CFU
INTERNATIONAL TRADE
& SERVICES INC.

Soil
Testing Equipments

Cfu Soil Testing Equipments are used for understanding and investigating the physical/mechanical properties, critical characteristic behaviors, performance of soil, unbound and hydraulically bound mixtures during compression, shear or inner liquid flow under dynamic and vibrating loading conditions. Soil characteristics are also used for deciding the most suitable method for excavating underground tunnels.

Every man-made structure needs a foundation that will resist to the exposed forces, such as live loads, dead loads and wind loads . The soil tests provide the engineering firms and construction companies with the ability to predict the mechanical behavior of soils in order to design foundations that ensure resistance to forces likely to act upon it, including any unusual / extreme events such as earthquakes or hurricanes, thus providing a safe environment for people in or around the structures.

In the soil section, CFU Testing Equipment is basically grouped in six main headings

- Field Inspection and Sampling
- Laboratory Testing/Specimen Preparation
- Soil Classification Tests
- Soil Mechanic Tests
- Compacted Road Base and Sub-Base Soils Tests
- Soil Permability and Dispersibility
- Advanced Soil Testing Systems

CONTENTS

SOIL SAMPLING

Product Code

CFS-0005 Augers Power Head
CFS-0008 Single Flute Bit Ø:80x1000 mm
CFS-0010 Single Flute Bit Ø:100x1000 mm
CFS-0015 Single Flute Bit Ø:150x1000 mm
CFS-0020 Single Flute Bit Ø:200x1000 mm

Standards

ASTM D420, D1452; AASHTO T86, T202; CNR a. VI n.25

Used in conjunction with sampling tubes to obtain disturbed or undisturbed soil samples. The flute bits with 80-100-150-200 mm diameters should be ordered separately.

Product Code	Dimensions	Weight
CFS-0005	400x400x500 mm	10 kg
CFS-0008	150x150x1150 mm	1 kg
CFS-0010	200x150x1150 mm	2 kg
CFS-0015	200x150x1150 mm	3 kg
CFS-0020	200x150x1150 mm	4 kg

CFS-0005 Properties	
Motor Power	1,6 kW
Cylinder Volume	50,2 cc
Reduction Ratio	40:1

SOIL SAMPLING

Product Code

CFS-0024 Hand Operated Auger Boring Set
CFS-0026 Extension Rod for CFS-0024, 1 meter
CFS-0027 T-Handle with 1 m Rod
CFS-0028 Auger Head Set,
Ø:80 mm Ø:100 mm and Ø:150 mm

CFS-0024 Hand Boring and Sampling Set for augering down to a depth of 5 meters.

The CFS-0024 Hand Operated Auger Boring Set consists of a T-Handle with 1 m Rod, 1 m Extension Rod, 80 mm, 100 mm and 150 mm diameter Auger Heads.

Dimensions	1100x200x200 mm
Weight (approx.)	5 kg

WATER LEVEL

Product Code

CFS-0050 Water Level Indicator 50 m Cable Length
CFS-0052 Water Level Indicator 100 m Cable Length
CFS-0055 Water Level Indicator 150 m Cable Length
CFS-0058 Water Level Indicator 200 m Cable Length

The Water Level Indicators (Electric Contact Meters) are portable, easy-to-use and reliable instruments for measuring water level and total depth in bore holes, wells, observation pipes, reservoirs, as well as control of pumping tests.

As soon as the measuring probe electrode touches the water surface, the signal indicator on the instrument lights up with an audible alarm. The water level can be read on the measuring tape in meters (m) and centimeters (cm).

Technical Specifications

Measuring Range	50 m, 100 m, 150 m, 200 m
Sensitivity	100m cable length - smaller than 1 cm
Probe	Chromium-Nikel plated brass Standart Version:14mm dia. 140mm long Standart Version:10mm dia. 320mm long
Cable	Polyamide coated steel tape with transparent polyethylene covering over 2 tinned copper conductors on both sides of the steel strip.
Cable Metrics	Dimensions in millimeters (mm), centimeters (cm) and decimeters (dm) on the yellow steel strip are colored in black and meters (m) in red.
Cable Construction	Transparent, hard plastic and heat resistant.
Power Supply	3V DC, 2piece AA size pen battery. Each one 1.5V

Product Code	Dimensions	Weight
CFS-0050	250x250x250 mm (for all models)	3.4 kg (50 m)
CFS-0052		5.6 kg (100 m)
CFS-0055		6.8 kg (150 m)
CFS-0058		8.8 kg (200 m)

POCKET PENETROMETERS

Product Code

CFS-0070 Pocket Dial Penetrometer, 0-6 kgf/cm^2
CFS-0072 Pocket Dial Penetrometer, 0-14 kgf/cm^2
CFS-0075 Pocket Dial Penetrometer, 0-6, 0-11 kgf/cm^2
CFS-0078 Pocket Penetrometer, 0-5 kgf/cm^2

The CFS Series of Pocket Dial Penetrometers are ideal instruments to determine the penetration resistance of cohesive soil, especially when various range measurements are required.

CFS-0075 Pocket Dial Penetrometer with respect to range and plunger diameters is avaliable for specific applications.

All Dial Penetrometer models have 60 mm. Dial Diameter and designed with Peak Hold Feature.

CFS-0075 Pocket Dial Penetrometer is used for evaluating the angle of internal friction "j" of sandy soils and the cohesion "c" in clay soils. Dual scale: 0-6 kgf/cm^2 for 6.35 mm diameter plunger and 0-11 kgf/cm^2.

The CFS-0078 Pocket Penetrometer is a portable and easy-to-use equipment to perform field classification of cohesive soils in terms of consistency, shear strength and approximate unconfined compressive strength.

CFS-0070 / CFS-0072

CFS-0075

CFS-0078

Product Code	Range (kgf/cm^2)	Plunger Dia.	Dimensions	Weight (approx.)
CFS-0070	0-6	6.35	100x200x60 mm	0.5 kg
CFS-0072	0-14	6.35	100x200x60 mm	0.5 kg
CFS-0075	0-6, 0-11	6.35-10-15-20-25	100x200x60 mm	0.5 kg
CFS-0078	0-5	6.35	20x20x180 mm	0.5 kg

FIELD INSPECTION KIT

Product Code

CFS-0080 Field Inspection Testing Kit
CFS-0082 Field Inspection Pocket Vane Tester
CFS-0083 Extension Rod for CFS-0082
CFS-0084 Heavy Duty Pocket Penetrometer, 0-10 kgf/cm^2

Standards

ASTM D2573

The CFS-0080 Field Inspection Testing Kit is ideal for geotechnicians, geologists and agronomists. It consists of the CFS-0084 Pocket Penetrometer and of the CFS-0082 Field Inspection Pocket Vane Tester. The instrument is contained in a practical carrying case.

CFS-0080 Field Inspection Testing Kit	
Dimensions (packed)	240x210x50 mm
Weight approx.	1.8 kg

CFS-0080

The CFS-0082 Field Inspection Pocket Vane Tester is especially designed to measure the undrained shear strength (CU) of cohesive soils, consists of a cylindrical body with a torsional spring and three interchangeable vanes of different sizes used depending upon the expected strength of the soil. The height/diameter ratio of all vanes is 2. During operation the vane is driven for 5-6 cm into the soil and then turned with the handle. Deep measures (i.e. on the top of undisturbed samples) can be obtained using the extension rod. All stainless steel construction. Supplied in a plastic case. Extension rod should be ordered separately.

CFS-0082 Field Inspection Pocket Vane Tester	
Vane Dimensions (height x dia.)	32x16; 40x20, 50.8x25.4 mm
Measuring Range	0 to 240 kPa (0-24 N/cm^2)
Torque Value	5 N · m
Extension Rod	500 mm depth.
Overall Dimensions (assembled)	310x105 mm
Weight approx.	1.3 kg

CFS-0082

The CFS-0084 Heavy Duty Pocket Penetrometer is designed for making field classification of cohesive soils in terms of consistency, shear strength and approximate unconfined compressive strength. Heavy duty model is all stainless steel construction, three interchangeable tips: 4.5 mm dia. for very hard soil, 6.35 mm for medium and soft soil, 8.98 mm for soft soil. Supplied complete with plastic case.

CFS-0084 Heavy Duty Pocket Penetrometer	
Measuring Range	0 to 10 kgf/cm^2
Dimensions (assembled)	210 mm length x 20 mm dia.
Weight approx.	0.5 kg

CFS-0084

POCKET VANE TESTER

Product Code

CFS-0088 Pocket Shear Vane Device

The CFS-0088 Pocket Shear Vane Device is a practical equipment for determining the shear strength of cohesive soils. It is widely used to perform onsite measurements of excavations covering trenches and test pits, thin-wall or split core samples, by providing a quick and efficient method for shear strength measurements and it is also suitable for laboratory usage. Pocket Shear Vane Device is supplied in a plastic carrying case.

Vane Type	Range
Standard 25mm Diameter Vane	0 -10 N/cm^2
Sensitive Vane Adaptor	0 - 2 N/cm^2
High Capacity Vane Adaptor	0- 25 N/cm^2

Dimensions	240x210x50 mm
Weight (approx.)	1,5 kg

DYNAMIC CONE PENETROMETER

Product Code

CFS-0095 TRL Dynamic Cone Penetrometer (DCP)

Standards

ASTM D 6951

The CFS-0095 TRL Dynamic Cone Penetrometer is used for the rapid, in situ measurement of structural properties of existing road pavement constructed with unbound materials.

The design of the DCP is similar to that described by Kleyn, Maree and Savage (1982); it incorporates an 8 kg weight dropping through a height of 575 mm and 60° cone having a diameter of 20 mm. with the standard DCP measurements can be made down to a depth of approximately 850 mm or when extension shafts are used to a recommended maximum depth of 2 m.

Readings are usually taken after a set number of blows, changing the number according to the strength of the layer being penetrated. A typical test takes only a few minutes, therefore the instrument provides a very efficient method of obtaining information that would normally require the digging of test pits.

The penetration hammer assembly consists of 8 kg hammer, hammer shaft, anvil with plastic plate coupling for ruler and handle.

Dimensions	1200x350x200 mm
Weight (approx.)	30 kg

The TRL Dynamic Cone Penetrometer is supplied complete with

- A hammer assembly,
- Penetration rod,
- 2 piece 60° cone,
- Metal plate coupling for ruler,
- Segmented adaptor for extension rods,
- Segmented upper extension rod,
- Segmented lower extension rod,
- 2 piece 1317 mm AF spanners,
- 3mm AF hex wrench,
- Tommy bar,
- A bottle of adhesive,10cc,
- Users Manual
- Steel ruler,
- Carrying Case, heavy-duty wooden

MOISTURE CONTENT in THE FIELD

Product Code

CFS-0150 Universal Speedy Moisture Tester

CFS-0150 Universal Speedy Moisture Tester is used to determine the moisture content of soils, sand and fine aggregates in the field. It is an easy and portable method. The amount of gas, which is given off when water and calcium carbide are mixed and react, is directly proportional to the amount of water present in the sample and results in percentage moisture are taken from a pressure gauge.

The Universal Speedy Moisture Tester is supplied complete with;

- Calibrated pressure bottle with surface thermometer
- Mechanical manometer up to 1,6 bar direct reading of humidity for the weights 20g, 50g and 100g
- Steel ball set (Ø10 mm/3 pcs. and Ø5,5 mm/1 pcs.)
- Digital sample scale up to 200g
- 25 normed carbide ampoules with 11,5g calcium carbide according to DIN 18560-4
- Other measurement accessories
- Double-walled plastic case

Dimensions	390x370x150 mm (case)
Weight (approx.)	10 kg

MOISTURE CONTENT in THE FIELD

Product Code

CFS-0155 Speedy Moisture Tester

Standards

ASTM D4944; AASHTO T217

The CFS-0155 Speedy Moisture Tester is used to determine the moisture content of soils, sand and fine aggregates in the field. It is an easy and portable method. The amount of gas, which is given off when water and calcium carbide are mixed and react, is directly proportional to the amount of water present in the sample and results in percentage moisture are taken from a pressure gauge.

These model is used for moisture determination of a 20 g specimen with 20% maximum moisture content. CFS-0155 Speedy Moisture Tester does not include Calcium Carbide Powder

The Speedy Moisture Tester is supplied complete with;

- Vessel with Gauge
- Digital Scale
- Scoop
- Cleaning Brush
- Cleaning Cloth
- Two Steel Pulverizing Balls
- Plastic Case

Dimensions	510x380x200 mm (case)
Weight (approx.)	9 kg

EXTRUDING SOIL SAMPLES

Product Code

CFGE-0082 **Hand Operated Hydraulic Specimen Extruder, Vertical Type, 60 kN Capacity**

Standards

EN 13286-2, 13286-47, 12697-30; AASHTO T134, T180, T193, T245; ASTM D698, D1557, D1883, D1559; BS 1377-4, 1924-2, 598-107

The CFGE-0082 Hand Operated Hydraulic Extruder is designed for extruding specimens from 50 mm (2") to 125 mm (5") (outer dia.) shelby sample tubes and moulds such as proctor, CBR and marshall moulds. Also useful for sampling and removing uniaxial and triaxial test specimens to/from the cutters inner dia. from 38mm to 100 mm. The extruder has 60 kN extrusion force and 650 mm ram travel.
To remove the sample from the shelby tubes, adapter sets of different sizes in the table below should be ordered separately.

