

# SECTION SU



# SOILS

Proeti offers a very wide variety of equipment necessary to prepare bases and sub-bases of the land to carry out the different civil engineering works. You will find different equipment for sampling, extraction and classification.

The different machines related to soil mechanics are also offered, thanks to which engineers are able to reproduce models that are very similar to the real situation on the ground. These machines and equipment perform geotechnical tests such as consolidation, resistance to direct shear and triaxial, complying with all the requirements of international standards.

On the other hand, you will also find the Proeti Soilmatic line. It combines quality, precision, reliability and intelligence. These equipments have been developed by our engineers in close collaboration with research centers and universities. They incorporate those details and features that only the end user knows. They are made-to-measure equipment that allows you to multiply the productivity of your laboratory or develop and implement your research projects at the highest level. All of this with the EDS software.



## HAND AUGERS

ASTM D420, D1452 | AASHTO T86, T202

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.

| CODE  | DIAMETER |
|-------|----------|
| SU011 | Ø 80 mm  |
| SU013 | Ø 100 mm |
| SU015 | Ø 150 mm |

## ACCESSORIES

SU010-01

Extension rod for above 1 m long



## SU033

### MACKINTOSH PROSPECTING EQUIPMENT

It is particularly useful for initial site investigation work in remote areas. The equipment is capable boring to a 10 - 12 m depth depending on ground conditions.

Equipment consists of:

- 12 Boring rods 1 m long
- 2 Pipe wrench and 1 tap wrench
- Core tube adaptor
- Clay core tube
- Driving head
- Clearing rod
- 2 Long and short driving point
- Auger tool
- Standard core tube
- Lifting/driving tool
- Hammer, die nut and hand tap
- Carrying case

Dimensions: 1050x260x120 mm

Weight: 35 Kg



SU033

## SU031

### SOIL PROSPECTING EQUIPMENT

ASTM D420 | ASTM D1452 | AASHTO T86

This kit comprises different augers, sampler and tools for soil investigations. The kit consists of:

- 3 auger head Ø80, Ø100 and Ø150 mm
- Edelman type head Ø150 mm
- Gravel auger head Ø50mm
- Extension rod 1 m long with "T" handle
- Soil sampler Ø38 mm
- 5 extension rods 1 m long
- 5 stainless steel sample tubes Ø38x230 mm
- 12 cap ends for sample tubes Ø38x230 mm
- Hand extruder for sample tubes Ø38x230 mm
- 2 wrenches
- Wooden carrying case

Dimensions: 1140x490x360 mm

Weight: 50 Kg



SU031

## SU021

### AUGER POWER HEAD

Motor capacity 3 HP, two strokes, without speed inverter. Fitted with two handwheels, to be used just by one operator. Drilling holes up to Ø 200 and maximum depth of 1000 mm.

Motor: 2 CV

Weight: 10 Kg

### ACCESSORIES

SU021-01

Auger Ø100x1000 mm

SU021-02

Auger Ø150x1000 mm

SU021-03

Auger Ø200x1000 mm



SU021-01

SU021-02

SU021-03

**SU035**  
**DYNAMIC CONE PENETROMETER**

ASTM D 6951-03

This apparatus has been designed for the rapid in-situ measurement of the structural properties of existing road pavements constructed with unbound materials. Correlations have been established in earlier work between the TRL penetrometer and so that results can be interpreted and compared with CBR specifications. The test is performed with continuous penetrations at 800 mm depth with max. depth of 2 m by using extension rods.

The penetrometer set, housed in carrying case, consists of:

- Drop sliding hammer 8 kg, falling height of 575 mm
- Impact anvil with driving rod
- Penetration rod with conical 60° point and Ø20 mm
- Bar wrench, spanners, accessories.

**Dimensions:** 1210x340x190 mm

**Weight:** 29 Kg



SU035

**SU041**  
**SOIL SAMPLER Ø38 MM**

This apparatus is designed for taking undisturbed Ø38 mm samples in soft and fine soils. Comprises a 'T' handle with shaft extension rod 900 mm.

**Weight:** 7 Kg

**ACCESSORY**

SU041-01

Hand extruder for Ø38 mm sample tubes

**SURFACE SOIL SAMPLER**

The sampling tube is driven into the soil by using the rammer dropping on the driving dolly. The sampled specimen is trimmed weighed and dried; the density and the moisture content % is calculated.

| CODE  | DIMENSIONS  | STANDARD            |
|-------|-------------|---------------------|
| SU043 | Ø73x66 mm   | ASTM D2937   CNR 22 |
| SU045 | Ø100x130 mm | BS 1377:9           |
| SU047 | Ø150x130 mm | BS 1377:9           |

**SU037**  
**LIGHTWEIGHT DYNAMIC PENETROMETER**

DIN 4094

Used to establish the thickness of different strata, when testing compaction works and to determine the relative density of fills and naturally deposited non-cohesive soils. In general if the ground is not too compact, penetration tests can be carried of about 8 to 12 metres.

The penetrometer set, housed in carrying case, consists of:

- Drop rammer 10 Kg, 500 mm fall and anvil
- 11 sounding rod Ø22x1000 mm with threaded
- Collar and guiding rod
- Grooved rod to extract samples
- 2 drive point 90°, 5 cm<sup>2</sup> and 10 cm<sup>2</sup> surface
- Lifting device for sounding rod

**Dimensions:** 1080x360x220 mm

**Weight:** 72 Kg



SU037



SU041

SU043

SU045

## SU051 EQUIPMENT FOR INSPECTION ON SITE

ASTM D2573

Used to determine the shear strength of soils on-site, from undrained cohesive soft soils, to firm non-fissured soils.

The instrument consists of a T-handle cylindrical body where a torsional spring is housed, and three interchangeable vanes of 16x32, 20x40, 25,4x50,8 mm.

The vane is inserted into the soil for 60 mm approx., and the max. torque value is measured on a collar attached to the shaft. It is supplied calibrated with calibration certificate and carrying case.

**Measuring range:**  
0 - 240 kPa  
**Dimensions:**  
500x300x100 mm  
**Weight:**  
4 Kg



SU051

## SU053 LOAD RING PENETROMETER

Used for measuring the bearing strength and degree of compaction of soils. The apparatus consists of a T-shaped handle connected to a 1 kN (100 kgf) load ring with a maximum load pointer, and an extension rod with five 100 mm graduations. The 30° end cone has an area of 645 mm<sup>2</sup> (1in<sup>2</sup>).

**Weight:**  
5 Kg

## SU055 PROCTOR PENETROMETER

ASTM D1558

Used to determine in field the moisture-penetration resistance relationship of fine grained soils. Spring load scale 0-40 kg, subdivisions of 1 kg, with direct maximum value reading in Kg on the sliding rod.

Supplied with 9 interchangeable stainless steel needles with diameters:  
4,52|5,23|6,40|9,07|12,83|16,54|20,22|24,79|28,55 mm  
accessories and carrying case.

**Weight:**  
5 Kg



SU055

## POCKET PENETROMETERS

ASTM D 2573-94 | AASHTO T202

### SU061 STANDARD POCKET PENETROMETER

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

**Measuring range:**  
0-4,5 kgf/cm<sup>2</sup>  
**Plunger:**  
Ø6,35 mm  
**Weight:**  
300 g



SU063

SU061

### SU063 POCKET PENETROMETER

Identical to model SU061 but:

**Measuring range:**  
0-16 kgf/cm<sup>2</sup>  
**Weight:**  
800 g

### SU065 DIAL POCKET PENETROMETER

For the classification of cohesive soft soils in terms of consistency, shear strength and approximate unconfined compression strength.

**Range:**  
0 a 6 kgf/cm<sup>2</sup>  
**Plunger:**  
Ø6,35 mm  
**Weight:**  
300 g



SU065

### SU067 PENETROMETER WITH GRADUATED SPHERE

Identical to model SU065 but:

**Range:** 1-14 kgf/cm<sup>2</sup>

### SU069 GEOPOCKET DIAL PENETROMETER

Designed for a quick determination of the foundation soils, from clay to sandy soils.

It indicates:

- The angle of internal friction (sandy soils)
- The cohesion "c" and the unconfined compressive strength.

**Dual scale:**  
0-6 | 0-11 kgf/cm<sup>2</sup>  
**Plungers:**  
Ø6,4|10|15|20|25 mm  
**Weight:**  
400 g



SU069

**WATER LEVEL INDICATORS**

Utilized to measure the water level in boreholes, wells and any open underground structures.

Battery operated, the cable is marked at cm. intervals, drum mounted and the stainless steel tip has diameter of 10 mm.

| CODE  | LENGTH |
|-------|--------|
| SU071 | 50 m   |
| SU073 | 100 m  |
| SU075 | 200 m  |



SU073

**SU081**

**MOTORISED HYDRAULIC EXTRUDER**

EN 13286-2, 13286-47 | ASTM D698, D1587, D1883 BS 598, 1377:4, 1924:2

Used for a smooth and rapid extrusion of soil samples from tubes also of thin walls with minimum disturbance. The hydraulic piston is equipped of speed adjuster and can be stopped in any position.

Supplied with rings and tampers to extrude samples of Ø38,1 (1 1/2"), 83, 100 mm.

**Power supply:** 230 V | 50 Hz | 1300 W

**Maximum load:** 70 kN

**Sample diameter:** from Ø35 up to 150 mm

**Maximum stroke:** 900 mm

**Dimensions:** 2741x635x1200 mm

**Weight:** 160 Kg

**ACCESSORIES**

Adaptors (ring and tamper) for SU081 and SU083.

| CODE     | LENGTH        |
|----------|---------------|
| SU080-01 | 35 mm         |
| SU080-02 | 50,8 mm - 2"  |
| SU080-03 | 76,2 mm - 3"  |
| SU080-04 | 101,6 mm - 4" |
| SU080-05 | 150 mm        |



SU081

**SU083**

**SCREW EXTRUDER**

EN 13286-2, 13286-47 | ASTM D698, D1587, D1883 BS 598, 1377:4, 1924:2

Extrudes samples from Ø 35 to 101,6 mm with maximum stroke of 650 mm.

Supplied with adaptors to extrude samples having diameter 38,1 (1 1/2"), 83, 100 mm, supporting bench, sample receiving table both adjustable in height and lowerable.

**Dimensions:** 1700x700x1200 mm

**Weight:** 90 kg



SU083

**SU085**

**UNIVERSAL EXTRUDER**

Hand operated, actuated by a hydraulic jack, it is designed to extrude samples having Ø4" and 6".

It can therefore extrude Marshall, CBR, Standard and Modified Proctor specimens.

**Dimensions:** Ø300x500 mm

**Weight:** 32 Kg

SU085



**SU091**

**SAMPLES REDUCTION EQUIPMENT**

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

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



SU091

**HR455**

**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.



HR455

**SU087  
SOIL DIE CUTTER | SAMPLER**

Used to prepare soil samples and to fit them into the relevant cells to perform triaxial, consolidation, shear, unconfined tests.

**Upper plate:** Ø120 mm  
**Vertical daylight:** 470 mm  
**Dimensions:** 500x300x900 mm  
**Weight:** 30 Kg



SU087

**ACCESSORIES**

Table of hollow punches and tampers.

| CELL                    | DIMENSIONS  | HEIGHT | HOLLOW PUNCH | TAMPER   |
|-------------------------|-------------|--------|--------------|----------|
| Consolidation           | Ø 50,47 mm  | 20 mm  | SU101-01     | SU101-11 |
| Consolidation           | Ø 63,50 mm  | 20 mm  | SU101-02     | SU101-12 |
| Consolidation           | Ø 71,40 mm  | 20 mm  | SU101-03     | SU101-13 |
| Consolidation           | Ø 75,00 mm  | 20 mm  | SU101-04     | SU101-14 |
| Consolidation           | Ø 79,80mm   | 20 mm  | SU101-05     | SU101-15 |
| Consolidation           | Ø 112,80 mm | 25 mm  | SU101-06     | SU101-16 |
| Permeable Consolidation | Ø 50,47 mm  | 20 mm  | SU103-01     | SU103-11 |
| Permeable Consolidation | Ø 63,50 mm  | 20 mm  | SU103-02     | SU103-12 |
| Permeable Consolidation | Ø 71,40 mm  | 20 mm  | SU103-03     | SU103-13 |
| Permeable Consolidation | Ø 75,00 mm  | 20 mm  | SU103-04     | SU103-14 |
| Permeable Consolidation | Ø 79,80mm   | 20 mm  | SU103-05     | SU103-15 |
| Permeable Consolidation | Ø 112,80 mm | 25 mm  | SU103-06     | SU103-16 |
| Direct Shear            | Ø 50 mm     | 23 mm  | SU105-01     | SU105-11 |
| Direct Shear            | Ø 60 mm     | 23 mm  | SU105-02     | SU105-12 |
| Direct Shear            | Ø 63,5 mm   | 23 mm  | SU105-03     | SU105-13 |
| Direct Shear            | Ø 100 mm    | 23 mm  | SU105-04     | SU105-14 |
| Direct Shear            | 60x60 mm    | 23 mm  | SU105-05     | SU105-15 |
| Direct Shear            | 100x100 mm  | 23 mm  | SU105-06     | SU105-16 |
| Triaxial                | Ø 38 mm     | 76 mm  | SU107-01     | SU107-11 |
| Triaxial                | Ø 50 mm     | 100 mm | SU107-02     | SU107-12 |
| Triaxial                | Ø 70 mm     | 140 mm | SU107-03     | SU107-13 |
| Triaxial                | Ø 100 mm    | 200 mm | SU107-04     | SU107-14 |

**SU089  
SOIL LATHE**

Designed to reduce by trimming the diameter of a soil sample until reaching the desired diameter size by using a wire saw.

The lathe is hand-operated, the height is adjustable up to 230 mm, and it accepts samples from Ø 38 to 110 mm.

Supplied with three sets of platens for samples and wire saw.

**Dimensions:**  
Ø460x720 mm  
**Weight:**  
20 Kg



SU089

**SU093  
COLOR STANDARD GLASS SCALE**

ASTM C40

Used for determining the organic impurities in fine aggregates by the colorimetric method together with the organic impurities test bottles. 5 colored glass mounted in plastic holder.

**Weight:** 150 g

**ACCESORIES**

MG401-04  
Graduated impurities test bottles, 500 ml (ASTM C40)  
MG401-05  
Graduated impurities test bottles, 1000 ml



SU093



MG401-05

**SU095  
SOIL COLOUR CHARTS**

The book of charts is laid out in a way that makes soil colour evaluations quick and easy, and using it enables practitioners from a wide range of professions to share reliable and consistent information about the colour of soils at a particular site.



SU095

**BA055**  
**PLANETARY MIXER 10 L**

This large capacity mixer have been designed to mix samples for tests where uniformity is required. A robust device for the efficient mixing of asphalt mixes, this model is a table mounted unit with planetary mixing action and a bowl and whisk that are easily fitted and removed.

The mixer is supplied with spiral, blade and whisk beaters and a stainless steel bowl.

**Power supply:**

750 W

**Timer:**

0-30 min

**Dimensions:**

410x523x688 mm

**Weight:**

44 Kg



BA055

**BA063**  
**LABORATORY PLANETARY MIXER 20 L**

A robust device for the efficient mixing of asphalt mixes, this model is table mounted units with planetary mixing action and a bowl and whisk that are easily fitted and removed.

The machine operates with a dedicated and easy to use display and keyboard interface. Either Standard speeds or user defined speeds can be easily selected (also adjustable during mixing).

The front grill, when opened, automatically stops the machine for operator protection conforming to CE requirements. Supplied with bowl and whisk.

**Power supply:** 220 V | 50 Hz | 1 Ph | 750 W

**Dimensions:** 605x735x1180 mm

**Weight:** 95 Kg

**BA067**  
**LABORATORY PLANETARY MIXER 30 L**

Same as model BA063 but 30 L capacity.

**Power supply:**

220 V | 50 Hz | 1 Ph | 1100 W

**Dimensions:**

605x735x1180 mm

**Weight:**

100 Kg



BA063

**AR217**  
**DIGITAL UNIVERSAL CARBIDE METER**

BS 6576 | AASHTO T217 | ASTM D4944

For a rapid and accurate determination of moisture content in sand, gravel, aggregates, soil etc, based on the calcium carbide method.

The bottle is calibrated and equipped with a surface thermometer. The glass ampoule containing the calcium carbide is broken when the bottle is closed and shaken, granting better accuracy to the test.

The instrument comprises the testing bottle with manometer, small balance, 25 ampoules of reagent, accessories and carrying case.

**Measurement system:** Digital manometer 3 bar

**Supported samples:** 10g - 20g - 50g - 100g



AR217

**AR211**  
**SPEEDY MOISTURE TESTER**

ASTM D4944 | AASHTO T217

For accurate moisture reading on field of soil, sand, aggregates.

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.

Supplied with an electronic balance, other accessories and carrying case.

**Capacity:** 6 g

**Moisture range:** 0 - 20%

**Weight:** 6 Kg



AR211

**AR213**  
**SPEEDY MOISTURE TESTER**

Same as model AR211 but 20 g capacity.

**Weight:** 6 Kg



**SU111  
ACIDITY TEST KIT**

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



SU111

**SU113  
CHLORIDE TEST KIT**

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



SU113

**SU115  
HARDNESS TEST KIT**

For determining the water total hardness.



SU115

**SU117  
ALKALINITY TEST KIT**

For determining the total alkalinity of water.



SU117

**CHLORIDE CONTENT**

BS 812:117 | BS 1377:3

Used to estimate the chloride content in aqueous solutions, sand and fine aggregates.

- SU121 Chloride strips range 0,005% to 0,1% (30 to 600 ppm)(40 pcs)
- SU123 Chloride strips range 0,05% to 1% (300 to 6000 ppm)(40 pcs)

**SULFATE CONTENT**

BS 1377:3

Used to determine the sulphate ions in aqueous solutions of sand and fine aggregates.

- SU125 Sulfate strips range 200 to 1600 mg/l (100 pieces)



SU121



SU125

**SU119  
ION EXCHANGE DEVICE**

BS 1377:3

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. Supplied assembled on a stand.

Dimensions: 190x110x600 mm  
Weight: 5 Kg



SU119

**ACCESSORY**

SU119-01  
Ion exchange resin 500 g

**AR219  
END-OVER-END SHAKER**

BS 1377:2

This method applies to soils containing up to 10% of particles retained on a 37.5 mm sieve, it rotates two gas jars at 50 r.p.m.

The shaker is equipped with an original friction device conforming the unit to CE Safety Directive. Supplied without gas jars to be ordered separately.

Power supply: 230 V | 50 Hz | 150 W  
Dimensions: 550x430x500 mm  
Weight: 20 Kg

**ACCESSORIES**

- AR219-01 Gas jar to determine the specific gravity of soils
- AR219-02 Rubber bung for the gas jar
- MG043 Separate control panel with on/off switch and timer

AR219-01

AR219-02



AR219

**MG309**  
**POCKET PH METER 0-14 pH**

A simple pH tester for routine measurements.

- Supplied with:
- 2 pH 4,01 calibration solutions
  - 2 pH 7,01 calibration solutions
  - pH electrodes
  - 2 cleaner solutions
  - Batteries



MG309

**MG311**  
**DIGITAL PH-TEMPERATURE METER**

A pH tester for quick and accuracy pH and temperature measurements with non-replaceable electrode.

- Supplied with:
- pH 4,01 calibration solution
  - pH 7,01 calibration solution
  - Cleaner solution
  - Batteries

Range pH: 0-14 pH  
Temperature range: 0,0-50,0°C



MG311

**MG313**  
**PORTABLE PH-ORP-TEMPERATURE METER**

This professional, waterproof meter accurately measures pH, ORP and temperature. Built-in diagnostic features for the most precise measurements and logging so you never miss a measurement is the perfect tool for environmental and industrial testing.

- Supplied in a rugged carrying case with:
- pH Electrode
  - pH 4,01 calibration solution
  - pH 7,01 calibration solution
  - Cleaner solution
  - Beaker
  - Software
  - Micro USB
  - Battery

Dimensions:  
185x93x35 mm  
Weight:  
400 g



MG313

**MG315**  
**MULTIPARAMETRIC METER PH-CE-OD**

Advanced pH-meter with high accuracy and versatility which can measure pH, conductivity and dissolved oxygen through its digital electrodes.

- Supplied with:
- Benchtop docking station with electrode holder
  - Wall mount cradle
  - USB cable
  - Adaptador alimentación 5 VDC
  - 2 pH 4,01 calibration solutions
  - 2 pH 7,01 calibration solutions
  - 2 pH 10,01 calibration solutions
  - 2 cleaner solutions
  - pH electrode

Dimensions:  
202x140x13 mm  
Weight:  
250 g



MG315

**MG307**  
**EC-TDS CONDUCTIVITY METER**

A waterproof meter for measuring Conductivity, Total Dissolved Solids (TDS) and Temperature easy to use with replaceable electrodes.

- Supplied with
- EC/TDS probe
  - Electrode replacement tool
  - Batteries

EC range: 0 - 3999 uS/cm  
Resolution: 1 uS/cm

TDS range: 0 a 2000ppm (mg/L)  
Resolution: 1 ppm (mg/L)

Temperature range: 0 - 60°C  
Resolution: 0,1°C

Weight: 100 g



MG307

## SPECIFIC GRAVITY BOTTLE

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

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

- MG375-02  
Gay Lussac Pycnometer 50 ml
- MG375-03  
Gay Lussac Pycnometer 100 ml
- MG375-04  
Gay Lussac Pycnometer 250 ml



## AR101 PYKNOMETER WITH CONE

BS 177:3 | BS 812

This method applies to soils containing particles up to medium gravel size and uses a large pycnometer. Glass pycnometer 1 L with non-corrodible metal cone and rubber seal.

Weight: 500 g



## DESICCATORS

Supplied with perforated porcelain plate.



MG421-02

MG423-03

Desiccators without vacuum

| CODE     | CAPACITY | DIMENSIONS  |
|----------|----------|-------------|
| MG421-01 | 4 L      | Ø210x300 mm |
| MG421-02 | 6 L      | Ø240x350 mm |
| MG421-03 | 10 L     | Ø300x400 mm |

Desiccators with vacuum

| CODE     | CAPACITY | DIMENSIONS  |
|----------|----------|-------------|
| MG423-01 | 4 L      | Ø210x308 mm |
| MG423-02 | 6 L      | Ø240x358 mm |
| MG423-03 | 10 L     | Ø300x408 mm |

## CE221 DIGITAL WATER BATH 40 L

BS 1377:2

The water bath is used to maintain particle density test specimens at a consistent temperature.

