1

EN 13286-2

T 619/1	**PROCTOR MOULD** (type A) Dia. 100 x 120 mm. With collar and base plate Dimensions: dia. 180 x 181 mm. Weight: 5.1 kg
T 619/4	**PROCTOR MOULD** (type B) Dia. 150 x 120 mm. With collar and base plate. Dimensions: dia. 250 x 181 mm. Weight: 8 kg
T 619/2	**PROCTOR RAMMER** (type A) Mass 2.5 kg. Drop height 305 mm. Dia. 50 mm. Dimensions: dia. 65 x 400 mm. Weight: 4.5 kg
T 619/3	**PROCTOR RAMMER** (type B) Mass 4.5 kg. Drop height 457 mm. Dia. 50 mm. Dimensions: dia. 65 x 700 mm. Weight: 8 kg
T 619/P	**STEEL PLATE** (EN) Dia. 99.5 x 10 mm
T 619/G	**STEEL PLATE (EN)** Dia. 149.5 x 10 mm.

ASTM D 558 ASTM D 698 ASTM D 1557
AASHTO T 99 AASHTO T 134 AASHTO T 180

T 631	**STANDARD PROCTOR MOULD**: 4” Dia. 4” x 4.584” (capacity 1/30 cu.ft). With collar and base plate. Dimensions: dia. 180 x 173 mm. Weight: 4.9 kg
T 631/Z	**SPLIT PROCTOR MOULD**: 4” Similar to T 631 but with split mould body.
T 634	**MODIFIED PROCTOR MOULD**: 6” Dia. 6” x 4.584” (capacity 1/13.33 cu.ft). With collar and base plate. Dimensions: dia. 235 x 173 mm. Weight: 7.3 kg
T 634/Z	**SPLIT PROCTOR MOULD**: 6” Similar to T 634 but with split mould body.
T 632	**STANDARD PROCTOR RAMMER** Weight 5.5 lb (2.495 kg). 12” (304.8 mm) drop. 2” dia. Dimensions: dia. 60 x 610 mm. Weight: 3.9 kg
T 633	**MODIFIED PROCTOR RAMMER** Weight 10 lb (4.535 kg). 18” (457.2 mm) drop. 2” dia. Dimensions: dia. 60 x 970 mm. Weight: 6.5 kg

BS 1377	BS 1924
T 635/A	**STANDARD PROCTOR MOULD** Dia. 105 x 115.5 mm. With collar and base plate. Weight: kg 5. Capacity 1000 cu.cm. 1/30 cu.ft.
T 635/B	**STANDARD PROCTOR RAMMER** Mass 2.5 kg - 300 mm drop. 50 mm dia. Dimensions: dia. 65 x 400 mm Weight: 4.5 kg.
T 635/C	**MODIFIED PROCTOR RAMMER** Mass 4.5 kg with 450 mm drop. 50 mm dia. Dimensions: dia. 65 x 700 mm Weight: 8 kg.

HYDRAULIC EXTRUDER N 519

Hand-operated with hydraulic jack (3000 kg capacity).
For the extrusion of 4" - 6" samples from moulds.
Annular and slotted plates for quick set-up. It enables the extrusion of Marshall, Proctor, CBR samples.

DIMENSIONS: dia. 300 x 500 (h) mm
WEIGHT: 30 kg

N 519

C.B.R. MOULDS AND ACCESSORIES

EN 13286-47

T 619/G	STEEL PLATE to EN , diameter 149.5 x 10 mm
T 619/B28	PERFORATED BASE PLATE with lateral rods for type B proctor mould
T 619/B35	NON-PERFORATED BASE PLATE with lateral rods for type B proctor mould
T 619/B29	ANNULAR SURCHARGE inner diameter 53 mm, outer diameter 145 mm, weight 2 kg
B 570/3	FILTER PAPER 15 cm dia. (100 pieces)
DV 739	STRAIGHT EDGE, 30 x 300 mm

NB: For relevant mould, see model T 619/4 illustrated and described on page 18

Rammers and moulds made of galvanized steel

ASTM D 1883 AASHTO T 193 CNR UNI 10009

T 628/A	MOULD dia. 6” x 7” (h). With collar and perforated base plate. Weight: 9 kg
T 628/Z	MOULD dia. 6” x 7” (h). Similar to T 628/A but with split mould body for easy sample removal
T 628/B	SPACER DISC 151 mm dia. x 61.3 (h) mm. With T-handle, which can be unscrewed
T 628/C	CUTTING COLLAR
T 628/G	ANNULAR SURCHARGE: 2.27 kg
T 628/L	SPLIT SURCHARGE: 2.27 kg
T 628/H	ANNULAR SURCHARGE: 4.54 kg
T 628/M	ANNULAR SURCHARGE: 9.08 kg
T 628/S	NON-PERFORATED BASE with lateral rods
T 628/T	PERFORATED BASE with lateral rods
T 628/R	FILTER SCREEN stainless steel 6” dia. (100 mesh)
B 570/3	FILTER PAPER 15 cm dia. (100 pieces)
DV 739	STRAIGHT EDGE, 30 x 300 mm

BS 1377 BS 1924

T 629/A	MOULD 152 mm dia. x 127 (h) mm With collar and perforated base plate. Weight: 9 kg
T 629	MOULD BODY 152 mm dia. x 127 (h) mm (without base and collar)
T 629/B	COLLAR 152 mm dia. x 50 mm
T 629/C	PERFORATED BASE with lateral rods
T 629/D	NON-PERFORATED BASE with lateral rods
T 629/E	CUTTING COLLAR
T 629/F	SPACER DISC 150 mm dia. x 50 mm With T-handle, which can be unscrewed
T 629/G	ANNULAR SURCHARGE: 2 kg
T 629/H	SPLIT SURCHARGE: 2 kg
T 629/J	TAMPING ROD dia. 12.7 x 380 mm
B 570/3	FILTER PAPER 15 cm dia. (100 pieces)
DV 739	STRAIGHT EDGE, 30 x 300 mm

SWELL TEST EQUIPMENT

ASTM D 1883 AASHTO T 193 CNR UNI 10009
BS 1377 EN 13286-47

T 628/P	SWELL PLATE - GALVANIZED STEEL 149 mm dia. Adjustable stem. Weight 1.5 kg
T 628/D	SWELL TRIPOD Dimensions: 200 x 150 x 120 (h) mm. Weight 1.5 kg
T 628/E	DIAL GAUGE 0.01 divisions. 30 mm travel
T 621	STAINLESS STEEL SOAKING TANK Dimensions: 450 x 300 x 300 (h) mm. Weight: 10 kg
T 622	HEAVY PLASTIC TANK Dimensions: 400 x 400 x 330 (h) mm. Weight: 3 kg

T 628/A
WITH ACCESSORIES

T 629/A
WITH ACCESSORIES

T 621
T 622
T 628/P
T 628/D
T628/E

AUTOMATIC C.B.R./PROCTOR COMPACTOR

This automatic machine eliminates laborious and, above all, inconsistent hand compactions.
A selector switch enables the operator to choose type of compaction required (circular blow pattern for 4" or 100 mm specimen moulds and double concentric circles for 6" or 150 mm specimen moulds). The number of blows can be preset on the electronic, microprocessor-based control panel which is separate from the machine so as to protect against vibrations. Safety guard complete with micro-switch (according to CE Standards).

POWER SUPPLY: 220 V, 50 Hz, single phase, 370 W
DIMENSIONS: 450 x 610 x 1380 (h) mm
WEIGHT: 260 kg

MODELS:

AUTOMATIC COMPACTOR — T 644/A

UNI 10009 CNR 69 ASTM D 558 ASTM D 559
ASTM D 560 ASTM D 698 ASTM D 1557 ASTM D 1883

Rammer diameter is 2" (50.8 mm) and weight is interchangeable from 5.5 lb (2.49 kg) to 10 lb (4.54 kg).
Height of rammer drop is adjustable from 12" (304.8 mm) to 18" (457.2 mm).

T 644
T 628/A

AUTOMATIC COMPACTOR — T 644/B

BS 1377 BS 1924

Rammer diameter is 50 mm and weight is interchangeable from 2.5 kg to 4.5 kg. Height of rammer drop is adjustable form 300 to 450 mm.

AUTOMATIC COMPACTOR — T 644/E

EN 13286-2

Rammer diameter is 50 mm and weight is interchangeable from 2.5 kg to 4.5 kg.
Height of rammer drop is adjustable from 305 to 457 mm.

Accessories and spare parts:

T 644/M	UNI - ASTM rammer assembly
T 644/MB	EN - BS rammer assembly
AD 225/009	“PROCTOR/C.B.R. compaction test” software

SOUND-PROOFING CABINET — T 644/C

For reducing the noise level to below 75 dB thus permitting operator exposure to be increased from one hour to the whole working day.
The control panel is located on the outer wall.
Bearing frame is in anodized aluminium with double-walled, insulated panels in galvanized sheet metal.
Door is locked by key.

DIMENSIONS: 750 x 1030 x 1980 (h) mm
WEIGHT: 220 kg

T 644
T 644/C
T 628/A

T 644/K

VIBRATING HAMMER COMPACTION

BS 1377 BS 1924 EN 13286-4

VIBRATING COMPACTION APPARATUS — T 644/K

Used for compacting Proctor and C.B.R. samples.
Hammer complete with tamping foot 146 mm diameter and shank 300 mm long.
Steel supporting frame thus rendering it stable and easy to use.

POWER SUPPLY: 220-240 V, 50 Hz, single phase. 800 W
DIMENSIONS: 500 x 500 x 1000 (h) mm
WEIGHT: 80 kg

ACCESSORIES AND SPARE PARTS:

T 644/K1	COMPACTION HAMMER
T 644/K2	SUPPORTING FRAME FOR HAMMER
T 644/KP4	TAMPING FOOT (unconfined test), distance of centering disc to square base 150 mm
T 644/KP5	TAMPING FOOT (without shaft) 102 mm dia.
T 644/KP6	TAMPING FOOT (without shaft) 146 mm dia.
T 644/KPG	SHAFT, 300 mm long

T 644/K1

T 644/KP6
T 644/KP5
T 644/KPG

T 644/KP4

KANGO ELECTRIC HAMMER COMPACTOR FOR ROCKFILL MOULD — T 645

Same features as T 644/K.
Bigger frame in order to accomodate a 12” diameter mould. Rammer diameter 300 mm.

POWER SUPPLY: 220-240V, 50 Hz, single phase, 800 W
DIMENSIONS: 800 x 600 x 1200 (h) mm
WEIGHT: 130 kg

T 645

ROCKFILL MOULD — T 645/1

Made of steel.
Complete with base plate and 100 mm high collar.
Internal diameter: 305 mm

INNER DIAMETER: 305 mm
MOULD HEIGHT: 274 mm
WEIGHT: 48 kg

50 kN C.B.R. TESTING MACHINES

ASTM D 1883 AASHTO T 193 UNI 10009 BS 1377
BS 1924 EN 13286/47

Tecnotest manufactures more than one model: a continuous, variable-speed machine (T 052/E), a six-speed machine (T 051), two fixed-speed machines (T 005 and T 005/B), as well as a hand-operated machine for C.B.R. in-situ tests, which can be supplied with a conversion frame for lab tests.