Supplied complete with;

- Adapter sets for Ø150 mm (1 ½") and Ø100 mm (4") inner dia. moulds
- Flanges and heads sets for Ø38 mm, Ø50 mm, Ø70 mm and 100 mm (only flange) inner dia. cutters.

The Hand Operated Hydraulic Extruder is supplied complete with;

- Adaptor sets for Ø100 mm (4") and Ø150 mm (6") inner dia. moulds

Dimensions	450x650x1650 mm (case)
Weight (approx.)	90 kg

For CFS-0082		
CFGE-0110	Adaptor Set for 2" (50,8 mm) Outer Dia Shelby Tubes.	Includes a ring with 48,5 mm ID. and an extruder head with Ø43,5 mm.
CFGE-0112	Adaptor Set for 2 ½" (63,5 mm) Outer Dia Shelby Tubes.	Includes a ring with 61 mm ID. and an extruder head with Ø56 mm.
CFGE-0114	Adaptor Set for 3" (75 mm) Outer Dia Shelby Tubes.	Includes a ring with 72 mm ID. and an extruder head with Ø67 mm.
CFGE-0116	Adaptor Set for 3 1/4" (83 mm) Outer Dia Shelby Tubes.	Includes a ring with 79,5 mm ID. and an extruder head with Ø74,5 mm.
CFGE-0118	Adaptor Set for 3 1/2" (88,9 mm) Outer Dia Shelby Tubes.	Includes a ring with 85 mm ID. and an extruder head with Ø80 mm.
CFGE-0120	Adaptor Set for 100 mm Outer Dia Shelby Tubes.	Includes a ring with 96 mm ID. and an extruder head with Ø91 mm.
CFGE-0122	Adaptor Set for Ø4" (101,6 mm) Outer Dia Shelby Tubes.	Includes a ring with 97,5 mm ID. and an extruder head with Ø92,5 mm.
CFGE-0124	Adaptor Set for 4 1/2" (114,3 mm) Outer Dia Shelby Tubes.	Includes a ring with 109 mm ID. and an extruder head with Ø104 mm.
CFGE-0125	Adaptor Set for 5" (125 mm) Outer Dia Shelby Tubes.	Includes a ring with 119 mm ID. and an extruder head with Ø114 mm.

EXTRUDING SOIL SAMPLES

Product Code

CFGE-0084 **Motorized Hydraulic Specimen Extruder, Horizontal Type, 60 kN Capacity**

Models for 220-240V 50-60 Hz, 1 ph	CFGE-0084
Models for 110-120V 60 Hz, 1 ph.	CFGE-0084-N

Standards

EN 13286-2, 13286-47, 12697-30; AASHTO T134, T180, T193, T245; ASTM D698, D1557, D1883, D1559; BS 1377-4, 1924-2, 598-107

The CFGE-0084 Motorized Hydraulic Extruder, Horizontal Type, is designed for extruding specimens from 50 mm (2") to 125 mm(5") (outer dia.) shelby sample tubes and moulds such as proctor, CBR and marshall moulds moulds Also useful for sampling and removing uniaxial and triaxial test specimens to/from the cutters inner dia. from 38mm to 100mm.

The Extruder has 60 kN capacity and 900 mm ram travel. The hydraulic piston can be stopped at any position during the extraction.

To remove the sample from the shelby tubes, the adapter sets of different sizes on the table in next page of CFGE-0082 should be ordered separately.

The Hand Operated Hydraulic Extruder is supplied complete with;

- Adapter sets for Ø100 mm (4") and Ø150 mm (6") inner dia. moulds
- Flanges and heads sets for Ø38mm, Ø50mm, Ø70 mm and 100mm (only flange) inner dia. cutters.

Capacity	60 kN	Weight (approx.)	195 kg
Ram Travel	900 mm	Power	750 W

Dimensions	2800x500x1250 mm (working position) 2050x500x1250 mm (shipping)

For CFS-0084		
CFGE-0110	Adaptor Set for 2" (50,8mm) Outer Dia Shelby Tubes.	Includes a ring with 48,5mm ID. and an extruder head with Ø43,5mm.
CFGE-0112	Adaptor Set for 2 ½" (63,5 mm) Outer Dia Shelby Tubes.	Includes a ring with 61mm ID. and an extruder head with Ø56mm.
CFGE-0114	Adaptor Set for 3" (75 mm) Outer Dia Shelby Tubes.	Includes a ring with 72mm ID. and an extruder head with Ø67mm.
CFGE-0116	Adaptor Set for 3 1/4" (83 mm) Outer Dia Shelby Tubes.	Includes a ring with 79,5mm ID. and an extruder head with Ø74,5mm.
CFGE-0118	Adaptor Set for 3 1/2" (88,9 mm) Outer Dia Shelby Tubes.	Includes a ring with 85mm ID. and an extruder head with Ø80mm.
CFGE-0120	Adaptor Set for 100 mm Outer Dia Shelby Tubes.	Includes a ring with 96mm ID. and an extruder head with Ø91mm.
CFGE-0122	Adaptor Set for Ø4" (101,6 mm) Outer Dia Shelby Tubes.	Includes a ring with 97,5mm ID. and an extruder head with Ø92,5mm.
CFGE-0124	Adaptor Set for 4 1/2" (114,3 mm) Outer Dia Shelby Tubes.	Includes a ring with 109mm ID. and an extruder head with Ø104mm.
CFGE-0125	Adaptor Set for 5" (125 mm) Outer Dia Shelby Tubes.	Includes a ring with 119mm ID. and an extruder head with Ø114mm.

EXTRUDING SOIL SAMPLES

Product Code

CFGE-0086 **Motorized Hydraulic Specimen Extruder Vertical Type, 60 kN Capacity**

Models for 220-240V 50-60 Hz, 1 ph	CFGE-0086
Models for 110-120V 60 Hz, 1 ph.	CFGE-0086-N

Standards

EN 13286-2, 13286-47, 12697-30; AASHTO T134, T180, T193, T245; ASTM D698, D1557, D1883, D1559; BS 1377-4, 1924-2, 598-107

The CFGE-0086 Motorised Hydraulic Extruder, Vertical Type, is designed for extruding specimens from 50mm(2") to 125mm(5") (outer dia.) shelby sample tubes and moulds such as proctor, CBR and marshall moulds Also useful for sampling and removing uniaxial and triaxial test specimens to/from the cutters inner dia. from 38mm to 100mm.
The Extruder has 60 kN capacity and 650 mm ram travel. The hydraulic piston can be stopped at any position during the extraction.
To remove the sample from the shelby tubes, the adapter sets of different sizes on the table in next page of CFGE-0082 should be ordered separately.

The Motorized Hydraulic Extruder is supplied complete with;

- Adapter sets for Ø100 mm (4") and Ø150 mm (6") inner dia. moulds
- Flanges and heads sets for Ø38mm, Ø50mm, Ø70 mm and 100mm (only flange) inner dia. cutters.

Capacity	60 kN
Ram Travel	650 mm
Dimensions	650x750x1750mm
Weight (approx.)	185 kg
Power	750 W

For CFS-0086		
CFGE-0110	Adaptor Set for 2" (50,8mm) Outer Dia Shelby Tubes.	Includes a ring with 48,5mm ID. and an extruder head with Ø43,5mm.
CFGE-0112	Adaptor Set for 2 ½" (63,5 mm) Outer Dia Shelby Tubes.	Includes a ring with 61mm ID. and an extruder head with Ø56mm.
CFGE-0114	Adaptor Set for 3" (75 mm) Outer Dia Shelby Tubes.	Includes a ring with 72mm ID. and an extruder head with Ø67mm.
CFGE-0116	Adaptor Set for 3 1/4" (83 mm) Outer Dia Shelby Tubes.	Includes a ring with 79,5mm ID. and an extruder head with Ø74,5mm.
CFGE-0118	Adaptor Set for 3 1/2" (88,9 mm) Outer Dia Shelby Tubes.	Includes a ring with 85mm ID. and an extruder head with Ø80mm.
CFGE-0120	Adaptor Set for 100 mm Outer Dia Shelby Tubes.	Includes a ring with 96mm ID. and an extruder head with Ø91mm.
CFGE-0122	Adaptor Set for Ø4" (101,6 mm) Outer Dia Shelby Tubes.	Includes a ring with 97,5mm ID. and an extruder head with Ø92,5mm.
CFGE-0124	Adaptor Set for 4 1/2" (114,3 mm) Outer Dia Shelby Tubes.	Includes a ring with 109mm ID. and an extruder head with Ø104mm.
CFGE-0125	Adaptor Set for 5" (125 mm) Outer Dia Shelby Tubes.	Includes a ring with 119mm ID. and an extruder head with Ø114mm.

EXTRUDING SAMPLES from MOULDS

Product Code

CFGE-0080 **Marshall / CBR / Proctor Specimen Extruder, 30 kN Capacity**

Standards

EN 13286-2, 13286-47, 12697-30; AASHTO T134, T180, T193, T245; ASTM D698, D1557, D1883, D1559; BS 1377-4, 1924-2, 598-107

The CFGE-0080 Extruder is designed to easily extrude specimens from marshall and CBR, standard and modified proctor moulds. The capacity of the extruder is 30 kN and is supplied complete with a manual hydraulic jack and 2 pcs. adaptor to extrude specimens from Ø100 mm (4") and Ø150 mm (6") dia. proctor, CBR and marshall molds.

Adaptors with different sizes should be ordered separately if required.

Ram Travel	130 mm
Screw Travel	90 mm
Dimensions	280x280x520 mm
Weight (approx.)	28 kg

SAMPLE PREPARATION

Product Code

CFC-1070 **Melting Pot 3 L Capacity**

Models for 220-240V 50-60 Hz, 1 ph	CFC-1070
Models for 110-120V 60 Hz, 1 ph.	CFC-1070-N

Standards

CEN ISO/TS 17892-2; EN 12390–3, 12390-1, 12504-1; ASTM C31, C192, C617; AASTHO T23, T126

The Melting Pot is designed for melting capping compound, sulphur, wax and similar materials.
The melted paraffin wax is used to seal soil samples and other materials.

The apparatus consists of a 3 liter capacity aluminum container in a well-lagged steel jacket, cover and a thermostatic control heating system to keep the temperature constant in the range of ambient to 200 °C.

Dimensions	350x320x290 mm
Weight (approx.)	9 kg
Power	600 W

SAMPLE PREPARATION

Product Code

CFS-0160	Soil Lathe / Trimmer and Extruder
CFS-0164	Wire Saw
CFS-0166	Trimming Knife
CFGG-2205	Porcelain Mortar with Pestle 130 mm dia
CFGG-2215	Rubber Headed Pestle

The CFS-0160 Soil Lathe/Trimmer and Extruder is used to extrude and trim soil samples from 35 mm to 100 mm diameter to reduce samples.

Wire Saw, Trimming Knife, Porcelain Mortar with Pestle.
The Rubber Headed Pestle can be ordered separately.

Technical Specifications

Specimen Lathe	35x70 mm to 100x200 mm
Specimen Trimming and Extrusion	35x70 mm to 50x100 mm
Vertical Daylight	260 mm

CFS-0160 with CFS-0164 and CFS-0166

Dimensions	220x300x450 mm
Weight (approx.)	15 kg

SAMPLE PREPARATION

Product Code

CFG-0130	Laboratory Mixer 10 L
CFG-0131	Spare Bowl for UTG-0130
CFG-0132	Spare Whisk for UTG-0130

Models for 220-240V 50-60 Hz, 1 ph	CFGE-0130
Models for 110-120V 60 Hz, 1 ph.	CFGE-0130-N

The CFG-0130, 10 L capacity mixer is designed for the mixing of soil and asphalt samples to be used for mechanical tests such as compaction, indirect tensile, Marshall etc. The mixing head rotates at speed positions from 10 to 240 rpm and the whisk from 20 to 480 rpm. The user can adjust the rotation speed between given values easily by using a control knob fitted to the machine.

UTG-0131

UTG-0132

CFG-0130

The Laboratory Mixer is supplied complete with;
- Bowl, Stainless Steel, 10 L.
- Whisk

Dimensions	700x750x800 mm
Weight (approx.)	75 kg
Power	550 W

PARTICLE DENSITY / MECHANICAL END-OVER-END SHAKER

Product Code

CFS-0170 Mechanical End-Over-End Shaker
CFS-0171 Gas Jar with a Rubber Cover for CFS-0170
CFS-0172 Ground Glass for CFS-0171

Models for 220-240V 50 Hz, 1 ph	CFS-0170-T
Models for 110-120V 60 Hz, 1 ph.	CFS-0170-N
Models for 220-240V 60 Hz, 1 ph.	CFS-0170-K

Standards

BS 1377:2

The CFS-0170 Mechanical End-Over-End Shaker is used for the determination of the particle density by the gas jar method and the particle size distribution by sedimentation.