- Power supply: 230 V | 50-60 Hz | 1200 W
- Temperature range: from ambient to 60°C
- Internal dimensions: 510x350x230 mm
- Overall dimensions: 680x420x420 mm
- Weight: 28 Kg



## AR097 BLUE METHYLENE TEST SET

EN 933-9 | NF P94-068

Utilized to determine the clay content in the fine portions of the aggregates. The set comprises:

- AR097-01  
Electric stirrer from 400 to 700 rpm with Ø70 mm propeller
- AR097-02  
Support base for stirrer
- AR097-03  
Burette 50 x 0,1 ml with stopcock
- AR097-04  
Support base for burette
- AR097-05  
Pan 200x150x80 mm
- AR097-06  
Filter paper Ø90 mm (pack of 100)
- AR097-07  
Glass rod Ø8x300 mm
- AR097-08  
2000 ml beaker
- AR097-09  
Methylene blue 100 g
- AR097-10  
Kaolinite 500 g

Weight: 10 Kg



## ACCESSORY

- AR097-20  
Automatic dispenser 0-10 ml x 0,1 ml grad

**SU131  
PARTICLE SIZE DISTRIBUTION (HYDROMETER)**

ASTM D422 | AASHTO T88

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

The set comprises:

- 6 Hydrometer jar 1000 ml
- Glass tank 600x300x380 mm
- Thermostat with cooling coil 230 V | 50-60 Hz
- Soil hydrometer 151 H, range 0,995 to 1,038 g/ml
- Soil hydrometer 152 H, range -5 a 60 g/l
- Thermometer range 0 - 50°C
- Beaker pyrex 250 ml
- Sodium Hexametaphosphate 1000 g
- High speed stirrer 10.000 r.p.m.

**Weight:** 60 Kg



SU131

**ACCESSORIES**

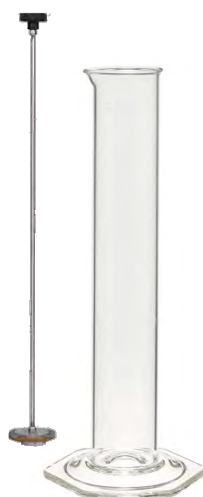
- SU130-01  
Nomographic chart for Stoke law determination
- MG041  
Separate control panel with switch according to CE

**SU133  
PARTICLE SIZE DISTRIBUTION  
HYDROMETER METHOD**

NF P94-057 | BS 1377:2

Similar to SU131 equipment except for:

- 6 Hydrometer jar 2500 ml, div 500-1500-2000 ml
- Hydrometer range 0,995 to 1,030 g/ml
- Manual stirrer 600 mm in compliance with NF



SU133

**SU137  
PIPETTE METHOD**

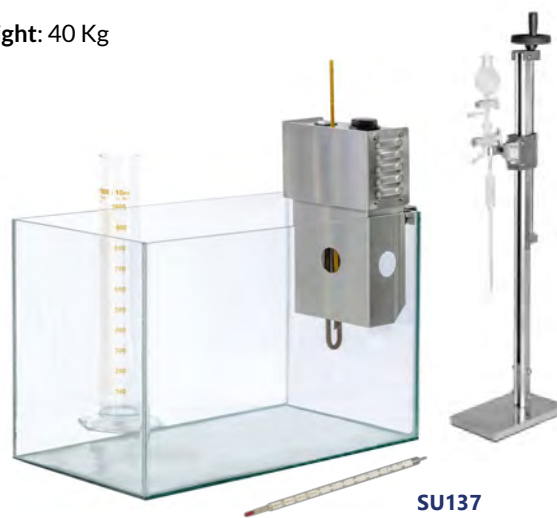
BS 1377:2

Pipettes are used for determining the particle size distribution of very fine soils.

The set comprises:

- Andreasen pipette 10 ml
- Pipette stand
- Sedimentation cylinder 500 ml
- Evaporating dish Ø90x50 mm
- Glass tank 600x300x380 mm
- Thermostat with cooling coil 230 V | 50-60 Hz
- Thermometer range 0 - 50°C

**Weight:** 40 Kg



SU137

**ACCESSORY**

- MG041  
Separate control panel with switch in compliance with CE

**AR103  
SAND ABSORPTION CONE AND TAMPER**

EN 1097-6 | BS 812

Used to determine the specific gravity and water absorption of fine aggregates.

**Weight:** 500 g



AR103

**SU151  
SAND EQUIVALENT TEST (BASIC SET)**

EN 933-8 | NF XP18-598

- SU150-01  
Measuring cylinder engraved at 100 - 380 mm (4 pieces)
- SU150-03  
Rubber stopper for cylinder (2 pieces)
- SU150-04  
Graduated rule 500 mm, stainless steel
- SU150-05  
Metallic funnel, conforming to EN and NF Specifications
- SU150-07  
Measuring can 200 ml capacity
- MG525-01  
Plastic bottle 5 litres capacity
- SU150-09  
Irrigator tube with stopcock and syphon assembly EN
- SU150-11  
Weighted foot assembly for sand level EN
- SU150-15  
Concentrated stock solution 1000 ml

**Weight:** 5 Kg

**ACCESSORY**

- SU150-18  
Carrying case



SU151

**SU153  
SAND EQUIVALENT TEST**

EN 933-8 | NF XP18-598

- SU150-01  
Graduated cylinder 100 y 380 mm (5 pieces)
- SU150-03  
Rubber stopper for cylinder (2 pieces)
- SU150-04  
Graduated rule 500 mm stainless steel
- SU150-05  
Metallic funnel, conforming to EN and NF Specifications
- SU150-07  
Measuring can 200 ml capacity
- MG525-01  
Plastic bottle 5 litre capacity
- SU150-09  
Irrigator tube with stopcock and syphon assembly EN
- SU150-11  
Weighted foot assembly for sand level EN
- SU150-15  
Concentrated stock solution, 1000 ml
- T1150  
Sieve Ø200 mm opening 2 mm
- MG901  
Stop watch
- SU150-17  
Clamp stand set to hold the syphon assembly with bottle
- SU150-19  
Plastic case 550x250x400 mm

**Weight:** 18 Kg



SU153

**SU150-20  
MOTORIZED SAND EQUIVALENT  
SHAKER WITH SECURITY CABINET**

EN 933-8 | ASTM D2419 | AASHTO T176  
NF XP18-598 | CNR N.27

The unit provides a constant uniform shaking with automatic cycle test. Equipped with steel safety cabinet, in compliance with CE Directive. When opening cabinet door while shaker is working a microswitch automatically stops the machine.

**Power supply:** 230 V | 50 Hz | 250 W  
**Dimensions:** 700 x 360 x 350 mm  
**Weight:** 30 Kg



SU150-20

**SU155**  
**SAND EQUIVALENT TEST (BASIC SET)**

ASTM D2419 | AASHTO T176

- SU150-02  
Graduated cylinder 100 and 380 mm (4 pieces)
- SU150-03  
Rubber stopper for cylinder (2 pieces)
- SU150-04  
Graduated rule 500 mm stainless steel
- SU150-06  
Funnel, wide mouth
- SU150-08  
Measuring can 85 ml
- MG525-01  
Plastic bottle 5 litre capacity
- SU150-10  
Irrigator tube with stopcock and syphon assembly ASTM
- SU150-12  
Weighted foot assembly for sand level ASTM
- SU150-15  
Concentrated stock solution 1000 ml

**Weight:** 5 Kg

**ACCESSORY**

- SU150-18  
Carrying case



**SU155**

**SU157**  
**SAND EQUIVALENT TEST**

ASTM D2419 | AASHTO T176

- SU150-02  
Graduated cylinder 100 and 380 mm (5 pieces)
- SU150-03  
Rubber stopper for cylinder (2 pieces)
- SU150-04  
Graduated rule 500 mm stainless steel
- SU150-06  
Funnel, wide mouth
- SU150-08  
Measuring can 85 ml
- MG525-01  
Plastic bottle 5 litre capacity
- SU150-10  
Irrigator tube with stopcock and syphon assembly ASTM
- SU150-12  
Weighted foot assembly for sand level ASTM
- SU150-15  
Concentrated stock solution 1000 ml
- T1159  
Sieve Ø200 mm opening 4,75 mm
- MG901  
Stop watch
- SU150-17  
Clamp stand set to hold the syphon assembly with bottle
- SU150-19  
Plastic case 550x250x400 mm

**Weight:** 18 Kg



**SU157**

**SU150-21**  
**MOTORIZED SAND EQUIVALENT SHAKER**

ASTM D2419 | AASHTO T176 | NF XP18-598 | CNR N.27

Identical to model SU150-20 but without safety cabinet.  
It cannot be sold in CE markets.



**SU150-21**

**SU161  
CONE DIAL PENETROMETER**

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

Used to determine the moisture content at which clay soils pass from a plastic to a liquid state (liquid limit). The result can also be used to evaluate the undrained shear strength.

The cone penetrometer consists of:

- Aluminium base with levelling screws and spirit level
- Chromed vertical rod with micrometric displacement device
- Dial gauge Ø150 mm , graduated in 360°, division 0,1 mm
- Free fall slider, made of brass
- Stop and release push button
- Automatic zero set
- Stainless steel penetration test cone 35 mm long, 30° angle
- Weight 20 g
- Two brass cups Ø55x35 mm and 70x45 mm

**Dimensions:** 220x170x410 mm

**Weight:** 13 Kg

**SU163  
SEMIAUTOMATIC CONE DIAL PENETROMETER**

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

Same as SU161 but equipped with a magnetic controller device with electronic digital programmable timer that automatically releases the plunger head and ensures free falling of the cone during the 5 seconds test.

**Power supply:** 230 V | 50-60 Hz | 200 W

**Dimensions:** 220x280x410 mm

**Weight:** 15 Kg

**SU165  
CONE DIGITAL PENETROMETER**

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

Same as SU161 but with digital readout of the penetration values which has readings in mm and inch, with 0,01 mm resolution, LCD 5 digits display, with zero set in any position.

**SU167  
SEMIAUTOMATIC CONE DIGITAL PENETROMETER**

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

Same as SU165 but equipped with a magnetic controller device with electronic digital programmable timer that automatically releases the plunger head and ensures free falling of the cone during the 5 seconds test.

**ACCESORIES FOR PENETROMETERS SU161...SU167:**

SU160-01

Test gauge to check the condition of the cone point 30° angle

SU160-02

Mirror to facilitate the height adjustment of the cone

SU160-03

Test cone 60° angle and 60 g weight

SU160-04

Test gauge to check the condition of the cone point 60° angle

SU160-05

Weight 320 g to be added to the 30° cone (shear strength)

SU160-06

Sample cup Ø55x40 mm aluminum made (BS 1377:2)



**SU171**  
**CASAGRANDE APPARATUS**

ASTM D4318 | AASHTO T89 | BS 1377:2 | UNE 7377

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

This method evaluates the relationship between the moisture percentage of a soil sample and the number of blows required to close a groove made into the soil, and therefore to determine when a clay soil changes from a plastic to a liquid state.

The unit comprises a removable brass cup, a bakelite base, a cam device which drops the cup on the base, and a drop counter.

**Weight:** 3 Kg

**SU173**  
**CASAGRANDE APPARATUS MOTORIZED**

ASTM D4318 | AASHTO T89 | BS 1377:2 | UNE 7377

Similar to SU171 but motor operated.

**Power supply:** 230 V | 50 Hz

**Weight:** 4,5 Kg

**SU175**  
**CASAGRANDE APPARATUS**

NF P94-051-1

Similar to SU171 but bakelite base and chromed cup in compliance with French standard.

**SU177**  
**CASAGRANDE APPARATUS MOTORIZED**

NF P94-051-1

Similar to SU175 but motor operated.

**Power supply:** 230 V | 50 Hz

**Weight:** 4,5 Kg



**ACCESSORIES FOR CASAGRANDE:**

- SU170-01 Grooving tool ASTM D4318
- SU170-02 Grooving tool AASHTO T79
- SU170-03 Grooving tool NF P94-051
- SU170-04 Grooving tool BS 1377:2
- SU170-10 Rough brass cup with central smooth band 10 mm wide (NF)



**SU170-10**

**SU181**  
**LINEAR SHRINKAGE**

BS 1377:2

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.

Mould to produce a specimen of Ø12,5x140 mm

**Weight:** 500 g



**SU181**



## SU183 SHRINKAGE LIMIT

ASTM D427 | AASHTO T92 | BS 1377:2  
NF XP94-060-1 | UNE 103-108

This test is performed to determine the maximum moisture content at which the soil stops shrinking when dried.

- Supplied in a plastic case containing:
- Shrinking plates Ø45x12,7 mm (2 pieces)
  - Crystallizing dish Ø57x32 mm
  - Shrinkage plexiglass prong plate with three metal prongs
  - Glass evaporating dish Ø120 mm
  - Graduated cylinder 25 ml
  - Flexible spatula 100 mm

**Dimensions:**  
390x300x100 mm  
**Weight:**  
2 Kg



## SU185 PLASTIC LIMIT

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

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

- The set is supplied in a carrying case containing:
- Glass plate 300x250x10 mm
  - Rod caliper Ø3 mm
  - Mixing porcelain dish Ø120 mm
  - Flexible spatula 100 mm
  - Aluminium moisture tins Ø55x35 mm (6 pieces)

**Dimensions:**  
400x340x100 mm  
**Weight:**  
5 kg



## ACCESSORIES

- SU185-01 Glass plate 105x50 mm according to NF P94-051
- SU185-02 Glass plate 500x500x10 mm

## SU201 DIGITAL RESISTIVITY METER 0,01Ω TO 10 MΩ

ASTM G57 | ASTM G187 | AASHTO T-288

When combined with appropriate electrodes and test leads, the Resistivity meter can be used to measure earth resistance with the push of a button.

Depending on the number of electrodes, the equipment can be used to determine the following:

- The average earth resistivity to a specific depth  
4 electrodes required
- The resistivity of a soil sample or of a liquid  
4 electrodes required
- The resistance-to-earth of a buried electrode  
3 electrodes required
- The resistance between two buried electrodes  
2 electrodes required



## ACCESORIES

- SU201-01 Resistivity meter test Kit  
Including:
  - Soil Box 280 ml
  - Soil container test leads set
  - Set of 4-Pin Test Reel leads
  - Set of 4-Pin soil resistivity test reel
  - 4 Heavy-duty, stainless steel T-handle
  - Soil pins
  - Rugged plastic carrying case



**SU205  
SEISMOGRAPH 24 CHANNELS**

This apparatus is a compact-sized 24 channel seismograph with a 24 bit data acquisition board. It is a reliable, affordable solution for all professional uses. Connected to your PC laptop or tablet, it becomes a seismic tool that is simple to use with top-level performance. This device consumes very little and is powered directly from the PC, guaranteeing a long day of work on-site. This seismograph can acquire using geophones with any resonance frequency (even 1Hz). To get 48 simultaneous channels, just connect two seismographs to the same PC using the correct accessories.

- Number of channels:** 24 canales
- Input impedance:** 2 MOhm | 22 nF
- Dynamic range:** 144 dB
- Distortion:** 0,007%



SU205



SU205-01



SU205-02

**ACCESSORIES**

- SU205-01  
Seismic cables for refraction/surface reflection
- SU205-02  
Shielded cable on reel 130m for starter geophone

**HR591  
CROSS HOLE EQUIPMENT**

The equipment is aimed to investigate the foundation piles of buildings, which, with the use of cross-hole ultrasonic pulses, allows accurate, high-resolution tests to be carried out. An ultrasonic wave is sent from a transmitter to a receiver and is conveyed automatically by the device along the entire length of the pile via the pipes embedded into it during casting. The speed of the sonic wave and its energy are strongly influenced by the quality of the concrete and it is therefore possible to assess the characteristics and give a tomographic representation in 2D and 3D.

The test can be carried out for any kind of foundation or concrete structure that has two or more access pipes that can hold water. The CSL can also be applied to submerged piles and structures that do not have internal pipes but can be fitted with external pipes. The computer tomographic imaging tests are carried out when the defects detected are critical and require an in-depth study.

The Crosshole system compounds:

- Portable computerized unit
- Acquisition card high-speed data
- Crosshole software for data acquisition and analysis
- Tripod for hanging the lifting mechanism
- 2 interchangeable probes (transmitter and receiver)
- An ultrasound pulse generator to excite the transmitter
- Amplifying systems and cabling for the CSL test
- Two cable coils for 80 metres of usable cable

These components are inter-connected by cables to form a complete system.



HR591

**SU211  
NUCLEAR DENSITY-MOISTURE GAUGE**

ASTM D6938, D2950, D7013, D7759, C1040 | AASHTO T310

This device is an advanced, yet easy to operate moisture density gauge designed for all operators ranging from new technicians to those with advanced density testing experience.

The mechanical design includes a machined, aluminum base and a rugged, polycarbonate topshell designed to withstand the demands of the toughest construction and environments. A Cesium 137 source measures density while an Americium 241: Beryllium source measures humidity.

The apparatus is loaded with simple, user friendly functions. Density, moisture and other required field parameters are automatically calculated and displayed and can be stored under specific user designed projects.

Nuclear gauge features a simple operator interface, a large backlit LCD display, illuminated keypad, precision machined base and is designed with reliable, surface-mount electronics.



The battery pack is designed to provide weeks of operation and is integrated with a 9V battery for backup. The data can be easily downloaded to a computer, printer or written to a USB flash drive.

**Density range:** 70 to 170 pcf (1,120 to 2,73 gcc)  
**Moisture range:** 0 to 40 pcf (0 to 0,64 gcc)  
**Memory Storage:** 10 Projects with 40 readings each  
**Dimensions:** 678x358x248 mm  
**Weight:** 13 Kg

**ACCESSORIES**

- SU210-01  
Drill pin
- SU210-02  
Rod guide - Scraper plate



**SU221**  
**NON-NUCLEAR DENSITY GAUGE SDG 200**  
 ASTM D7830

Designed to operate with standard soils used in civil construction projects.

- This device requires inputs from standard:
- Liquid Limit, Plastic Limit, Plasticity Index (ASTM D4318)
  - Particle Size Distribution (ASTM D422)
  - Proctor Test (ASTM D698 and D1557)

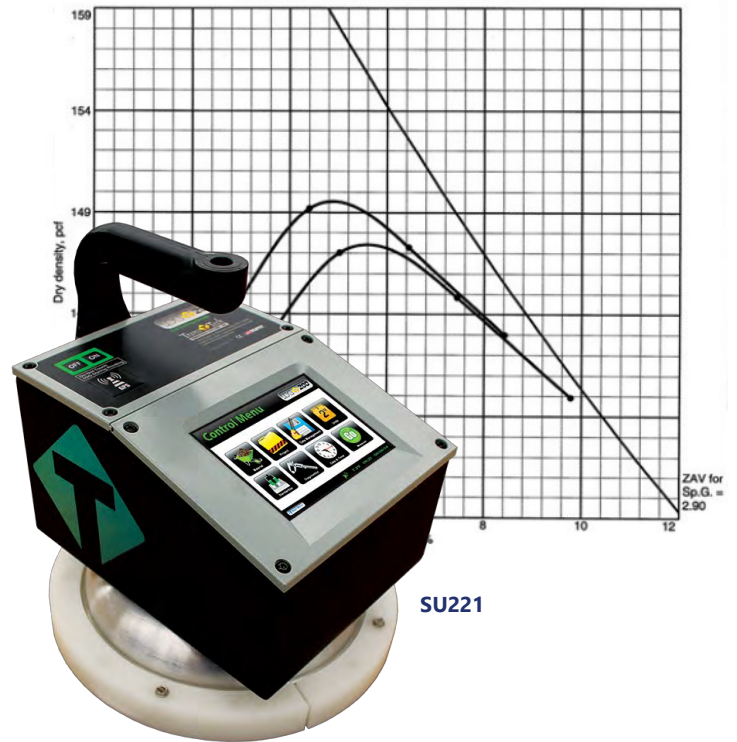
The operating system offers fast, accurate and repeatable readings in real time. Full color graphics driven user interface, 480x640 touch screen display with LED backlight for easy visibility in daylight or dark situations. Interchangeable units settings for density (kg/m<sup>3</sup>, lb/ft<sup>3</sup>) and temperature (°C, °F).

Ability to upload and download files via USB drive. Stores up to 20 materials, details include:

- Material Name
- Description
- Maximum Dry Density
- Optimal Moisture
- Dry Density Offset
- % Moisture Offset
- % Greater than 3"
- % Greater than 3/4"
- % Gravel
- % Sand
- % Fines
- Plastic Limit
- Liquid Limit
- Cu
- Cc

The sensing area (Ø279 mm) allows optimum measurement on fine and coarse material types and its measurement depth of 300 mm has been designed for use on a standard uncompacted layer of soil during or after compaction.

When activated GPS will display latitude and longitude positions, number of satellites the gauge is connected to as well as the UTC date and time. GPS information will store with each measurement when Data save feature is enabled.



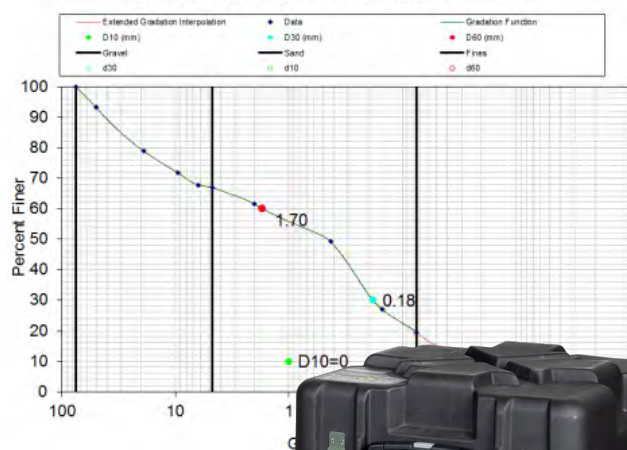
SU221

Most important, Non-Nuclear means no badges, licenses or storage and transport concerns.

The equipment is supplied with interchangeable batteries easily to change in field, a battery charger and carrying case.