VARIABLE SPEED TESTING MACHINE 50 kN T 052/E

The special characteristic of the machine consists in its VARIABLE SPEED OPERATING WITHIN A CONTINUOUS RANGE (from 0.01 to 52 mm/min.). Speed change is via keyboard.
Platen speed is shown on the display.
LOAD AND DEFORMATION (DISPLACEMENT) CONTROL: for test procedures requiring constant deformation rate, speed must be input at the start.
The closed-loop control maintains this speed during the test irrespective of load.
Feedback control may also be extended to load so as to enable tests that require a constant load rate to be performed.
In this case rate must be input at the start of the test: automatic control will ensure that this rate is maintained during the test irrespective of deformation.

Safety devices limit cylinder stroke while controlling stability measuring instrument and mould.
Max. vertical span: 800 mm, minimum 100 mm.
Horizontal span: 380 mm.
Cylinder stroke: 100 mm.

Given the range of operating speeds, the machine can be used for other tests, such as compression tests on soil-bituminous mixes, on asphalt (Marshall and indirect tensile tests), soil-cement mixes and flexural tests on concrete, mortar, natural stones, clay blocks and tiles, as well as for quick triaxial tests.

The control unit is our microprocessor-based, two channel EUROTRONIC with two extra channels, as optional. When connected to a load cell and transducer it controls the test, data acquisition, processing, storage, display as well as downloading to a PC.
Specifications on the following pages.

POWER: 220 V, 50 Hz, 1 ph, 1 KW
DIMENSIONS: 520 x 550 x 1450 (h) mm
WEIGHT: 160 kg

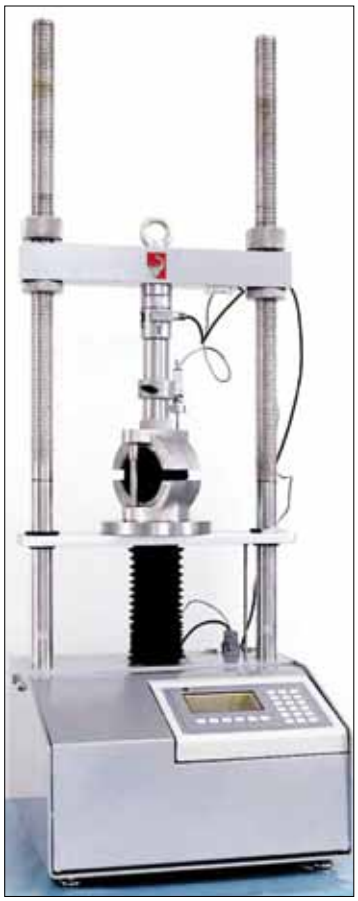
The machine has to be completed with:

AP 032/050	Load cell (50 kN)
AD 115/026	Displacement transducer: 25 mm travel
BA 201	Load penetration piston
T 630 - T 630/2	Transducer bracket and extension

T 052/E
TESTING MACHINE EQUIPPED FOR CBR TEST

AP 032/050	LOAD CELL
AD 115/026	DISPLACEMENT TRANSDUCER
T 630, T 630/2	BRACKET AND EXTENSION
BA 201	PENETRATION PISTON
T 628/A	CBR MOULD

T 052/E
TESTING MACHINE EQUIPPED FOR MARSHALL TEST



AP 032/050	LOAD CELL
AD 115/026	DISPLACEMENT TRANSDUCER
T 630, T 630/2	BRACKET AND EXTENSION
BA 201	PENETRATION PISTON
B 005/T	BREAKING HEAD STABILITY MOULD

T 051 TESTING MACHINE

BB 050	PROVING RING
BA 201	PENETRATION PISTON
T 630	BRACKET
T 628/E	DIAL GAUGE
B 005/T	BREAKING HEAD
	STABILITY MOULD

50 kN VARIABLE SPEED MACHINE (6 SPEEDS) T 051

The special characteristic of the machine consists in its 6 speeds (pre-set and ranging from 0.6 to 50.8 mm/min.).
Speeds: 0.635 - 1 - 1.27 - 5 - 25.4 - 50.8 mm/min.
Speed change is via keyboard.
Max vertical span 600 mm, minimum 100 mm.
Horizontal span 380 mm. Ram travel 100 mm.

Particularly suitable for the following tests:

MARSHALL	Piston speed 2”/min. (50.8 mm)
HUBBARD-FIELD	Piston speed 1”/min. (25.4 mm)
C.B.R. (ASTM)	Piston speed 0.05”/min. (1.27 mm)
C.B.R. (BS)	Piston speed 1 mm/min.
UNCONFINED	Piston speed 0.025”/min. (0.635 mm)

The machine can also be used for other tests.

POWER: 220 V, 50 Hz, single phase, 750 W.
DIMENSIONS: 520 x 550 x 1250 (h) mm.
WEIGHT: 156 kg.

The machine is available in analog version.

MARSHALL TEST ACCESSORIES: page 28
UNCONFINED TEST ACCESSORIES: page 33

T 005

T 005

BB 050	PROVING RING
BA 201	PISTON
T 630	BRACKET
T 628/E	DIAL GAUGE
T 628/A	CBR MOULD

50 kN C.B.R. TESTING MACHINE T 005

ASTM D 1833 AASHTO T 193 UNI 10009

TEST SPEED 1.27 mm (0.05”)/MINUTE ACCORDING TO ASTM D 1833, AASSHTO T 193 AND UNI 10009.
A crossbeam and two columns hold the measurement group in position whilst the platen is raised at a constant rate by means of an electric motor.
Maximum span between columns 290 mm.
Vertical span: maximum 600 mm, minimum 200 mm.
Vertical clearance may be adjusted by means of the threaded columns and locknuts. Rapid platen adjustment. Safety devices limit cylinder stroke while controlling stability measuring instrument.
Complete with a magnetothermal switch and a lever for upstroke/downstroke of the test platen.

POWER SUPPLY: 220 V, 50 Hz, single phase, 600 W.
DIMENSIONS: 500 x 550 x 1300 (h) mm.
WEIGHT: 110 kg.

T 005/B

AD 200	EUROTRONIC
AP 032/050	LOAD CELL
AD 115/026	TRANSDUCER
T 630	BRACKET
T 630/2	EXTENSION
BA 201	PENETRATION PISTON
T 628/A	CBR MOULD

50 kN C.B.R. TESTING MACHINE T 005/B

TEST SPEED 1 MM/MINUTE ACCORDING TO BS 1377.
Identical to T 005 model.

POWER SUPPLY: 220 V, 50 Hz, single phase.

THE MACHINES T 051 - T 005 - T 005/B ARE SUPPLIED WITHOUT MEASURING DEVICES OR ACCESSORIES FOR THE TEST, ALL OF WHICH ARE MENTIONED BELOW AND SHOULD BE ORDERED SEPARATELY.
MODELS T 005 - T 005/B ARE AVAILABLE IN BOTH ANALOG AND DIGITAL VERSIONS.

COMPUTERISED C.B.R. TEST

An extremely interesting feature of our machines is the possibility of using a PC interface in order to acquire test data automatically. Provided that the machines are fitted with our Eurotronic control/display unit and electronic transducers, an automatic data acquisition system may be implemented, thus enabling such data to be subsequently processed and to provide a test certificate (also in hard copy version if a printer is connected). PC and printer, if not available in the laboratory, should be sourced locally.

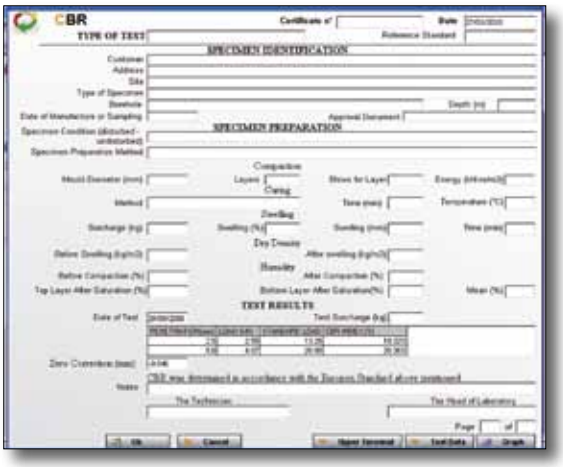
Various types of data acquisition software are available:

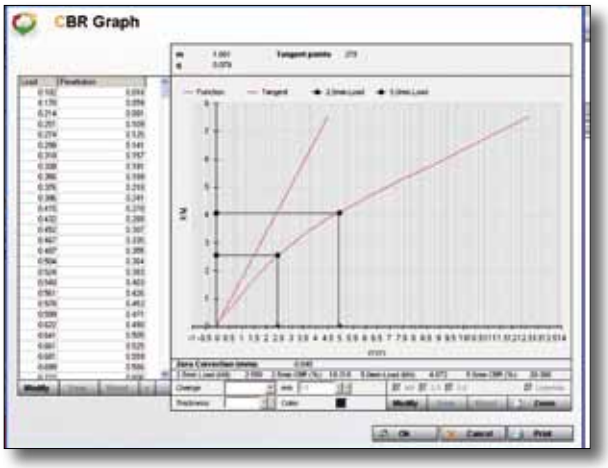
AD 050/001	DATA ACQUISITION SOFTWARE
AD 050/B11	DATA ACQUISITION AND PROCESSING SOFTWARE FOR MARSHALL TEST (see page 258)
AD 050/B12	DATA ACQUISITION AND PROCESSING SOFTWARE FOR C.B.R. TEST
AD 050/B13	DATA ACQUISITION AND PROCESSING SOFTWARE FOR INDIRECT TENSILE TEST (see page 258)
AD 050/B34	DATA ACQUISITION AND PROCESSING SOFTWARE FOR UNCONFINED COMPRESSION TEST

AD 050/001
This software enables acquisition by a PC of test data (time, load, displacement) from the Eurotronic.
Data thus transmitted are collected in a file which can be opened using MS Windows applications (such as MS Excel) for subsequent graphic processing.

AD 050/B12 and AD 050/B34
These two types of software enable acquisition by a PC of test data (time, load, displacement) from the Eurotronic.
Data thus transmitted are collected in a file which can be opened using MS Windows applications (such as MS Excel) for subsequent graphic processing.
Data are also sent to an MS Access module for automatic processing of test certificate and graph. All tests are gathered in an MS Access data base which is easy to consult. Some customization of software is also possible.
Using this software, the laboratory letter head and logo may also be included in the test ccertificate.