End-Over-End Shaker is used to rotate two gas jars with rubber covers at about 50 rpm.

The 1 L capacity gas jar is made of plexiglass.

CFS-0171 Gas Jar with a rubber cover and CFS-0172 ground glass should be ordered separately.bber cover and a ground glass should be ordered separately.

CFS-0171

Product Code	Dimensions	Weight (approx.)	Power
CFS-0170	900x700x600 mm	21 kg	180 W
CFS-0171	120x120x270 mm	0.6 kg	

LIQUID LIMIT CONE PENETROMETER

Product Code

CFS-0180	Semi-Automatic Penetrometer for Liquid Limit
CFS-0182	Liquid Limit Penetration Test Cone, Stainless Steel, 30° Angle
CFS-0183B	Cone Test Gauge for 30° Angle Cone, BS
CFS-0183E	Cone Test Gauge for 30° Angle Cone, EN ISO
CFS-0184	Liquid Limit Penetration Test Cone, Aluminium Alloy, 60° Angle
CFS-0185E	Cone Test Gauge for 60° Angle Cone, EN ISO
CFGH-1435	Penetration Sample Cup / Moisture Content Tin with Lid, 75x50mm, Aluminium
CFGH-1440	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x30 mm, Aluminium
CFGH-1442	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x40mm, Aluminium
CFGH-1444	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x40mm, Stainless Steal

Models for 220-240V 50-60 Hz, 1 ph	CFS-0180
Models for 110-120V 60 Hz, 1 ph.	CFS-0180-N

Standards

BS 1377:2; NF P94-052-1; CEN ISO/TS 17892-6, 17892-12

CFS-0180 with CFS-0182

The Cone Penetrometer is used to determine the moisture content at which clay soils pass from a plastic to a liquid state, and used also for the determination of undrained shear strength.

CFS-0180 Semi-Automatic Penetrometer for liquid limit consists of a frame with a levelling screws and screw gear assembly with handwheel for vertical adjustment, a digital penetration measurement gauge with 0.01 mm resolution/readibility, a digital timer, a magnifying lens and a low voltage illuminator mounted on flexible arms.

Penetration time 0-99 sec can be set up by user with the digital timer. The timer will allow the cone to free fall into the sample for the engaged time interval and then lock the cone from advancing while providing a direct reading of the test results.

Supplied complete with a cones holder.Penetration cone/s, cone test gauges and sample cups should be ordered seperately.

CFGH-1435	Ø (75±2) mm x h (50±2) mm
CFGH-1440	Ø (55+2) mm x h (30±2) mm
CFGH-1442	Ø (55+2) mm x h (40±2) mm
CFGH-1444	Ø (55±2) mm x h (40±2) mm

Dimensions	260x240x600 mm
Weight (approx.)	10 kg

LIQUID LIMIT CONE PENETROMETER

Product Code

CFS-0186	Automatic Electronic Penetrometer for Liquid Limit
CFS-0182	Liquid Limit Penetration Test Cone, Stainless Steel, 30° Angle
CFS-0183B	Cone Test Gauge for 30° Angle Cone, BS
CFS-0183E	Cone Test Gauge for 30° Angle Cone, EN ISO
CFS-0184	Liquid Limit Penetration Test Cone, Aluminium Alloy, 60° Angle
CFS-0185E	Cone Test Gauge for 60° Angle Cone, EN ISO
CFGH-1435	Penetration Sample Cup / Moisture Content Tin with Lid, 75x50mm, Aluminium
CFGH-1440	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x30 mm, Aluminium
CFGH-1442	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x40mm, Aluminium
CFGH-1444	Penetration Sample Cup / Moisture Content Tin with Lid. Ø55x40mm, Stainless Steal

Models for 220-240V 50-60 Hz, 1 ph	CFS-0186
Models for 110-120V 60 Hz, 1 ph.	CFS-0186-N

Standards

BS 1377:2; NF P94-052-1; EN ISO 17892-6, 17892-12

CFS-0180

The CFS-0186 Automatic Electronic Penetrometer is used for determination the moisture content at which clay soils pass from a plastic to a liquid state, and used also for the determination of undrained shear strength.according to BS 1377:2; NF P94-052-1; EN ISO 17892-6 and EN ISO17892-12
standards.

The frame with levelling screws and spirit level consists of a digital control unit with touch screen, an anodised aluminum base plate with centering guide, magnifying lens and low voltage illuminator mounted on flexible arms. The penetration depth of the cone is determined with a pulse type electronic measuring system, which is separated from the plunger during the test, this allows the free guidance of the plunger which virtually eliminates friction during the test.

The cone is lowered so that the tip of the cone just touches the surface of the soil by pressing up and down arrows on the screen with fast and slow motion option.In this process, magnifying glass and led lamp help the operator. .The pernetrometer allows the cone to free fall into the sample for the specific seted time interval. which can be set on display.

Penetration cone/s, cone test gauge and sample cups should be ordered seperately.

Measuring Range	0-50 mm
Resolution	0.01 mm
Total Test Load	100 g or 200 g
Time	Adjustable from 0.1 to 9999 sec.

Dimensions	260x240x600 mm
Weight (approx.)	10 kg
Power	75 W

The Automatic Penetrometer is supplied complete with;

- Penetration Needle, 1 piece.
- Needle holder
- Weights of 50g and 100g
- Transfer Dish
- Sample Cup, Ø 55x35 mm, 6 pieces, stainless steel

LIQUID LIMIT / CASAGRANDE APPARATUS

Product Code

CFS-0200B	Manual Liquid Limit Device (Casagrande), BS
CFS-0202A	Manual Liquid Limit Device (Casagrande), ASTM-AASHTO
CFS-0210B-T	Motorized Liquid Limit Device (Casagrande), BS, 220-240V, 50Hz, 1ph
CFS-0212A	Motorized Liquid Limit Device (Casagrande), ASTM-AASHTO
CFS-0215A	Metal Grooving Tool and Gauge Block, ASTM
CFS-0216A	Plastic Grooving Tool, ASTM
CFS-0217B	Plastic Grooving Tool, BS
CFS-0218EH	Brass Grooving Tool, AASHTO, EN ISO
CFS-0220A	Resilience (Rebound) Tester, ASTM
CFS-0221EH	Resilience (Rebound) Tester, AASHTO
CFS-0225A	Spare Brass Cup, for ASTM Models

Models for 220-240V 50 Hz, 1 ph.	UTC-0212A-T
Models for 110-120V 60 Hz, 1 ph.	UTC-0212A-N
Models for 220-240V 60 Hz, 1 ph.	UTC-0212A-K

CFS-0200B with CFS-0216

CFS-0210B

Standards

ASTM D4318; BS 1377:2; AASHTO T89

The CFU Manual and Motorized Liquid Limit Apparatus (Casagrande) are used to determine the moisture content at which clay soils pass from plastic to liquid state.

The Devices consist of an adjustable crank and cam mechanism, a blow counter and a removable brass cup fitted on the base. Different models with the same shape but with different base and cup weights are available according to the required specifications. Manual and Motorized versions are available.

CFS-0200B and 0210B models are supplied with a BS type plastic grooving tool. CFS-0202A and 0212A models are supplied with a ASTM type plastic grooving tool. Other types of grooving tools should be ordered separately.

	Manual	Motorized
Dimensions	240x230x150 mm	200x290x170 mm
Weight (approx.)	2 kg	4.2 kg

SHRINKAGE LIMIT

Product Code

CFS-0230	Shrinkage Limit Test Set
CFS-0234	Shrinkage Prong Plate
CFGH-1425	Moisture Content Tin with Lid, Aluminium, Ø:55 mm h:35 mm
CFGH-1430	Moisture Content Tin with Lid, Aluminium, Ø:45 mm h:10 mm
CFGG-2170	Porcelain dish, 100 mm dia.
CFGH-1495	Spatula, small, length:120 mm
CFGG-1005	Graduated glass cylinder 25 ml

Standards

ASTM D427; AASHTO T92; UNE 103-108; UNI 10014

When the water content of a fine-grained cohesive soil is reduced below the plastic limit, shrinkage of the soil mass continues until the shrinkage limit is reached. This method of test covers the determination of the shrinkage limit, shrinkage ratio, volumetric shrinkage and linear shrinkage.

Dimensions	340x290x80 mm
Weight (approx.)	1,5 kg

The Shrinkage Limit Test Set is supplied complete with;

- Prong Plate
- Moisture Content Tin with Lid, aluminum, Ø:45 mm h:10 mm, 2 pcs.
- Moisture Content Tin with Lid, aluminum, Ø:55 mm h:35 mm
- Porcelain Dish, 120mm dia.
- Spatula, 100 mm
- Graduated Glass Cylinder, 25 ml,
- Carrying Case

PLASTIC LIMIT

Product Code

CFS-0250	Plastic Limit Test Set
CFS-0252	Plastic Limit Reference Rod Ø 3x100 mm
CFS-0254	Plastic Limit Plate 300x300x10 mm, Glass
CFGG-2170	Porcelain dish, 120 mm dia.
CFGH-1433	Moisture content tin with lid, Aluminum, Ø:75 mm h:30
CFGH-1495	Spatula, small, length:100 mm
CFGP-1000	Piset, 250 ml

Standards

ASTM D4318; AASHTO T90; BS 1377:2; EN ISO 17892-12; UNE 103-104; UNI 10014

The plastic limit (PL) is defined as the lowest moisture content of a soil that will permit a sample to be rolled into threads of 3 mm diameter without the threads breaking.

Dimensions	360x370x180 mm
Weight (approx.)	2 kg

The Plastic Limit Test Sets are is supplied complete with;

- A Glass Plate, 300x300x10 mm (One face ground)
- Steel Reference Rod, Ø3 mm
- Moisture Content Tins, Ø:75 mm h:30, 6 pcs.
- Porcelain Mixing Dish, 120 mm dia.
- Spatula, 100 mm
- Carrying Case
- Piset 250 ml

LINEAR SHRINKAGE

Product Code

CFS-0235 Linear Shrinkage Mould

Standards

BS 1377:2

The CFS-0235, Linear Shrinkage Mould is 140 mm long and 12.5 mm radius and is used for the determination of the total linear shrinkage of soils and indicates the plastic properties of soils with low clay content.

Dimensions	20x30x160 mm
Weight (approx.)	0,3 kg

PARTICLE SIZE DISTRIBUTION

Product Code

CFS-0270 Hydrometer Test Set
CFS-0272Y Soil Dispersion Mixer, 220-240 V 50-60 Hz, 1 ph
CFS-0272A Soil Dispersion Mixer, ASTM, 220-240V 50-60Hz, 1 ph
CFS-0273 Hydrometer Bath, 220-240 V 50-60 Hz
CFS-0274 Hydrometer 151H
CFS-0275 Hydrometer 152H
CFS-0276 Hydrometer Jar (Sedimentation cylinder), 1000 ml
CFGC-0900 Sodium Hexametaphosphate, 1kg

Standards

ASTM D422; AASHTO T88

Hydrometer Test Set is used to determine the particle size distribution of very fine materials such as silt and clay.

Soil dispersion mixer which are necessary for the test should be ordered separately.

50 L (8 cylinders) capacity hydrometer bath complete with a circulating unit, a heater (ambient to 35°C working temperatue) and a thermostate.

As an alternative of 151H hydrometer, 152H hydrometer can be available.

The soil dispersion mixers with baffle rods for hydrometer test include dispersion cup, stirring paddle, automatic switch-on by positioning bowl, 100 W power consumption.

The Hydrometer Test Set is supplied complete with;

- Hydrometer bath (with heater, circulation unit and thermostate)
- 151H Hydrometer or 152H Hydrometer (alternatively available) (1 pcs)
- Hydrometer Jar (Sedimentation cylinder), 1000 ml (6 pcs) and rubber stopper (1 pcs)
- Beaker, 600 cc (1 pcs)
- Sodium hexametaphosphate 1 kg

151 H Hydrometer		
11 " length	0,995-1,038 g/ml	in 0,001 g/ml division

152 H Hydrometer		
11 " length	-5 - +60 g/L in 1g/L	in 1g/L division

Dimensions	330x630x450 mm
Weight (approx.)	20 kg

CHEMICAL TESTS / PH / CHLORIDE CONTENT

Product Code

CFGE-4300 pH Indicator Papers pH Range 1 to 14
CFGE-4320 Quantab Chloride Titrator Type 1175, 40 strips/pack
CFGE-4322 Quantab Chloride Titrator Type 1176, 40 strips/pack

Standards

BS 812:117, 1377:3

CFGE-4300

CFGE-4320 & CFGE-4322

The CFGE-4300 pH Indicator Papers are used for quick determination of pH in the 1 to 14 pH range.

CFGE-4320 and CFGE-4322 Quantab Chloride Titrators are used for quick determination of water soluble chloride salts present in soils and aggregates. It is based on the Volhard Method. UTA-0870 covers 0.005% to 0.1% NaCl and UTA-0872 covers 0.05% to 1% NaCl.