- Dimensions:** 279x279x304 mm
- Handle length:** 736 mm
- Recharge time:** 4 h
- Weight:** 6 Kg

**Particle Size Distribution - ASTM D 422**



SU221



Used for determining the relationship between the moisture content and density of compacted soils. Steel made with mould body, collar and base; plated against corrosion.



| CODE     | PROCTOR        | STANDARDS          | DIMENSIONS      | WEIGHT  |
|----------|----------------|--------------------|-----------------|---------|
| SU250-11 | Standard       | EN13286:2   DIN    | Ø100x120 mm     | 9 Kg    |
| SU250-12 | Split Standard | EN13286:2   DIN    | Ø100x120 mm     | 7,5 Kg  |
| SU250-21 | Modified       | EN13286:2   DIN    | Ø150x120 mm     | 13 Kg   |
| SU250-22 | Split modified | EN13286:2   DIN    | Ø150x120 mm     | 12,5 Kg |
| SU250-13 | Standard       | ASTM AASHTO CNR NF | Ø101,6x116,4 mm | 4,5 Kg  |
| SU250-14 | Split Standard | ASTM AASHTO CNR NF | Ø101,6x116,4 mm | 5 Kg    |
| SU250-23 | Modified       | ASTM AASHTO CNR    | Ø152,4x116,4 mm | 10 Kg   |
| SU250-24 | Split modified | ASTM AASHTO CNR    | Ø152,4x116,4 mm | 10 Kg   |
| SU250-15 | Standard       | BS                 | Ø105x115,5 mm   | 5 Kg    |
| SU250-25 | Modified       | NF                 | Ø152x152 mm     | 10 Kg   |
| SU250-30 | Large size     | EN13286:2   DIN    | Ø250x200 mm     | 32 Kg   |

**PROCTOR RAMMERS**

Used to compact the soil sample into the mould. The rammers are steel made, plated against corrosion.

| CODE     | PROCTOR    | STANDARDS          | FALL HEIGHT | DIAMETER | RAMMER   | WEIGHT |
|----------|------------|--------------------|-------------|----------|----------|--------|
| SU250-17 | Standard   | EN13286:2 BS       | 305 mm      | Ø50 mm   | 2,5 Kg   | 5 Kg   |
| SU250-27 | Modified   | EN13286:2 BS       | 457 mm      | Ø50 mm   | 4,5 Kg   | 8 Kg   |
| SU250-18 | Standard   | ASTM AASHTO CNR NF | 304,8 mm    | Ø50,8 mm | 2,495 Kg | 5 Kg   |
| SU250-28 | Modified   | ASTM AASHTO CNR NF | 457,2 mm    | Ø50,8 mm | 4,536 Kg | 8 Kg   |
| SU250-31 | Large size | EN13286:2          | 600 mm      | Ø125 mm  | 15 Kg    | 23 Kg  |



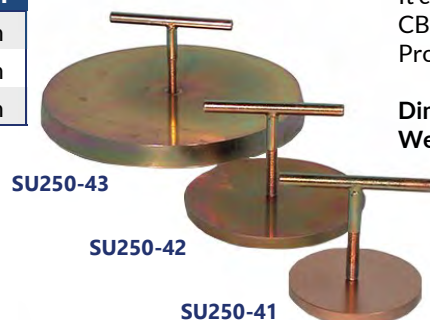
SU250-27 SU250-17

**COMPACTION DISK**

EN 13286:2 | DIN 18127

Used to compact the EN moulds, it is supplied with T handle, plated against corrosion.

| CODE     | DIAMETER  | WIDTH |
|----------|-----------|-------|
| SU250-41 | Ø99,5 mm  | 10 mm |
| SU250-42 | Ø149,5 mm | 10 mm |
| SU250-43 | Ø249,5 mm | 20 mm |



**SU085**

**UNIVERSAL EXTRUDER**

Hand operated, actuated by a hydraulic jack, it is designed to extrude samples having Ø4" and 6".

It can therefore extrude Marshall, CBR, Standard and Modified Proctor specimens.

Dimensions: Ø300x500 mm  
Weight: 32 Kg



SU085

**SU251**  
**AUTOMATIC PROCTOR - CBR COMPACTOR**

EN 13286-47 | ASTM D698, D1557, D1883 | DIN 18127  
 AASHTO T99, T180, T193 | BS 1377:4, 1990, 1994  
 NF P94-093, P94-066 | UNE 7365, 7255, 103-501-94

This microprocessor-controlled soil compaction tester is designed for Proctor and CBR moulds.

This programmable, microprocessor-controlled model is particularly suitable for laboratories purposes as it is possible to program a user-defined compaction sequence and a sequence conforming to standards.

The software gives the possibility to program customized sequences allowing the user to select and perform different compaction cycles with turntable rotation granting a precise and uniform blows distribution.

The digital control panel is separate from the machine and it can be fixed to the wall or mounted on a bench. The digital unit is easy to use, friendly menu driven, versatile, of simple and practical maintenance. The high resolution graphic display visualizes selected Standard, total number of blows, effected and remaining ones to end the test, and execution of each layer.

The lift system of the rammer can be selected at 12" or 18", and at 300 or 450 mm, granting a correct and constant fall height. Rammer drop speed is 1 blow each 2 seconds.

The compactor accepts moulds having Ø4" and 6", 100 and 150 mm. The machine includes an universal mould fixing system and safety guards in compliance with CE Directive, if the door is opened when the device is working, it stops automatically.

The machine is supplied without rammers to be ordered separately and selected according to the desired Standard.

**ACCESORIES**

RAMMERS (EN | BS | DIN)

SU251-01

Standard rammer Ø50 mm and 2,5 Kg

SU251-02

Modified rammer Ø50 mm and 4,53 Kg

RAMMERS (ASTM | NF | CNR | AASHTO)

SU251-11

Standard rammer Ø50,8 mm and 2,49 Kg

SU251-12

Modified rammer Ø50,8 mm and 4,53 Kg

RAMMERS (AS 1289)

SU251-21

Standard rammer Ø50 mm and 2,7 Kg

SU251-22

Modified rammer Ø50 mm and 4,9 Kg



SU251-11 SU251-12

SU251-05

Safety guards to CE Directive

If the door is opened when the compactor is working, it stops automatically.

SU251-05

SU251



**Power supply:** 230 V | 50 Hz | 500 W

**Dimensions:** 610x470x1710 mm

**Weight:** 200 Kg

SU251-07

Noise reduction cabinet

The cabinet is manufactured from sheet steel and lined internally with soundproofing material to considerably reduce the noise. If the door is opened when the compactor is working, it stops automatically.

**Dimensions:**

740x730x1900 mm

**Weight:**

80 Kg



SU251-07

SU251

**SU255  
VIBRATING COMPACTION HAMMER**

EN 12697-9 | EN 12697-10 | EN 12697-32 | EN 13266-4  
BS 1377:4 | BS 1924:2

Double insulated motor, trigger handle, for asphalt compaction in the percentage refusal density test. It can be used also for the compaction of Proctor and CBR specimens.

**Power supply:** 230 V | 50-60 Hz | 720 W  
**Dimensions:** 105x430x270 mm  
**Weight:** 6 Kg

**ACCESSORIES**

**SU255-01**  
Support frame for vibrating hammer  
Made of steel and protected against corrosion.

**Dimensions:** 500x320x1100 mm  
**Weight:** 75 Kg

**SU255-03**  
Ø146 mm head



**SU261  
MOISTURE CONDITION APPARATUS**

EN 13286-46 | BS 1377:4

Used in the assessment of earthworks for construction by comparing compaction characteristics at various moisture contents in order to determine the moisture condition value.

This robust apparatus is designed for use in the construction laboratory and incorporates a rammer, scale, counter and mould.

**Weight:** 60 Kg



**SU271  
RELATIVE DENSITY OF COHESIONLESS SOILS**  
EN 13286-5

This method, in the EN standard, covers the determination of the maximum dry density and water content of cohesionless materials when compacted using a vibrating table. Materials for which this method is applicable may contain up to 12% fines (<0.063 mm) by mass. The maximum particle size of the material to be tested is 80 mm. This method applies to mixtures to be used in road construction.

The set is composed of:

- Relative density mould 14 L with accessories
  - Surcharge weight and base with handle for the 14 L mould
  - Vibrating electromagnetic table with separate control panel
- Dimensions: 762x762 mm  
Vibration frequency: 3600 r.p.m.  
Amplitude range: 0,05 to 0,64 mm  
Load capacity: up to 250 Kg  
Power supply: 230 V | 50-60 Hz

**Total weight:** 290 Kg



**SU273  
RELATIVE DENSITY OF COHESIONLESS SOILS**  
ASTM D4253, D4254

The ASTM also specifies that the method is used for the determination of the relative density of cohesionless soil for which impact compaction will not produce a well-defined moisture/ density relationship curve and where the maximum density of the impact method will generally be less than by the vibratory method.

The set is composed of:

- Relative density mould 0,5 ft<sup>3</sup> with accessories
  - Surcharge weight and base with handle for 0,5 ft<sup>3</sup> mould
  - Relative density mould 0,1 ft<sup>3</sup> with accessories
  - Surcharge weight and base with handle for 0,1 ft<sup>3</sup> mould
  - Relative density gauge measuring set
  - Vibrating electromagnetic table with separate control panel
- Dimensions: 762x762 mm  
Vibration frequency: 3600 r.p.m.  
Amplitude range: 0,05 to 0,64 mm  
Load capacity: up to 250 Kg  
Power supply: 230 V | 50-60 Hz

**Total weight:** 310 Kg



**FIELD DENSITY SAND REPLACEMENT METHOD**

ASTM D1556 | AASHTO T191 | NF P94-061-3  
UNE 7371 | CNR N° 22

The verification of the degree of compaction can be determined on site with a simple procedure that essentially involves removing and weighing a section of compacted soil and then refilling the hole with sand.

A simple apparatus is used to record the volume of sand, and then the density of the removed soil can be calculated.



SU275-02

| CODE     | DESCRIPTION                   | CONTAINER |
|----------|-------------------------------|-----------|
| SU275-01 | Tray and funnel Ø4" - 102 mm  | SU275-11  |
| SU275-02 | Tray and funnel Ø6" - 152 mm  | SU275-12  |
| SU275-03 | Tray and funnel Ø12" - 305 mm | SU275-13  |

**ACCESSORIES**

SU270-01  
Standard sand 25 Kg

**SAND REPLACEMENT METHOD**

BS 1377:9 | BS 1924:2

Identical to the method according to ASTM and AASHTO but designed according to the BS.

The equipment consists of a plugged sand pouring cylinder made of cast and machined aluminium, upper cylinder, metal tray with central hole for housing the cone.

Calibration container is an optional accessory.



SU277-02

| CODE     | DESCRIPTION               | CONTAINER |
|----------|---------------------------|-----------|
| SU277-01 | Cylinder and tray Ø100 mm | SU277-11  |
| SU277-02 | Cylinder and tray Ø150 mm | SU277-12  |
| SU277-03 | Cylinder and tray Ø200 mm | SU277-13  |

**STRENGTH OF STABILIZED SOIL DETERMINATION**

EN 13286-53 | BS 1924:2 | NF P 94-100

These tests are performed to determine the unconfined compressive strength of fine and medium grained soils. Made of plated steel.

**SU281**

Strength of stabilized soil set for samples Ø50x50 mm  
EN 13286-53 | BS 1924:2 | NF P 94-100

- Mould Ø50x122 mm of fine and medium grained soil
- Base and upper piston Ø50x36 mm
- Set of 2 displacing collars Ø50x5 mm
- Set of 2 displacing collars Ø50x6 mm
- Set of 2 displacing collars Ø50x8,33 mm
- Penetration and demoulding piston Ø50x125 mm
- Collecting cylinder Ø56x60 mm

**SU283**

Strength of stabilized soil set for samples Ø50x100 mm  
EN 13286-53 | BS 1924:2

- Mould Ø50x172 mm of fine and medium grained soil
- Base and upper piston Ø50x36 mm
- Set of 2 displacing collars Ø50x10 mm
- Set of 2 displacing collars Ø50x12,5 mm
- Set of 2 displacing collars Ø50x16,66 mm
- Penetration and demoulding piston Ø50x175 mm
- Collecting cylinder Ø56x110 mm

**SU285**

Strength of stabilized soil set for samples Ø100x100 mm  
EN 13286-53 | BS 1924:2

- Mould Ø100x242 mm of coarse grained soil
- Base and upper piston Ø100x71 mm
- Set of 2 displacing collars Ø100x10 mm
- Set of 2 displacing collars Ø100x16,66 mm
- Set of 2 displacing collars Ø100x20 mm
- Penetration and demoulding piston Ø100x20 mm
- Collecting cylinder Ø106x110 mm

**SU287**

Strength of stabilized soil set for samples Ø100x200 mm  
EN 13286-53 | BS 1924:2

- Mould Ø100x342 mm of coarse grained soil
- Base and upper piston Ø100x71 mm
- Set of 2 displacing collars Ø100x25 mm
- Set of 2 displacing collars Ø100x33,33 mm
- Set of 2 displacing collars Ø100x50 mm
- Penetration and demoulding piston Ø100x345 mm
- Collecting cylinder Ø106x210 mm



SU285



**SU291  
BALLOON DENSITY APPARATUS 1600 ML**

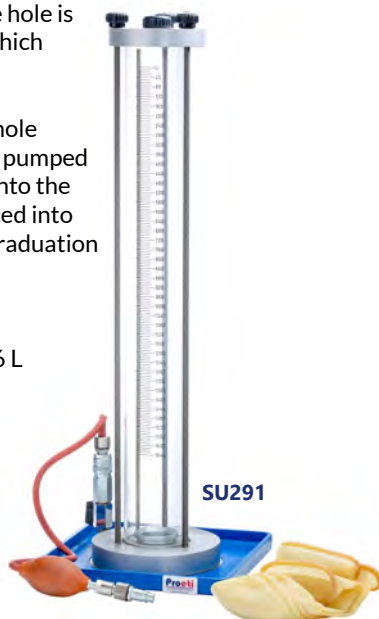
ASTM D2167 | AASHTO T205 | CNR N° 22

The principle of operation is similar to the sand replacement method but the hole is filled with a rubber balloon into which water is pumped.

The apparatus is placed over the hole excavated in the soil, and water is pumped into a rubber balloon and forced into the hole. The amount of water displaced into the balloon is measured from the graduation of the scale.

- The instrument consists of:
- Graduated plexiglass cylinder 1,6 L
  - Rubber pump with stop valve
  - Density plate
  - Rubber balloons (12 pieces)

**Dimensions:** 340x340x700 mm  
**Weight:** 6 Kg



**SU293  
BALLOON DENSITY APPARATUS 3000 ML**

NF P94-061-2 L

This apparatus is used for determining the in-situ density of well-bonded soil according to NF specifications. A metal cylinder is filled with water which is then pumped into a rubber membrane mounted on the base of the cylinder, which fills a hole previously made in the soil. The water pressure is controlled by a pressure gauge and the volume of the balloon is measured on the graduated piston stem.

The unit is supplied with 6 reinforced rubber membranes, 4 locking clamps, base plate, accessories.

**Dimensions:** 360x360x700 mm  
**Weight:** 10 Kg

**SU295  
BALLOON DENSITY APPARATUS 6000 ML**

NF P94-061-2 L

Identical to S293, but with 6 litres capacity.

**Weight:** 15 Kg



**SU269  
CLEGG HAMMER**

ASTM D5874-02

Used to obtain an indication of the degree of compaction of soil in road construction. Results can be directly correlated to the CBR test.

Lightweight and sturdy aluminum framed transit and storage case is provided.

**Dimensions:**  
710x130x130 mm  
**Weight:**  
6,2 Kg



SU269

**SU299  
PINHOLE EQUIPMENT**

ASTM D4647 | BS 1377:5

Certain fine-grained soils with a high sodium content are highly susceptible to erosion by the water flowing through them. During the dispersibility test the flow of water through a cavity in the soil under a high hydraulic gradient is reproduced.

The apparatus consists of a cylindrical container equipped at its ends with water inlet/outlet connectors, tube with graduated scale, base support with rod.

**Weight:** 4 Kg

**ACCESSORIES**

- SU401-04  
Constant level tank
- SU401-05  
5 m tubing Ø8 mm



SU299

**SU311  
UNCONFINED COMPRESSION**

ASTM D2166 | AASHTO T208 | BS 1377:7

It is a hand-operated tester, utilized both on site and in laboratory. It comprises a mechanical jack 50 kN, a load ring 2 kN, upper and lower compression platens, a dial gauge 10x0,01 mm and a dial gauge holder. The apparatus can test samples up to Ø80x 200 mm.

**Dimensions:** 380x460x1380 mm  
**Weight:** 68 Kg



SU311

**CBR (CALIFORNIA BEARING RATIO)**

EN 13286-47, 13286-4 | ASTM D1883 | AASHTO T193  
 UNE 103-502 | NF P94-078, P94-093, P98-231-1  
 BS 1377:4, 1924:2

This method is used for the laboratory evaluation of subgrade and subbase coarse materials in road construction. Different models are available that conform to the various relevant specifications. The compaction test can be performed both with the manual rammers and the automatic compactors.



SU301-01...SU300-15

| DESCRIPTION                           | EN 13286-47 | ASTM D1883<br>AASHTO T193<br>UNE 103-502 | NF P94-078<br>NF P94-093<br>NFP98-231-1 | BS 1377:4<br>BS 1924:2 |
|---------------------------------------|-------------|--|---|------------------------|
|                                       | Ø150x120 mm | Ø152,4x177,8 mm                          | Ø152x152 mm                             | Ø152x127 mm            |
| CBR mould                             | SU301-01    | SU303-01                                 | SU305-01                                | SU307-01               |
| CBR Hinged mould                      | SU301-02    | SU303-02                                 | SU305-02                                | SU307-02               |
| Collar                                | SU301-03    | SU303-03                                 | SU305-03                                | SU307-03               |
| Perforated base plate                 | SU301-04    | SU303-04                                 | SU305-04                                | SU307-04               |
| Spacer disc                           | SU301-05    | SU303-05                                 | SU305-05                                | SU307-05               |
| Perforated plate with adjustable stem | SU301-06    | SU303-06                                 | SU305-06                                | SU307-06               |
| Annular surcharge                     | SU301-07    | SU303-07                                 | SU305-07                                | SU307-07               |
| Slotted surcharge                     | SU301-08    | SU303-08                                 | SU305-08                                | SU307-08               |
| Tripod to measure swelling            | SU301-09    | SU303-09                                 | SU305-09                                | SU307-09               |
| Straight edge                         | SU300-10    |  |   |                        |
| Cutting edge                          | SU300-11    |  |   |                        |
| Filter paper                          | SU300-12    |  |   |                        |
| Soaking tank                          | SU300-15    |  |   |                        |

**SU315  
FIELD CBR TEST SET**

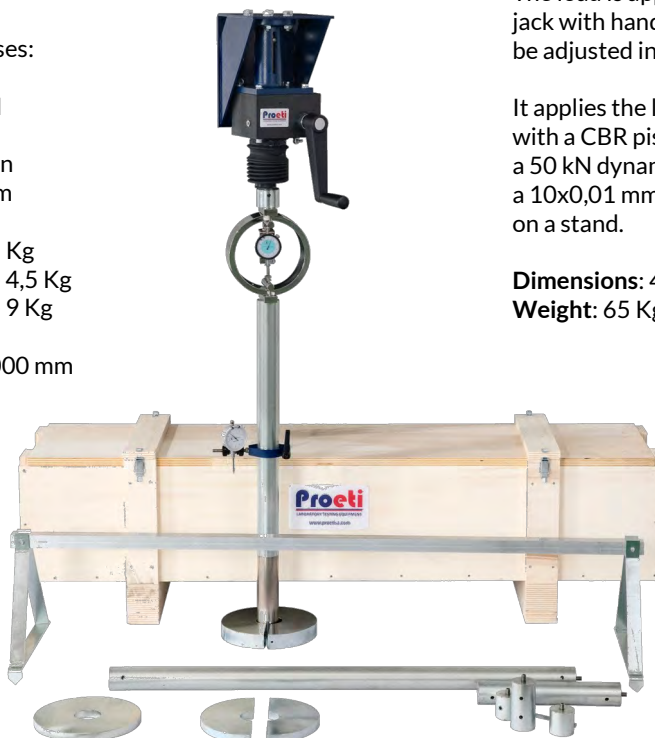
BS 1377:9, 1924:2 | ASTM D4429

Used for the in-situ determination of the bearing capacity of soils used in road construction.

The equipment comprises:

- Datum bar 1400 mm
- Mechanical jack 50 kN
- Load ring 40 kN
- CBR penetration piston
- Dial gauge 25x0,01 mm
- Dial gauge holder
- Annular surcharge 4,5 Kg
- Two slotted surcharge 4,5 Kg
- Two slotted surcharge 9 Kg
- Extension rods:  
2x100, 1x300, 600, 1000 mm
- Wooden carrying case

**Weight: 70 Kg**



SU315

**SU313  
CBR LOADING MACHINE**

EN 13286-47 | ASTM D1883 | BS 1377:4  
 AASHTO T193 | NF P94-078

The load is applied through a mechanical jack with handwheel. The upper beam can be adjusted in height.

It applies the load by a handwheel with a CBR piston. The machine includes a 50 kN dynamometric ring and a 10x0,01 mm dial indicator mounted on a stand.

**Dimensions: 420x370x1180 mm**  
**Weight: 65 Kg**



SU313

**SU321  
DIGITAL CBR TESTING MACHINE**

EN 13286-47 | ASTM D1883 | AASHTO T193 | NF P94-078

Designed to load the penetration piston into the soil sample at a constant rate of 1,27 mm/min, and to measure the applied loads and piston's penetrations at determined intervals.

This machine features a rigid two-column frame with an upper crossbeam which can be adjusted in height and locked in position with locknuts. The drive force is provided by a mechanical jack housed in the base cabinet which also houses the motor and the electric panel.

The load is measured by an electric 50kN cell with high precision strain transducers. The deformation is measured by a displacement transducer 50 mm stroke.

The digital display system measures and displays at the same time the load (stability) in kN and the deformation (flow) in mm with pick hold features and possibility to print certificates and graphics directly on a laser printer via USB or to transfer them to PC via Ethernet.

**Power supply:**  
230 V | 50 Hz | 750 W  
**Dimensions:**  
430x380x1180 mm  
**Weight:**  
98 Kg

**SU323  
ANALOGIC CBR TESTING MACHINE**

EN 13286-47 | ASTM D1883 | AASHTO T193 | NF P94-078

Designed to load the penetration piston into the soil sample at a constant rate of 1,27 mm/min, and to measure the applied loads and piston's penetrations at determined intervals.

This machine features a rigid two-column frame with an upper crossbeam which can be adjusted in height and locked in position with locknuts. The drive force is provided by a mechanical jack housed in the base cabinet which also houses the motor and the electric panel.

The load is measured by a load ring 50 kN and the deformation is measured by a dial gauge 10x0,01 mm with holder.

**Power supply:**  
230 V | 50 Hz | 750 W  
**Dimensions:**  
430x380x1180 mm  
**Weight:**  
98 Kg



**SU325**  
**CBR/MARSHALL DIGITAL MACHINE**

The frame is provided of three fixed speed ranges, easily selectable with a frequency changer (inverter) activated by an electric switch:

- CBR 1,00 mm/min
- CBR 1,27 mm/min
- Marshall 50,8 mm/min

The load is measured by an electric load cell 50 kN with high precision strain transducers; the flow is measured by an electronic displacement transducer 50 mm stroke and ± 0.1% linearity.

Supplied with a digital display unit load cell, displacement transducer, and holder for transducer but without accessories to be ordered separately.