T 052/E MULTITEST





VARIOUS CONFIGURATIONS FOR T 052/E MULTITEST MACHINE

1. MARSHALL TEST

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
AD 115/026	ELECTRONIC TRANSDUCER, 25 mm TRAVEL
T 630	BRACKET FOR DIAL GAUGE/TRANSDUCER
T 630/2	EXTENSION TO T 630 FOR TRANSDUCER
B 005/T	BREAKING HEAD STABILITY MOULD

2. ASPHALT INDIRECT TENSILE TEST WITH MEASUREMENT OF HORIZONTAL AND VERTICAL DEFORMATION

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
AD 115/026	ELECTRONIC TRANSDUCER, 25 mm travel (2 pieces)
T 630	BRACKET FOR DIAL GAUGE
T 630/2	EXTENSION to T 630 for TRANSDUCER
B 008	DEVICE for Ø 100 mm (4”)

3. CBR TEST

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
AD 115/026	ELECTRONIC TRANSDUCER, 25 mm travel
T 630	BRACKET FOR DIAL GAUGE/TRANSDUCER
T 630/2	EXTENSION to T 630 for TRANSDUCER
T 628/A	CBR MOULD

4. SOIL-CEMENT INDIRECT TENSILE TEST

AP 032/050	LOAD CELL (50 kN)
KR 023	INDIRECT TENSILE STRESS TESTING DEVICE
BA 201	PENETRATION PISTON
KR 024/C	HARD BOARD PACKING STRIPS

5. UNCONFINED TEST

AP 032/050	LOAD CELL (50 kN)
T 630/5	COMPRESSION PLATE
T 630/3	DIAL GAUGE/TRANSDUCER DATUM BAR
AD 115/026	ELECTRONIC TRANSDUCER, 25 mm travel
T 630	BRACKET FOR DIAL GAUGE/TRANSDUCER
T 630/2	EXTENSION to T 630 for TRANSDUCER

6. QUICK TRIAXIAL TEST

AP 032/005	LOAD CELL: 5 kN SUPPLIED WITH SMALL THRUST PISTON AND RELEVANT TRANSDUCER BRACKET
T 630/2	EXTENSION to T 630 for TRANSDUCER
AD 115/026	ELECTRONIC TRANSDUCER, 25 mm travel
TR 205	TRIAXIAL CELL

VARIOUS CONFIGURATIONS FOR T 052/E MULTITEST MACHINE

7. CEMENT/MORTAR COMPRESSION TEST

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
C 362/N	COMPRESSION TESTING DEVICE

8. CEMENT/MORTAR FLEXURAL TEST

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
C 362/F	FLEXURE TESTING DEVICE

9. NATURAL STONES FLEXURAL TEST

AP 032/050	LOAD CELL (50 kN)
KR 005/EN	FLEXURAL TESTING DEVICE TO EN 12372

10. CONCRETE BEAM FLEXURAL TEST

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
KR 08	FLEXURAL TESTING DEVICE FOR CONCRETE BEAMS

11. CONCRETE TILES AND BLOCKS FLEXURAL TEST

AP 032/050	LOAD CELL (50 kN)
P 406/3	UPPER FLOATING BEARER
P 406/2	PAIR OF LOWER BEARERS
P 406/T	BEARERS SUPPORTING BEAM

12. CLAY BLOCKS PUNCHING TEST

AP 032/050	LOAD CELL (50 kN)
P 406/1	HARD WOODEN BLOCK
P 406/2	PAIR OF LOWER BEARERS
P 406/T	BEARERS SUPPORTING BEAM

Other tests possible using T 052/E:

UNIAXIAL TEST ON SOILS

AP 032/050	LOAD CELL (50 kN)
T 630/5	COMPRESSION PLATE

COMPRESSION TEST ON SOIL-CEMENT SAMPLES

AP 032/050	LOAD CELL (50 kN)
T 630/6	COMPRESSION PLATEN, 155 mm diameter

ASPHALT INDIRECT TENSILE TEST "EN"

AP 032/050	LOAD CELL (50 kN)
BA 201	PENETRATION PISTON
B 006	DEVICE for Ø 100 mm (4")

LOAD MEASURING DEVICES

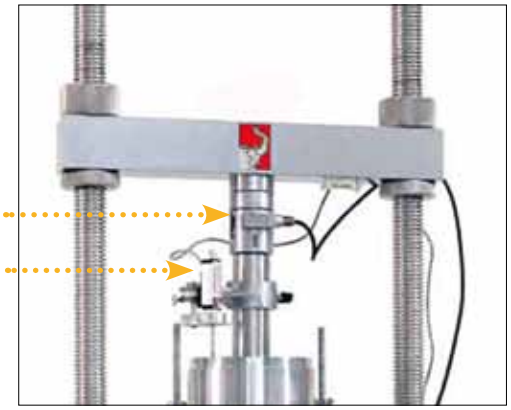
BA 005 BA 040 BA 050

LOAD PROVING RINGS

The proving rings are used as calibration instruments (dynamometers) and load measuring devices for laboratory testing machines. Made of special steel subjected to heat-treatment to improve the elastic properties.
A dial gauge (RAMBOLD original) is positioned within the proving ring to read its deformation which is expressed in 0.001 mm.
Each BA model proving ring (with relevant dial gauge) is calibrated by an Accredited Laboratory which issues a CALIBRATION CERTIFICATE. The BB model proving rings are calibrated in Tecnotest's laboratory and are supplied with in-house certificate.

RANGE OF TECNOTEST LOADING RINGS

MODELS		NEWTON	kg
BA 001	**BB 001**	1000	100
BA 002	**BB 002**	2000	200
BA 003	**BB 003**	3000	300
BA 005	**BB 005**	5000	500
BA 006	**BB 006**	6000	600
BA 010	**BB 010**	10000	1000
BA 020	**BB 020**	20000	2000
BA 030	**BB 030**	30000	3000
BA 040	**BB 040**	40000	4000
BA 050	**BB 050**	50000	5000



EXTENSOMETRIC LOAD CELLS

Extensometric, type - high precision - stainless steel made, high resistance, cylindrical shape. Thermal compensation.

Linearity - hysteresis	≤ ± 0.03 % F.S.	
Repeatability	(%)	≤ ± 0.01 F.S.
Nominal sensitivity	(mV/V)	2
Recommended supply voltage	(V)	10
Protection class (EN 60529)	IP67	

RANGE OF TECNOTEST LOAD CELLS

MODEL	NEWTON CAPACITY	KG CAPACITY
AP 032/003	3500	350
AP 032/005	5000	500
AP 032/010	10000	1000
AP 032/025	25000	2500
AP 032/050	50000	5000
AP 032/075	75000	7500
AP 032/100	100000	10000

FLOW MEASURING DEVICES

MECHANICAL

T 628/E	Dial gauge, 30 mm travel - 0.01 sensitivity
T 630	Bracket for dial gauge/transducer with micrometric screw for zero setting

N.B.
On purchasing our load cells or transducers, together with readout units, initial calibration of system is performed of charge in Tecnotest's Metrological laboratory.

ELECTRIC

AD 115/026	Potentiometric transducer 25 mm travel, 0.01 mm sensitivity
T 630	Bracket for dial gauge/transducer with micrometric screw for zero setting
T 630/2	Extension to T 630 for transducer

EUROTRONIC AD 200

HARDWARE FEATURES

- 24 VDC power (supplied with mains adaptor 110/220 V)
- 320 x 240 pixel backlit display complete with energy save feature
- 4 Channels which may be set at 2 mV/V, 3 mV/V, 7 mV/V or 10 VDC: each channel has a resolution of 500000 points
- 24 Button keyboard, including a numeric keypad, for quick test selection and easy data input, more practical than the minimalistic models with fewer buttons
- 8 Digital inputs
- 8 Digital outputs
- 2 Pulse width modulation output (PWM) for stepper or brushless motor control
- 2 Analog outputs (12 bits – 0/10 Volts) for closed-loop feedback control
- 1 Serial RS-232 port and 2 serial RS-485 ports for transmitting data to a PC in real time or at the end of test
- 1 Slave USB port for transmitting data to a PC or for uploading software upgrades or custom modifications to software in use
- 1 Master USB port for connecting to a USB data stick
- 1 Ethernet port or Wi-Fi port for data transmission or remote control

The Eurotronic is one of the few instruments (if not the only one) in the market to have a numeric keypad for data input.
To enter a number there is no need to call up the number required by first scrolling up or down using arrow keys, as it is sufficient to input it via the numeric keypad.

SOFTWARE FEATURES

- Selectable languages: Italian, English, Spanish, French, Portuguese, Russian (Cyrillic alphabet), Polish and Rumanian. All test pages are translated, including those sent to PC or printer
- Selectable units of measurement: kN, N, lbf, tonnes, kgf, mm, in. The instrument automatically converts values in one unit of measurement to another without any need for recalibration
- Display of test graph in real time
- Transmission to PC to test data in real time with data time scan selection (1 datum per second, 2 data per second, 5 data per second, 10 data per second, 1 datum every 10 seconds)
- Tests performed are stored in an archive
- Archive with scroll index for tests performed: it is possible to send to a PC test results only or all test data foreseen, time/load/displacement, for subsequent processing in graph format
- Clock and calendar with daylight saving hour foreseen
- Memorizes for each test: time, user ID, sample parameters and serial number, test results
- Special functions, protected by password, for verification of functioning of keyboard, A/D inputs, inputs and outputs

CALIBRATION

Tecnotest has taken special care as usual to ensure that maximum readout accuracy of its calibration function is guaranteed.
The calibration function is obviously protected by a password.
Calibration is performed over 11 programmable points from zero to full scale of the instrument under calibration.
The procedure is particularly simple and designed so that there is no need for calculation of coefficients, to enter them by hand or to repeat procedures on a trial and error basis.
In practice, the user is invited to explore the entire readout scale, then to press a key when the sample dynamometer indicates exactly 0, 10%, 20%.....90%, 100% relative to full potential of the machine.
The instruments suggests memorizing 11 points equally distributed along the readout scale, but these may be modified as desired : for example, it may be decided to memorize points 0, 1%, 5%, 10%, 20%.....80%, 100% of full scale thus guaranteeing, thanks to the 500000 divisions available, high precision even at very low loads. All these operations are extremely simple and quick to perform thanks to the unit's function keys and numeric keypad.

AD 200

ACCESSORIES

AD 200/ETH	Ethernet port
AD 200/WFI	Wi-Fi port

NB: Implementation of any one of the optional ports (not both) is possible only at the time the AD 200 is ordered, not once delivered, so choice of port must brbbe specified, if required, on ordering.

1.1.2 PROCTOR C.B.R.

TECNOTEST

TEST SCREENS

Eurotronic has the following test routines:

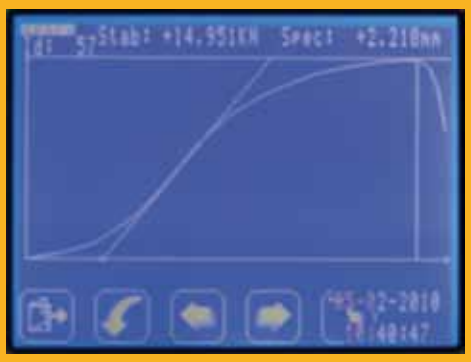
- Manual mode
- Compression test on cubes, cylinders, blocks
- Flexural tests with 3 or 4 point loading
- Tensile test
- Block pavers test
- Marshall test
- CBR test
- Indirect tensile test for asphalt
- Unconfined test
- Failure under controlled loading
- Failure under controlled test speed

For each test previous considerations are valid (see software features)

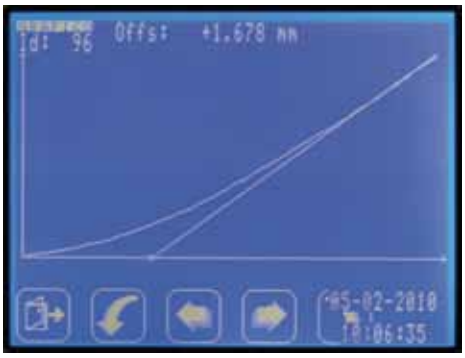
Compression test:
Graph display in real time, automatic calculation of sample strength at end of test. In automatic machines test start, test speed management and test stop with calculation of results are all, obviously, completely automatic. If numerous tests are to be performed on samples of equal shapes and sizes, a simple touch of a key allows other tests to be performed again and again without having to repeat input of sample parameters.

Flexural test:
Four types of flexural tests may be selected. Centre point or two point loading by inputting parameters for base and heght of specimen or also section.

Marshall test:
Automatic calculation of Marshall stability with correction of height of sample, flow and tangential flow according to EN or ASTM Standard procedures. Allows change of peak position and tangent and consequently recalculates test results. Time/load/flow data are sent to a PC at a rate of 10 data per second in real time or from archive after backup.
Start threshold setup and automatic test stop.