Product Code	Dimensions	Weight (approx.)
CFGE-4300	40x60x20 mm	0.1 kg
CFGE-4320	75x75x120 mm	0.1 kg
CFGE-4322	75x75x120 mm	0.1 kg

CHEMICAL TESTS / SULPHATE CONTENT

Product Code

CFS-0280 Ion Exchange Apparatus
CFS-0282 Ion Exchange Resin 500 g

Standards

BS 1377:3

The CFS-0280 Ion Exchange Apparatus when used together with CFS-0282 Ion Exchange Resin, is used to determine the sulphate content of aqueous soil extracts and ground water.The apparatus consists of an ion exchange column of 10 mm diameter and 400 mm long, swan-neck outlet and a 1500 ml round bottom flask to give a constant head. The apparatus is supplied assembled on a stand.

CFS-0282 Ion Exchange Resin, 500 g should be ordered separately.

	CFS-0280	CFS-0282
Dimensions	200x100x600 mm	100x100x100 mm
Weight (approx.)	5 kg	0,5 kg

SOIL COLOR

Product Code

CFS-0285 Munsell Soil Chart

The CFS-0285 Munsell Soil Chart provides a simple method for soil classification by of determining the color of soil specimens. Test set consists of 7 constant hue charts covering a total of 196 colors. The color chart and the diagram are fitted in a pocket size binder. Supplied complete with a Tropical Soil Color Chart, set of 2 which can be fitted into the binder of CFS-0285.

Dimensions	150x150x50 mm
Weight (approx.)	1 kg

CONSOLIDATION

Product Code

CFS-0300	Front Loading Oedometer (Consolidation)
CFS-0302	Bench for Consolidation, 3 Oedometer Capacity
CFS-0307	Consolidation Cell for High Pressure, Ø 50 mm
CFS-0309	Consolidation Cell for High Pressure, ASTM Ø 63.5 mm (2.5")
CFS-0313	Consolidation Cell for High Pressure, BS/EN, Ø 75 mm
CFS-0315	Consolidation Cell for High Pressure, Ø 101,6 mm (4")
CFS-0320	Consolidation Cell for High Pressure, Ø112,8 mm
CFGM-0120	Analog Dial Gauge, 30x0.01 mm
CFGM-0148	Digital Dial Gauge 25x0.01 mm, LCD display
CFGM-0152	Digital Dial Gauge 12.7x0.001 mm, LCD display
CFGM-0060	Linear Potentiometric Displacement Transducer, 10x0,001mm
CFGM-0062	Linear Potentiometric Displacement Transducer, 25x0,001mm
CFGM-0072	High Accurate Strain Gauge Based Displacement Transducer, 10x0,001 mm
CFGM-0078	High Accurate Strain Gauge Based Displacement Transducer, 50x0,001 mm
CFCU-0320	Interface Unit with 4 Channel for Data Acquisition
CFCU-0325	Interface Unit with 8 Channel for Data Acquisition
CSOFT-0300	CFU Software for Consolidation Test

Standards

BS 1377:5; ASTM D2435, D3877, D4546; AASHTO T216;
CEN ISO/TS 17892-5

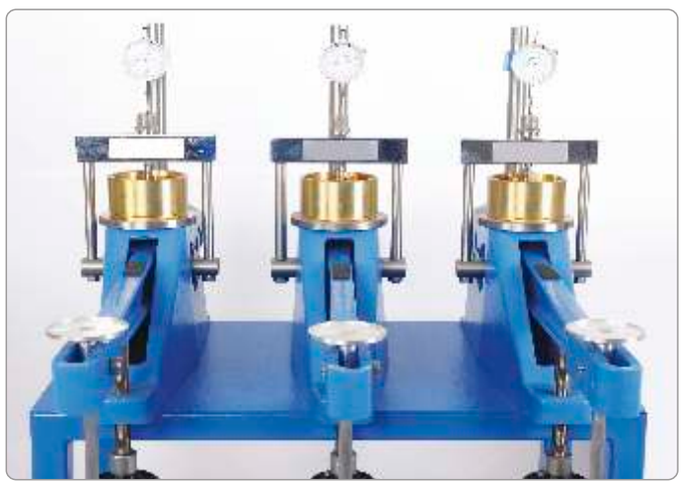
The CFS-0300 Front Loading Oedometer is rigidly constructed to ensure minimum frame distortion. The frame is designed to load the specimen through a lever arm assembly and one of three alternative beam ratios as 9:1, 10:1 and 11:1. The beam is fitted with a counter balance weight and beam support jack. The cell platform will accept the complete range CFU consolidation cells and is fitted with a central spigot to ensure accurate centering of the cell under the loading.

The CFU fixed ring consolidation cells are manufactured from corrosion-resistant materials and conform to the requirements of the relevant standards. An integral water reservoir is incorporated in the cell which allows the specimen to be inundated when required. All cells are supplied complete with upper and lower porous disc, pressure pad and cutting (specimen) ring.

The One-dimensional Consolidation test is used to determine the consolidation characteristics of soils of low permeability.

Tests are carried out on specimens prepared from undisturbed samples. Data obtained from these tests together with classification data and a knowledge of the soils loading history, enables estimates to be made of the behavior of foundations under load. Consolidation cell, dial gauge or displacement transducer and data logger, bench, weights, apparatuses for prepare Consolidation samples and calibration disc should be ordered separately.

CFS-0300



Data Acquisition & PC Software

CFG-0320

4 or 8 channel interface units for data acquistion (CFCU-0320 or CFCU-0325) are used for recording displacement data over time.

- **High resolution : 260.000 points.**
- **Serial port for PC and printer connection.**
- **CPU card by microprocessor 32 bit ARM risk architecture.**
- **4 or 8 analogical channels for displacement transducers.**

CFU Consolidation Software (USOFT-0300) is developed according to ASTM D2435, D3877, D4546, BS 1377:5 and AASHTO T216 standards to be used with CFCU-0320 and CFCU-0325.

Displacement transducers are connected to interface unit and interface unit is connected to PC by RS232 serial output. The software is capable monitoring the change of displacement data over time.

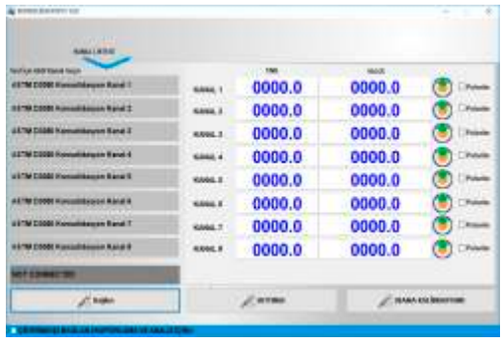
User can initiate and end data recording process by using the software. The user can determine and assign different time intervals (or select fixed time intervals) and stresses for the calculation of the consolidation test data.

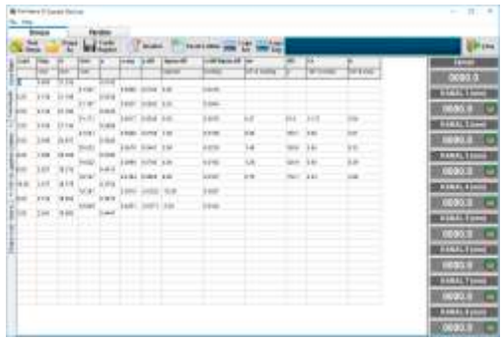
The consolidation software has different data recording columns each assigned to the consolidation cells and they can be set to different normal load (stress) values. The user can also manually enter the vertical displacement data to these columns for correction.

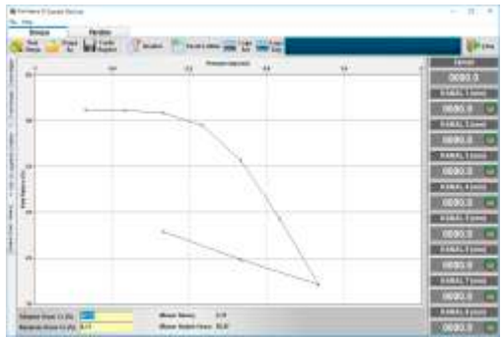
The graphs of time-displacement pairs are drawn in both square-root time and logarithmic time scales. In addition to these visualizations, the software can calculate required parameters such as √t90, √t50, √t100, mv, Cv , etc. according to the related standards indicated above. Recorded data, graphs, calculations and all other generic data can be exported to Microsoft Excel for further evaluation.

- **Customizable User Interface**
- **Graphical outpCFS and reports can be saved as MS Excel worksheet**
- **Flexibility in edit report and graph templates**

Dimensions	750x850x1400 mm (3pcsCFS-0300 + CFS-0302+CFS-0376 +Acessories)
Weight (approx.)	180 kg (3pcs CFS-0300 + CFS-0302 + CFS-0376 +Accessories)



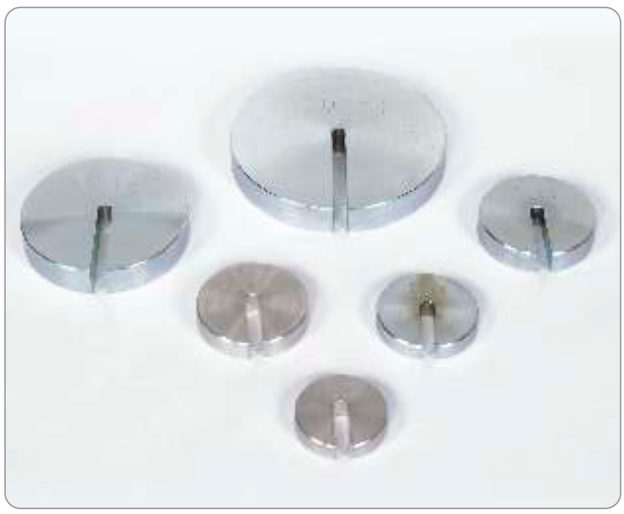




Product Name	CFS-0307 (Ø 50 mm)	CFS-0309 Ø 63,5 mm (2,5")	CFS-0313 (Ø 75 mm)	CFS-0317 Ø101,6 mm (4")	CFS-0321 Ø112,8 mm
Spare Cutting Ring	CFS-0308	CFS-0312	CFS-0314	CFS-0318	CFS-0322
Upper and Lower Porous Disc	CFS-0330	CFS-0331	CFS-0333	CFS-0335	CFS-0338
Calibration Disc, stainless steel	CFS-0339	CFS-0341	CFS-0343	CFS-0345	CFS-0347
Apparatus for Prepare Cons. Sample	CFS-0358	CFS-0359	CFS-0360	CFS-0362	CFS-0364

Sets of Weight for Consolidation

CFS-0368	16 kgf Set	(2) 5 kg	(1) 2 kg	(2) 1 kg	(3) 0,5 kg	(2) 0,25 kg	-----
CFS-0370	32 kgf Set	(1) 10 kg	(3) 5 kg	(2) 2 kg	(1) 1 kg	(3) 0,5 kg	(2) 0,25
CFS-0372	50 kgf Set	(3) 10 kg	(2) 5 kg	(3) 2 kg	(2) 1 kg	(3) 0,5 kg	(2) 0,25
CFS-0374	64 kgf Set	(4) 10 kg	(3) 5 kg	(2) 2 kg	(3) 1 kg	(3) 0,5 kg	(2) 0,25
CFS-0376	80 kgf Set	(6) 10 kg	(2) 5 kg	(3) 2 kg	(2) 1 kg	(3) 0,5 kg	(2) 0,25



CFS-0348

Code	Slotted Weight
CFS-0380	125 g
CFS-0382	250 g
CFS-0384	500 g
CFS-0386	1 kg
CFS-0388	2 kg
CFS-0390	5 kg
CFS-0392	10 kg
CFS-0394	4 kg
CFS-0396	8 kg

AUTOMATIC CONSOLIDATION

Product Code

CFS-0305.SMPR **Automatic Soil Consolidation Testing Machine, 110-230 V 50-60 Hz**

Standards

BS 1377:5, ASTM D 2435, ASTM D 3877, ASTM D 4546, AASHTO T 216, CEN ISO/TS 17892-5

CFU Automatic Soil Consolidation Testing Machine, CFS-0305.SMPR is used for determination of one-dimensional consolidation properties of soils using incremental loading and measurement of swelling potential of soils. Test machine comprises a rigid frame, electromechanical motor, optimized PID closed loop control system, U-Touch PRO high resolution touchscreen and a high precision load cell.

Advanced closed loop control system specially designed for CFS-0305.SMPR assures accurate loading and precise load control over a wide range of load increments. Machine can apply pre-defined loads for pre-defined intervals using U-Touch PRO control panel and perform one-dimensional consolidation tests in accordance with ASTM D 2435 Test Method A. Machine can display both axial strain vs log time and axial strain vs square root of time graphs real time on the U-Touch PRO touchscreen.

CFU Automatic Soil Consolidation Testing Machine is supplied with Usoft-0305, CFU Software for Soil Consolidation Tests. Using USOFT-0305 users can perform one-dimensional consolidation testing in accordance with ASTM D 2435 Method B. The software can automatically calculate end of primary consolidation (d100) and coefficient of consolidation (cv) and perform the test automatically. Using this method, the machine can perform consolidation tests quicker and in a more reliable way by eliminating the need for manual intervention thus reducing the risk of human error.