**Power supply:**  
230 V | 50-60 Hz | 750 W  
**Dimensions:**  
450x400x1200 mm  
**Weight:**  
130 Kg

SU320-01

SU301-02

MG010-04

SU325



**ACCESSORIES**

CBR TEST

- SU320-01
- CBR Piston
- MG010-04
- Bench for lateral bearing of digital display
- MG030-41
- Software for CBR test

UNCONFINED COMPRESSION TEST

- SU310-01
- Upper and lower compression platens Ø100 mm or
- SU310-02
- Upper and lower compression platens Ø165 mm
- MG020-01
- Load cell 2,5 kN
- MG010-04
- Bench for lateral bearing of digital display
- MG030-42
- Software for Unconfined Compression test

**SU327**  
**CBR/MARSHALL ANALOGIC MACHINE**

The testing frame is the same as for mod SU325, but the load is measured by a loading ring.

Supplied without load ring and accessories which have to be ordered separately.

**Power supply:**  
230 V | 50-60 Hz | 750 W  
**Dimensions:**  
450x400x1200 mm  
**Weight:**  
130 Kg

SU305-02

SU320-01

MG010-52

SU327



**ACCESSORIES**

CBR TEST

- SU320-01
- CBR Piston
- MG061-12S
- Load ring 50 kN with electric stop safety device
- MG060-01
- Brake device to hold max. load
- MG010-52
- Dial gauge 10x0,01 mm
- MG010-82
- Device to fix the displacement transducer/dial

UNCONFINED COMPRESSION TEST

- SU310-01
- Upper and lower compression platens Ø100 mm or
- SU310-02
- Upper and lower compression platens Ø165 mm
- MG061-03S
- Load ring 2kN with electric stop safety device
- MG060-01
- Brake device to hold max. load
- MG010-52
- Dial gauge 10x0,01 mm with holder
- MG010-82
- Device to fix the displacement transducer/dial

**SU351  
DIGITAL MULTIPURPOSE TESTER 50 KN**

This frame represents the ideal solution for major laboratories performing tests requiring displacement control. The multipurpose tester features a rigid two-column structure with an upper cross beam which can be set at various heights and an automatic load or displacement/deformation control, for testing:

The versatility of the machine allows to carry out the tests:

**SOIL:**

- CBR (California Bearing Ratio)
- Unconfined compression
- Quick triaxial

**CONCRETE:**

- Flexural on beams and tiles

**CLAY BLOCKS:**

- Punching

**CEMENT:**

- Flexural test on mortar prisms 40x40x160 mm
- Compression test on mortar prisms 40x40x160 mm

**ASPHALT:**

- Marshall
- Splitting tensile
- Direct shear Leutner

**ROCKS AND STONES:**

- Uniaxial splitting tensile

The load is applied by a mechanical jack that is driven by a motor brushless with closed loop through optic encoder and controlled by a microprocessor. Limit switches are installed at the end of the stroke to prevent accidental damage.

The electronic control unit with touch-screen colour display, runs like a standard PC based on Windows. The machine has unlimited memory storage with: 2 USB ports, 1 SD card slot.

Supplied without accessories and software to perform the specific tests which must be ordered separately.

**ACCESORIES MULTIPURPOSE 50 KN FOR SOILS:**

CBR TEST

EN 13286 -47 | ASTM D1883 | BS 1377:4  
AASHTO T193 | NF P94-078

- MG020-06
- Load cell 50 kN
- SU320-01
- CBR piston
- MG030-41
- Software for CBR test

**SU320-01**

**SU301-02**



UNCONFINED COMPRESSION TEST

ASTM D2166 | BS 1377:7 | AASHTO T208

- MG020-01
- Load cell 2,5 kN
- SU310-01
- Upper and lower compression platens Ø100 mm
- SU310-02
- Upper and lower compression platens Ø165 mm
- MG030-42
- Software for unconfined compression test

**SU310-01**



- Power supply:** 230 V | 50-60 Hz | 150 W
- Adjustable testing speed:** from 0,01 to 51 mm/min
- Load gradient:** from 1 to 15000 N/seg
- Maximum ram travel:** 100 mm
- Daylight between columns:** 380 mm
- Maximum vertical daylight:** 850 mm
- Dimensions:** 500x450x1450 mm
- Weight:** 130 Kg

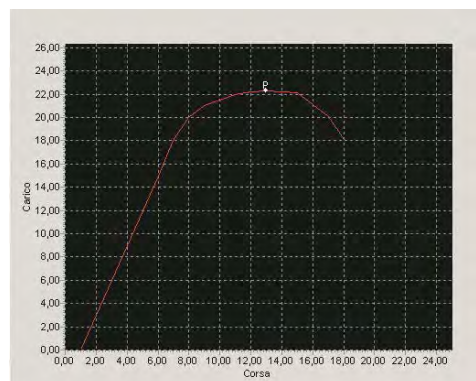
QUICK TRIAXIAL TEST  
ASTM D2850 | BS 1377

- MG020-04
- Load cell 20 kN
- SU350-02
- Loading piston with ball
- SU483
- Triaxial cell
- MG030-47
- Software for quick triaxial test

**SU483**



**SU351**



**SU355**  
**DIGITAL MULTIPURPOSE TESTER 200 KN**

By using suitable devices, our multipurpose tester performs compression, flexural, splitting tensile and direct tensile tests with automatic load or displacement/deformation control, up to 200 kN for compression/flexural and 50 kN for tensile.

The versatility of the machine allows to carry out the tests:

**SOIL:**

- CBR (California Bearing Ratio)
- Unconfined compression
- Quick triaxial

**CONCRETE:**

- Flexural on beams and tiles

**CLAY BLOCKS:**

- Punching

**CEMENT:**

- Flexural test on mortar prisms 40x40x160 mm
- Compression test on mortar prisms 40x40x160 mm
- Tensile on mortar briquettes

**ASPHALT:**

- Marshall
- Splitting tensile
- Direct shear Leutner
- Duriez

**ROCKS AND STONES:**

- Uniaxial splitting tensile

**METAL, PLASTIC, WIRES, ROPES, TEXTILES, PAPERS,...**

- Tensile test 50 kN max capacity load

The machine consists essentially of a robust two-column frame with an upper crosshead which can be adjusted in height and a lower mobile crosshead moved by an electromechanical system with a single recirculating ball screw powered by a brushless servomotor which assures smooth application of load at constant speed.

The load is applied by a mechanical jack that is driven by a brushless motor with closed loop through optic encoder and controlled by a microprocessor. Limit switches are installed at the end of the stroke to prevent accidental damage.

The electronic control unit with touch-screen colour display, runs like a standard PC based on Windows. The machine has unlimited memory storage with: 2 USB ports, 1 SD card slot.

**ACCESORIES MULTIPURPOSE 200 KN ON SOILS:**

CBR TEST

- MG020-06
- Load cell 50 kN
- MG020-16
- Connector for 50 kN load cell
- SU320-01
- CBR piston
- MG030-41
- Software for CBR test



UNCONFINED COMPRESSION TEST

- MG020-03
- Load cell 10 kN
- MG020-13
- Connector for 10 kN load cell
- SU310-01
- Upper and lower compression platens Ø100 mm
- SU310-02
- Upper and lower compression platens Ø165 mm
- MG030-42
- Software for unconfined compression test



QUICK TRIAXIAL TEST

- MG020-04
- Load cell 20 kN
- MG020-14
- Connector for 20 kN load cell
- SU350-02
- Loading piston with ball
- SU483
- Triaxial cell
- MG030-47
- Software for quick triaxial test



SU355

Supplied with an electric load cell 200 kN and lower compression platens. Accessories and software for specific tests are not included which must be ordered separately.

- Power supply:** 230 V | 50-60 Hz | 850 W
- Maximum vertical distance:** 900 mm
- Daylight between columns:** 650 mm
- Adjustable testing speed:** from 0,01 to 100 mm/min
- Load gradient:** from 1 N/s to 5 kN/s
- Dimensions:** 950x560x2400 mm
- Weight:** 820 Kg

## PLATE BEARING TEST EQUIPMENT

ASTM D1194, D1195, D1196 | UNE 739, 7391  
CNR N° 92, N° 146 | BS 1377:9 | DIN 18134

These test methods are used for estimating the bearing capacity of a soil under field loading conditions for a specific loading plate and depth of embedment. They also cover load tests on soil and flexible pavement components, for use in evaluation and design of airport and highway pavements.

The equipments comprises:

- Hydraulic jack with hand pump and rubber pipe
- Set of extension rods of different lengths
- Digital pressure manometer
- Upper spherical seat
- Load plate Ø300 mm
- Intermediate plate Ø160 mm
- Datum bar assembly 2,5 m, telescopic with base
- 3 dial gauge 25x0,01 mm with articulated supports
- Carrying case

| CODE  | CAPACITY | WEIGHT |
|-------|----------|--------|
| SU371 | 100 kN   | 60 Kg  |
| SU373 | 200 kN   | 70 Kg  |
| SU375 | 500 kN   | 110 Kg |



SU373

## DIGITAL PLATE BEARING TEST EQUIPMENT

ASTM D1194, D1195, D1196 | UNE 739, 7391  
CNR N° 92, N° 146 | BS 1377:9 | DIN 18134

The equipments comprises:

- Hydraulic jack with hand pump and rubber pipe
- Set of extension rods of different lengths
- Pressure transducer, connected to the pump
- Data acquisition and processing system
- Software for test data processing
- Upper spherical seat
- Load plate Ø300 mm
- Intermediate plate Ø160 mm
- Datum bar assembly 2,5 m, telescopic with base
- 3 Linear displacement transducers 50 mm
- 3 Articulated transducer supports
- 3 Extension cables 5 m for transducer
- 3 Universal coupling pliers for transducers
- Carrying case

| CODE  | CAPACITY | WEIGHT |
|-------|----------|--------|
| SU381 | 100 kN   | 60 Kg  |
| SU383 | 200 kN   | 70 Kg  |
| SU385 | 500 kN   | 110 Kg |



SU383

## ACCESSORIES

SU370-01

Load plate Ø450 mm

SU370-02

Load plate Ø600 mm

SU370-04

Load plate Ø760 mm

SU370-05

Set of telescopic extension rods

To be connected to the datum bar to obtain a max. adjustable length of 5.5 m as requested by ASTM, CNR

SU370-03

Load plate Ø600 mm in aluminum with reinforced bars NF P94-117-1

This bearing plate is normally used, together with a hydraulic jack and the Benkelman beam apparatus, for determining the bearing capacity and deflection of road pavements.



SU370-01

SU370-02

SU370-04



SU370-03

**PLATE BEARING TEST HIGH ACCURACY**

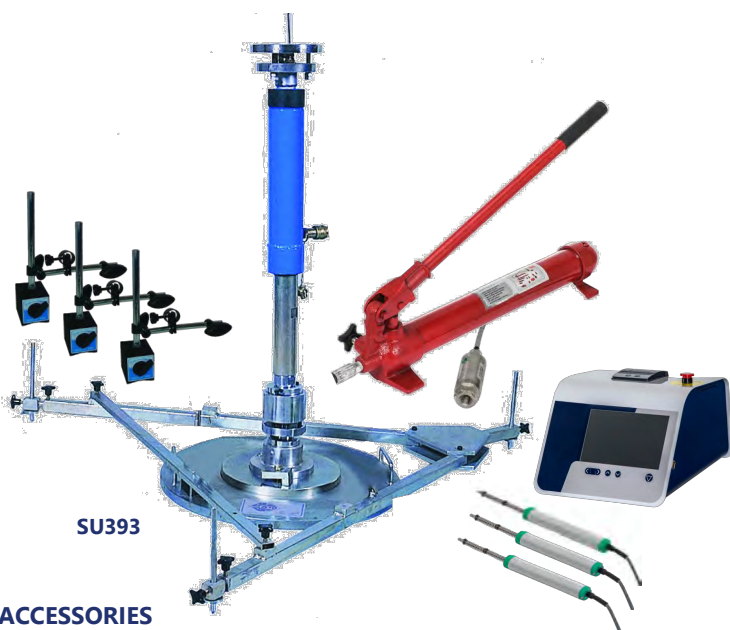
UNE 103808:2006

These test methods are used for estimating the bearing capacity of a soil under field loading conditions on flexible pavement components. The relatively low weight and small dimensions of this apparatus make it very easy to use and to move from one place to another. The measuring bridge, made from aluminium alloy, is very light and has telescopic extensions so it can be positioned in a few minutes with minimum effort.

The equipment consists of:

- Extendable tripod and 250 and 500 mm extensions
- Load plate Ø300 mm
- Intermediate plate Ø160 mm
- Lower seat
- Attachments and extensions 250 and 500 mm
- Loading piston
- Upper spherical seat
- Hydraulic jack with hand pump
- Pressure transducers 700 bar
- 3 displacement transducers de 25x0,01 mm
- 3 Magnetic transducers holder
- Rubber pipe 3 m
- Digital unit for data acquisition
- Software for test data processing
- Wooden carrying case

| CODE  | CAPACITY |
|-------|----------|
| SU391 | 100 kN   |
| SU393 | 200 kN   |



SU393

**ACCESSORIES**

- SU370-01 Load plate Ø450 mm
- SU370-02 Load plate Ø600 mm
- SU370-03 Load plate Ø600 mm with reinforced bars according to NF SU370-04
- SU370-04 Load plate Ø760 mm

**SU389**

**DYNAMIC PLATE LOAD TEST**

ASTM E 2835-11 | TP BF-STB PARTE B 8.3  
ZTV E-STB 2017 | RIL 836 | RVS 08.03.04

The dynamic plate load test performed with the Lightweight deflectometer is used to determine the soil bearing capacity and compaction quality of soils and non-cohesive subbases, as well as for soil improvement applications. Built-in soil layers can easily be tested without load abutment, facilitating quick assessments of test lots even under limited space conditions. The test method is suited to coarse-grain and mixed grain soils with a maximum grain size of 63mm and can be used to determine the dynamic modulus of deformation of soil in the range  $E_{vd} = 15$  to  $70 \text{ MN/m}^2$ .

Being easy to handle and providing immediate measuring results. The documentation can be printed directly at the site via the thermal printer or as a protocol printout after transferring and processing the data on a PC.

Supplied in a wooden carrying case.

- Power supply:**  
4 x R6 Batteries
- Measure range:**  
 $E_{vd} < 225 \text{ MN/m}^2$
- Maximum impact force:**  
7,07 kN
- Load plate diameter:**  
Ø300 mm
- Dimensions:**  
210x100x45 mm
- Drop weight:**  
10 Kg
- Weight:**  
15 Kg



SU389

**ACCESSORIES**

- SU389-01 Transport cart for easier on-site transport
- SU389-02 Magnetic base plate  
For proper positioning of loading unit.
- SU389-03 Thermal printer  
For documenting the test results within seconds at any time and any place.
- SU389-04 Software for evaluation and processing of measurement series



SU389-01



**SU401  
CONSTANT HEAD APPARATUS**

ASTM D2434 | AASHTO T215 | BS 1377:5

The permeability of soil is a very important factor in the study of the natural behaviour of soil with respect to water flow.

This apparatus is particularly suitable for relatively coarse-grained soil such as sands and gravel.

The equipment consists of:

- Manometer stand with 3 manometer tubes
- Includes a metre scale and connecting tubing.
- Constant level tank
- Made from acrylic plexiglass.



**SU401**

**ACCESSORIES**

SU401-01

Constant permeability cell Ø75 mm  
With 3 pressure take-off points.

SU401-02

Constant permeability cell Ø116 mm  
With 6 pressure take-off points and 6 blanked.  
When using this cell, two manometer stands are required.

**SU403  
FALLING HEAD PERMEAMETER**

CEN ISO/TS 17892-11

This apparatus is particularly suitable for fine-grained soils such as clay-like or silty soils with a permeability in the range of  $1 \times 10^{-2}$  to  $1 \times 10^{-6}$  cm/s.

The equipment consists of:

- Stand with three manometer tubes
- Diameters of Ø3, 4 and 6 mm for the different degrees of permeability.
- Soaking reservoir with cock
- Tubing and connectors



**SU490-01**

**SU405-01**

**SU403**

**ACCESSORIES**

SU405-01

Compaction permeameter Ø4"

SU405-02

Plein base and collar Ø4" for compaction tests

SU405-11

Compaction permeameter Ø6"

SU405-12

Plein base and collar Ø6" for compaction tests

SU490-01

De-airing tank 20 litre

SU493-01

Water trap

MG747

Portable vacuum pump

MG740-02

Rubber tubing for vacuum 3 m

**SU405  
PERMEAMETER STAND 4 CELL CAPACITY**

ASTM D2434 | AASHTO T215 | BS 1377:5

This 4 cells capacity stand is designed to perform both constant head and falling head permeability tests on compacted granular soil samples. The stand consists of a metal frame with water tank adjustable in height between 1350 and 3450 mm for constant head tests. Supplied with tubes, graduated rules, piping, connectors and cocks; but without permeameters to be ordered separately. The stand can hold up to 4 permeameters having Ø4" or 6" to perform different types of tests at the same time.

**Dimensions:**

1050x900x2000 mm

**Weight:**

75 Kg



**SU405**

**ACCESSORIES**

SU405-01

Compaction permeameter Ø4"

SU405-02

Plein base and collar Ø4" for compaction tests

SU405-03

Mould with Ø4" lateral water inlet/outlet for permeability

SU405-04

Cutting edge Ø4"

SU405-11

Compaction permeameter Ø6"

SU405-12

Plein base and collar Ø6" for compaction tests

SU405-13

Mould with Ø6" lateral water inlet/outlet for permeability

SU405-14

Cutting edge Ø6"



**SU405-11**

**SU405-01**

**SU411  
MARSH FUNNEL**

ISO 2431

The Marsh funnel is used for routine viscosity determinations on almost every drilling rig. It is made of rugged, shatterproof plastic that is resistant to temperature change deformation, assuring volumetric accuracy.

Supplied with a 1 liter plastic measuring cup.

**Dimensions:**  
Ø160x370 mm  
**Weight:**  
500 g



SU411

**SU413  
FLOW CONE APPARATUS**

EN 445 | NF P18-358, P18-507

Used for determining the flow properties of mortars, grouts, muds and many other type of fluid materials.

Mortar fluidity is considered suitable when the flow time of 1000 cc of mortar is comprised between 17 to 25 seconds.

Entirely made of brass, cone top dia is 155 mm, total length 290 mm, capacity 1700 cc.

Supplied with:  
-4 interchangeable nozzles Ø8-9-10-11 mm  
-Stand adjustable in height  
-Plastic graduated cup

**Weight:** 10 Kg

**ACCESSORIES**

**SU413-01**

Interchangeable nozzle Ø13 mm

**SU413-02**

Sieve Ø150 mm mesh size 1,5 mm



SU413

**SU415  
SAND CONTENT OF DRILLING MUDS KIT**

API, 13 B-1 and 13 B-2

A simple kit for accurate and inexpensive sieve analysis apparatus for determining the sand content of drilling muds. The kit consists of a special 200-mesh sieve 2,5" in diameter, fastened inside a collar upon which a small funnel is fitted on either end.

This is used with a 10 ml glass measuring tube, graduated to read from 0 to 20% the percentage sand by volume.

The collar and funnel are made of polyethylene and the screen is made of brass. A 500 ml wash bottle and carrying case are included.

**Weight:** 1500 g



SU415

**SU417  
MUD BALANCE**

API 13 B-1 | API 13 B-2

The mud balance provides a simple method for the accurate determination of mud density, with a durable construction that makes it ideal for field use.

Principally the balance consists of a base with a fulcrum, and a graduated beam with cup, lid, weighted slider, built-in spirit level and counter-weight. The constant volume cup is affixed to one end of the graduated beam and the counter weight on the opposite end. A plastic carrying case is provided that holds the balance in its working position.

**Weight:** 3 Kg



SU417

**SU419  
FILTER PRESS FOR MUDS**

API, 13 B-1 and 13 B-2

Measuring filtration behaviour and wall-coke building characteristics of fluids is essential to drilling fluid control and treatment.

This apparatus is the most effective means of determining the filtration properties of drilling muds and cement slurries. It consists essentially of a mud reservoir mounted in a frame, a pressure source, a filtering medium and a graduated cylinder for receiving and measuring filtrate.

Supplied with filter paper and CO2 cartridges.

**Dimensions:** 200x230x480 mm

**Weight:** 10 Kg



SU419

**SU451  
FRONT LOADING OEDOMETER**

ASTM D2434 | AASHTO T215 | BS 1377:5

The oedometer has been designed for consolidation tests, it determines the rate and magnitude of consolidation of a soil specimen restrained laterally and subjected to a number of successive vertical load increment.

The oedometer apparatus has a rigid aluminium alloy frame which avoids distortion under load. The lever arm assembly is supported by precision self-aligning bearings.

**Maximum axial load:** 17500 N  
**Dimensions:** 480x200x820 mm  
**Weight:** 32 Kg

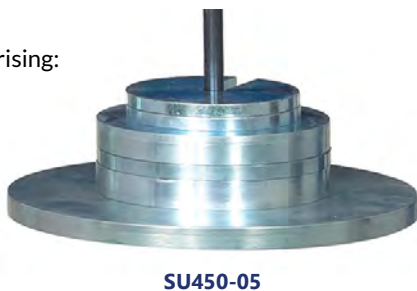


**ACCESSORIES**

SU450-01  
Bench for up to 1 oedometer

SU450-03  
Bench for up to 3 oedometers

SU450-05  
Weight set 50 Kg comprising:  
-1x0,1 kg  
- 2x0,2 kg  
-3x0,5 kg  
-2x1 kg  
-3x2 kg  
-2x5 kg  
-3x10 kg



**ANALOGIC MEASUREMENT SYSTEM**

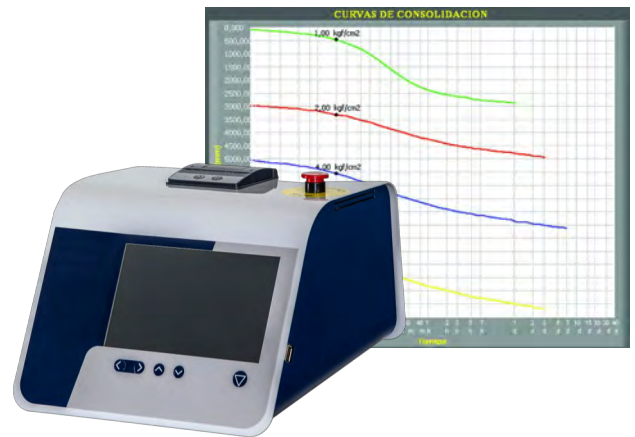
MG010-52  
Dial gauge 10x0,01 mm  
or  
MG010-61  
Digital gauge 12,7x0,001 mm



**MG010-52**

**DIGITAL MEASUREMENT SYSTEM**

MG005  
Digital control unit  
8 channels acquisition and processing data system (expandable to 16 channels) it automatically performs test and data processing.  
MG010-30  
Displacement transducer 10 mm travel  
MG030-45  
Software for consolidation tests



**MG005 + MG005-01**

MG005-01  
8 channel internal module for MG005 digital control unit  
To expand the number of channels up to 16.