CBR test:
Automatic calculation of CBR value at 2.5 mm and at 5 mm per second. Graph display. Allows correction of tangent position and subsequent recalculation of CBR value.
Start threshold setup and automatic test stop.



1.1.2 PROCTOR C.B.R.

TECNOTEST

Indirect tensile test on asphalt:
Test is performed calculating only failure load, with calculation of failure and axial deformation or failure calculation and axial and diametral deformation calculation.
Start threshold setup and automatic test stop.

Unconfined test:
Calculation of failure load and deformation. Graph display possible to individuate point of failure of sample.
Start threshold setup and automatic test stop.

Failure under load control:
Generic test function which foresees readout of a load to apply on a sample.
It is possible to manage and display test speed.
Start threshold setup and test stop are optional.

Failure under load speed control:
Test function which foresees readout of a load and deformation.
It is possible to display load and deformation speeds.
It is possible to perform tests under load speed control or under deformation speed control

Manual mode:
Generic routine for displaying one, two, three or four channels and allowing memorization of peak valve. This routine is particularly useful for checking calibration.

BUYER'S GUIDE

	ANALOG VERSION	DIGITAL VERSION	ANALOG VERSION	DIGITAL VERSION
TESTING MACHINE (50 kN)	FIXED SPEED	FIXED SPEED	6 FIXED SPEEDS	VARIABLE SPEED
C.B.R. TESTING MACHINE	T 005 - T005/B	T 005 - T005/B	T 051	T 052/E
LOAD MEASUREMENT				
PROVING RING 5000 kg	BB 050		BB 050	AP 032/050
LOAD CELL FOR 50 kN		AP 032/050		
PENETRATION PISTON	BA 201	BA 201	BA 201	BA 201
DIGITAL READOUT UNIT EUROTRONIC		AD 200		
DEFORMATION MEASUREMENT				
DIAL GAUGE	T 628/E		T 628/E	
ELECTRONIC TRANSDUCER, 25 mm TRAVEL		AD 115/026		AD 115/026
BRACKET FOR DIAL GAUGE/TRANSDUCER	T 630	T 630	T 630	T 630
EXTENSION TO T 630 FOR TRANSDUCER		T 630/2		T 630/2
DATA ACQUISITION SUITABLE PC AND PRINTER ARE REQUIRED				
DATA ACQUISITION SOFTWARE		AD 050/001		AD 050/001
DATA ACQUISITION AND PROCESSING SOFTWARE FOR "C.B.R." (WINDOWS)		AD 050/B12		AD 050/B12
ACCESSORIES FOR MARSHALL TEST (FOR T 051 - T 052/E ONLY)				
BREAKING HEAD STABILITY MOULD			B 005/T	B 005/T
BRACKET FOR DIAL GAUGE			B 005/A	
DATA ACQUISITION AND PROCESSING SOFTWARE FOR "MARSHALL" (WINDOWS)				AD 050/B11
INDIRECT TENSILE TEST (EN)				
COMPRESSION DEVICE ø 100 mm SAMPLE			B 006	B 006
UNCONFINED COMPRESSION TEST				
COMPRESSION PLATEN			T 630/5	T 630/5
DIAL GAUGE/TRANSDUCER DATUM BAR			T 630/3	T 630/3

IN-SITU C.B.R. TESTING

The mechanical jack T 640/1 has been designed to perform C.B.R. tests in-situ (BS 1377, ASTM D 4429) but may also be used for plate bearing tests.
When used with the conversion frame T 640/5 (see following page) a simple hand operated machine for laboratory CBR tests (ASTM D 1883, AASHTO T 193, BS 1377, BS 1924, UNI 10009, LCPC) and unconfined compression tests (ASTM D 2166, AASHTO T 208, BS 1377) is formed.

50 kN MECHANICAL JACK T 640/1

The aluminium housing encloses a worm screw reducer. A quick-release key allows the rapid adjustment of the plunger.

SPECIFICATIONS:
Max. thrust: 50 kN
Movement ratio: 1 handle rotation = 0.02 mm
Max. travel: 100 mm

DIMENSIONS: 150 x 260 x 290 (h) mm.
WEIGHT: 7.3 kg

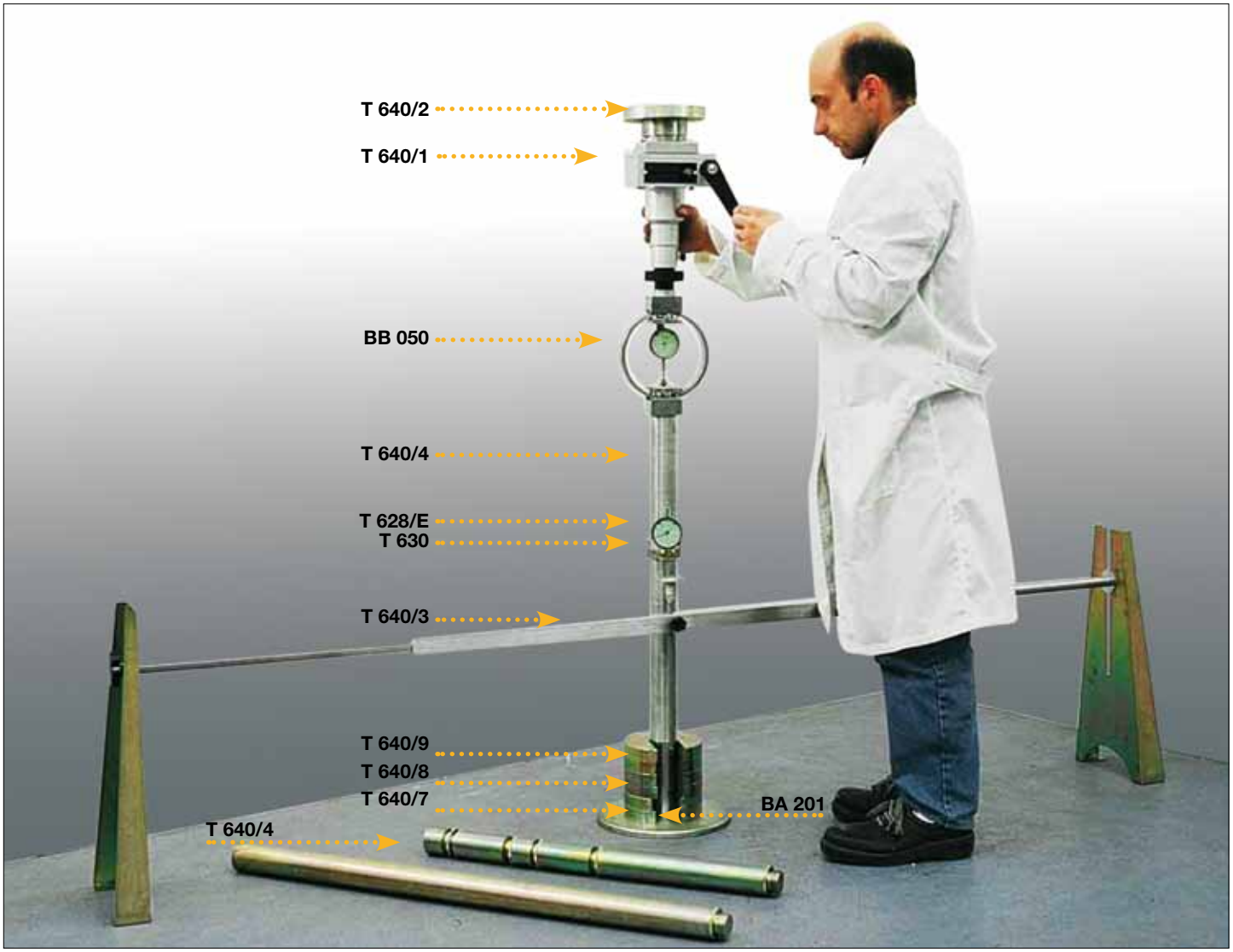
T 640/2	BALL SEATING WITH CONNECTIONS for T 640/1
BB 050	50kN PROVING RING
BA 201	C.B.R. PENETRATION PISTON
T 640/4	SET OF EXTENSION RODS Consisting of 6 coupling elements and 2 x 38 mm, 2 x 76 mm, 1 x 305 mm 1 x 610 mm, 1 x 915 mm extensions
T 640/3	DATUM BAR ASSEMBLY In tubular aluminium, telescopic, 2.4 m long, adjustable supports
T 630	BRACKET FOR DIAL GAUGE/TRANSDUCER WITH MICROMETRIC SCREW FOR ZERO SETTING
T 628/E	ANALOG DIAL GAUGE. 30 mm travel, 0.01 divisions

SURCHARGE WEIGHTS:

T 640/7	ANULAR SURCHARGE WEIGHT **4.54 kg**
T 640/8	SPLIT SURCHARGE WEIGHT **4.54 kg**
T 640/9	SPLIT SURCHARGE WEIGHT **9,08 kg**

ACCESSORIES:

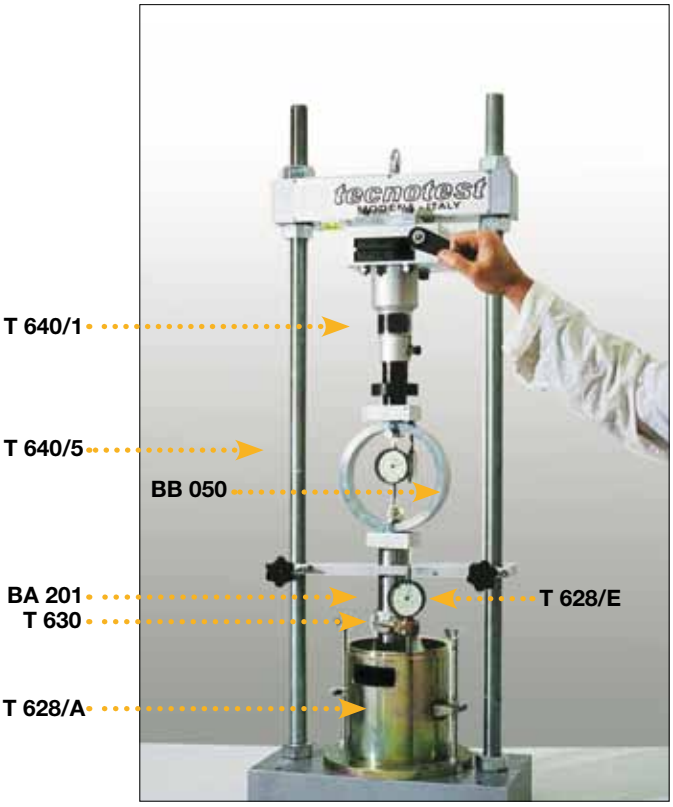
T 640/0	Carrying case (1140 x 450 x 355 mm)



LABORATORY C.B.R. TESTING

Macchina ad azionamento manuale.
For testing exclusively in the laboratory the following items are required:

T 640/1	50 kN MECHANICAL JACK
T 640/5	CONVERSION FRAME for T 640/1
BB 050	50 kN LOAD RING
BA 201	C.B.R. PENETRATION PISTON
T 630	BRACKET FOR DIAL GAUGE/TRANSDUCER WITH MICROMETRIC SCREW FOR ZERO SETTING
T 628/E	ANALOG DIAL GAUGE. 30 mm travel, 0.01 divisions



If one already has the set for in-situ C.B.R. testing, only the following is required:

CONVERSION FRAME FOR T 640/1 — T 640/5

Rigid and stable frame, made in corrosion-proof steel.
For C.B.R. and unconfined compression tests in the laboratory.