Test reports can be displayed on Usoft-0305 or exported to usb flashdrive in *.xls format for detailed analysis.

Consolidation cells and apparatus for sample preparation should be ordered separately.

DIRECT/ RESIDUAL SHEAR

Product Code

CFS-2060.SMPR	Automatic Direct-Residual Shear Test Machine
CFS-2065	Shearbox Assembly, 60x60 mm
CFS-2065-07	Cutting Ring, 60x60 mm
CFS-2065-08	Extrusion Dolly, 60x60 mm
CFS-2066	Shearbox Assembly, Ø 60 mm
CFS-2066-07	Cutting Ring, Ø 60 mm
CFS-2066-08	Extrusion Dolly, Ø 60 mm
CFS-2067	Shearbox Assembly, 100x100 mm
CFS-2067-07	Cutting Ring, 100x100 mm
CFS-2067-08	Extrusion Dolly, 100x100 mm
CFS-2068	Shearbox Assembly, Ø 100 mm
CFS-2068-07	Cutting Ring, Ø 100 mm
CFS-2068-08	Extrusion Dolly, Ø 100 mm
CFS-2069	Shearbox Assembly, Ø 2.5 inch
CFS-2069-07	Cutting Ring, Ø 2.5 inch
CFS-2069-08	Extrusion Dolly, Ø 2.5 inch
CFS-2100	Slotted Weight Set, 50.75 kg (4x10 kg + 1x5 kg + 2x2 kg + 1x1 kg + 1x0.5 kg + 1x0.25 kg)

Standards

ASTM D3080; BS 1377:7; AASHTO T236, TS 1900-2, CEN-ISO-TS 17892-10

The test covers the determination of consolidated drained shear strength of a soil material by direct shear. CFS- CFS-2060.SMPR Automatic Direct - Residual Shear Test Machine is motorized and floor mounted. Normal stress is applied to the specimen by utilizing a weight hanger, a lever arm (amplification ratios of 9:1, 10:1 and 11:1), and a vertical loading yoke. Hanger can receive up to 50 kg of weight which is amplified by the lever arm and transferred to the specimen by the vertical loading yoke as a normal force up to 5 kN (5000 N).

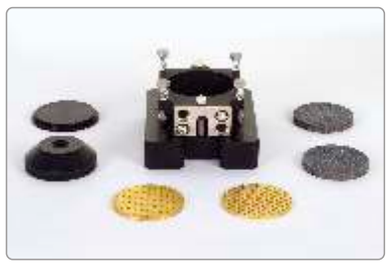
The machine is supplied with a shearbox bowl that accepts 60 mm square, 100 mm square, 60 mm dia. round, 100 mm dia. round and 2.5 inc. dia. round shearboxes. Shearbox bowl is designed to contain water to inundate the specimen during the test. The shearbox assemblies consist of rigid upper and lower shearbox frames with lifting and locking screws, a grooved loading pad, a grooved base plate, porous plates (2 pcs.), and perforated plates (2 pcs.).

Drive unit utilizes a high resolution servomotor and a gear box assembly to ensure continuously variable transmission of speed in a range from 0.00001 mm-min. to 15 mm-min for both forward and reverse directions. 5 kN load cell is used for load measurement. 10 x 0.001 mm and 25 x 0.001 mm sensitivity linear potentiometric transducers are used for vertical and horizontal displacement measurements respectively. Displacement limits are controlled by limit switch.

Shearbox Assemblies, Slotted Weight Set and other optional accessories including cutting ring and extrusion dolly should be ordered separately.

Models for 220-240V 50-60 Hz, 1 ph	CFS-2060.SMPR
Models for 110-120V, 60Hz, 1ph	CFS-2060.SMPR-N

CFS-2065



Accessories of Shear Box Assemblies					
Model of Shear Box	CFS-2065 60x60 mm	CFS-2066 Ø:60 mm	CFS-2067 100x100 mm	CFS-2068 Ø:100 mm	CFS-2069 Ø:2,5 inch
Shear Box	CFS-2065-01	CFS-2066-01	CFS-2067-01	CFS-2068-01	CFS-2069-01
Loading Pad	CFS-2065-02	CFS-2066-02	CFS-2067-02	CFS-2068-02	CFS-2069-02
Grooved Retaining	CFS-2065-03	CFS-2066-03	CFS-2067-03	CFS-2068-03	CFS-2069-03
Porous Plate	CFS-2065-04	CFS-2066-04	CFS-2067-04	CFS-2068-04	CFS-2069-04
Perforated Grid	CFS-2065-06	CFS-2066-06	CFS-2067-06	CFS-2068-06	CFS-2069-06

The Optional Accessories of CFS-2060 Automatic Direct / Residual Shear Test Machine					
Cutting Ring	CFS-2065-07	CFS-2066-07	CFS-2067-07	CFS-2068-07	CFS-2069-07
Extrusion Dolly	CFS-2065-08	CFS-2066-08	CFS-2067-08	CFS-2068-08	CFS-2069-08

*2 pcs. supplied with the shear box assemblies

U-Touch PRO Control Unit for Direct/Residual Shear Test

The U-Touch PRO Control Unit for Direct/Residual Shear Test is designed to control the machine to perform direct - residual shear test acc. to EN,ASTM/AASHTO and BS standards to process.

The Unit can perform direct - residual shear tests as a stand-alone without the use of a PC or with the USOFT-2060 software and a PC. Control of machine, acquisition of load and displacement data in real time are provided by the unit.

The U-Touch PRO has easy to use menu options. It displays all menu option listings simultaneously, allowing the operator to access the required option quickly to activate that option or enter a numeric value to set the test parameters and see all the data while the test running.

The U-Touch PRO graphic display allows real time Load vs. Displacement or Stress vs. Displacement graph. The advanced functions for data base management provide an easy navigation of all saved data. The test results certificate includes all descriptive information. Therefore, test parameters can be set, and details about the test carried out such as customer details, test type, specimen type, user info and other information required can be entered and printed out as well as test reports and graphs. Also, all minor revisions can be implemented upon request. The Software calculates both the maximum and resilient shear stress.

After three runs, the software calculates the cohesion value "c" and shear resistance angle"ϕ" by using the best straight line fit. Q

Main Features

- Can make the test with displacement control
- Real time display of test graph.
- 4 analog channels for load cell and displacement sensor
- Calibration function for channels.
- Programmable digital gain adjustment for load-cell and potentiometric sensors, voltage and current transmitters
- Closed-loop PID for steady pace rate

Consolidation

- 25 pairs of time-vertical displacement values are written to memory.
- The vertical displacement value can be tared prior to recording.
- The analogical channel reading vertical displacement has 260000 points effective resolution.
- The memory can be exported to PC software.

Testing

- 3 different shearing test types can be selected.

- The machine run with the speed determined by user to the direction of shear and stop when the load decreases.

- The machine run with the speed determined by user to the direction of shear and stop when it reaches to the target horizontal displacement value which is also determined by the user at the beginnig of the test.

- The machine run with the speed to the direction of shear, after reaching to the target displacement, returns and finds the exact initial (HOME) position, waits for the dissipation of excess pore pressure and starts to the same procedure again. User can create testing scenarios by determining all the parameters of this multi-reversal shearing test such as test speed, return speed, displacement target, standby time, and cycle number.

- By using the control unit, consolidation before shearing tests are possible.

- The screen displays load, shear stress, horizontal and vertical displacements, and τ-Δx graph continuously.

PLEASE see the pages of "U-Touch PRO Control Units" for details of the properties of software and hardware.

CFU Software for Direct/Residual Shear Test

CFU Direct and Residual Shear Software is developed in accordance with ASTM D3080, BS 1377:7 and AASHTO T 236 standards to be used with CFS-2060.SMPR Machine.
Direct residual and shear software consist of two sections. First section is used for the consolidation of the sample prior to shear.

The second section of the software is capable of performing three different types of test. The first type moves the machine with the speed determined by user until a shear failure occurs. On the second type, the user can set a speed and a horizontal displacement and the test will continue until the machine reaches to the set value.
On the last type of test, the machine can be configured for cyclic (multireversal) operation. In cyclic mode device will advance to the determined distance with an assigned speed and turn back to the initial (home) position with a different assigned speed, wait for a time for the dissipation of excess pore pressure and start to the new cycle again.
All these test parameters such as forward-reverse speed, distance, cycle number, etc. can be defined by the user.

The software supports 5 different normal load values in order to calculate cohesion (C) and internal friction angle (Ø) values. Prior to the test normal load value must be entered to the software.
The normal stress is calculated according to normal load and sample size automatically.
The software supports both square and round type samples.
Stress values can be optionally and automatically calculated as "standard area" and the "corrected area" approach. When the test is completed peak and residual stress values are recorded.

The normal load versus peak stress pair is used for the calculation of cohesion and internal friction angle value. At least 3 loading with different normal loads are required for this property.
One can set test speed, axis values etc. through the setup of the software. The results can be submitted as a report or can be exported to Microsoft Excel for advanced reanalyze procedures.

The Automatic Direct Residual Shear Test Machine is supplied complete with;

- Load Cell 5 kN
- Linear Potentiometric Displacement Transducer (10x0.001 mm)
- Linear Potentiometric Displacement Transducer (25x0.001 mm)
- Software

Speed Range	0.00001 to 10,00 mm/min
Maximum Shear Force	5 kN (5000 N)
Maximum Vertical Load	0 to 500 N
Horizontal Travel	30 mm
Dimensions	450x1250x1200 mm
Weight (approx.)	110 kg
Power	1100 W

DIRECT/ RESIDUAL SHEAR

Product Code

CFS-2160	Large Type Direct Shear Testing Machine, 100 kN, for 300mm, 450mm, 600mm shearboxes, 220-240V 50-60 Hz
CFS-2163	Shearbox Assembly 300 x 300 mm
CFS-2164	Shearbox Assembly 450 x 450 mm
CFS-2166	Shearbox Assembly 600 x 600 mm

Standards

BS 1377-7; ASTM D 6243; EN ISO 12957

Models for 220-240V 50-60 Hz, 1 ph	CFS-2160
Models for 220V, 60Hz, 3ph	CFS-2160-CN

The test covers the determination of consolidated drained shear strength of a soil material in direct shear. The machine is ideal for determining shear resistance of soil-geosynthetic / geomembrans by direct shear.
CFS-2160 Automatic Direct / Residual Shear Test Machine is motorized and floor mounted. The total vertical load on the specimen can reach up to 100 kN.
CFS-2160 accepts 300, 450, 600 mm square shearbox assemblies. All shearbox assemblies are designed to contain water that surrounds the specimen. The Assemblies consist of a shear box with a rigid wall square or round hole complete with a vertical loading pad two retaining plates (one is smoot, the other is perforated.

The shear machines are driven by high resolution servomotor and gear box assembly. Speed range is fully stepless variable over the range 0.00001 to 9.99999 mm/min for both direction (shear and return).
After test the return speed is 10 mm/min. 100 kN load cell is used for load measurement. 200 x 0.01 mm sensitivity linear potentiometric transducers are used for vertical and horizontal displacement measurements. Horizontal Displacement limits are controlled by limit switches.

Display Unit and Controller

U-TouchPro Graphic Display & Control Unit is used for monitoring horizontal load, vertical load and displacement values. All test parameters such as speed, failure condition etc. Can be defined through this interface. The test can be started up and stopped by touch buttons.

The controller has two independent control axes, one for horizontal motion one for vertical motion. The displacement on horizontal motion is measured through external displacement sensor fitted to frame and also through the encoder behind the servo motor. All calibration of sensors can be done easily by entering new points respect to the error.

The software is capable of monitoring all measured values and drawing Shear stress vs Horizontal displacement graph. After three runs with different normal loads, the software calculates the cohesion value "c" and internal friction angle "φ" by using the best straight line fit.

User can select 3 different test types:

The machine run with the speed determined by user to the direction of shear and stop when the load decreases.

The machine run with the speed determined by user to the direction of shear and stop when it reaches to the target horizontal displacement value which is also determined by the user at the beginnig of the test.

The machine run with the speed to the direction of shear, after reaching to the target displacement, returns and finds the exact initial (HOME) position, waits for the dissipation of excess pore pressure and starts to the same procedure again. User can create testing scenarios by determining all the parameters of this multi-reversal shearing test such as test speed, return speed, displacement target, standby time, and cycle number.

4 analog channels for vertical load cell, vertical displacement, horizontal load and horizontal displacement transducer (one for each)

1/65000 points resolution per channel

1000 data per second sample rate for each channel. (In the software filtered as 10Hz)

Ethernet connecting for computer interface

240x320 resolution 65535 color TFT-LCD industrial touchscreen

Free of charge PC software for the test control and advanced report generation

The CFU Direct and Residual Shear Software is developed according to BS 1377-7; ASTM D 6243; EN ISO 12957 standards to be used with CFS-2160 machine. Direct residual and shear software consist of two sections. First section is used for the consolidation of the sample prior to shear. The software is capable of making three different types of test. The first type of the tests is to move the machine till a load failure happens. On the second type of test the user can set a horizontal displacement and the test will continue till the machine reaches set value. On the last type of test, the machine can be configured as going to a pre-set horizontal displacement value and return to home position. The software supports 5 different normal load values in order to calculate cohesion values. Prior to the test normal load value must be entered to the software. The normal stress value would be calculated with respect to normal load and sample size automatically. The software supports both square and round type samples. For both sample shape, stress values can optionally and automatically be calculated as "standard area" and the "corrected area" approach. When the test is completed peak and resilient stress values are recorded. The normal load versus max stress pair is used for calculating the cohesion value and angle. At least 3 loading with different normal loads are required for this property. One can set test speed, axis values etc through the setup of the software. The results can be submitted as a report or can be exported to Microsoft Excel for advanced reanalyze procedures.