MG010-41  
Extension cable 2 m long  
MG010-42  
Extension cable 5 m long  
MG010-43  
Extension cable 10 m long



**MG005-01**

**CONSOLIDATION CELLS**

The cells are supplied with base, methacrylate wall, 2 porous dics, load pad and cutting ring

| CODE     | SPECIMEN DIAMETER | SPECIMEN AREA          | SPECIMEN THICKNESS |
|----------|-------------------|------------------------|--------------------|
| SU450-11 | Ø50,47 mm         | 20,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-12 | Ø63,50 mm         | 31,67 cm <sup>2</sup>  | 20,00 mm           |
| SU450-13 | Ø71,40 mm         | 40,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-14 | Ø75,00 mm         | 44,16 cm <sup>2</sup>  | 20,00 mm           |
| SU450-15 | Ø79,80 mm         | 50,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-16 | Ø112,80 mm        | 100,00 cm <sup>2</sup> | 25,00 mm           |



**CONSOLIDATION CELLS - PERMEABILITY ATTACHMENT**

Similar in manufacture to consolidation cells, they are also provided of a pipe connector with cock and graduated glass burette 10 ml capacity allowing to perform permeability tests.

| CODE     | SPECIMEN DIAMETER | SPECIMEN AREA          | SPECIMEN THICKNESS |
|----------|-------------------|------------------------|--------------------|
| SU450-21 | Ø50,47 mm         | 20,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-22 | Ø63,50 mm         | 31,67 cm <sup>2</sup>  | 20,00 mm           |
| SU450-23 | Ø71,40 mm         | 40,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-24 | Ø75,00 mm         | 44,16 cm <sup>2</sup>  | 20,00 mm           |
| SU450-25 | Ø79,80 mm         | 50,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-26 | Ø112,80 mm        | 100,00 cm <sup>2</sup> | 25,00 mm           |

**SU450-30**

Stand and burette for permability tests

Recommended for soil samples having great value of permeability.

Consists of:

- Burette 50 ml subdiv. 0,1 ml
- Stand
- Clamps
- Tube to be connected to the cells SU450-21...SU450-26



**SU453  
SOILMATIC OEDOMETER**

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

Our Proeti technical department has developed Soilmatic brand such as comprehensive range of testing machines for performing fully automatic tests on soil.

The innovative Soilmatic philosophy provides an unique equipment which allow geotechnical laboratories the complete automation of all test stages.

Here we present our Soilmatic Oedometer to automatically perform the consolidation test, which determines the rate and magnitude of consolidation of a soil specimen restrained laterally and subjected to a number of successive increments of vertical loads.

Soilmatic Oedometer consists of a small and compact load frame housing a twin chromed-column structure, a lower platen and an upper mobile crosshead moved by an electromechanical system with a single recirculating ball screw which assures smooth application of load at constant speed.

The superior quality of its components makes this device one of the top of the range currently available for consolidation testing on soils. A high precision load cell assures smooth application of load and a high performance LVDT transducer for measuring displacement. Fully PC controlled to eliminate or reduce to the absolute minimum any forms of manual intervention, which the oedometer test requires.



Automated loading eliminates negative factors such as operator error and manual handling of dead weights. Testing can continue 24 hours a day, 7 days a week without interruption giving greater throughput of tests with a considerable cost decrease.

PID controller allowing accurate load application ranging from 1 N to 10 kN improving pneumatic systems that are typically inaccurate at low load values. Also the PID controller provides an incremental loading which applies the consolidation loads without any human intervention. It does not require any air source.

Smaller than traditional edometers the laboratory need less space to accommodate this device. Furthermore, one single machine can reliably accomplish the task performed by various traditional oedometers. For these reasons Soilmatic Oedometer improves considerably the productivity and cost effectiveness of the laboratories.

It is supplied with 10 kN load cell, LVDT transducer 10 mm, but without edometric cells, PC, software that must be ordered separately.

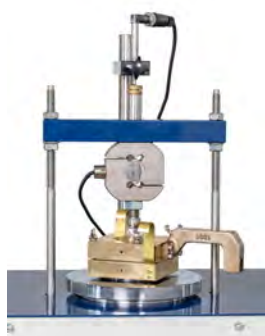


In addition, the versatility of the Soilmatic Oedometer enables the user to perform additional tests, such as:  
-Lambe test UNE-103600  
-Unconfined compression  
-Direct shear specimens consolidation

- Load cell capacity:**  
10 kN (20 kN available on request)
- Maximum vertical clearance:**  
100 mm
- Distance between columns:**  
190 mm
- Specimen size:**  
from 38 to 100 mm
- Maximum ram travel:**  
35 mm
- Power supply:**  
230 V | 50-60 Hz
- Dimensions:**  
405x400x650 mm
- Weight:**  
38 Kg



Lambe test



Direct shear specimen consolidation



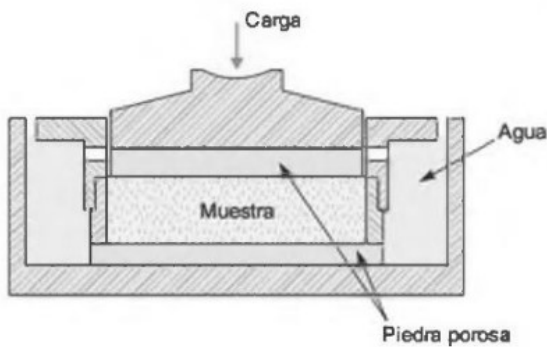
Oedometric consolidation test

**SU450-95  
OEDOMETRIC SOILMATIC SOFTWARE**

Soilmatic software is purpose built and draws upon over 30 years of advanced materials testing experience. Using a comprehensive and user-friendly interface with easy to navigate menus to allow you to set up your test parameters with minimal hassle.

Dedicated software developed by the geotechnical experts to perform consolidation, free swelling, swelling pressure and collapse tests meeting all the requirements of the most important international standards. Aslo with the automatic oedometer the user can perform customized tests.

Fully automated system reduces time tests because enables to program many incremental loading steps.If the specimen under test tends to expand, a swelling limit can be preset: in case the pre set limit is exceeded, the system will automatically skip to the next loading step.



**CONSOLIDATION TEST**

This advanced software enables to calculate fully automated t100 value in real time during the test. The parameters can be defined by the operator with the choice of setting single or multiple steps. The user can program the test for skipping to the next loading step when the primary consolidation has been completed.

**COLAPSE TEST**

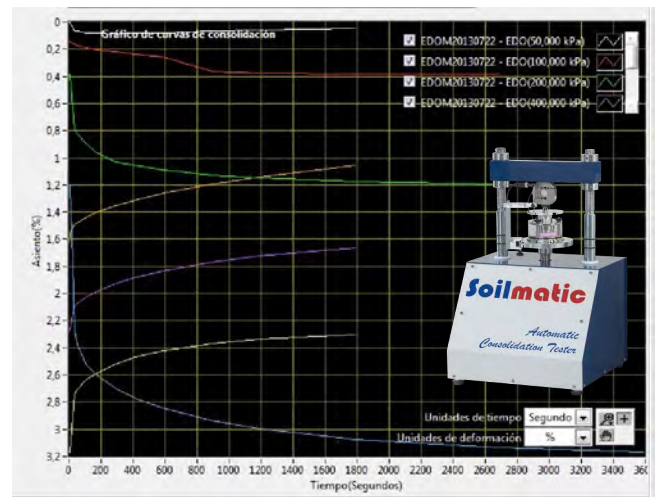
Automatic determination of soil volumen change when it is subjected to increases of stresses or when it is saturated.

**FREE SWELLING TEST**

The software calculates a percentage of initial value of height increment which a confined specimen has when is subjected to a vertical load.

**SWELLING PRESSURE TEST**

By setting previously the parameter, the software applies different load/unload sequences to avoid the volume change of a flooded specimen. Perfoming fully automated swelling pressure test.

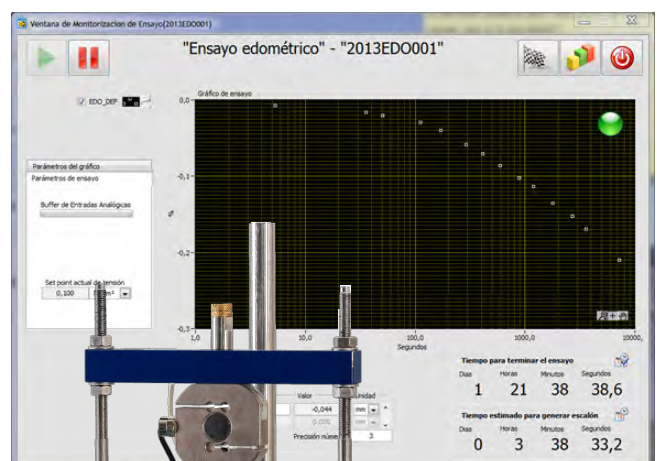


Real-time data and graph display. The software allows to Visualizes the remaining time to finish the test. Each sensor will be shown by the graphics one by one or all together. Also the user could select linear or logarithmic time ranges.

The software can control many units from a single PC, giving the operator the choice of controlling single or multiple units.

Once the software is installed with the first Soilmatic Oedometer unit, it is possible to extend the control of further units. System modularity is ensured for subsequent integrations.

Test results are recorded and displayed in real time and calculations are performed automatically. Printing and backing-up the test data in Excel and Word files to be processed using the proper Geo-Analysis.



SU450-95

SU450-11



SU453

**SU457  
HIGH CAPACITY SOILMATIC OEDOMETER**

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

This automatic oedometer version has been designed to perform tests up to 50 kN capacity.

Accepts specimens maximum diameter up to 200 mm. By using a large sample it is possible to gain a more representative indication of the soils subjected to geotechnical analysis. Therefore is the ideal machine for laboratories and universities with research purposes.

Fully PC controlled to eliminate or reduce to the absolute minimum any forms of manual intervention, which the oedometer test requires. Also the machine provides an incremental loading which applies the consolidation loads without any human intervention. Great advantage for academic centres and universities to avoid all load and unload operations by the students improving their security. It does not require any air source.

PID controller allowing accurate load application ranging from 1 N to 50 kN improving pneumatic systems that are typically inaccurate at low load values.

Soilmatic Oedometer consist essentially of a robust two-column frame with an upper crosshead which can be adjusted in height and a lower mobile crosshead moved by an electromechanical system with a single recirculating ball screw which assures smooth application of load.

Real-time data and graph display. The software allows to Visualizes the remaining time to finish the test. Each sensor will be shown by the graphics one by one or all together. Also the user could select linear or logarithmic time ranges.

Fully automated system reduces time tests because enables to program many incremental loading steps. If the specimen under test tends to expand, a swelling limit can be preset: in case the pre set limit is exceeded, the system will automatically skip to the next loading step.

**ACCESORIES**

MG031

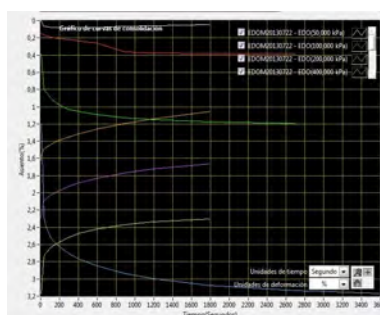
Custom computer

Including keyboard, mouse, connection cables, installation and setting up of the purchased software.

SU450-95

Soilmatic software for edometric tests:

- Consolidation
- Colapse
- Free swelling
- Swelling pressure



**SU457**

Test results are recorded and displayed in real time and calculations are performed automatically. Printing and backing-up the test data in Excel and Word files to be processed using the proper Geo-Analysis.

It is supplied with 50 kN load cell, LVDT transducer 10 mm, but without edometric cells, PC, software that must be ordered separately.

- Load cell capacity:** 50 kN
- Maximum vertical clearance:** 145 mm
- Distance between columns:** 290 mm
- Specimen size:** from 38 to 200 mm
- Maximum ram travel:** 30 mm
- Power supply:** 230 V | 50-60 Hz
- Dimensions:** 480x550x760 mm
- Weight:** 82 Kg

SU450-06

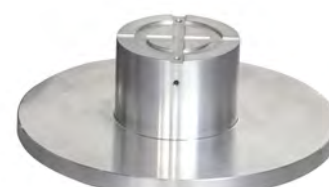
Attachment for measuring on the top of consolidation cell  
Used to measure cell deformation with higher accuracy avoiding any deviations due to platen movement.

SU450-07

Attachment for measuring swelling pressure  
Replacing top CAP of the consolidation cell to calculate the swelling of the specimen. Including adjustable supports.



**SU450-06**



**SU450-07**

**CONSOLIDATION CELLS**

The cells are supplied with base, methacrylate wall, 2 porous discs, load pad and cutting ring.



Disassembled consolidation cell desmontada

Assembled consolidation cell

| CODE     | SPECIMEN DIAMETER | SPECIMEN AREA          | SPECIMEN THICKNESS |
|----------|-------------------|------------------------|--------------------|
| SU450-11 | Ø50,47 mm         | 20,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-12 | Ø63,50 mm         | 31,67 cm <sup>2</sup>  | 20,00 mm           |
| SU450-13 | Ø71,40 mm         | 40,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-14 | Ø75,00 mm         | 44,16 cm <sup>2</sup>  | 20,00 mm           |
| SU450-15 | Ø79,80 mm         | 50,00 cm <sup>2</sup>  | 20,00 mm           |
| SU450-16 | Ø112,80 mm        | 100,00 cm <sup>2</sup> | 30,00 mm           |
| SU450-17 | Ø200,00 mm        | 315,00 cm <sup>2</sup> | 40,00 mm           |

**SU550+SU555+SU555+SU555**  
**SOILMATIC THREE-HIGH CAPACITY OEDOMETER**

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

With this Soilmatic three-frame, your laboratory will obtain an unique fully automatic tester. Adopting this multi-frame concept maximizes laboratory productivity.

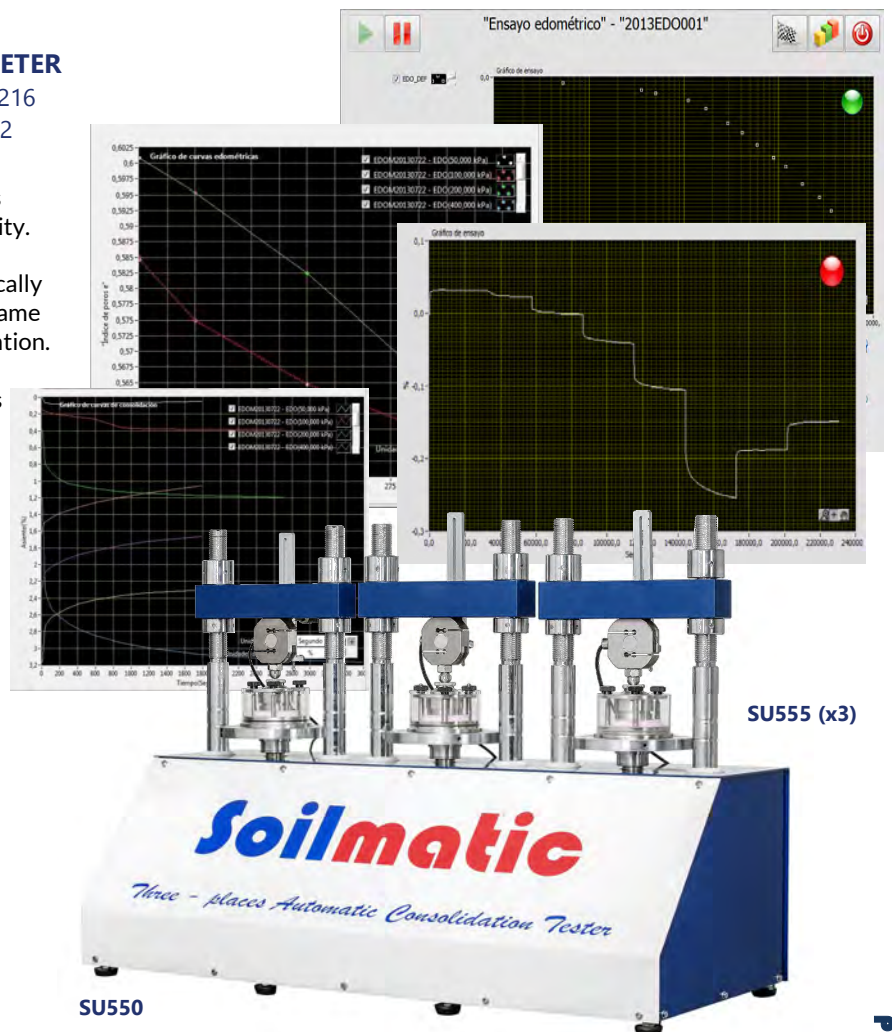
Controlled by only one PC the machine can automatically perform up to 3 entire and independent tests at the same time, from start to finish, without any human intervention.

Ideal solution for advanced and research laboratories that require high productivity.

We give here, a 3-frame Soilmatic testing machine consists of a chassis housing three high capacity oedometer frames which allows high levels of productivity in any geotechnical laboratory.

For detailed information see page 216.

**Power supply:** 230 V | 50-60 Hz  
**Dimensions:** 480x550x760 mm  
**Weight:** 82 Kg



SU555 (x3)

SU550



**SU471  
DIRECT/RESIDUAL SHEAR MACHINE**

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

This apparatus is used to determine the resistance to shearing of all types of soil specimens including both consolidated and drained, undisturbed or remolded.

In the traditional direct shear test the soil specimen (either undisturbed, remoulded or compacted) is placed in a rigid metal box and subjected to a normal constant stress.

The metal box consists of two halves that can slide horizontally each other and will apply an increasing horizontal force to the lower part of the specimen while the upper part is reacting against the shearing action.

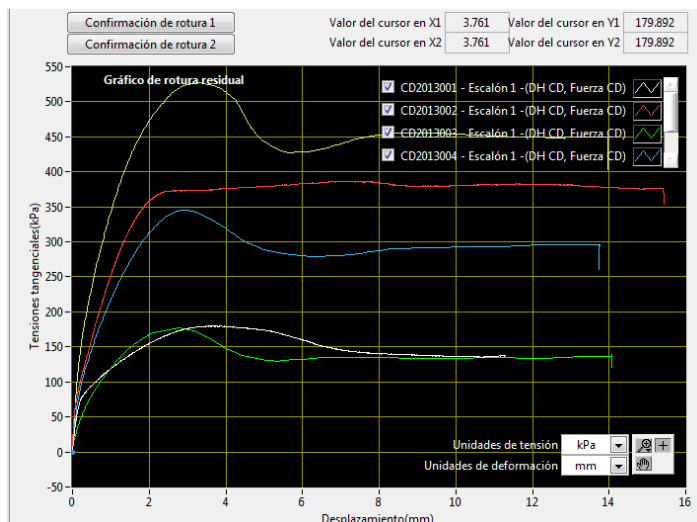
From the measurement of this shearing action the shear strength of the soil is calculated.

After a first immediate general failure, the soil will stabilize, since the soil can still offer a residual strength.

At the beginning of each test the machine performs an automatic and complete internal check including a position reset resulting in the elimination of all position errors.

The machine has an integral closed loop control motor with epicyclic reducers. A user-friendly microprocessor controlled touch screen is used to input all test patterns providing an efficient and flexible interface.

All data are input and stored when the machine is in stand-by, without affecting the specimen under test with quick machine setting.



Graphic direct-residual shear test



Only with digital system the effects of the primary consolidation can be identified directly on the consolidation curve. Performs an automatic calculation of the appropriate shear velocity with selection of optimal consolidation parameters for t50, t90 and t100.

Facility for shear box maximum extension detection, to automatically stop the test.

Facility to input a different return speed (residual shear) in relation to the one used for the shear test, thus allowing a quick playback of the residual shear test, saving a lot of time.

The machine can accommodate round specimens Ø50-60-63,5-100 mm and square 60x60 and 10x100 mm. Supplied with set of 50 kg of slotted weights.

- Power supply:** 230 V | 50-60 Hz | 200 W
- Maximum shear load:** 5000 N
- Max vertical direct load:** 500 N
- Max lever arm load:** 5500 N
- Shear speed:** 0,00001 to 15,0000 mm/min
- Dimensions:** 1040x420x1350 mm
- Weight:** 120 Kg

**ACCESORIES**

SU471-01

Dial System

Comprising:

- Load ring 5 kN with electric safety stop device
- Dial gauge 25x0,01 mm for horizontal displacement
- Dial gauge 10x0,01 mm for vertical displacement

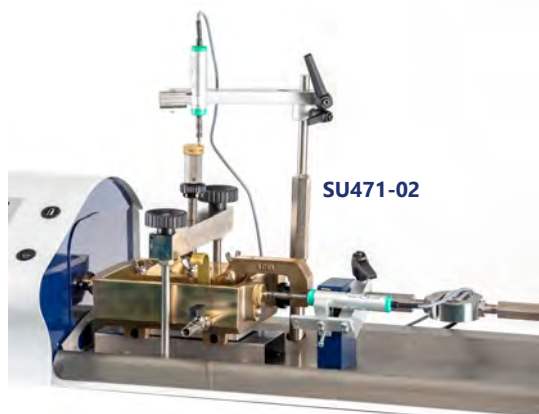


SU471-02

Digital System

Comprising:

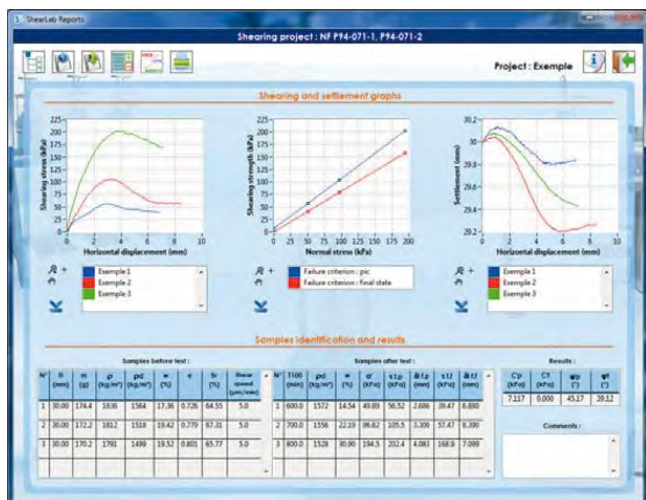
- Electric load cell 5 kN
- Linear transducer 25 mm travel for horizontal displacement
- Linear transducer 10 mm travel for vertical displacement
- Firmware activating 3 connectors for basic data acquisition



MG030-46

Software for direct/residual shear tests

To be used with digital system SU471-02 as a tool which allows geotechnical laboratories to process data and to view the results obtained from direct and residual shear tests. Simple and flexible graphical interface giving the possibility to view, edit and print all the parameters involved in shear tests.