DIMENSIONS: 380 x 220 x 1140 (h) mm.
WEIGHT: 36 kg.

ACCESSORIES FOR UNCONFINED COMPRESSION TEST:

T 630/5	COMPRESSION PLATEN
T 630/3	ADJUSTABLE DIAL GAUGE/TRANSDUCER DATUM BAR

STRENGTH OF STABILISED SOIL

EN 13286-53 BS 1924:2

For unconfined compressive strength testing.
The kit consists of: mould, set of two end plugs, set of two plug displacing collars, plunger and specimen collector. Made of galvanized steel.

T 657/1	STABILISED SOIL MOULD KIT FOR FINE AND MEDIUM GRAINED SOILS. SPECIMEN: 100 x 50 mm DIAMETER WEIGHT: APPROX. 10 kg
T 657/2	STABILISED SOIL MOULD KIT FOR MEDIUM AND COARSE-GRAINED SOILS. SPECIMEN: 200 x 100 mm DIAMETER WEIGHT: APPROX. 54 kg

T 657/2

RELATIVE DENSITY
OF COHESIONLESS SOIL

ASTM D 4253 ASTM D 4254 EN 13286-5

Used on soils which contain up to 12% (by weight) of soil passing a N° 200: (0.075 mm) sieve.
The method uses vibratory compaction to obtain maximum density and pouring to obtain minimum density.

For performing the test according to ASTM Standards, the following items are necessary:
T 652/1 (vibratory table), T 652/4 (measuring device) and the ASTM moulds (T 652/2 and/or T 652/3).

For performing the test according to EN Standards, the following items are necessary:
T 652/1 (vibratory table), T 652/5 (EN mould and accessories).
A simple vernier caliper (0.01) is sufficient for measuring.

VIBRATORY TABLE — T 652/1

Used to compact cohesionless soil in the relative density moulds.
Table dimensions: 762 x 762 mm (30" x 30")

Electro-magnetic vibrator: 3600 vibrations/min.
Max vibrating capacity: 250 kg.
Amplitude range: 0.05 to 0.64 mm.
Separate electric control console for wall mounting.

POWER SUPPLY: 220 V, 50 Hz, single phase

COMPLETE MOULD (ASTM): 0.1 CU.FT — T 652/2

Made of galvanised steel. Dia. 152.4 x 155.19 (h) mm, with handles and guide bracket for mounting dial gauge.
Supplied complete with 25.6 kg surcharge weight
150.8 mm diameter x 228.6 mm high, and surcharge base plate with handle.

COMPLETE MOULD (ASTM): 0.5 CU.FT — T 652/3

Made of galvanised steel. Dia. 279.4 x 230.9 (h) mm, with handles and guide bracket for mounting dial gauge. Supplied complete with 86.2 kg surcharge, weight 276.2 mm diameter x 152.4 mm high, and surcharge base plate with handle.

MEASURING DEVICE (ASTM) — T 652/4

Complete with dial gauge 50 mm x 0.01, calibration rod (76.2 x 304.8 x 3.2 (h) mm) and dial support.

COMPLETE MOULD (EN): 14000 CC — T 652/5

Made of galvanized steel, diameter 280 x 230 (h) mm with handles, 86.2 kg surcharge weight, surcharge base plate with handle.

SOUND PROOFING CABINET — T 652/P

The test is particularly noisy and for this reason the machine is usually positioned inside protective casings or outside the laboratory.
This special sound-proof cabinet (in sheet steel covered in a sound-absorbing material) overcomes this inconvenience by reducing the noise level to below 75 dB thus permitting operator exposure to be increased from one hour to the whole working day.
The control panel is located on the outer wall.

DIMENSIONS: 900 x 900 x 800 (h) mm.
WEIGHT: 110 kg.

T 652/P

"IN SITU DENSITY"

SAND REPLACEMENT METHOD

ASTM D 1556 AASHTO T 191 CNR 22 1972

APPARATUS FOR "IN SITU DENSITY" T 615/E

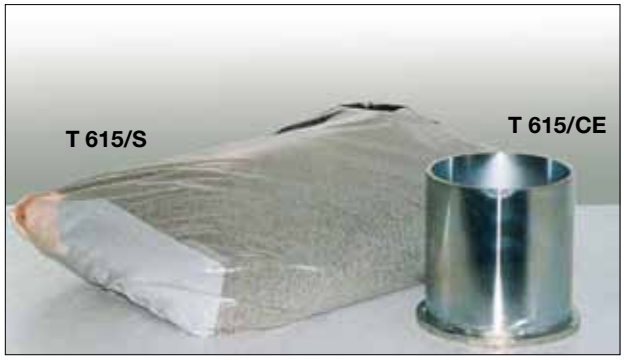
Cone 165 mm diameter made of chromium-plated, accurately machined, steel and with a calibrated valve (12.70 mm dia. hole). Aluminium casting base and 5 litre plastic container provided.

DIMENSIONS: 460 x 470 x 610 (h) mm.
WEIGHT: 4 kg

ACCESSORIES AND SPARE PARTS:

T 615/CE	**CALIBRATION CYLINDER STEEL MADE.** Inner diameter 165 mm and 187 mm high. Weight 5 kg
T 615/S	**CALIBRATED DENSITY SAND (50 kg)**
T 615/B	**5 LITRE PLASTIC CONTAINER**
T 615/1	**BASE PLATE, ALUMINIUM CASTING**

T 615/E



APPARATUS FOR "IN SITU DENSITY" T 615/G
305 mm diameter

This model is used only for soils containing gravel. The cone (steel made) is 305 mm in diameter while the pouring hole has a diameter of 25 mm.
Capacity of the Plexiglas jug is 15 litres. Round base made of sheet steel.

DIMENSIONS: 900 x 900 x 1100 (h) mm.
WEIGHT: 28 kg.

SPARE PART:

T 615/BG	**PLEXIGLASS JUG (SPARE)**

T 615/G

BS 1377 BS 1924

T 612/1	**SAND POURING CYLINDER (100** mm dia.**)**
T 612/2	**CALIBRATION CONTAINER 100 Ø x 150** (h) mm
T 612/3	**METAL BASE TRAY, 100** mm **Ø** hole **300** mm square
T 613/1	**SAND POURING CILINDER (150** mm dia.)
T 613/2	**CALIBRATION CONTAINER 150 Ø x 200** (h) mm
T 613/3	**METAL BASE TRAY, 150** mm **Ø** hole **300** mm square
T 614/1	**SAND POURING CYLINDER (200** mm dia.**)**
T 614/2	**CALIBRATION CONTAINER 200 Ø x 250** (h) mm
T 614/3	**METAL BASE TRAY, 200** mm **Ø** hole **500** mm square

T 616

"IN SITU DENSITY"

WATER METHOD

ASTM D 2167 AASHTO T 205 CNR 22

BALLOON DENSITY APPARATUS 1596 ml **T 616**

Aluminium casting, with valves made of stainless steel; thick-glass graduated cylinder. Guard base with fittings, valves and built-in membrane.
Actuating bulb of the double-acting type (suction - pressure) with quick coupling. Base plate, made of cast aluminium, with central hole. The apparatus is supplied with 12 balloons.

DIMENSIONS: 250 x 240 x 680 (h) mm
WEIGHT: 6.5 kg

ACCESSORIES AND SPARE PARTS:

T 616/0	CARRYING CASE
T 616/1	PUMP WITH COUPLING, FITTINGS AND VALVE
T 616/2	BASE PLATE: 9" x 9" (228 x 228 mm)
T 616/H	PACK OF 12 RUBBER BALLOONS
T 616/V	GLASS CYLINDER (10 CC DIVISIONS)

T 616/G

ASTM D 2167 AASHTO T 205 CNR 22

BALLOON DENSITY APPARATUS 3000 ml - LCPC **T 616/G**

In this model the water pressure is controlled by a hand-operated piston which slides inside the metal cylinder.
The pressure is measured by a manometer while the volume of the balloon appears on the graduated stem of the piston. The apparatus is supplied with 4 reinforced balloons, plate and clamps.

DIMENSIONS: 360 x 340 x 700 (h) mm
WEIGHT: 10 kg

ACCESSORIES AND SPARE PARTS:

T 616/R	PACK OF 6 REINFORCED BALLOONS
DV 677/2	SCRAPER
DV 672	DENSITY HAND PICK
DV 904/M	IRON CLUB HAMMER
DV 677/1	METAL DIBBER TOOL
DV 904	RUBBER HEADED MALLETT
DV 904/P	STEEL POINTED ROD
DV 671	DENSITY SPOON, 36 cm LONG
DV 674	DENSITY CHISEL

DV 904-DV 671-DV 904/P-DV 674-DV 672-DV 904/M

"IN SITU DENSITY"

CALIBRATED MOULD METHOD

SURFACE SOIL SAMPLERS

A core cutter sampling tube is driven into the soil, using specific accessories, to take a standard volume sample.
The equipment is made of galvanized steel.

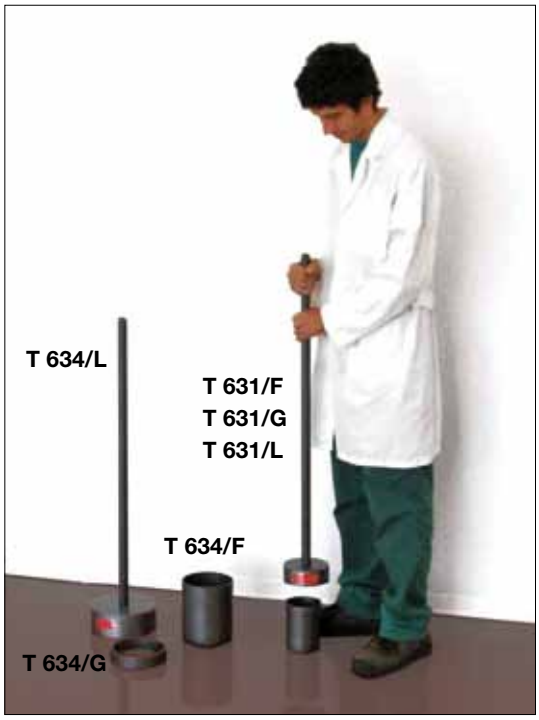
ASTM D 2937 CNR 22

T 631/PM	DRIVING DOLLY COMPLETE WITH HEAD AND SLIDING HAMMER, **5 kg**
T 631/PB	SAMPLING TUBE: DIAMETER **73 x 66 mm**

BS 1377/9

T 631/F	SAMPLING TUBE: DIAMETER **100 x 130 mm (1 kg)**
T 631/G	DRIVING DOLLY **(1 kg)**
T 631/L	DRIVING HAMMER **(13.5 kg)**
T 634/F	SAMPLING TUBE: DIAMETER **150 x 180 mm (5 kg)**
T 634/G	DRIVING DOLLY **(4 kg)**
T 634/L	DRIVING HAMMER **(16 kg)**

T 631/PB
T 631/PM



PERMEABILITY CELLS

Types of permeability cells and test methods vary according to the physical characteristics of the soil (grain size, permeability, density, etc.).
Generally speaking, for soils of high permeability, water is made to pass through the sample at a constant rate while the volume of water seeping through the sample over a defined period of time, or the pressure generated in two or more inner sections of the sample, is measured. For soils of low permeability the water is allowed to vary freely inside a transparent tube of suitable diameter and variation in level is measured over a pre-set period of time.
Very low permeability does not give rise to an appreciable head so it must be determined indirectly by means of consolidation or triaxial tests
Shape and dimensions of the permeability cell vary according to type of test, grain size and kind of treatment to which specimen is to be subjected. For example, should it prove necessary to measure permeability of compacted grit, the cell should have a wall large enough for grains to be dimensioned according to filter section and, at the same time, be made of metal in order to withstand compaction.