CFS-2163 or/and CFS-2164 or/and CFS-2166 shear boxes with accessories should be ordered seperately.

The Automatic Direct Residual Shear Test Machine is supplied complete with

- 2 Load Cell 100 kN
- 2 Linear Potentiometric Displacement Transducer (200x0.01 mm)
- Software

CFS-2160	
Speed Range	0.00001 to 9.99999 mm/min
Maximum Shear Force	100 kN
Maximum Vertical Load	100 kN
Horizontal Travel	200 mm
Dimensions	2000x1250x1900 mm

Shearbox Assemblies

Product Code	Dimensions (mm)	Max. Shear Stress for 100 kN	Max. Normal Stress for 100 kN
CFS-2163	300 x 300	300 kPa	300 kPa
CFS-2164	450 x 450	500 kPa	500 kPa
CFS-2166	600 x 600	1100 kPa	1100 kPa

TRIAXIAL STRESS MEASUREMENT TEST (UU-CU-CD TESTS)

Product Code

Triaxial Test Systems

Standards

ASTM D2850, D4767, D7181; AASHTO T-297;
BS 1377-7, BS 1377-8

Determining the mechanical properties of soils is a very important step to design foundations, embankments and other soil structures. Building constructions, excavations, tunnelling and similar applications have several effects on the subsoil structures and these effects are successfully simulated with Triaxial Tests where the stress-strain relation of undisturbed soil specimen are investigated by subjecting the soil sample to different stress levels and drainage conditions.

The CFU Triaxial Test System provides automated triaxial compression tests on cylindrical undisturbed and remolded soil samples. Unconsolidated undrained (UU), consolidated drained (CD) and consolidated undrained (CU) compression tests can be automatically run, controlled and reported using this apparatus.

UU Only Triaxial Test Configuration

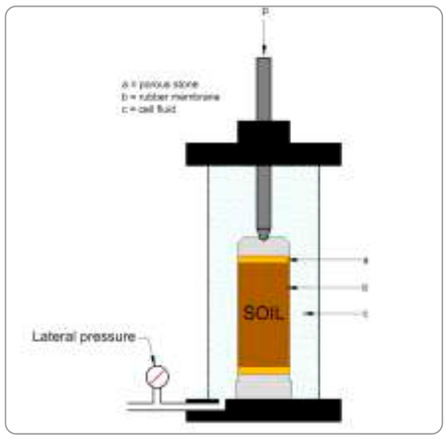
Unconsolidated Undrained (UU) Test

For the UU test , the specimens (assumed to be saturated prior to test) are subjected to a confining fluid pressure in a triaxial chamber. Once the specimen is inside the triaxial cell, the cell pressure is increased to a predetermined value by rotating the knob of the constant pressure unit, and the specimen is brought to failure by increasing the vertical stress by applying a constant rate of axial strain. Since saturation and consolidation do not exist in this method, original structure and water content of sample is untouched. Pore and back pressures are not measured during this test and therefore the results can only be interpreted in terms of total stress over a confinement pressure (stress).

These tests are generally carried out on three specimens of the same sample subjected to different confining stresses.

Since all specimens are supposedly saturated the shear strength are similar for all tests.

The results of the test are plotted as curves of principal stres difference against strain. For conditions of maximum principal stress difference (taken as failure) Mohr circles are plotted in terms of total stress. The average undrained shear strength is recorded, and the failure (Mohr) envelope is drawn tangential to the Mohr circles in order to find the “undrained cohesion intercept” and undrained “angle of shearing resistance”.



Consolidated Undrained (CU) Test & Consolidated Drained (CD) Test

Peak effective strength parameters (c' and ϕ') can be determined either from the results of consolidated undrained (CU) triaxial compression tests with pore pressure measurement, or from consolidated drained (CD) triaxial compression tests. The consolidated undrained/ drained triaxial compression tests are normally performed in several stages, involving the successive saturation, consolidation and shearing of each of three specimens.

Typical Configuration of Triaxial Test System for UU-CU-CD Tests

Saturation is carried out in order to ensure that the pore fluid in the specimen does not contain free air.
Saturation is normally carried out by leaving the specimens to an elevated back pressure so that the air in the pores is dissolved in water. Back pressure (which is simply an imposed pore pressure) is applied through a volume change gauge to the top of the specimen, while a cell pressure of slightly higher value is also applied.
Both cell pressure and back pressure are normally increased in increments, allowing time for equalization at each stage. The degree of saturation can be expressed in terms of Skempton's pore pressure parameter (Skempton, 1954):

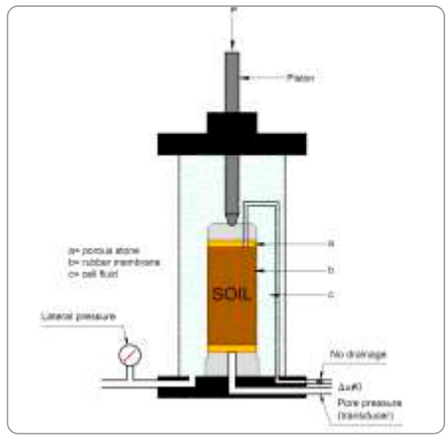
$$B = \frac{\Delta u}{\Delta \sigma_3}$$

where Δu is equal to change in pore pressure for an applied cell pressure change of Δσ3. For an ideally saturated soil B is equal to unity. It is recommended by several standard test methods that a value of B greater than, or equal to, 0.95 must be achieved before the specimen may be considered as fully saturated and the consolidation stage started. The consolidation stage of an effective stress triaxial test is carried out for two reasons. First, three specimens are tested and consolidated at three different effective pressures, in order to give specimens of different strengths which will produce widely spaced effective stress Mohr circles.
Secondly, the results of consolidation are used to determine the minimum time to failure in the shear stage.
The effective consolidation pressures (i.e. cell pressure minus back pressure) will normally be increased by a factor of two between each specimen, with the middle pressure approximating to the vertical effective stress in the ground.
When the consolidation cell pressure and back pressure are applied to the specimen, readings of volume change are made using a volume change device in the back pressure line.
Pore pressure is measured at the specimen base, with drainage to the back pressure line taking place through a porous stone covering the top of the specimen.
The coefficient of consolidation of the clay can be determined by plotting volume change as a function of the square root of time.
Theoretical considerations indicate that the first 50% of volume loss during consolidation should show as a straight line on this plot.
This straight line is extended down to cut the horizontal line representing 100% consolidation, and the time intercept at this point (termed "t " by Bishop and Henkel) 100 can be used to obtain the coefficient of consolidation.

TRIAXIAL STRESS MEASUREMENT TEST (UU-CU-CD TESTS)

Consolidated Undrained (CU) Test:

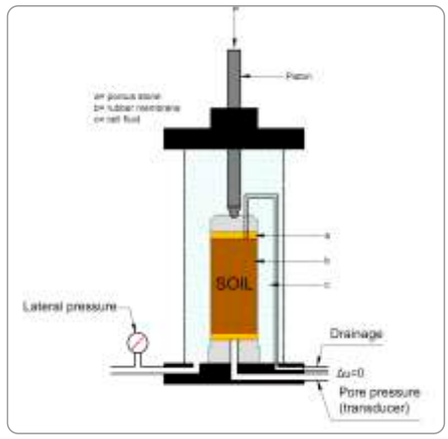
Once consolidation is complete, the specimen is to be isolated from the back pressure and the rate of vertical movement of the compression machine platen set according to result of consolidation.. During the shear stage the vertical stress is increased by the loading ram, and measurements are made at regular intervals of deformation, ram load and pore pressure. These are converted to graphs of principal stress difference ($\sigma 1 - \sigma 3$) and pore pressure as a function of strain, and failure is normally taken as the point of maximum principal stress difference. The effective stress Mohr circles are plotted for the failure conditions of the three specimens which has been subjected to different consolidation level, and the gradient and intercept of a straight line drawn tangential to these circles defines the effective strength parameters c' and ϕ'.



Consolidated Drained (CD) Test:

The consolidated drained triaxial compression test, with volume change measurement during shear is carried out in a similar sequence to the consolidated undrained test, but during shear the back pressure remains connected to the specimen which is loaded sufficiently slowly to avoid the development of excess pore pressures.

The shear stage of a drained triaxial test can be expected to take between 7 and 15 times longer than that of an undrained test with pore pressure measurement. Once shearing is complete, the results are presented as graphs of principal stress difference and volume change as a function of strain, and the failure Mohr circles are plotted to give the drained failure envelope defined by the parameters cd' and φd'.



Triaxial CD-CU-UU equipment is computer controlled, test values can be transferred to computer and data processing can be made with Triaxial software on Windows operating system. All data can be used on Excel programs. The load data and axial displacement data are transfered and recorded through U-Touch PRO Control Unit to the software.

Three pressure data (cell pressure, back pressure and pore pressure) from triaxial cell and volume change data transfered and recorded through the interface unit with 4 channel for data acquisition (CFCU-0320) to the software.

Typical configuration of system for different tests (UU-CU-CD)			
Product Code	Description	UU	UU-CU-CD
CFM-0108.SMPR	Multiplex Universal Electromechanic Test Machine*	1	1
CFGM-0010	Load Cell 5 kN	1	1
CFS-2400 CFS-2401	Triaxial Cell**	1	1
CFS-2405	Block with One Connection Line for Triaxial Test Cells	1	-
CFS-2406	Block with 3 Connection Lines for Traxial Test Cells	-	1
CFGM-0110	Pressure Transducer	1	3
CFS-2408	Oil and Water Constant Pressure System	1	2
CFS-2415	Automatic Volume Change Unit	-	1
CFCU-0320	Interface Unit with 4 Channel for Data Acquisition	-	1
CSOFT-2419	Software to Perform UU Triaxial Tests	1	1
CSOFT-2420	Software to Perform CU-CD Triaxial Tests	-	1
CFS-1330 and CFGP-1140	De-Airing Water Tank, 7 L. and Hose	1	1

* Supplied complete with CFGM-0025 50 kN Load Cell, CFGM-0062 25 mm Linear Potentiometric Transducer and U-Touch PRO Control Unit.
** Choose the suitable cell for the specimen size (CFS-2400: 38-50 mm dia. samples / CFS-2401: 70-100 mm dia. samples). For cell accessories and sample prepatarion accessories see next page.

Optional Apparatus which should be ordered seperately for de-airing water see the page of de-airing water.

Multiplex Universal Electromechanic Test Machine

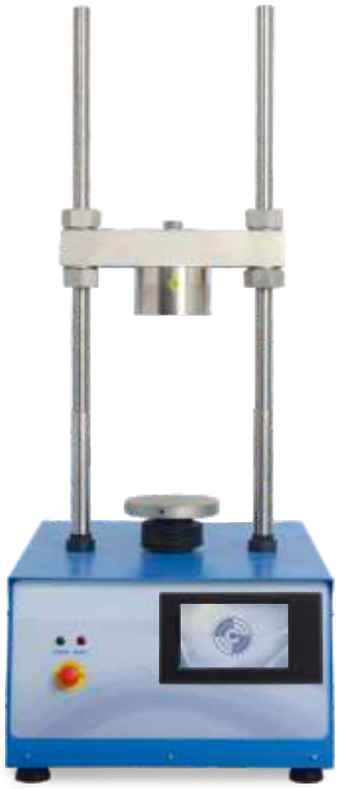
The CFM-0108.SMPR Multiplex Universal Electromechanic Test Machine is a Servo Controlled Multiplex Machine supplied complete with 50 kN Load Cell (CFGM-0025), 25 mm Linear Potentiometric Transducer (CFGM-0062) and U-Touch PRO Control Unit. 5 kN Loadcell should be ordered separately for Triaxial Tests.

The Frame capacity is 50 kN. This versatile digital loading frame features a microprocessor controlled drive system with an advanced servo motor enabling the operator to easily set any test speed via the coloured touch screen. Touch screen comprises adjustment buttons such as "start", "increase", "automatic", "manual", "down", "up" as well as other user defined test parameters. The testing speed can be set between 0,00001 mm/min to 51mm/min. The test automatically stops when load and/or displacement is reached to 99% value of the set measuring range. See CFM-0108.SMPR pages for details.

Load and displacement values are collected by U-Touch PRO Control Unit and transferred to PC for further processing with the, USOFT -2419 software for performing UU and USOFT -2420 software for CU-CD tests.