MG030-46 Software for direct/residual shear tests

SHEAR BOXES, HOLLOW PUNCH AND TAMPERS

Shear box assemblies, made from brass, accurately machined. Supplied with carriage, walled round or square hole, base plate, two grids, two perforated grids, two porous discs and adapters to fit the box holder.

Hollow punch is used to prepare the soil sample.

Tamper ejects the specimen filling into the shear box without disturbing it.

| SPECIMEN   | SHEAR BOX | HOLLOW PUNCH | TAMPER   |
|------------|-----------|--------------|----------|
| Ø50 mm     | SU470-11  | SU105-01     | SU105-11 |
| Ø60 mm     | SU470-12  | SU105-02     | SU105-12 |
| Ø100 mm    | SU470-14  | SU105-04     | SU105-14 |
| 60x60 mm   | SU470-15  | SU105-05     | SU105-15 |
| 100x100 mm | SU470-16  | SU105-06     | SU105-16 |



SU470-10

Consolidation frame

It is used to apply a constant load on the specimen in the shear box, so as to shorten the test duration when just few shear machines are available. The frame can also be used to consolidate oedometric cells. It is supplied with three lever arms ratio 10:1 having each max. load up to 550 kg, centering devices and dial gauge holders.

Dimensions: 2300x450x900 mm

Weight: 150 Kg

SU470-21

Water container up to max size 60 mm

By keeping the specimen deep into the water.

SU470-22

Water container up to 100 mm

By keeping the specimen deep into the water.

SU450-05

Set of 50 Kg of slotted weights

MG010-52

Dial gauge 10x0,01 mm



SU470-10

**SU475**

**SOILMATIC DIRECT / RESIDUAL SHEAR**

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

The innovative Soilmatic philosophy provides a fully computerized system which allow geotechnical laboratories the complete automation of all test stages.

This apparatus have been designed to determine the resistance to shearing of all types of soil specimens including both consolidated and drained, undisturbed or remolded.

Soilmatic Direct Shear apparatus is an advanced system specifically designed to perform in a fully automated way the following stages:

- Consolidation
- Drained Direct Shear
- Undrained Direct Shear
- Residual Direct Shear

In the direct shear test an increasing horizontal force is applied to the lower part of the soil specimen while the upper part is reacting against the shearing action. From the measurement of this shearing action the shear strength of the soil is calculated.

After a first immediate general failure, the soil will stabilize, since the soil can still offer a residual strength.



**SU475**

The Soilmatic system reads and processes vertical and horizontal force and displacement readings. Also manages the motors, the safety system and the test steps.

Accepts shear boxes of round Ø50, Ø60 and Ø100 mm and square 60x60 and 100x100 mm specimens.

Supplied with horizontal displacement transducer 20 mm, vertical displacement transducer 10 mm and 5 kN load cell.

- Load capacity:** 5 kN (10 kN available on request)
- Maximum horizontal travel:** 28 mm (50 mm on request)
- Maximum vertical travel:** 20 mm
- Shear speed:** from 0,000001 to 10 mm/min
- Power supply:** 230 V | 50-60 Hz | 200 W
- Dimensions:** 1000x450x800 mm
- Weight:** 120 Kg



Soilmatic direct shear apparatus is an electromechanical system powered by PID servomotors which apply high accuracy vertical and horizontal loads to a tested specimen without any human intervention for placing weights.

**ACCESORIES**

**SHEAR BOX ASSEMBLIES**

Made from brass, accurately machined, complete with carriage, walled round or square hole, base plate, two grids, two perforated grids, two porous stones, adapters to fit the box holder.

**HOLLOW PUNCH AND TAMPER**

The hollow punch with cutting rim is used to prepare the soil sample, and the tamper ejects the specimen filling it directly into the shear box without disturbing it.

SU470-95  
 Soilmatic Software for direct/residual shear tests

MG031  
 Custom computer



| SPECIMEN   | SHEAR BOX | HOLLOW PUNCH | TAMPER   |
|------------|-----------|--------------|----------|
| Ø50 mm     | SU470-11  | SU105-01     | SU105-11 |
| Ø60 mm     | SU470-12  | SU105-02     | SU105-12 |
| Ø100 mm    | SU470-14  | SU105-04     | SU105-14 |
| 60x60 mm   | SU470-15  | SU105-05     | SU105-15 |
| 100x100 mm | SU470-16  | SU105-06     | SU105-16 |

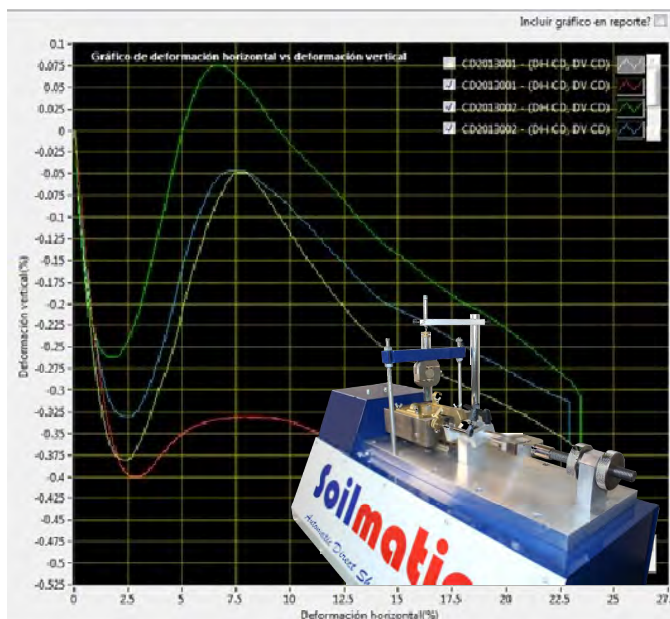
**SU470-95**  
**SOILMATIC DIRECT/RESIDUAL SHEAR SOFTWARE**

Soilmatic software has been designed as an informatic tool which allows geotechnical laboratories to process data and to view the results obtained from direct and residual shear tests.

The software interface that can be used in a very simple and intuitive way. A dedicated window allows to select the machine the user wants to work with while a test-specific setup guides the acquisition process, including data collection parameters that best fit the specific test.

All test-specific parameters are calculated based on input of specimen information, such as:

- Sample type: round or square
- Sample size: diameter or width mm
- Sample initial height mm
- Initial wet masses g
- Final wet masses g
- Dried mass after oven g
- Applied load Kg
- Grain density Kg/m<sup>3</sup>
- Consolidation time min

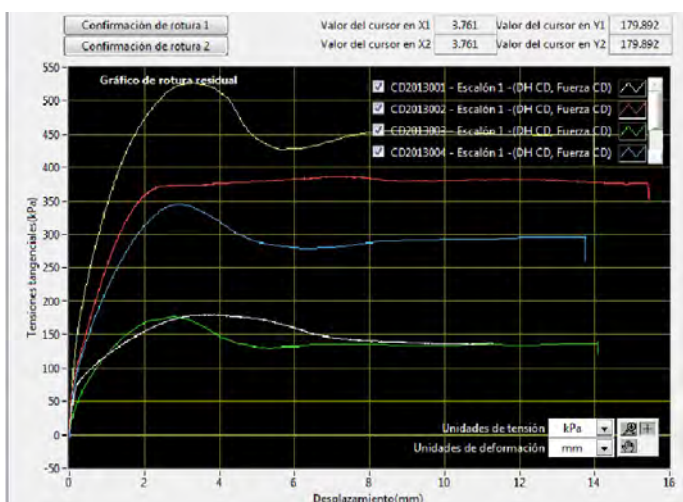


- The main features of this software allow the users to create:
- Test files from data entered manually or imported
  - Projects to perform calculations as selected standard require
  - Customized test reports and print them

Allows to generate the following graphics that can be imported into Excel files for data processing and analysis:

- Tension versus deformation (residual)
- Index “e” versus deformation
- Vertical tension versus horizontal tensión

Soilmatic Direct Shear Software can be connected to one or more direct shear machines, thus allowing automatic data control and acquisition during the test.

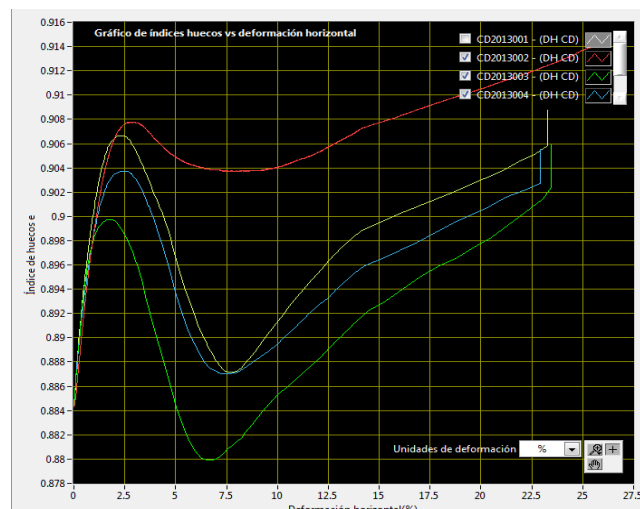


*Graphic Tension versus deformation (residual)*

Soilmatic Software displays real-time values of:

- Test information
- Test status
- Horizontal force
- Vertical pressure (maintained constant)
- Horizontal displacement
- Vertical displacement

Software enables to calculate the appropriate shear velocity for the material to be tested after the consolidation stage is completed.



*Graphic Index “e” versus deformation*

**TRIAXIAL TEST**

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

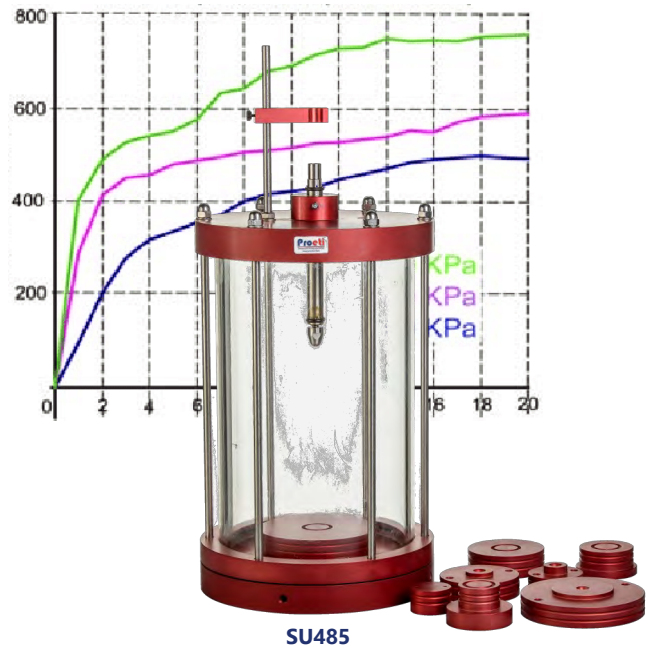
This section contains descriptions of different testing solutions and details of the equipment required to carry out the various types of triaxial test in manual, semi-automatic or automatic mode.

UNCONSOLIDATED UNDRAINED TEST (UU)

ASTM D2850 | CEN-1SO/TS17892-8  
NF P94 070, P94 074 | BS 1377:7

With this method the shear strength is measured in terms of total stress. The soil specimen is not allowed to consolidate and maintains its original structure and water content, so that its compressive strength depends only on the level of geostatic stress in the field. Tests are often carried out on three specimens from the same sample, each subjected to a different confining pressure.

Provided that the soil is fully saturated, the shear strength will be the same for each test and is known as "undrained shear strength".

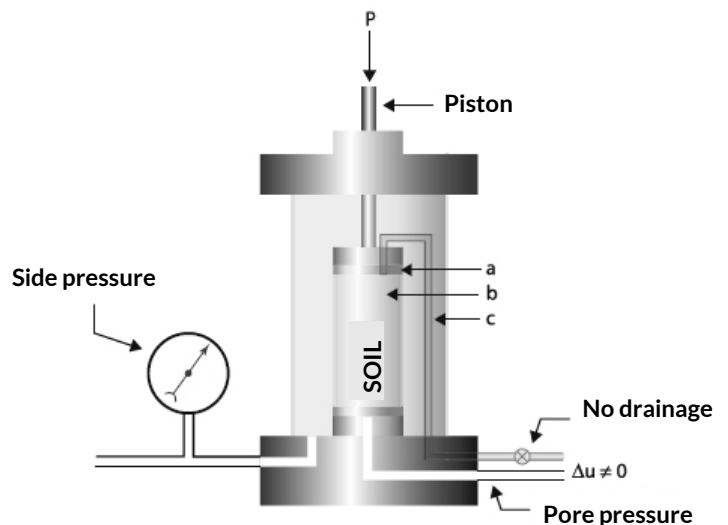
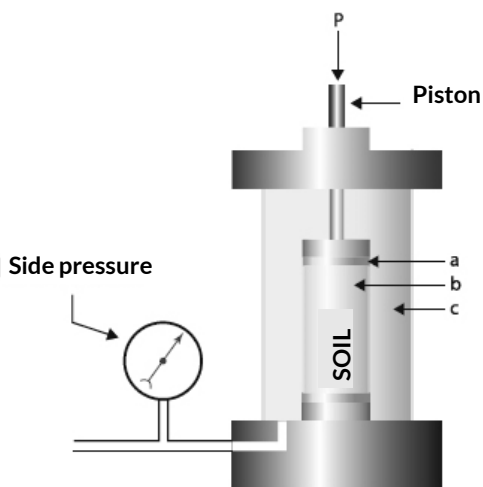


CONSOLIDATED UNDRAINED TEST (CU)

ASTM D4767 | CEN-1SO/TS17892-9  
NF P94 070, P94 074 | BS 1377:8

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

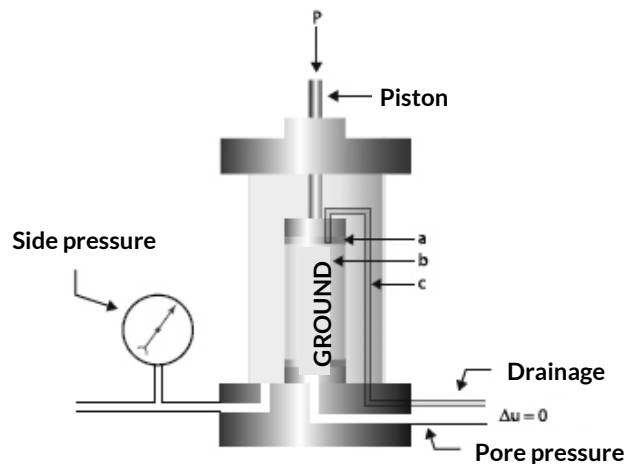
The effective stresses are calculated as the difference between the total stress and the pore pressure. Since the shear strength is affected by the effective stresses, by testing a set of three specimens at different confining pressures, it is possible to define the failure envelope according to Coulomb's model and define the parameters  $c'$  and  $\phi'$ .



**CONSOLIDATED DRAINED TEST (CD)**

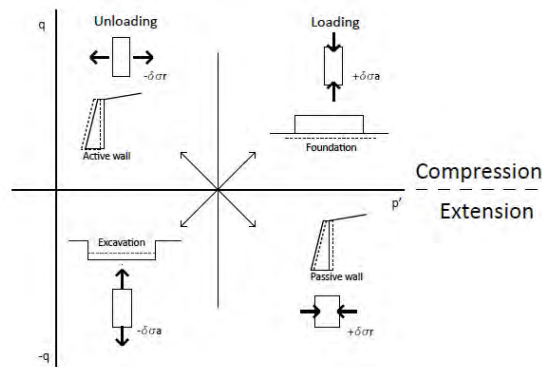
ASTM D7181 | CEN-ISO/TS17892-9  
NF P94 070, P94 074 | BS 1377:8

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



**STRESS PATH TEST**

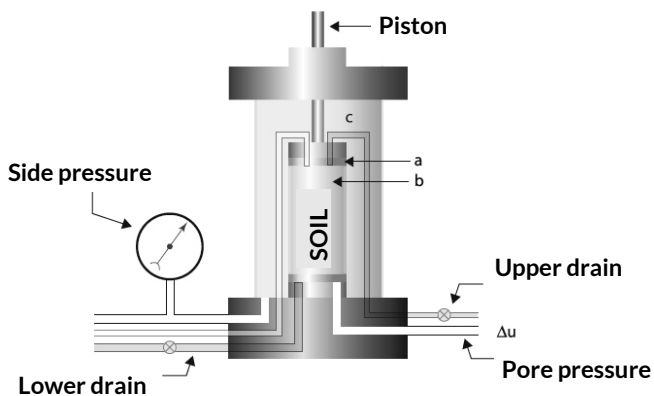
vents on site such as excavation, construction or natural occurrences can produce changes in the magnitude and ratio of the principal stresses (major and minor). In a stress path test the horizontal and vertical pressures applied to the specimen are managed independently, which allows the behaviour of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



**PERMEABILITY TEST IN TRIAXIAL CELL**

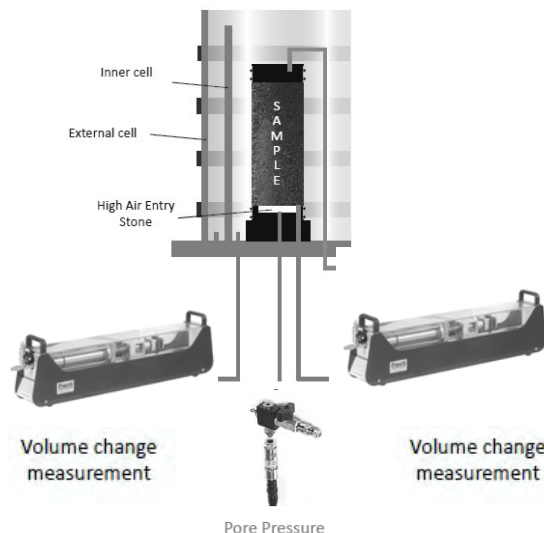
ASTM D5084 | CEN-ISO/TS17892-11 | BS 1377:6

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



**UNSATURATED SOIL TEST**

An unsaturated testing system is used when effective stress testing is required that recreates in-situ conditions of specimens that exist in a naturally unsaturated state (for example soil that is higher than the water table). In an unsaturated soil, the voids between soil particles are filled with both air and water, and surface tension forces create a negative pore water pressure (or suction) which pulls the soil particles together and increases the strength of the soil. Saturating the soil (replacing the air in the voids with water) results in a positive pore water pressure which pushes the soil particles apart and reduces the overall strength. The solution to this problem is to use what is known as the axis translation method, which involves applying an air pressure via the top cap in the same way as a water back pressure in a saturated test.



**SU481  
SOILMATIC TRIAXIAL FRAME**

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

Our Soilmatic Triaxial is an outstanding system specifically designed for advanced soil testing. This system can be used from educational to construction engineering laboratories to reduce to the absolute minimum any form of manual intervention.

This advanced Triaxial frame can automatically perform tests, from start to finish, without any human intervention, such as:

- UU (Unconsolidated Undrained)
- CU (Consolidated Undrained)
- CD (Consolidated Drained)
- Permeability tests in triaxial cells

Ideal solution for advanced and research laboratories that require high productivity and high quality testing. Connectable to PC via software including a remote control function for full computerization of the system.

Based on heavy duty triaxial load frames, with advanced electronics and high quality components, these frames are the top of the range currently available for triaxial testing on soils. The load frame is manufactured with a robust twin chromed-column structure, ensuring extremely high rigidity.

Fully computerized system including a remote control function for full computerization of the system. This automatic triaxial system is operated with an extremely low displacement velocity.

The loading application is measured by a high accuracy load cell and platen displacement and the displacement by an encoder fitted in the servomotor which provides to the machine a high reliability.

**ACCESORIES**

**MG031**  
Customized computer, includes installation of user-purchased software, keyboard, mouse, and connection cables

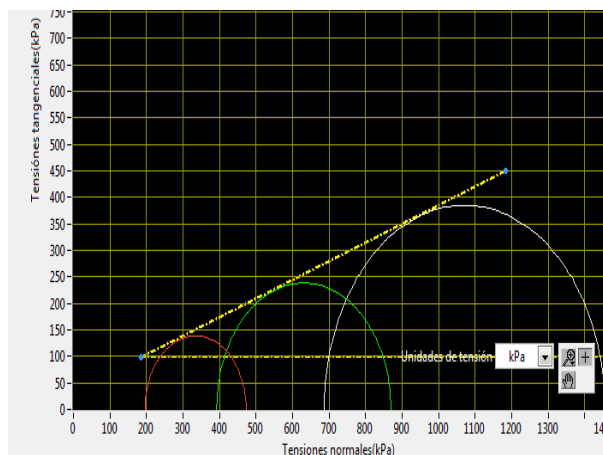
**SU480-95**  
Software to perform triaxial tests  
This software allows the user to:  
-Configure the necessary acquisition parameters  
-All phases: Saturation, Consolidation and Shear  
-Calculate the t100 value used for shear rate  
-Record data for each calculation step  
-Save test data and test parameters

**SU481-01**  
Bench for Soilmatic triaxial frame  
Used to hold the testing machine at a proper height for its utilization.



The machine is supplied without triaxial cell, PC, software and accesories that must be ordered separately.

- Load capacity:** 50 kN
- Speed range:** from 0,00001 to 10 mm/min
- Maximum vertical daylight:** 790 mm
- Daylight between columns:** 340 mm
- Platen diameter:** Ø177 mm
- Platen travel:** 100 mm
- Power supply:** 220-240 V | 50 Hz
- Dimensions:** 420x580x1410 mm
- Weight:** 105 Kg



**SU480-95 Software for triaxial test**

**TRIAXIAL FRAME ACCESSORIES**

**LOAD CELLS**

Used to measure the axial force applied to a specimen in a triaxial cell. Supplied complete with a connector for attaching to the crosshead of our triaxial load frames.

- MG020-01  
Load cell 2,5 kN
- MG020-02  
Load cell 5 kN
- MG020-03  
Load cell 10 kN
- MG020-04  
Load cell 20 kN
- MG020-05  
Load cell 50 kN

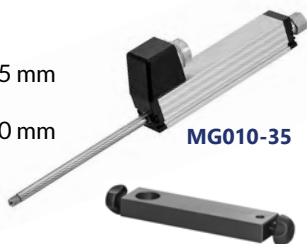


**MG020-01**

**DISPLACEMENT TRANSDUCERS "TYPE TR"**

Linear potentiometric transducers are used with various types of testing equipment, such as consolidation apparatus, shear testing machines and conventional triaxial testing systems, to measure sample deformation.

- MG010-34  
Displacement transducer "TR type" 25 mm
- MG010-35  
Displacement transducer "TR type" 50 mm
- MG010-84  
Small horizontal coupling device for TR transducers



**MG010-35**

**MG010-84**

**PRESSURE TRANSDUCERS**

Used for the measurement of pore pressure in conventional testing systems and also cell and back pressure in the automatic and dynamic testing systems.