Among the numerous possible alternatives, Tecnotest manufactures three types of permeability cells, that is to say:

A) PERMEAMETERS WITH STAINLESS STEEL CENTRAL BODY MEASURING 4" (PROCTOR), 6" (C.B.R) AND 12" (ROCKFILL);
B) 75 mm DIAMETER PERMEAMETER WITH TRANSPARENT CENTRAL BODY AND 3 CONNECTIONS FOR MANOMETER TUBES;
C) 4" METAL PERMEAMETER WITH PERFORATED BASE.

The (A) type permeability cells have two sealed bases and are provided with water inlet and outlet ducts as well as a deaeration valve.
These permeameters are generally used for tests on granular soils compacted according to Proctor or C.B.R. methods; they are suitable for both falling and constant head tests.

T 690

T 690	PERMEAMETER diameter 4"
	Central body Ø 101.6 x 116.4 mm
	Weight: approx. 7 kg
T 691	PERMEAMETER diameter 6"
	Central body Ø 152.4 x 177.8 mm
	Weight: approx. 13 kg
T 692	PERMEAMETER diameter 12"
	Central body Ø 304.8 x 274 mm
	Weight: approx. 50 kg

The (B) type permeability cell is specially designed for constant head test on incoherent soil samples.
It has a central body with 3 outlets for 3 manometer tubes through which water is collected after seepage through the sample.
Inlet and drainageducts are found in the metal base.
A movable stem enables stabilisation of the upper surface of the sample.

T 689	PERMEABILITY CELL diameter 75 mm
	Weight: approx. 3 kg

The (C) type permeability cell has a central body with cutting edge for obtaining a core of the sample.
It comprises a completely perforated base for draining, a top plate with connections for water and de-airing tanks.
The test is performed with the permeability cell fully immersed in a tank fitted with overflow valve.
For falling head tests.

T 688	PERMEABILITY CELL WITH PERFORATED BASE
	Central body Ø 100 mm
	Weight: approx. 4 kg

T 692

ACCESSORIES, WATER TANKS AND MEASURING DEVICES FOR PERMEABILITY TESTS

Necessary equipment for permeability tests varies according to the type of tests performed. For constant head tests a stationary flow must be generated. To achieve this a tank is positioned above the rest of the equipment and is continuously supplied with water at a higher rate than seepage rate. Excess water is drained off via an overflow valve. Falling head is given by lowering of the level inside the tank supplying the cell; with samples of moderate permeability a long glass tube is used to measure flow as a small amount of seepage will give rise to a large fall in level of water. If various glass tubes of different diameters are available, it is possible to chose the one which determines a consistent fall over a reasonable period of time. Constant head determines a constant flow of water discharged so measurement is obtained by weighing the quantity of water that has passed through the sample over a defined period of time.
Should the permeameter be equipped with connections for manometer tubes, a panel is required for mounting the tubes together with a series of graduated glass tubes. Permeability will however vary substantially according to the degree of saturation of the sample so it is preferable for measurements to refer to samples in the saturated state. In order to eliminate air bubbles, a vacuum pump and special hydraulic circuitry are used. It is a good idea moreover to use de-aerated water obtained using a de-airing apparatus for this purpose.

CONSTANT AND FALLING HEAD TEST

STAND FOR PERMEABILITY TESTS **T 697/4**
4 place model

Comprises both the tank with overflow valve for constant head tests and the glass tube for falling head tests. The water tank can be placed at heights from 135 to 435 cm whilst hydraulic circuitry may accommodate up to 4 cells.
The same amount of glass tubes are provided for falling head tests.

DIMENSIONS: 1000 x 900 x 2500 (h) mm.
WEIGHT: approx. 120 kg.

N.B.: SUITABLE FOR T 690 - T 691 - T 692 PERMEAMETERS

CONSTANT HEAD TEST

CONSTANT LEVEL TANK **T 698**

Supplied with support for wall mounting, it comprises a transparent body, water supply ducts, discharge and flow valves.

WEIGHT: approx 3 kg

STANDPIPE WITH THREE MANOMETER TUBES **T 685**

Comprises 3 glass tubes all of the same diameter, relevant graduated rods, taps and metal pedestal for bench mounting.

DIMENSIONS: 320 x 500 x 1450 (h) mm.
WEIGHT: approx. 15 kg

N.B.: SUITABLE FOR T 689 PERMEAMETER

SPARE PARTS:

T 685/ST KIT OF 3 GLASS TUBES FOR T 685

T 697/4

T 698
T 685
T 689

FALLING HEAD TEST

STANDPIPE PANEL **T 690/P**

Suitable for falling head tests, it comprises 3 glass tubes each 1 m long with bores of 2.0, 3.8 and 5.5 mm diameter as well as a support for water tank.
Wall mounted.

DIMENSIONS: 320 x 250 x 1380 (h) mm.
WEIGHT: approx. 10 kg

N.B.: SUITABLE FOR ALL TYPES OF PERMEAMETERS

SOAKING TANK **T 687**

Used for containing permeameter T 688, it is fitted with an overflow valve so that level is maintained constant.

DIMENSIONS: diameter 360 x 285 (h) mm.
WEIGHT: 6 kg.

SPARE PARTS
T 690/SB KIT OF 3 GLASS TUBES FOR T 690/P

TR 697/D

DE-AIRING TANK **TR 697/D**

Anodized aluminium base and attachments for wall mounting.
Manufactured from transparent Perspex.
De-airing jet inlet and flow outlet.
Capacity: 15 litres

DIMENSIONS: 800 x 220 x 220 mm
WEIGHT: 10 kg

3-TAP BLOCK **TR 697/V**

V 899

VACUUM PUMP **V899**
66.6 litres/minute

Small-sized, it is particularly suitable for laboratory use.
Manometer with vacuum indication.
Max. vacuum 1 Torr.
Electric motor: 220 V, 50 Hz, single phase. Kw 0.30

DIMENSIONS: 350 x 450 x 280 mm.
WEIGHT: approx. 13 kg

RED RUBBER TUBING: Ø 8-16 mm - 5 m **V 793**

POCKET PENETROMETERS AND SHEAR VANE DEVICES

Light-weight devices for determining the approximate unconfined compressive strength of cohesive soils.

POCKET PENETROMETER **T 636**
0 - 4,50 kgf/cm²

With a special, calibrated, spring, reading is taken directly on the penetration plunger.
Measures: 0 - 4.5 kgf/sq.cm

DIMENSIONS: 19 mm dia. x 152.4 mm long
WEIGHT: 250 g

T 636

DIAL PENETROMETER **T 693**
0 - 5 kgf/cm²

The compressive strength can be read directly on the dial. Graduated scale 0 - 5 kgf/sq.cm.
Standard needle diametre 6.4 mm

DIMENSIONS: 150 x 80 x 45 (h) mm.
WEIGHT: 200 g

T 693

DIAL PENETROMETER **T 694**
3 - 15 kgf/cm²

Similar to T 693. Graduated scale 3 - 15 kgf/sq.cm. Particularly suitable for high consistency soils.

WEIGHT: 200 g

GEOTEST DIAL PENETROMETER **T 695**
- 0 - 6 kgf/cm²

Value is read directly on dial gauge.
In addition to the 6.4 mm diameter standard type, 4 load plates (10, 15, 20, 25 mm diameter) are supplied for the indirect determination of the friction angle of incoherent soils.

DIMENSIONS: 150 x 80 x 45 (h) mm.
WEIGHT: 200 g.

T 695

The field vane shear test is the most widely used method for measuring the undrained shear strength of soft to medium stiff clays in-situ. It also has good repeatability and is quick in providing valuable information for the planning of more detailed surveys.

POCKET SHEAR VANE DEVICE **T 655/S**

Standard vane, 25 mm dia., range 0 - 10 N/sq.cm
Sensitive vane adaptor, range 0 - 2 N/sq.cm
High capacity vane adaptor, range 0 - 25 N/sq.cm

T 655/S

POCKET SHEAR VANE DEVICE **T 655**

Similar to the model T 655/S but in plastic.

T 656

HAND VANE TESTER — T 656

0 - 1 kgf/cm²

Used for the determination of shear strength of cohesive soils. Torque head has a dial which gives direct readings of shear strength.

DIMENSIONS: 60 mm dia. x 120 mm long.
WEIGHT: 500 g

HAND VANE TESTER — T 656/1

0 - 2 kgf/cm²

Like the aforesaid T 656 but with calibrated scale from 0 to 2 kgf/sq.cm

T 650

FIELD INSPECTION VANE TESTER — T 650

For site investigation work. The kit, supplied in carrying case, consists of: N° 6 extension rods, N° 3 vanes Ø 16 - 20 - 25.4, dummy, N° 3 wrenches, N° 10 connections.
Measurements from 0 to 200 kPa.

DIMENSIONS: 480 x 380 x 80 mm.
WEIGHT: 4.5 kg

SPARE PARTS:

T 650/1	SET OF EXTENSION RODS: Ø 10 mm x 0.5 m
T 650/2	VANE: Ø 16 x 32 mm (0 - 50 kPa)
T 650/3	VANE: Ø 20 x 40 mm (0 - 100 kPa)
T 650/4	VANE: Ø 25.4 x 50.8 mm (0 - 200 kPa)

T 653/N

FIELD INSPECTION VANE TESTER — T 653/N

For safe vane boring down to 10 m by simple hammering, drilling or pressing.
Its unique 180 degrees “anti-friction” slip coupling system always ascertains the real friction between rods and soil.

SPECIFICATIONS:

1	Torque wrench having dual scale 0-100 and 0-200kPa, accuracy +/- 3% of full range
1	Stainless steel vane 60 x 120 mm; 0-160 kPa
1	Stainless steel vane 75.8 x 151.5 mm; 0-80 kPa
10	Extension rods dia. 25 x 1000 mm
1	Drive head, hexagonal, 24 mm, M18
1	Adaptor, hexagonal, 24 mm
2	Spanners for extension rods
1	Rod/vane swivel joint
1	Extractor for dia. 22 & 25 mm extension rods
1	Ball cone clamp, 21-28 mm for extractor
1	Steel transport case

DIMENSIONS: 1300 x 300 x 210 (h) mm.
WEIGHT: 61 kg

SAMPLE EXTRUDERS

ASTM D 698 ASTM D 1587 ASTM D 1883 BS 598 BS 1377 BS 1924

HAND-OPERATED UNIVERSAL EXTRUDER N 203

Hand-operated with hydraulic jack (480 mm travel, 6000 kg capacity). Suitable for the extrusion of 35 mm to 152.4 mm dia. samples (thus enabling the extrusion of Marshall, Proctor and C.B.R. samples). Supplied without accessories.