Dimensions	550x650x1100 mm
Weight (approx.)	95 kg
Power	750 W

CFGM-0042 with CFGM-0062



CFM-0108.SMPR

U-Touch PRO Control Units

U-Touch PRO Control Unit is designed to control the machine and processing of data from load-cells, pressure transducers or displacement transducers which are fitted to the machine.

All the operations of U-Touch PRO are controlled from the front panel consisting of color resistive touch screen display and function keys 4 analogue channels are provided for load-cells, pressure transducers or displacement transducers.

U-Touch PRO Control Units has easy to use menu options and displays all menu option listings simultaneously, allowing the operator to access the required option in a seemless manner to activate the option or enter a numeric value to set the test parameters.The digital graphic display of each control unit is able to draw realtime "Load vs. Time", "Load vs. Displacement" or "Stress vs. Time" graphics.

The Control Unit offers many addition unique features. You can save more than 10000 test results in its internal memory. The Control Units can be controlled remotely from anywhere around the world.

MAIN FEAUTURES

- Can make test with displacement control
- Real time display of test graph
- 4 analog channels for load cell or pressure sensors or displacement sensors
- Calibration function for 4 channels
- Programmable digital gain adjustment for load-cell, pressure transducers, strain-gauge based sensors potentiometric sensors, voltage and current transmitters
- Closed-loop for pace rate

PLEASE see the pages of "General/Data Aqusition and Control Units" for details of the properties of software and hardware of U-Touch PRO Control Unit

Soil Triaxial Test Softwares

The CU-CD triaxial test is a complicated test needs load data, diplacement data 3 pressure data from triaxial cell and volume change data. Load data and displacement data are transfered and recorded through U-Touch PRO Control Unit to the software. 3 pressure data from triaxial cell and volume change data transfered and recorded through the interface unit with 4 channel for data acquisition (CFCU-0320) to the software.

The CFU software USOFT-2420 for CD-CU tests is compatible with interface unit with 4 channel for data acquisition (CFCU-0320) and U-Touch PRO Control Unit. CFCU-0320 can be connected to PC by RS232 port. All channel gains can be set manually and accuracy of the reading can be increased.

Triaxial Software is a modular software that when a new test wanted to do, it directs the user step by step. First the software wants to input initial measurements such as diameter, heigth, sample weigth etc. On this stage the user decides CU or CD test will be done and enters cell pressure increment steps, back pressure differential pressure and effective stress that will be used on consolidation.

After the initialization is completed, the user goes to Saturation Cell Pressure increment stage. Cell presure must be incremented to the pressure entered at initialization stage. During this stage the software calculates B and pore pressure and submits their graph respect to time. When B value saturates this stage must be ended. Generally value of B would not reach to 0.95, therefore a back presuure increment stage must be implemented. On the saturation back pressure increment stage, prior to the start of this stage software commands what back pressure must be applied respect to initial settings. The software draws volume change and pore pressure data during this stage.

Saturation stages can be done recursively at most of 10 cycles. The relevant data of each stage is written to respective files for further investigation and report facilities.

When the saturation is completed the consolidation stage can be implemented. On this stage the software commands to adjust both cell and back pressure to apply effective stress. On the consolidation stage Volume change, pore pressure and pore pressure disssipation percent is drawn as graphs.

When the stage is completed, the next stage will be shear stage of CU or CD. The software suggest the shear speed respect to the results found on consolidation stage. Axial displacement and force must be tared prior to the start of shearing.

On the shear stage deviator stress, pore pressure, σ' versus σ'3 and s' versus t' graphs are drawn. 4 different test specimen can be configured in same file. All the results are used for drawing mohr circles. The data is evaluated with respect to specimen shear end condition. This condition can be selected as constant pore pressure, constant volume change effective prime deviator ratio etc. With the final measurements one set of data is closed.

The raw data can be exported to Microsoft Excel. Without using Microsoft Excel environment all reports can be printout which includes summary of each stage with relevant graphs.

See the pages of "CFU Softwares" for details of the properties of the software.

CFG-0320

Triaxial Cells & Sample Preperation

CFS-2400 Standard Triaxial cell for 38 and 50 mm dia. samples
CFS-2401 Standard Triaxial cell for 70 and 100 mm dia. samples

The cell has been designed and treated to minimize corrosion. Particular attention has been paid to the quality of finish between the piston and the head. Final assembly includes the fitting of an O-ring seal and the use of a special lubricant to reduce friction to a minimum and eliminate water leakage. The piston load capacity is designed to accept high axial loads which may be present during the final stages of a test.

Each cell has five take-off positions drilled in the base for top drainage/back pressure, pore water pressure and bottom drainage.

Each cell will accept a range of base adaptors and various accessories for testing a wide range of specimens.

The cell capacity is designed to tolerate confining pressures as high as 1700 kPa which is enough for simulating most in-situ conditions.

For cell accessories and sample prepatarion accessories see next page.

CFS-2400 CFS-2401

	CFS-2400	CFS-2401
Dimensions	160x160x400 mm	210x210x550 mm
Weight (approx.)	4.5 kg	12 kg

TRIAXIAL STRESS MEASUREMENT TEST (UU-CU-CD TESTS)

Cell Accessories

Sample Diameter(mm)	38	50	70	100	UU Test	CU CD Test
Base Adaptor	CFS-2420	CFS-2450	CFS-2470	CFS-2500	YES	YES
Porous Top Cap	CFS-2421	CFS-2451	CFS-2471	CFS-2501	YES	YES
Nylon Tubing for Drainage	CFS-2422	CFS-2452	CFS-2472	CFS-2502	--	YES
Pair of Porous Discs	CFS-2423	CFS-2453	CFS-2473	CFS-2503	--	YES
Rubber Membrane	CFS-2424	CFS-2454	CFS-2474	CFS-2504	YES	YES
Membrane Placing Tool (Strecher)	CFS-2425	CFS-2455	CFS-2475	CFS-2505	YES	YES
0 Ring(10 pcs.)	CFS-2426	CFS-2456	CFS-2476	CFS-2506	YES	YES
0 Ring Placing Tool	CFS-2427	CFS-2457	CFS-2477	CFS-2507	YES	YES
Leteral Filter Paper(50 pcs.)	CFS-2428	CFS-2458	CFS-2478	CFS-2508	--	YES
Filter Paper Discs(100 pcs.)	CFS-2429	CFS-2459	CFS-2479	CFS-2509	--	YES
Plastic Discs (2 pcs.)	CFS-2430	CFS-2460	CFS-2480	CFS-2510	YES	--

Sample Preparation Accessories

Sample Diameter(mm)	38	50	70	100
Split Sand Former	CFS-2431	CFS-2461	CFS-2481	CFS-2511
Split Mould	CFS-2432	CFS-2462	CFS-2482	CFS-2512
Cutter	CFS-2436	CFS-2466	CFS-2486	CFS-2516
Aluminium Dolly	CFS-2437	CFS-2467	CFS-2487	CFS-2517

Oil and Water Constant Pressure System

Product Code

CFS-2408 Oil and Water Constant Pressure Unit, 1700 kPa
CFGE-3554 Dijital Vakum ve Basınç Göstergesi, (-1...30 bar)
CFGM-0110 Pressure Transducer, 2000 kPa

Models for 220-240V 50-60 Hz, 1 ph.	CFS-0408
Models for 110-120V 60 Hz, 1 ph.	CFS-0408-N

CFS-2408

The Oil and Water Constant Pressure Unit is extremely versatile and can be used in conjunction with a wide range of test equipment. The unit provides continuous variable pressure up to 1700 kPa. Pressure is increased or decreased simply by turning a control knob.

The Unit is used for providing cell/back pressure in triaxial tests. The apparatus is supplied without a gauge for those customers who have suitable pressure monitoring equipment.

As optional equipment for monitoring the pressure of the unit;

- The Digital Pressure Gauge (CFGE-3554) or
- The pressure transducer(CFGM-0110) which can be used with U-Touch PRO Control Unit on the Multiplex Universal Electromechanic Test Machine (CFM-0108.SMPR) for only UU test or
- The pressure transducer(CFGM-0110) which should be used with CFCU-0320 for CU-CD tests

can be used and prefered optional equpment should be ordered separately.

The machine features a clear hydraulic/water interface reservoir and up to 1 liter capacity of water is available under pressure. Supplied complete with 2 liters of No.46 regular hydraulic oil.

CFS-2408	Dimensions	300x250x250 mm
	Weight	7.5 kg
	Power	35 W

CFGE-3554	Dimensions	150x150x100 mm
	Weight	0.6 kg

Volume Change Measurement

Product Code

CFS-2415 Automatic Volume Change Unit

The Unit consists of a piston connected to a 25 mm travel linear transducer which is 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 creates an electrical signal proportional to the volume of water flowing through the unit. By connecting it to the data acquisition system the measured volume change will be used by software during the test and in final report.

Capacity : 100 cm^3
Transducer Input : up to 12 V DC
Accuracy : ± 0.1 ml

Dimensions	260x260x400 mm
Weight (approx.)	5 kg

CFS-2415

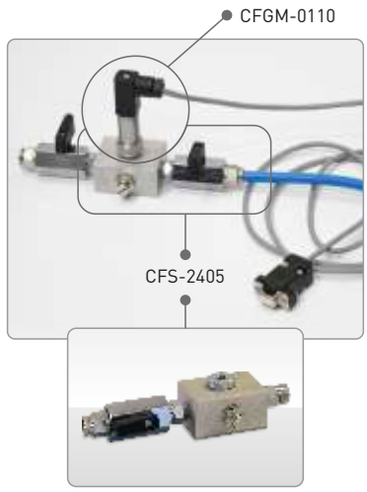
Pressure Transducer and Block for Triaxial Test Cells

Product Code

CFGM-0110 Pressure Transducer, 2000 kPa
CFS-2405 Blockwith One Connection Line for Triaxial Test

The Pressure Transducer is used for the measurement of cell or back or pore pressure of water in triaxial test systems and also should be used with a U-Touch PRO Control Unit) or a CFCU-0320 (interface unit with 4 channel for data acquisition)

The Block for triaxial test cells is used for connection of the pressure transducers and de-airing in the water hoses.



TRIAXIAL STRESS MEASUREMENT TEST (UU-CU-CD TESTS)

De-Airing Water

Product Code

CFS-2418	De-Airing Water Apparatus, 230V, 50Hz, 1ph
CFS-1330	De-Airing Water Tank, 7 L.
CFGE-3580	Vacuum Control and Water Connection Panel with Regulator and Vacum Gage Manometer
CFGE-3585	Connection Panel for Vacuum and Water with Vacuum Gage Manometer
CFGE-3505	Vacuum Pump 51 L/min. Capacity, 220-240 V 50-60 Hz
CFGG-2015	Filter Flask 2000 ml
CFGE-3570	Air Drying Unit / Water Trap, Vacuum Type
CFGP-1140	Plastic Hose, Ø8mm OD, 3 m

CFS-2418

The CFS-2418 De-Airing Water Apparatus is a compact and self-contained equipment which can de-air water quickly and efficiently down to levels of dissolved oxygen acceptable for geotechnical test methods. The apparatus used in conjunction with the de-airing tank (CFS-1330). Air is removed from the water by a vacuum system. De-airing tank should be ordered separately.

The first option for de-airing water;

- De-Airing Water Apparatus CFS-2418
- De-Airing Water Tank (CFS-1330)
- Vacuum Control and Water Connection Panel with Regulator and Vacum Gage Manometer (CFGE-3580) or Connection Panel for Vacuum and Water with Vacuum Gage (CFGE-3585) (These panels are optional)
- Plastic Hose (CFGP-1140)

CFS-1330

The second option for de-airing water;

- Vacuum Pump (CFGE-3505),
- Filter Flask (CFGG-2015) or Air Drying Unit / Water Trap (CFGE-3570)
- De-Airing Water Tank (CFS-1330)
- Vacuum Control and Water Connection Panel with Regulator and Vacum Gage Manometer (CFGE-3580) or Connection Panel for Vacuum and Water with Vacuum Gage (CFGE-3585) (These panels are optional)
- Plastic Hose (CFGP-1140)

By using CFGE-3580 Vacuum Control and Water Connection Panel, vacum pressure degree can be regulated.

By using CFGE-3585 or CFGE-3580 de-aring water equipment can be used without repeated assembling the hoses. The panels are supplied with 3 m hose. (CFGP-1140).