- MG010-11  
Pressure transducer 1000 kPa
- MG010-12  
Pressure transducer 2000 kPa
- MG010-28  
De-airing block
- MG010-29  
De-airing block with fast coupling



**MG010-11**

**MG010-12**



**MG010-28**



**MG010-29**

**EXTENSION CABLE**

Used with displacement and pressure transducers

- MG010-41  
Extension cable 2 metres long
- MG010-42  
Extension cable 5 metres long
- MG010-43  
Extension cable 10 metres long



**MG010-42**

**SU485**

**TRIAXIAL CELL 1700 kPa**

Aluminium made, maximum working pressure of 1700 kPa. The high quality finish between the piston and the head, the use of a circular sealing ring and a special lubricant reduce friction levels and prevent water leaks.

Proeti Triaxial cell is composed by a transparent chamber of a high resistance material which allows to see the specimen during the test. Four quick-release attachment rods are used to hold the cylinder and head unit to the base.

The triaxial cell includes 5 inlet/outlet tubes.

- 2 for top rear drainage/pressure
- 2 for bottom drainage/pore pressure
- 1 for confinement pressure

Different colours available on request.



**SU485+SU485-07**

**TRIAXIAL CELL ACCESSORIES**

- SU485-01  
Flaring tool
- SU485-02  
Terminal for connection tube (10 pcs)
- SU485-03  
Nylon tube Ø4 mm (20 m)
- SU485-04  
Vaseline oil (1000 ml)
- SU485-05  
Silicon grease (1 kg)
- SU485-06  
Grease pump
- SU485-07  
Customized colour for triaxial cell



**SU485-03**

**SU485-05**

**SU485-04**



**SU485-06**



**SU485-01**



## TRIAXIAL CELL ACCESSORIES

### PEDESTAL

Used to adapt the triaxial cell base for different sample sizes. Supplied complete with a solid disc for tests without drainage.

### TOP CAP

Used to spread the load evenly over the whole cross-sectional area of the sample when drainage to the top of the sample is required.

Includes a nylon tube and connector for the drainage line.

### POROUS DISC

Acts as a filter ensuring that the passage of water into and out of the sample is evenly spread over the whole cross-sectional area. Two are required - one for the top of the sample and one for the base.

### PERSPEX PLAIN DISCS

To replace porous discs in undrained tests. Two pieces are required. They are made of 10 mm thick Perspex.

### RUBBER MEMBRANE

Provides a protective waterproof barrier around the sample. Made of rubber latex and supplied in packs of 10.

### "O" RINGS

They are used to seal the membrane with the pedestal and with the top plug at each end of the sample. Supplied in packs of 10 units.

### MEMBRANE STRETCHER

Used to the membrane open so it can be easily placed over the specimen without any disturbance.

### "O" RINGS PLACING TOOL

Used for applying the O-rings with the minimum disturbance to the sample.

### SPLIT SAND FORMER

A specially designed piece of equipment for use when preparing non-cohesive soils which otherwise could not be mounted in a triaxial cell.

### SPLIT MOULD

Used for trimming the ends of undisturbed soil specimens.

### LATERAL FILTER DRAINS

Used as side drains when specimens have low permeability. They are particularly useful when saturating clays before consolidation and shearing. Pack of 50.

### FILTER PAPER FOR BASE

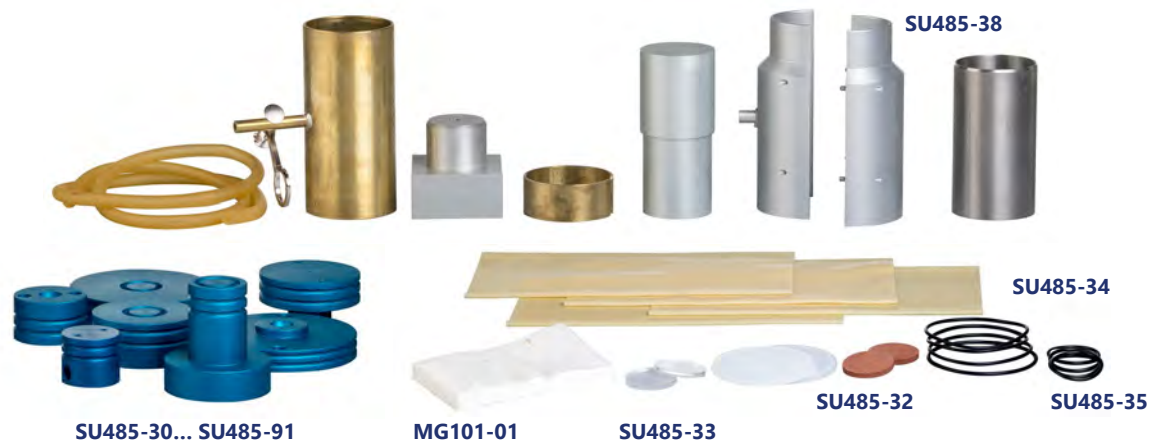
to avoid passages of soil particles into the porous stones.

### CORE CUTTER

To cut soil cohesive specimens in correct diameters from bigger samples. It is made of stainless steel with a cutting edge.

### DOLLY FOR EXTRACTION

To extrude the specimen from the core cutter.



| ACCESSORIES                        | Ø38X76 MM | Ø50X100 MM | Ø70X140 MM | Ø100X200 MM | Ø150X300 MM |
|------------------------------------|-----------|------------|------------|-------------|-------------|
| Pedestal                           | SU485-30  | SU485-50   | SU485-70   | SU485-80    | SU485-90    |
| Top cap                            | SU485-31  | SU485-51   | SU485-71   | SU485-81    | SU485-91    |
| Porous Disc (2 pieces)             | SU485-32  | SU485-52   | SU485-72   | SU485-82    | SU485-92    |
| Perspex Plain Disc (2 pieces)      | SU485-33  | SU485-53   | SU485-73   | SU485-83    | SU485-93    |
| Rubber membrane (10 pieces)        | SU485-34  | SU485-54   | SU485-74   | SU485-84    | SU485-94    |
| "O" rings (10 pieces)              | SU485-35  | SU485-55   | SU485-75   | SU485-85    | SU485-95    |
| Membrane tensioner                 | SU485-36  | SU485-56   | SU485-76   | SU485-86    | SU485-96    |
| "O" rings placing tool             | SU485-37  | SU485-57   | SU485-77   | SU485-87    | SU485-97    |
| Split Sand Former                  | SU485-38  | SU485-58   | SU485-78   | SU485-88    | SU485-98    |
| Split mould                        | SU485-39  | SU485-59   | SU485-79   | SU485-89    | SU485-99    |
| Lateral Filter Drains (50 pieces)  | MG101-01  | MG101-02   | MG101-03   | MG101-04    | MG101-05    |
| Filter paper for base (100 pieces) | MG103-01  | MG103-02   | MG103-03   | MG103-04    | MG103-05    |
| Core cutter                        | SU107-01  | SU107-02   | SU107-03   | SU107-04    | SU107-05    |
| Dolly for extraction               | SU107-11  | SU107-12   | SU107-13   | SU107-14    | SU107-15    |

**SU480-10**  
**THREE-CELLS CONSOLIDATION FRAME**

ASTM D4767 | D7181 | BS 1377:8 | CEN-ISO/TS 17892-9

This apparatus has been designed to reduce the testing time for triaxial tests when only one compression machine is available. With this equipment it is possible to perform the consolidation stage of three triaxial specimens at the same time for CU and CD tests under anisotropic conditions.

The apparatus consists of a steel bench complete with three load frames and centering platens, which fit any of our triaxial cells for specimens from 38 to 100 mm diameter. Each consolidation frame can be equipped with a beam loading device to reduce the number of dead weights required for anisotropic consolidation.

Weights can be placed on both the centre hanger and on the lever hanger. The apparatus has to be completed with vertical displacement gauges or transducers (which connect to data acquisition and processing systems for soil mechanics), and slotted weights and pressure system for cell and back pressure.

**Dimensions:** 2300x400x1800 mm  
**Weight:** 150 Kg



SU480-10

**ACCESSORIES**

- SU450-05  
Set of slotted weights 50 kg
- MG010-53  
Dial gauge 25x0,01 mm for specimens of max. 50x100 mm
- MG010-55  
Dial gauge 50x0,01 mm for specimens of max. 70x140 mm
- MG010-31  
Displacement transducer 25 mm travel
- MG010-32  
Displacement transducer 50 mm travel

**VOLUME CHANGE SYSTEMS**

To measure volume changes during testing, we offer two systems.

**SU487**  
**DOUBLE BURETTE VOLUME CHANGE APPARATUS**

This apparatus has two measurement tubes consisting of a burette mounted internally and an acrylic tube externally. The burette tubes are connected directly to a reversing valve system, which is used to reverse the direction of travel of the interface in the measurement tubes without affecting the direction of flow of water to or from the triaxial cell. The unit also includes a by-pass valve system when volume change measurement is not required.

**Dimensions:** 230x270x860 mm  
**Weight:** 5 Kg



SU487

**SU489**  
**AUTOMATIC VOLUME GAUGE**

This apparatus measures change in sample volume by providing an electrical signal directly proportional to the volume of water flowing through the unit. The apparatus comprises a piston connected to a 25 mm linear potentiometric transducer, sealed against a precision-machined calibration chamber so that the linear movement of the piston is exactly proportional to the volume of water in the calibration chamber. The apparatus has a front control panel with a reversing valve system to measure the water flow in both directions.

**Dimensions:** 360x270x210 mm  
**Weight:** 7,6 Kg



SU489

**PRESSURE SYSTEMS**

At Proeti we offer several different systems to supply controlled pressures to triaxial systems

**SU491**

**OIL/WATER PRESSURE APPARATUS**

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

This unit provides a hydraulic pump, honed piston/spring assembly, cylindrical oil/water interchange vessel, pressure gauge, valves and high viscosity oil.

To be noted that the maximum tolerable pressure in the cell is 1700 kPa.

**Power supply:** 230 V | 50 Hz  
**Dimensions:** 320x320x410 mm  
**Weight:** 20 Kg



SU491

**SU493**

**AIR/WATER BLADDER PRESSURE SYSTEM**

Used to deliver pressurized water up to 1700 kPa to triaxial cells via the pressure distribution panels.

The main advantages of using this apparatus are:

- High degree of accuracy
- Extremely simple to operate
- Future expansion of system very easy and low cost
- Large reservoir for long term tests and large samples

The device requires to be connected to an air compressor.

**Dimensions:** Ø160x380 mm  
**Weight:** 3 Kg



SU493

**ACCESSORIES**

**SU490-01**

De-airing tank 20 L

It produces de-aired water when connected to the vacuum pump. It is a perspex tank with an inlet water valve and an outlet air valve.

**Dimensions:**  
 320x320x520 mm  
**Weight:**  
 15 Kg

SU490-01



**MG741**

Vacuum pump 0,1 mbar

**MG740-01**

Vacuum regulator with with vacuum gauge, control valve, suction filter and moisture trap

**MG740-02**

Rubber tube 3 m for vacuum

**MG753**

Laboratory air compressor 10 bar



MG741

**SU490-02**

**DIAL GAUGE UNITS 4 VALVES 1700 KPA**

44 inlet/outlet null displacement valves are supplied with the dial gauge.

Used to measure water pressure as cell pressure or pore pressures.

**Pressure range:** 0-1700 kPa  
**Dimensions:** 410x350x110 mm  
**Weight:** 6 Kg



SU490-02

**SU490-03**

**SCREW PUMP**

It has to be connected to the pressure dial gauge unit and it is used to control water pressures by means of small screw rotations. It can decrease or increase pressures as required.

**Weight:** 3 Kg



SU490-03

**SU490-04**

**DISTRIBUTION UNIT**

The device consist of 5 inlet/outlet valves with null variation of volume connected to an aluminium support. It is used to deliver pressurized water to different lines.

**Dimensions:**  
 200x200x55 mm  
**Weight:**  
 3 Kg



SU490-04

SU490-05

**SU490-05**

Bi-directional distribution valve for air or water

**SU495**

**2 WAYS PRESSURE PANEL**

This pressure panel is designed to distribute the water pressure used in laboratory applications.

The panel is constituted by two pressure lines fitted with high accurate regulators and pressure valves.



SU495

**SU497**

**3 WAYS PRESSURE PANEL**

Identical to the SU495 but fitted with three pressure lines.

**SU499**

**4 WAYS PRESSURE PANEL**

Identical to the SU495 but fitted with four pressure lines.

**ACCESSORY**

**SU495-01**

Digital manometer 1 kPa to be connected on pressure panels

**CONFIGURATION OF THE TRIAXIAL:  
PRESSURE PANEL AND AIR/WATER BLADDERS**

Beside is shown typical configurations of systems to perform triaxial tests:

TRIAXIAL FRAME

- SU481
- Soilmatic triaxial machine 50 kN
- MG020-04
- Load cell 20 kN
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-84
- Small horizontal coupling device for TR transducers
- MG010-11
- Pressure transducer 1000 kPa
- MG010-29
- De-airing block

VOLUME CHANGE AND PRESSURE SYSTEMS

- SU489
- Automatic volume change apparatus
- SU497
- 3-ways pressure panel
- SU490-02
- Dial gauge units 4 valves 1700 kPa
- SU493
- Air-water bladders cylinders (3 pieces required)
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum
- MG753
- Laboratory air compressor 10 bar

TRIAXIAL CELL AND ACCESORIES FOR Ø50 MM SAMPLES

- SU485
- Triaxial cell 1700 kPa
- SU485-50
- Pedestal for samples Ø50 mm
- SU485-51
- Top cap for samples Ø50 mm
- SU485-52
- Porous disc (2 pieces) for samples Ø50 mm
- SU485-54
- Rubber membranes (10 pieces) for samples Ø50 mm
- SU485-55
- "O" Rings (10 pieces) for samples Ø50 mm
- SU485-56
- Membrane tensioner for samples Ø50 mm
- SU485-57
- "O" Rings placing tool for samples Ø50 mm
- SU485-58
- Split sand former for sample Ø50x100 mm
- SU485-59
- Split mould for sample Ø50x100 mm
- MG101-02
- Lateral filter drains (50 pieces) for samples Ø50 mm
- MG103-02
- Filter paper for base (100 pieces) for samples Ø50 mm
- SU107-02
- Die ring for samples Ø50 mm
- SU107-12
- Extractor tamper for samples Ø50 mm

CONTROL, SOFTWARE AND ADQUISITION DATA

- MG031
- Custom computer
- SU480-95
- Software for triaxial tests



**SU501  
AUTOMATIC PRESSURE/VOLUME CONTROLLER**

R&D Proeti department is constantly investing and developing for maximizing laboratories productivity. For this reason, we developed an advanced solution for geotechnical laboratories demanding automatic pressure and volume control.

The pressure/volume controllers are used to:  
 -Confining pressure  
 -Back pressure  
 -Pore pressure  
 -Volume change

The device consist of a stainless steel volumen/pressure controller contained in a painted metal sheet structure with a perpeX protective enclosure.

Providing very high versatility and flexibility by allowing to upgrade the older systems or by adding additional units to the current systems through an economical investment.

Standard effective stress tests require 2 controllers: one for cell pressure and the other for back pressure which can be also used to measure the volume change.

PC controlled eliminate or reduce to the absolute minimum any forms of manual intervention.



**SU501**

Supplied with 1000 kPa pressure transducer.  
 No air compressor is required.

**Output pressure:** 3500 kPa (5000 kPa available on request)  
**Volume capacity:** 300 cc (1000 cc available on request)  
**Pressure resolution:** 0,1 kPa  
**Power supply:** 240 V | 50 - 60 Hz  
**Dimensions:** 900x110x230 mm  
**Weight:** 7 Kg

**SU503  
2 WAYS COMPUTERIZED  
PRESSURE/VOLUME CONTROLLER**

By purchasing this 2 ways computerized controller your laboratory obtain a complete triaxial system to perform:

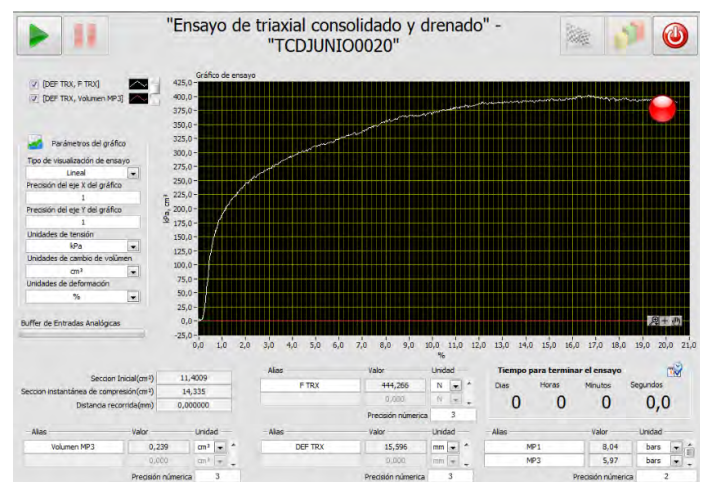
- UU
- CU
- CD
- Saturation
- Consolidation

Composed by 2 stainless steel volumen/pressure controller contained in a painted metal sheet structure with a perpeX protective enclosure.

The controller allows to perform fully automated all the test above mentioned by a PC control avoiding any user interventions to increase the laboratory productivity.

Supplied with two 1000 kPa pressure transducers.

**Output pressure:** 3500 kPa (5000 kPa available on request)  
**Volume capacity:** 300 cc (1000 cc available on request)  
**Pressure resolution:** 0,1 kPa  
**Power supply:** 240 V | 50 - 60 Hz  
**Dimensions:** 1030x460x500 mm  
**Weight:** 86 Kg



**SU503**

**SU505**  
**3 WAYS COMPUTERIZED**  
**PRESSURE/VOLUME CONTROLLER**

3 ways computerized pressure/volume controller has been dedicated developed by the geotechnical experts to perform fully automated pressure and volume change control.

The equipment consist of 3 stainless steel volumen/pressure controllers enclosed in the top of a robust painted metal sheet cabinet with a 10 liters water tank inside.

Perpex protective cover which also can be used as a desk to ensure a full traceability of the test. Include an articulated holding device for computer screen to make an easier visualization and controlling of the program.

There is a wheel kit at the bottom of the cabinet for an easy displacement of the 3 computerized controller device in the laboratory.

By purchasing this 3 ways computerized controller your laboratory will increase the versatility and productivity. Allows to saturate a post tested specimen and perform a triaxial test at the same time reducing costs and time. The 3 ways controller also can perform permeability tests.

Supplied with three 1000 kPa pressure transducers.

- Output pressure:** 3500 kPa (5000 kPa available on request)
- Volume capacity:** 300 cc (1000 cc available on request)
- Pressure resolution:** 0,1 kPa
- Power supply:** 240 V | 50 - 60 Hz
- Dimensions:** 850x600x950 mm
- Weight:** 135 Kg



**SU507** **SU505**  
**4 WAYS COMPUTERIZED**  
**PRESSURE/VOLUME CONTROLLER**

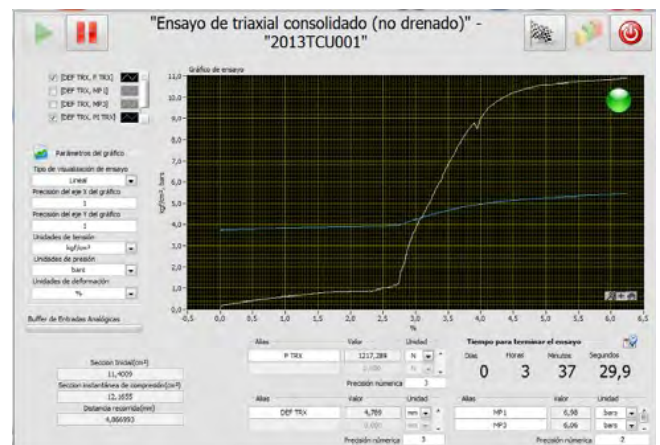
This equipment is practically identical to 3 ways model but with 4 stainless steel volumen/pressure controllers enclosed increasing further the versatility and productivity. aumentando aún más la versatilidad y productividad del equipo y el laboratorio.

**Weight:** 155 Kg

**SOFTWARE**

Advanced software developed by Soilmatic brand for continuously controlling and monitoring execution of tests. PID controller allows to the software reaching a high accuracy pre-set pressure parameters.

Soilmatic software provides the user with a simple and flexible graphical interface. It can be connected to one or more pressure controllers and testing machines allowing automatic data acquisition and control during the test.



- A menú composed by different specific windows - allows the user to introduce the test parameters in a easy and clear way:
- Main window: to create define and edit tests
  - Data window: to register and unsubscribe specimens
  - Support window: to register and calibrate measuring sensors
  - Test window: to perform, visualize and graphic tests

Soilmatic soil software allows up to 24 units (machines or pressure controllers) can be connected to the same PC providing geotechnical laboratories with a powerful tool to control single or multiple units at choice.

All readings are graphed in real time during the test by a PC database system for further processing.

In any moment all the tests made are available to make an analysis of the results or to print their certificate.

**ACCESORY**

- MG031**
- Custom computer
- Including keyboard, mouse, connection cables,
- installation and setting up of the purchased software.