DIMENSIONS: 350 x 320 x 1150 (h) mm.
WEIGHT: 50 kg

ACCESSORIES AND SPARE PARTS:

N 203/A	STANDARD **U100 (U 4)** SAMPLE TUBE, inner diameter 106 mm x 457.2 mm; complete with end caps
N 203/B	STEEL SAMPLE TUBE, inner diameter 38 mm x 230 mm complete with end caps
N 203/1	ACCESSORIES FOR EXTRUDING 38, 100 e 150 mm diameter and 4" and 6" samples
N 203/2	ACCESSORIES FOR EXTRUDING 38 mm diameter samples
N 203/3	ADAPTOR FOR EXTRUDING sample from N 203/A tube

HYDRAULIC EXTRUDER N 519

With hydraulic manual jack (3000 kg capacity).
Suitable for the extrusion of 4" and 6" samples from moulds.
Annular and slotted plates for quick set-up.
It enables the extrusion of Marshall, Proctor, C.B.R. samples.

DIMENSIONS: 300 mm dia. x 500 (h) mm.
WEIGHT: 30 kg

N 203

N 203/1 N 203/2

N 203/A

N 203/3

N 203/B

N 519

HYDRAULIC EXTRUDER
FOR SAMPLES FROM 38 TO 150 mm DIA. N 201/S

Used for the extrusion of undisturbed samples from thin-wall sample tubes, having diameter 38 to 150 mm, with maximum length up to 900 mm.
Receiving tray is made in stainless steel and its height can be regulated to allow alignment independently of sample diameter.
Wheels fore asy displacement.

- **Supplied without adaptors to be ordered separately.**
- **Max. thrust: 7000 kg (hydraulic pump)**
- **Max. piston stroke: 900 mm**
- **Speed range: 0 - 10 mm/sec. (adjustable)**
- **Max. ext. dia. of sample tube: 160 mm**

DIMENSIONS: in working position 3000 x 600 x 1200 (h) mm which can be reduced to 1400 x 600 x 1200 (h) mm for transport and storage.
WEIGHT: 250 kg
POWER SUPPLY: 220 V, 50 Hz, single phase, 1500 W

HYDRAULIC EXTRUDER (HAND-OPERATED)
FOR SAMPLES FROM 38 TO 150 mm DIA. N 202/S

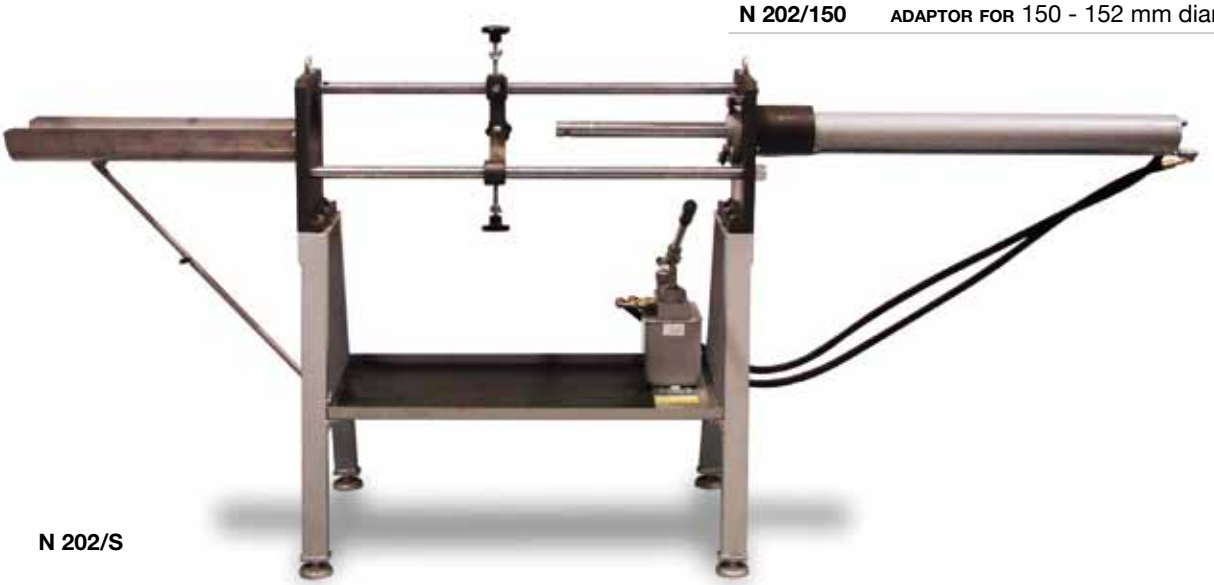
Used for the extrusion of undisturbed samples from thin-wall sample tubes, having diameter 38 to 150 mm, with maximum length up to 900 mm.
Receiving tray is made in stainless steel and its height can be regulated to allow alignment independently of sample diameter.

Supplied without adaptors to be ordered separately.
Max. piston stroke: 900 mm
Max. external diameter of tube: 160 mm

DIMENSIONS: in working position: 2900 x 600 x 1200 (h) mm which can be reduced to 1300 x 600 x 1200 (h) mm for transport and storage.
WEIGHT: 130 kg.

ADAPTORS FOR N 201/S - N 202/S

N 202/038	ADAPTOR FOR 38 mm diameter samples
N 202/080	ADAPTOR FOR 80 mm diameter samples
N 202/085	ADAPTOR FOR 85 mm diameter samples
N 202/097	ADAPTOR FOR 97 mm diameter samples
N 202/100	ADAPTOR FOR 100 - 102 mm diameter samples
N 202/150	ADAPTOR FOR 150 - 152 mm diameter samples



N 202/S

N 201/S
N 202/080
N 202/085
N 202/097

LABORATORY CORING MACHINE TS 748

With this machine it is possible to obtain cylindric specimens from blocks or cores of rock, concrete, bituminous conglomerates, bricks etc. with max. diameter of 100 mm.
The coring machine consists of a slide-mounted motor rotation unit (with pinion coupling), the support column, cooling system with used-water tank and quick coupling tube and adjustable specimen blocking device.
Supplied without diamond bits.

SPECIFICATIONS:

Slide stroke: 600 mm
Two transmission speeds: 450 rpm and 930 rpm.

POWER SUPPLY: 220 V, 50 Hz, single phase, 2300 W
DIMENSIONS: 800 x 700 x 1200 (h) mm
WEIGHT: 90 kg

N.B.: A WIDE RANGE OF DIAMOND BITS IS AVAILABLE WITH DIAMETERS FROM 23 mm TO 100 mm (HEIGHT 400 mm).
SEE PAGE 358: IMPREGNATED BITS AND ADAPTORS.

TS 748
AT 245/038

BENCH CUTTING-OFF MACHINE

Specifically designed for use in laboratories, this machine enables rock or metal samples to be taken when it is required that cold smooth cuts only be made.
This saw is equipped with a 200 mm diameter grinding wheel suitable for specimens of max. 60 mm diameter.
Complete with precision clamp and specimen holder.

SPECIFICATIONS:

Solid steel frame on vibration-dampening supports
Motor and grinding-wheel mandrel are fully water-tight Safety systems complying with European CE Standards: 24 V low voltage controls; emergency push-button; automatic cut-out when lid is opened.
Closed cycle cooling system with water jets directed at cutting area, motor-driven pump.
Wide working area which can be equipped with fixtures suitable for specimens of different shapes and sizes.
Power: 1.2 kW - 3000 rpm.

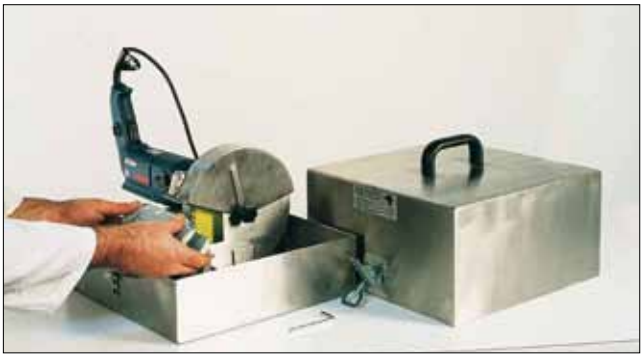
DIMENSIONS: 570 x 720 x 550 (h) mm.
WEIGHT: 75 kg.

MODELS:

TS 704	**POWER SUPPLY: 220V, 50 Hz, SINGLE PHASE**
TS 704/1	**POWER SUPPLY: 380V, 50 Hz, THREE PHASE**

TS 704

TS 713



TS 714

MICRO-CORING EQUIPMENT — TS 713

Micro-core samples are extremely useful for verifying structures especially since their extraction does not cause any damage due to the dimensions of the holes (which, in any case, can be filled with mortar).
The test is easily performed and only requires the presence of one operator. The drilling jig, the self-blocking pincers and the bit guide device all contribute to guarantee correct and accurate sampling.
The equipment is water-cooled and the tank is pressurised via a foot pump.

The equipment comprises:
- 2 speed electric hammer-drill (220 V, single phase)
- Bit guide device
- Water tank with foot pump
- 2 impregnated diamond bits, 28 mm (inner dia.), 35 mm (outer dia.) with different lengths for cores of 100 and 200 mm
- 2 self-blocking pincers for securing the guide device
- Series of blocks, screws, bits and wrenches for use with the equipment.

ACCESSORIES AND SPARE PARTS:

TS 713/1	IMPREGNATED DIAMOND BIT INNER DIAMETER 28 mm, 100 mm LONG COMPLETE WITH BUILT-IN ADAPTER
TS 713/2	IMPREGNATED DIAMOND BIT INNER DIAMETER 28 mm, 200 mm LONG COMPLETE WITH BUILT-IN ADAPTER

If the samples obtained are to be subjected to compression tests it will be necessary to trim them for identification purposes.

The equipment we recommend for this purpose is:

TRIMMING/CUTTING OFF MACHINE FOR SPECIMENS — TS 714

Complete with 180 mm dia. diamond disk and safety guard. Operated with the drill and tank supplied with the afore-mentioned model (TS 713).
After trimming, the sample is ready for the determination of its resistance to failure.
For this purpose we recommend the use of TS 706 with appropriate platens (page 49).

POWER SUPPLY: 220 V, 50 Hz, single phase

ACCESSORIES AND SPARE PARTS:

TS 713/A	2 SPEED ELECTRIC HAMMER-DRILL
TS 713/G	WATER TANK WITH FOOT PUMP
TS 714/D	180 mm DIAMETER DIAMOND DISK

SINGLE PLATEN LAPPING MACHINE — TS 703/1

Useful for the preparation rock and metal specimens, from lapping to polishing.
Abrasive disk: 200 mm diameter
Rotation speed: 300 rpm (fixed speed)
Supplied complete with work disk in Bakelite and 25 abrasive disks in silicon carbide.