**TRIAXIAL SYSTEM WITH A PRESSURE/VOLUME CONTROLLER (QUICK TRIAXIAL - UU)**

TRIAXIAL FRAME

- SU481
- Soilmatic triaxial machine 50 KN
- MG020-04
- Load cell 20 kN
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-84
- Small horizontal coupling device for TR transducers

PRESSURE SYSTEM

- SU501
- Automatic pressure/volume controller
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum

CONTROL, SOFTWARE AND ADQUISITION DATA

- MG031
- Custom computer
- SU480-95
- Software for triaxial tests

TRIAXIAL CELL AND ACCESORIES FOR Ø38 MM SAMPLES

- SU485
- Triaxial cell 1700 kPa
- SU485-30
- Pedestal for samples Ø38 mm
- SU485-31
- Top cap for samples Ø38 mm
- SU485-32
- Porous disc (2 pieces) for samples Ø38 mm
- SU485-34
- Rubber membranes (10 pieces) for samples Ø38 mm
- SU485-35
- "O" Rings (10 pieces) for samples Ø38 mm
- SU485-36
- Membrane tensioner for samples Ø38 mm
- SU485-37
- "O" Rings placing tool for samples Ø38 mm
- SU485-38
- Split sand former for sample Ø38x100 mm
- SU485-39
- Split mould for sample Ø38x100 mm
- MG101-01
- Lateral filter drains (50 pieces) for samples Ø38 mm
- MG103-01
- Filter paper for base (100 pieces) for samples Ø38 mm
- SU107-01
- Die ring for samples Ø38 mm



**TRIAXIAL SYSTEM WITH TWO PRESSURE/VOLUME CONTROLLERS (UU-CD-CU)**

TRIAXIAL FRAME

- SU481
- Soilmatic triaxial machine 50 KN
- MG020-04
- Load cell 20 kN
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-84
- Small horizontal coupling device for TR transducers
- MG010-11
- Pressure transducer 1000 kPa
- MG010-29
- De-airing block

VOLUME CHANGE AND PRESSURE SYSTEMS

- SU501
- Automatic pressure/volume controller
- SU501
- Automatic pressure/volume controller
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum

TRIAXIAL CELL AND ACCESORIES FOR Ø50 MM SAMPLES

- SU485
- Triaxial cell 1700 kPa
- SU485-50
- Pedestal for samples Ø50 mm
- SU485-51
- Top cap for samples Ø50 mm
- SU485-52
- Porous disc (2 pieces) for samples Ø50 mm
- SU485-54
- Rubber membranes (10 pieces) for samples Ø50 mm
- SU485-55
- "O" Rings (10 pieces) for samples Ø50 mm
- SU485-56
- Membrane tensioner for samples Ø50 mm
- SU485-57
- "O" Rings placing tool for samples Ø50 mm
- SU485-58
- Split sand former for sample Ø50x100 mm
- SU485-59
- Split mould for sample Ø50x100 mm
- MG101-02
- Lateral filter drains (50 pieces) for samples Ø50 mm
- MG103-02
- Filter paper for base (100 pieces) for samples Ø50 mm
- SU107-02
- Die ring for samples Ø50 mm
- SU107-12
- Extractor tamper for samples Ø50 mm

CONTROL, SOFTWARE AND ADQUISITION DATA

- MG031
- Custom Computer
- SU480-95
- Software to perform triaxial tests





**TRIAXIAL SYSTEMS WITH 2 WAYS COMPUTERIZED PRESSURE/VOLUME CONTROLLER**

TRIAXIAL FRAME

- SU481
- Soilmatic triaxial machine 50 KN
- MG020-04
- Load cell 20 kN
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-84
- Small horizontal coupling device for TR transducers
- MG010-11
- Pressure transducer 1000 kPa
- MG010-29
- De-airing block

VOLUME CHANGE AND PRESSURE SYSTEMS

- SU503
- 2 ways computerized pressure/volume controller
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum

CONTROL, SOFTWARE AND ADQUISITION DATA

- MG031
- Custom Computer
- SU480-95
- Software for triaxial tests

TRIAXIAL CELL AND ACCESORIES FOR Ø50 MM SAMPLES

- SU485
- Triaxial cell 1700 kPa
- SU485-50
- Pedestal for samples Ø50 mm
- SU485-51
- Top cap for samples Ø50 mm
- SU485-52
- Porous disc (2 pieces) for samples Ø50 mm
- SU485-54
- Rubber membranes (10 pieces) for samples Ø50 mm
- SU485-55
- "O" Rings (10 pieces) for samples Ø50 mm
- SU485-56
- Membrane tensioner for samples Ø50 mm
- SU485-57
- "O" Rings placing tool for samples Ø50 mm
- SU485-58
- Split sand former for sample Ø50x100 mm
- SU485-59
- Split mould for sample Ø50x100 mm
- MG101-02
- Lateral filter drains (50 pieces) for samples Ø50 mm
- MG103-02
- Filter paper for base (100 pieces) for samples Ø50 mm
- SU107-02
- Die ring for samples Ø50 mm
- SU107-12
- Extractor tamper for samples Ø50 mm



SU490-01



SU503



SU485-50...SU107-12



SU481

MG020-04



MG031



SU485

**TRIAXIAL SYSTEMS WITH 4 WAYS COMPUTERIZED PRESSURE/VOLUME CONTROLLER**

TRIAXIAL PRESS

- SU481
- Soilmatic triaxial machine 50 KN
- MG020-04
- Load cell 20 kN
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-84
- Small horizontal coupling device for TR transducers
- MG010-11
- Pressure transducer 1000 kPa
- MG010-29
- De-airing block

VOLUME CHANGE AND PRESSURE SYSTEMS

- SU507
- 4 ways computerized pressure/volume controller
- SU493
- Air-water bladders cylinders (3 pieces)
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum

TRIAXIAL CELL AND Ø50 MM ACCESORIES

- SU485
- Triaxial cell 1700 kPa
- SU485-50
- Pedestal for samples Ø50 mm
- SU485-51
- Top cap for samples Ø50 mm
- SU485-52
- Porous disc (2 pieces) for samples Ø50 mm
- SU485-54
- Rubber membranes (10 pieces) for samples Ø50 mm
- SU485-55
- "O" Rings (10 pieces) for samples Ø50 mm
- SU485-56
- Membrane tensioner for samples Ø50 mm
- SU485-57
- "O" Rings placing tool for samples Ø50 mm
- SU485-58
- Split sand former for sample Ø50x100 mm
- SU485-59
- Split mould for sample Ø50x100 mm
- MG101-02
- Lateral filter drains (50 pieces) for samples Ø50 mm
- MG103-02
- Filter paper for base (100 pieces) for samples Ø50 mm
- SU107-02
- Die ring for samples Ø50 mm
- SU107-12
- Extractor tamper for samples Ø50 mm

CONTROL, SOFTWARE AND ADQUISITION DATA

- MG031
- Custom Computer
- SU480-95
- Software for triaxial tests



**SU550 SOILMATIC 3-FRAMES TESTING MACHINE**

R&D Proeti department is constantly investing and developing proprietary technologies and innovative products.

We give here some example of machine based on the innovative philosophy Soilmatic developed by Proeti over recent years, our Soilmatic Three-Frames. Adopting this multi-frame concept maximizes laboratory productivity.

With this advanced apparatus, your laboratory will obtain an unique fully automatic tester to perform with high accuracy, all the most important loading and unloading tests.

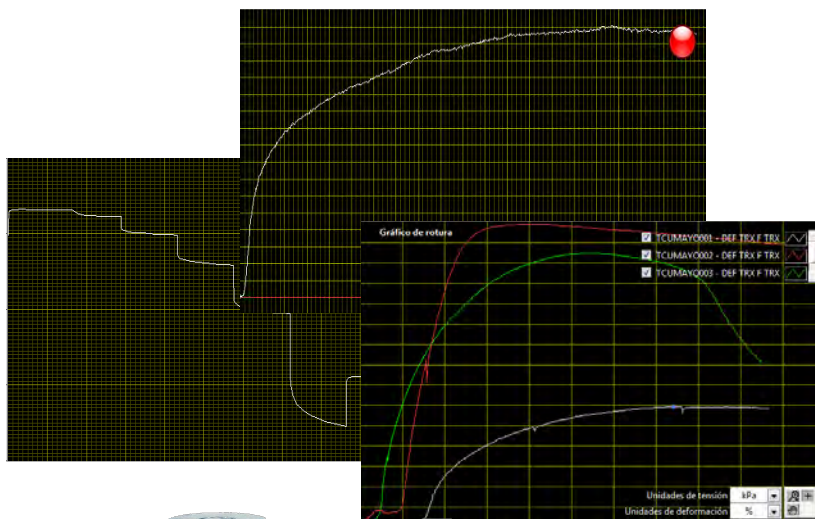
Soilmatic technology has been created to eliminate or reduce to the absolute minimum any forms of manual intervention, which any test requires. This therefore results in greater efficiency and cost effectiveness.

It consists of a chassis housing three high precision independent electromechanical systems which assure smooth application of load at constant speed. Ideal solution for laboratories that need to perform a wide range of tests.

This testing machine of high performance and advanced solutions is equipped with top quality components. Automatic measurement of the displacement by an encoder fitted in the servomotor and its advanced technology provides large flexibility in conducting tests.

Soilmatic three-places multiframe is equipped with three fully customizable test areas to suit a large range of testing applications. The possibility to customize the frames gives to the operator ultimate flexibility and versatility.

Ideal solution for advanced and research laboratories that require high productivity and high quality testing and for small laboratories that need a very versatile machine suitable to perform a wide range of tests.



**SU550**

Fully computerized system controlled by only one PC which its software enables to the machine automatically perform up to 3 entire and independent tests at the same time, from start to finish, without any human intervention.

The wide range of configurations, may cause, sometimes, doubts in the selection of the appropriate model. For this reason, in order to steer our client into the best solution for the requested application, we summarize, hereunder, the main frames for configuring the Soilmatic 3-frames:

- TRIAXIAL
- OEDOMETER
- MINI OEDOMETER
- CBR

Accessories and software for specific tests are not included that must be ordered separately.

**ACCESORIES**

SU550-01  
Bench to hold Soilmatic multiframe

SU550-02  
Kit of wheels with brake for bench

MG031  
Custom computer  
Includes installation of user-purchased software, keyboard, mouse, and connecting cables.



**SU550-01**

**SOILMATIC 3-FRAMES MACHINE CONFIGURATIONS:**

**SU551  
TRIAXIAL FRAME CONFIGURATION**

Triaxial configuration includes:

- SU551-01
- Triaxial frame
- MG020-04
- Electric load cell 20 kN
- SU480-02
- Loading piston with ball joint
- MG010-35
- Displacement transducer "TR type" 50 mm travel
- MG010-83
- Mounting bracket to fit transducers
- MG010-11
- Pressure transducer 1000 kPa
- MG010-29
- De-airing block
- SU480-95
- Software for triaxial tests

**SU553  
OEDOMETER FRAME CONFIGURATION**

Oedometeric frame configuration includes:

- SU553-01
- Oedometer frame
- MG020-03
- Load cell 10 kN
- MG010-38
- Displacement transducer "LVDT type" 10 mm travel
- MG010-84
- Horizontal mount for LVDT transducer
- SU450-95
- Software for consolidation tests

**SU555  
HIGH CAPACITY OEDOMETER CONFIGURATION**

High capacity Oedometer configuration includes:

- SU555-01
- High capacity Oedometer frame
- MG020-06
- Load cell 50 kN
- SU450-06
- Attachment for measuring on the top of consolidation cell
- MG010-38
- Displacement transducer "LVDT type" 10 mm travel
- MG010-86
- Vertical mount for LVDT transducer
- SU450-95
- Software for consolidation tests

**SU557  
CBR FRAME CONFIGURATION**

CBR configuration includes:

- SU557-01
- CBR test frame
- MG020-06
- Load cell 50 kN
- SU320-01
- CBR loading piston
- MG010-32
- Displacement transducer 50 mm travel
- MG010-82
- Device to fix the displacement transducer
- MG030-41
- Software for CBR test



**SOIL PERMEABILITY TEST**

ASTM D5084 | BS 1377:6 | CEN-ISO/TS 17892:11

The permeability test is designed for measuring the hydraulic conductivity (coefficient of permeability) of water saturated porous materials.

The following configurations are intended as a practical guide for the most typical and common configurations, limited to the part required for the main components, to cover different type of permeability tests.



**SYSTEM FOR PERMEABILITY TESTS**

The system consists of a number of parts and accessories required for a system performing triaxial permeability tests on 70 mm diameter samples.

However, the test can be performed with other sample diameters by substituting the items that are sample size dependent with those of the required size.

- SU485  
Triaxial cell 1700 kPa
- SU485-70  
Pedestal for samples Ø70 mm
- SU485-71  
Top cap for samples Ø70 mm
- SU485-72  
Porous disc (2 pieces) for samples Ø70 mm
- SU485-74  
Rubber membranes (10 pieces) for samples Ø70 mm
- SU485-75  
"O" Rings (10 pieces) for samples Ø70 mm
- SU485-76  
Membrane tensioner for samples Ø70 mm
- SU485-77  
"O" Rings placing tool for samples Ø70 mm
- SU485-78  
Split sand former for sample Ø70x100 mm
- SU485-79  
Split mould for sample Ø70x100 mm
- MG101-03  
Lateral filter drains (50 pieces) for samples Ø70 mm
- MG103-03  
Filter paper for base (100 pieces) for samples Ø70 mm

- SU107-03  
Die ring for samples Ø70 mm
- SU107-13  
Extractor tamper for samples Ø70 mm
- MG010-29  
De-airing block (2 pieces required)
- SU487  
Double burette volume change apparatus
- SU497  
3-ways pressure panel
- SU490-02  
Dial gauge units 4 valves 1700 kPa
- SU493  
Air-water bladders cylinders (3 pieces required)
- SU490-01  
De-airing tank 20 L
- MG741  
Vacuum pump 0,1 mbar
- MG740-01  
Vacuum regulator
- MG740-02  
Rubber tube 3 m for vacuum (2 pieces required)
- SU485-05  
Silica gel 1 Kg
- MG753  
Laboratory air compressor 10 bar

**AUTOMATED SYSTEM FOR PERMEABILITY TESTS**

BS1377: PART 6 | ASTM DS5084-10 METHODS A & D

This configuration is for the automatic control of permeability stages. This system basically is a 3 ways pressure/volume Soilmatic controller in place of automatic volume change apparatus and 3-ways pressure panel.

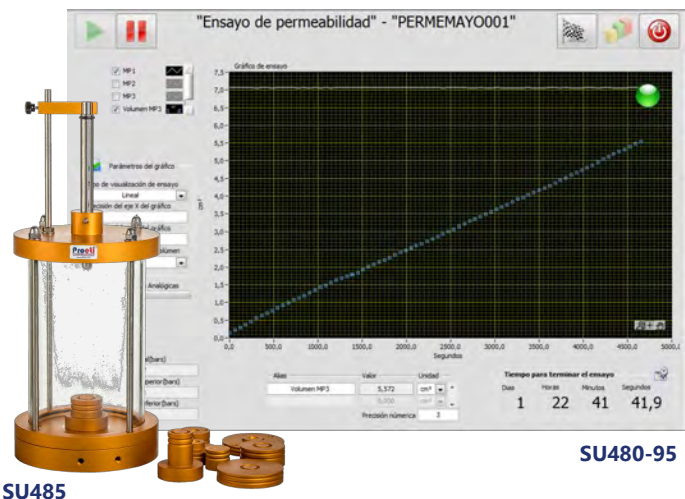
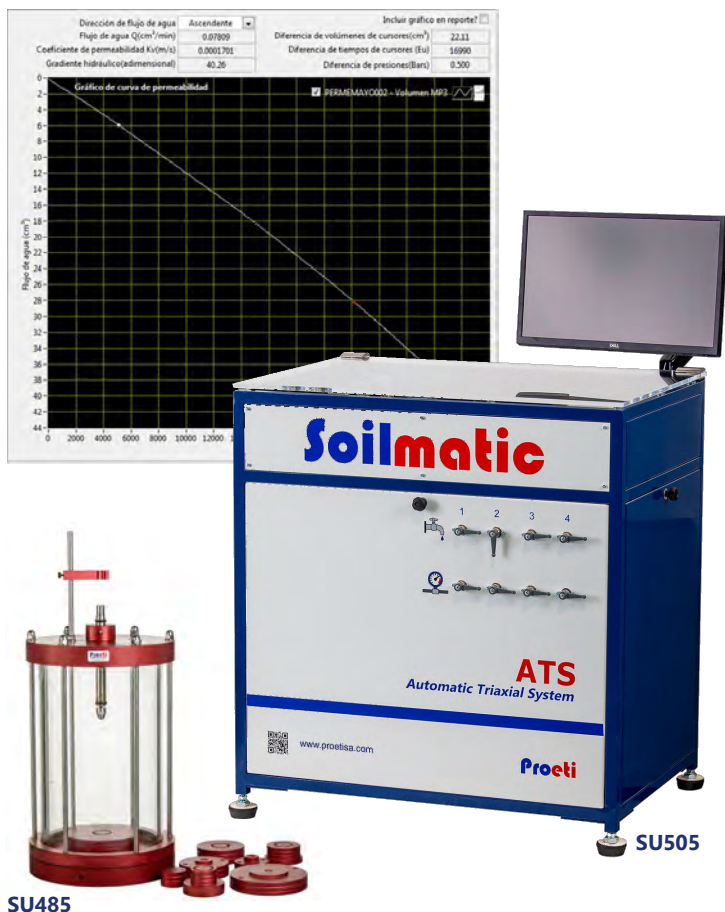
Soilmatic pressure/volumen controllers allow to perform permeability test on geosynthetic walls and soils with high reliability and accuracy. The system measures permeabilities of cohesive soils varying from  $10^{-4}$  cc/sec to  $10^{-9}$  cc/sec.

On soils the measurements include:

- Basic pressure
- Permeability under a constant hydraulic gradient

On flexible geosynthetic walls test the Soilmatic 3 ways automatically controls the pressure at cell, the bottom and the top of the sample. Also indicating the temperature.

The software gives the possibility to program automatically customized sequences to saturate the sample. Graphical test data can be displayed on separate graphs in real time. Data processing and reporting by quickly and easily importing test data.



SU485

SU480-95

The system consists of a number of parts and accessories required for a system performing triaxial permeability tests on 100 mm diameter samples.

- SU485
- Triaxial cell 1700 kPa
- SU485-80
- Pedestal for samples Ø100 mm
- SU485-81
- Top cap for samples Ø100 mm
- SU485-82
- Porous disc (2 pieces) for samples Ø100 mm
- SU485-84
- Rubber membranes (10 pieces) for samples Ø100 mm
- SU485-85
- “O” Rings (10 pieces) for samples Ø100 mm
- SU485-86
- Membrane tensioner for samples Ø100 mm
- SU485-87
- “O” Rings placing tool for samples Ø100 mm
- SU485-88
- Split sand former for sample Ø100x100mm
- SU485-89
- Split mould for sample Ø100x100 mm
- MG101-04
- Lateral filter drains (50 pieces) for samples Ø100 mm
- MG103-04
- Filter paper for base (100 pieces) for samples Ø100 mm
- SU107-04
- Die ring for samples Ø100 mm
- SU107-14
- Extractor tamper for samples Ø100 mm
- MG010-29
- De-airing block (2 pieces required)
- SU505
- 3 ways computerized pressure/volume controller
- SU490-01
- De-airing tank 20 L
- MG741
- Vacuum pump 0,1 mbar
- MG740-01
- Vacuum regulator
- MG740-02
- Rubber tube 3 m for vacuum (2 pieces required)
- SU485-05
- Silica gel 1 Kg
- MG031
- Custom computer
- SU480-95
- Software for permeability tests

**CYCLIC TRIAXIAL AUTOMATED SYSTEM**

ASTM D7181, D2850, D3999, D4767, D5311  
BS 1377:7, 1377:8 | AASHTO T307-9

Dynamic properties of soils such as stress-strain characteristics have been recognized a very important part of many aspects of construction design as maritime, seismic engineering, placement of foundations of machines or structures subjected to different dynamic interactions.

The correct description of the soil behavior within the range of small deformations is also an extremely important element in the prediction of the movement of structures cooperating with subsoil, and thus has a great impact on the quality of the actual mapping of the internal forces in the structural system of the whole building, including foundations.

Stiffness modules for very small deformations are now recognized as fundamental properties of the soil. For this reason, in geotechnical engineering we commonly use information obtained from laboratory and field dynamic and seismic tests to solve also conventional problems of interaction between the building and the subsoil.

The Automated Cyclic Triaxial with its innovative features represents the most ideal solution for modern laboratories that need to investigate the effects of vibration and dynamic loading for soil and unbound granular materials.

Based on the 4 axis control and 16 channels control and data acquisition. Fully configurable to suit a large range of testing applications including maximum shear modulus calculation through bender elements option.

- Typical applications include:
- Civil engineering including seismic and blasting analysis
  - Environmental engineering
  - Construction and architectural design
  - Advanced research on soils

**Vertical/compression load tension:** up to 9 kN  
**Maximum vertical daylight:** 50 mm  
**Maximum cell pressure:** 2000 KPa  
**Maximum back pressure:** 2000 KPa



**CYCLIC TRIAXIAL SYSTEM CONFIGURATION**

**FRAME AND TRIAXIAL CELL**

**SU521**  
 Load frame 20 kN  
 With a manual crosshead 9 kN servo-pneumatic actuator with its LVDT 50 mm stroke.

**Power supply:** 90-264 V | 50-60 Hz | 240 W  
**Dimensions:** 400x470x1262 mm  
**Weight:** 80 Kg



**SU525**  
 Triaxial cell Ø150x300 mm  
**Max pressure:** 2200 kPa  
**Dimensions:** Ø338x648 mm  
**Weight:** 40 Kg

- SU525-01 Submersible load cell 10 kN
- SU525-02 Loading ram for submersible cell
- SU525-03 Transducers holder ring
- SU525-04 Vacuum generator
- SU525-05 Vacuum adaptor
- SU525-06 Alignment coupler assembly
- SU525-07 Spherical exclusion
- SU525-08 Base Pedestal spacer

**PRESSURE SYSTEMS**

**SU501**  
 Pressure/volume controller 1 way (2 pieces required)  
**Output pressure:** 3500kPa  
**Volume capacity:** 250cc

- MG010-12 Pressure transducer 2000 kPa (2 pieces required)
- MG010-28 De-airing block for pressure transducer (2 pieces required)
- SU521-02 Solenoid valve (2 pieces required)
- SU497 3 way distribution panel
- SU495-01 Digital manometer 1 kPa

- SU490-01 De-airing tank 20 L
- MG741 Vacuum pump 0,1 mbar
- MG740-01 Vacuum regulator
- MG740-02 Rubber tube for vacuum 3 m
- SU521-03 Air reservoir assembly with membrane dryer
- MG753 Laboratory air compressor 10 bar



**SU521-03**

**CONTROL, SOFTWARE AND DATA MANAGEMENT**

**MG031**  
 Custom computer  
**SU521-90**  
 16 channels control system and data acquisition  
**SU521-91**  
 Software for cyclic triaxial tests



**MG031**

**SU521-91**

**SU521-90**

**BENDER ELEMENTS KIT FOR MEASUREMENT OF THE MAXIMUM SHEAR MODULUS**

- SU525-11 Picoscope
- SU525-12 T-4001 waveforms transformer
- SU525-13 Universal puck for Bender elements top
- SU525-14 Universal puck for Bender elements bottom

- SU525-31 Base pedestal for Bender element Ø38 mm
- SU525-32 Top platen for Bender element Ø38 mm
- SU485-32 Pair of porous disc Ø38 mm

- SU525-51 Base pedestal for Bender element Ø50 mm
- SU525-52 Top platen for Bender element Ø50 mm
- SU485-52 Pair of porous disc Ø50 mm

- SU525-71 Base pedestal for Bender element Ø70 mm
- SU525-72 Top platen for Bender element Ø70 mm
- SU485-72 Pair of porous disc Ø70 mm

- SU525-81 Base pedestal for Bender element Ø100 mm
- SU525-82 Top platen for Bender element Ø100 mm
- SU485-82 Pair of porous disc Ø100 mm