POWER SUPPLY: 220/240 V, 50 Hz, single phase, 200 W
DIMENSIONS: 370 x 500 x 300 (h) mm
WEIGHT: 31 kg

TS 703/1

SINGLE PLATEN LAPPING MACHINE — TS 703/2

Similar to TS 703/1 but with variable rotation speed from 0 to 300 rpm

POWER: 220/240 V, 50 Hz, single phase, 200 W
DIMENSIONS: 370 x 500 x 300 (h) mm.
WEIGHT: 32 kg

TS 703/D	SET OF **25** ABRASIVE DISKS **200 mm** DIAMETER

DIGITAL POINT LOAD APPARATUS — TS 706

ASTM D 5731

This is a portable instrument which can be used in both the laboratory or in situ to ascertain the rock strength index of samples of rock or core with diameters up to 102 mm.
The values required for the calculation of the rock strength index are failure load and distance between the conical points.
- Hydraulic loading ram with manual pump
- Capacity: 60 kN
- Scale: 0-6000 daN (resolution 1 daN - 6000 divisions)
- Measurement: microprocessor-based digital gauge (linearity-hysteresis ≤ ± 0.20 F.S.), battery-run using lithium battery 3.6V - 2/3 AA type
- Peak value memorized
- Pair of conical points
- Polycarbonate safety guard

INSTRUMENT DIMENSIONS: 240 x 280 x 660 (h) mm
PUMP DIMENSIONS: 500 x 150 x 230 (h) mm
OVERALL WEIGHT: 37 kg

TS 706

AD 010

TS 706/7

TS 706/6

ACCESSORIES AND SPARES PARTS:

TS 706/7	TWO TESTING PLATES, **40 mm** DIAMETER FOR COMPRESSION TESTS ON CYLINDRICAL SPECIMENS
AD 010	MICROPROCESSOR BASED DIGITAL GAUGE (BATTERY RUN)
TS 706/6	SET OF TWO CONICAL POINTS

ROCK PICK POINTED TIP 28 cm — DV 908

DV 908

ROCK PICK CHISEL EDGE — DV908/Z

DV 908/Z

TS 705

PORTABLE INSTRUMENT FOR DIRECT SHEAR ON ROCKS — TS 705

This shear box has been designed to receive irregularly shaped samples with surfaces measuring up to 115 x 125 mm or cores with a maximum diameter of 102 mm. The lower half of the box is connected to two hydraulic rams which generate the shearing force (in both directions) and the upper half supports the ram that applies the load at a right angle to the failure surface. The horizontal and vertical actuators are connected to two manually-operated hydraulic pumps. During the test the normal stress and the shearing stress are read on two independent dial gauges calibrated in engineering units; if the measurement of the shear deformation is required an appropriate dial gauge can be mounted on the support (see item T 628/E below).

SHEAR BOX AND FITTINGS:
Each unit comprises the following:
- two horizontal rams for shearing (one in each direction);
- a vertical ram;
- two standard dial gauges fitted with quick couplings, full scale 50 kN/11,000 lbf divisions every 1 kN/200 lbf;
- two manual pumps with all the necessary hydraulic parts including the adjustable device for the maintenance of a constant pressure in the vertical ram;
- attachment for a horizontal deformation gauge;
- two aluminium/Perspex moulds with relative clamps.

ACCESSORIES AND SPARE PARTS:
All the dial gauges below are calibrated in relation to the specific thrust section of the rams, they therefore give a direct readout of the stress on the sample.
These dial gauges also have a needle that records the peak and quick couplings.

TS 705/5	BASIC DIAL GAUGE, DOUBLE SCALE UP TO 50 kN AND 11,000 LBF WITH 1 kN/200 LBF STEPS (INTERNAL BATTERY)
TS 705/4	DIAL GAUGE WITH DOUBLE SCALE UP TO 25 kN AND 5,500 LBF, WITH 0.5 kN /100 LBF STEPS
TS 705/3	DIAL GAUGE WITH DOUBLE SCALE UP TO 11 kN AND 2,500 LBF, WITH 0.2 kN/50 LBF STEPS
TS 705/2	DIAL GAUGE WITH DOUBLE SCALE UP TO 5 kN AND 1,250 LBF, WITH 0.1 kN/25 LBF STEPS
TS 705/1	DIAL GAUGE WITH DOUBLE SCALE UP TO 3 kN AND 750 LBF, WITH 0.05 kN/10 LBF STEPS

TS 705/S

SHEAR DEFORMATION MEASUREMENT DIAL GAUGE — T 628/E

Travel 30 mm, divisions 0.01 mm, including the rear attachment.

MOULD IN ALUMINIUM/PERSPEX — TS 705/S

For the preparation of samples. Complete with clamp.

TS 705/A — SAMPLE CASTING PLASTER
50 kg pack of plaster for casting samples into mould assembly.

HOEK CELLS FOR TRIAXIAL TEST

For cylindrical rock samples, cell length is twice the diameter. The cells are complete with caps, sleeve, high pressure joints and pistons. A kit of 5-6 sleeves and the couple of platens (load spreaders) are suggested.

TS 708/C	HOEK TRIAXIAL CELL **1.5"/38.10 mm** DIAMETER
TS 708/CM	RUBBER SLEEVE FOR **TS 708/C**
TS 710/4	COUPLE OF PLATENS FOR **TS 708/C**
TS 708/BX	HOEK **BX** TRIAXIAL CELL **42.05 mm** DIAMETER
TS 708/BXM	RUBBER SLEEVE FOR **TS 708/BX**
TS 710/5	COUPLE OF PLATENS FOR **TS 708/BX**
TS 708/NX	HOEK **NX** TRIAXIAL CELL. **54.75 mm** DIAMETER
TS 708/NXM	RUBBER SLEEVE FOR **TS 708/NX**
TS 710/7	COUPLE OF PLATENS FOR **TS 708/NX**

Hoek cells and accessories

N.B.: Relevant diamond bits are listed on page 358

"SC" SERIES AUTOMATIC PRESSURIZER TS 709/B15

For use in combination with compression testing machine for performing tests with Hoek cells (pressurizes automatically up to 700 bar). The console houses the power unit and digital control unit which acts as user interface.

The system comprises:
- Automatic, electro-hydraulic power unit of the "SC" Silent & Cold Power series characterized by very low noise and heat generation so it is ideal for continual usage.
- Monotronic digital display/readout unit with relevant strain transducer for measuring pressures up to 700 bar.
- Hydraulic hose with quick coupling.

POWER SUPPLY: 220 V, 50 Hz, single phase, 700 W
DIMENSIONS: 400 x 600 x 1200 (h) mm.
WEIGHT: 110 kg

N.B. The Hoek cell is meant to be positioned between the platens of a compression testing machine, generally for concrete testing, on which the ball seating must be blocked. Such a machine can be found in section 2.1.1 page 114.

TS 710/C	BALL SEATING BLOCKING DEVICE FOR 2000-3000-4000 kN COMPRESSION MACHINES
TS 710/D	BALL SEATING BLOCKING DEVICE FOR 1500 kN COMPRESSION MACHINES
TS 710/S	EQUIPMENT FOR POSITIONING HOEK CELL BETWEEN TESTING PLATENS OF COMPRESSION MACHINE

TS 709/B15

EXTRUDER FOR ROCK SAMPLES TS 715

Used for extruding rock samples directly from Hoek cells thus avoiding having to extract rubber sleeves or drain the confining fluid. Incorporates a rack and pinion mechanism mounted in a metal frame.

DIMENSIONS: 600 x 300 x 300 (h) mm
WEIGHT: 12 kg

ACCESSORIES:

TS 715/C	ADAPTOR SET FOR **"C"** HOEK CELL (Ø 38.10 mm)
TS 715/BX	ADAPTOR SET FOR **"BX"** HOEK CELL (Ø 42.05 mm)
TS 715/NX	ADAPTOR SET FOR **"NX"** HOEK CELL (Ø 54.75 mm)

Each adaptor set comprises a back plate adptor, cell body support and extruder shaft each.

TS 715

TS 780

MOHS HARDNESS SCALE TEST — TS 780

EN 101

Used for identifying minerals according to the surface hardness . The kit comprises 9 reference minerals (talc, gypsum, calcite, fluorite, apatite, feldspar, quartz, beryllium, corundum)

DIMENSIONS: 180 x 120 x 20 (h) mm.
WEIGHT: 500 g.

TILT TEST INSTRUMENT — TS 718

The instrument is used to measure the roughness coefficient of a joint.
The sample is usually a rock core cut in half lengthwise or a core placed on another two.
Should the surfaces or flow lines prove to be smooth, the measurement is that equivalent to the basic angle of friction of the rock. A crank handle allows accurate and continuous inclination angle. Angle: 0 - 90°

DIMENSIONS: 300 x 300 x 250 (h) mm
WEIGHT: 14 kg.

TS 718

DEFORMETER-EXTENSOMETER — AT 390

ASTM C 426 BS 1881: 206

For measuring linear deformations on mortar, rock, concrete specimens. The instrument comprises an Invar bar which has a head with a conic point at each end.
The point at one end is fixed whilst the one at the other end can be slightly rotated around a perpendicular axis.
The rotational motion is transmitted with a 1:1 ratio to the dial gauge with 5 mm travel (-2.5 +2.5).
The structure to be checked is prepared by glueing together 2 disks with marked centres.
Position at which, to glue the disks is given by the gauge stick that has fixed points at each end.
Variation of distance between the two disks is measured with micrometric precision and shown on the instrument.
The equipment comprises the instrument, the gauge stick, 50 datum discs, 1 tube of glue.
Gauge length: 300 mm (standard).
Upon request other lengths (200-250-400-600-900 mm) are also available.

DIMENSIONS: 350 x 200 x 100 (h) mm.
WEIGHT: 3.2 kg.

AT 390

SPARE PARTS:

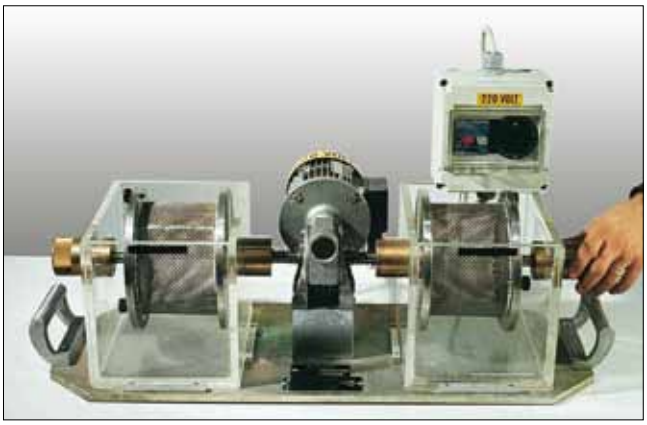
AT 390/P	PACK OF 100 DATUM DISCS
AT 390/C	SPECIAL GLUE FOR DISCS

SLAKE DURABILITY APPARATUS TS 720

This apparatus assists in the evaluation of the resistance of rocks to disintegration when subjected to different drying and water-immersion cycles.
The test consists in oven-drying a number of pieces of the material and then subjecting them to wear inside a drum rotating in water.
This procedure will be repeated two or more times; the disintegration index is determined by the percentage loss in weight that the sample undergoes.
The methodology referred to for the design of this apparatus is that recommended by the International Society for Rock Mechanics which prescribes a 140 mm dia. drum 100 mm long, made of square metal mesh (2 mm), revolving at 20 rpm; the water level is 20 mm below the rotation axis.
TS 720 consists of a pair of drums driven by a gear reduction unit, two Perspex tanks and a base; the electric system is fitted with a programmable timer for automatic stop at the end of the test cycle.
Waterproofed quick-release drive mechanisms allow the removal of drums and tanks; all elements in contact with water are made of corrosion resistant material (stainless steel, bronze).

SPECIFICATIONS:

POWER SUPPLY: 220 V, 50 Hz, single phase, 100 W
DIMENSIONS: 350 x 740 x 250 (h) mm
WEIGHT: 37 kg.



TS 720

NW ROCK CRADLE TS 711

For holding NW cores (54.7 mm dia.) in the correct position.

DIMENSIONS: 200 x 100 x 330 (h) mm.
WEIGHT: 10 kg.

TS 711
TS 712

ROCK CLASSIFICATION HAMMER TS 712

ASTM D 5873
Similar to the concrete model. The rebound readings are used for rocks classification test (0.075 kgm percussion energy).

PROFILE GAUGE (BARTON TYPE) TS 750

This instrument gives an immediate visual indication of the profile of a rock piece. Mobile needles in hardened steel.

LENGTH: 300 mm.
WEIGHT: 1 kg

TS 750