CFGE-3580

Product Code	Dimensions	Weight (approx.)
CFS-2418	465x240x340 mm	15 kg
CFGE-3580 CFGE-3585	450x150x500 mm	7 kg
CFS-1330	250x250x250 mm	2.7 kg
CFGG-1442	120x120x220 mm	0.5 kg
CFGE-3505	300x150x240 mm	8.5 kg
CFGE-3570	70x80x170 mm	0,5 kg

CFGE-3570

DENSITY-WATER CONTENT RELATIONSHIP / Proctor Moulds And Rammers

Product Code

CFS-0600A Standard Proctor Mould, ASTM
CFS-0605A Standard Proctor Compaction Rammer, ASTM
CFS-0610A Modified Proctor Mould, ASTM
CFS-0615A Modified Proctor Compaction Rammer, ASTM
CFS-0600E A Type Proctor Mould (Standard), EN
CFS-0603E A Type Split Proctor Mould (Standard), EN
CFS-0605E A Type Proctor Compaction Rammer (Low Energy-Standard), EN
CFS-0607E Steel Plate for The End Layer Comp. for A Type Proctor Moulds, EN
CFS-0610E B Type Proctor Compaction Mould (Modified), EN
CFS-0613E B type (Modified) Split Proctor/CBR Split Mould, EN,
CFS-0615E B Type Proctor Compaction Rammer (Medium Energy-Modified), EN
CFS-0617E Steel Plate for The End Layer Comp. for B Type Proctor Moulds,, EN
CFS-0620E C Type Proctor Compaction Mould, EN
CFS-0625E C Type Proctor Compaction Rammer (High Energy), EN
CFS-0627E Steel Plate for The End Layer Comp. for C Type Proctor Moulds, EN
CFS-0600B.TS 1 Liter Mould (Standard Proctor), BS, TS 1900-1
CFS-0605B 2.5 kg Compaction Rammer, BS
CFS-610B.E Modified Proctor (CBR Type Mould), BS / Vibrating Hammer Mould BS, EN, TS 1900-1
CFS-0615B 4.5 kg Compaction Rammer, BS
CFS-0600NF Standard Proctor Mould, NF
CFS-0603NF Split Standard Proctor Mould, NF
CFS-0605NF Standard Proctor Compaction Rammer, NF
CFS-0610NF CBR Type Mould (Modified Proctor), NF
CFS-0613NF Split CBR Type Mould (Modified Proctor), NF
CFS-0615NF Modified Proctor Compaction Rammer, NF
CFS-0600AS A type Proctor Mould (Standard), AS
CFS-0605AS Standard Proctor Compaction Rammer with Round Foot. AS
CFS-0606AS Standard Proctor Compaction Rammer with Sector Foot. AS
CFS-0610AS B type Proctor Compaction Mould (Modified), AS
CFS-0615AS Modified Proctor Compaction Rammer with Round Foot. AS
CFS-0616AS Compaction Rammer with Sector Foot. AS

Standards

ASTM D 698, D 1557, D 558 ; AASHTO T 99, T180, T 134 ; EN 13286-2; BS 1377:4, 1924:2; NF P 94-093 (Alternative); AS 1289.5.1.1 and 5.1.2

Moulds and rammers are used for determining the relationship between the moisture content and density of compacted soil. Made of plated steel, includes collar, mould body and base plate. Rammers are used to compact the soil sample in the Proctor Moulds and made of plated steel. Different models are available conforming to the relevant standards.

According to NF P 94-093, proctor moulds and rammers that include "...NF", can be used as an alternative to the moulds and rammers that include "...E" which also in compliance with EN 13286-2.

Proctor Moulds - ASTM / AASHTO

Product Code	Description	Internal Dia. (mm)	Body Height (mm)	Volume (cm^3)	Weight (approx. kg)
CFS-0600A	Standard Proctor Mould	101.6 ± 0.4	116.4 ± 0.5	944.0 ± 14	7
CFS-0610A	Modified Proctor Mould	152.4 ± 0.7	116.4 ± 0.5	2124 ± 25	9

Proctor Moulds - EN

Product Code	Description	Internal Dia. (mm)	Body Height (mm)	Volume (cm^3)	Weight (approx. kg)
CFS-0600E	A Type Proctor Mould EN (Standard)	100 ± 1	120 ± 1	942	5
CFS-0603E	A Type Split Proctor Mould (Standard), EN	100 ± 1	120 ± 1	942	5
CFS-0610E	B Type Modified Proctor / CBR Mould, EN	150 ± 1	120 ± 1	2120	8.9
CFS-0613E	B Type Mod. Split Proctor / CBR Mould, EN	150 ± 1	120 ± 1	2120	8.9
CFS-0620E	C Type Proctor Mould, EN	250 ± 1	200 ± 1	9813	20

Proctor Moulds - BS

Product Code	Description	Internal Dia. (mm)	Body Height (mm)	Volume (cm^3)	Weight (approx. kg)
CFS-0600B	1liter Mould (Standard Proctor) BS,TS-1900-1	105 ± 0.5	115.5 ± 0.5	1000	5
CFS-0610B	Modified Proctor (CBR Type Mould) / Vibrating Hammer Mould BS, EN, TS-1900-1	152 ± 0.5	127 ± 1	2303	7.3

***C Spanners (CFS-0611B.E) and Assembly Tool (CFS-0612B.E) should be ordered separately for assembling and disassembling the these moulds.**

Proctor Moulds - NF P 94-093 (Alternative)

Product Code	Description	Internal Dia. (mm)	Body Height (mm)	Volume (cm^3)	Weight (approx. kg)
CFS-0600NF	Standard Proctor Mould, NF	101,5± 0.5	116,5± 0,5	942	5
CFS-0603NF	Split Standard Proctor Mould, NF				
CFS-0610NF	Modified Proctor (CBR Type) Mould, NF	152 ± 0.5	152,0± 0,5	2757	8.3
CFS-0613NF	Split Modified Proctor (CBR Type) Mould, NF				

Proctor Moulds - AS

Product Code	Description	Internal Dia. (mm)	Body Height (mm)	Volume (cm^3)	Weight (approx. kg)
CFS-0600AS	A Type Proctor Mould AS (Standard)	105 ± 0,5	115± 0,5	1000	5
CFS-0610AS	B Type Proctor Mould AS (Modified)	152 ± 1	132,5 ± 0,5	2400	9

Proctor Rammers - ASTM / AASHTO

Product Code	Description	Rammer Dia. (mm)	Free Fall Height (mm)	Mass of Rammer (g)	Weight (approx. kg)
CFS-0605A	Standard Proctor Compaction Rammer	50.8	304.8± 1	2495 ± 23	4.5
CFS-0615A	Modified Proctor Compaction Rammer	50.8	457 ± 1.3	4540 ± 10	8

Proctor Rammers - EN

Product Code	Description	Rammer Dia. (mm)	Free Fall Height (mm)	Mass of Rammer (g)	Weight (approx. kg)
CFS-0605E	A Type Rammer EN (Low Energy-Standard)	50 ± 0.5	305± 3	2500 ± 20	4.5
CFS-0615E	B Type Rammer EN (Med. Energy-Modified)	50 ± 0.5	457 ± 3	4500 ± 40	8
CFS-0625E	C Type Proctor Cmp. Rammer EN (High Energy)	125 ± 0.5	600 ± 3	15000 ± 40	25

Proctor Rammers - BS

Product Code	Description	Rammer Dia. (mm)	Free Fall Height (mm)	Mass of Rammer (g)	Weight (approx. kg)
CFS-0605B	2.5 kg Compaction Rammer BS	50 ± 0.5	300± 3	2500 ± 25	4.5
CFS-0615A	4.5 kg Compaction Rammer BS	50 ± 0.5	450 ± 4	4500 ± 50	8

Proctor Rammers - NF P 94-093 (Alternative)

Product Code	Description	Rammer Dia. (mm)	Free Fall Height (mm)	Mass of Rammer (g)	Weight (approx. kg)
CFS-0605NF	Standart Proktor Tokmak, NF	51 ± 1.0	305± 2	2490 ± 2.5	4.5
CFS-0615NF	Modifiye Proktor Tokmak, NF	51 ± 1.0	457 ± 2	4535 ± 5	8

Proctor Rammers - AS

Product Code	Description	Rammer Dia. (mm)	Free Fall Height (mm)	Mass of Rammer (g)	Weight (approx. kg)
CFS-0605AS	Standard Proctor Compaction Rammer with Round Foot. AS	50±0,4	300±2,0	2.7±0,01 kg	4.5
CFS-0606AS	Standard Proctor Compaction Rammer with Sector Foot. AS	74±0,5 (Radius of sector foot)	300±2,0	2.7±0,01 kg	4.5
CFS-0615AS	Modified Proctor Compaction Rammer with Round Foot. AS	50±0,4	450±2,0	4.9±0,01 kg	9
CFS-0616AS	Modified Proctor Compaction Rammer with Sector Foot. AS	74±0,5 (Radius of sector foot)	450±2,0	4.9±0,01 kg	9

DENSITY-WATER CONTENT RELATIONSHIP
Automatic Soil Compactor

Product Code

CFS-0650 Automatic Soil Compactor
CFS-0652 ASTM/EN/BS Rammer for CFS-0650
CFS-0654 ASTM Rammer Face, Ø2" (50.8 mm) for CFS-0650
CFS-0655 EN/BS Rammer Face Ø 50 mm for CFS-0650

Models for 220-240V 50 Hz, 1 ph.	CFS-0650-T
Models for 110-120V 60 Hz, 1 ph.	CFS-0650-N
Models for 220-240V 60 Hz, 1 ph.	CFS-0650-K

Standards

ASTM D558, D559, D560, D698, D1557, D1883; EN 13286 2, 13286-47; BS 1377:4 AASHTO T99, T134, T135, T136, T180, T193; NLT 107/98, 108/91, 111/87

CFS-0650 Automatic Soil Compactor is designed to compact specimens automatically and uniformly, assuring conformity with the above listed international standards.

The principle of the design is to allow the hammer to drop the required height into the soil in the mould which rotates circularly to distribute the blows uniformly over the surface of the specimen in the mould. The drop height is adjustable to 300 mm, 12" (305 mm), 450 mm and 18" (457 mm). The rammer is circular faced and interchangeable to 50 mm or 2" (50.8 mm).diameter. Rammer weight is adjustable to 5,50 lbf (2.5 kg) or 10 lbf (4.54 kg) according to reference standard. When compacting 100 mm or 4" diameter specimens the unit operates on a single radius and when compacting 150 mm or 6" diameter specimens the unit operates on iner and outer radius to obtain even compaction.

The number of blows per layer can be set at the beginning of the compaction process by the digital counter according to the standard preferred by user. This automatic blow pattern ensures effective and equal compaction for each layer of soil by rotating the base table, so the mould, in equal steps and travelling the rammer across the mould. User defined blow number and in-out distribution is also available.

Compactor is equipped with programmable digital counter which allows the machine;

- **To select reference standard (number of blows and mould size) by the operator at the beginning of the test.**
- **To set desired compaction cycle (number of blows and count of the number of inner and outer drops) by user.**

Dimensions	650x550x1550 mm
Weight (approx.)	150 kg
Power	370 W

Start, stop, emergency stop buttons and digital counter are on control panel which is connected to the main body by anti-vibrating connections

CFS-0652 with CFS-0654

The Standard Type (BS, EN, ASTM, AASHTO) Mould Size (4"or 6") and The Number of Drops can be selected easily

The Automatic Soil Compactor is supplied complete with:
- ASTM/EN/BS Rammer
- ASTM Rammer Face, Ø2" (50.8 mm).
- EN/BS Rammer Face, Ø 50 mm.

Rammers

EN / BS	Circular faced,50 mm dia. Adjustable to 2.5 kg or 4.54 kg weight
ASTM / AASHTO	Circular faces, Ø2" (50.8 mm) dia. Adjustable to 5,50 lbf (2.5 kg) or 10 lbf (4.54 kg) weight

Drop Height

BS	Adjustable to 300 mm or 450 mm
ASTM / AASHTO / EN	Adjustable to 12" (305 mm) or 18.00".(457. mm)

DENSITY-WATER CONTENT RELATIONSHIP
Automatic Mechanical Compactor

Product Code

CFS-0660 Automatic Soil Compactor only ASTM

Models for 220-240V 50 Hz, 1 ph.	CFS-0660-T
Models for 110-120V 60 Hz, 1 ph.	CFS-0660-N
Models for 220-240V 60 Hz, 1 ph.	CFS-0660-K

Standards

ASTM D558, D559, D560, D698, D1557, D1883; AASHTO T99, T134, T135, T136, T180, T193

The CFS-0660 Automatic Mechanical Compactor is designed to perform fast and accurate compaction of soil samples automatically acc. to ASTM and AASHTO standards. The weights of rammers are adjustable to 5,5 lbf (2,5 kg) or 10 lbf (4,5 kg).Also the drop heights of rammers are adjustable to 18"(457 mm) or 12" (305 mm). The pie-shaped rammer can only be used for 6" mold compaction while the circular-faced rammer can only be used for 4" mold compaction.Hammers can easily be replaced from the front side of the compactor.

Machine stops automatically after preset number of blows per compaction is completed. Compaction mould is mounted on the round base; the circular base indexes automatically with each blow to ensure uniform sample compaction.

The Automatic Mechanical Compactor is supplied complete with:

- Circular-Faced Rammer, Ø2"
- Pie-Shaped Rammer

Dimensions	29,5"x13,8"x49" (750x350x1500 mm)
Weight (approx.)	397 lbs (180 kg)
Power	600 W

Circular-Faced & Pie-Shaped Hammer

Compacted Road Base and Subbase Soils

DENSITY-WATER CONTENT RELATIONSHIP
Vibratory Compaction

Product Code

CFS-0680-T	Vibratory Hammer for Compaction of Soil and Bituminous Mixtures, 220-240V, 50 Hz, 1ph.
CFS-0681	Supporting Frame for Vibratory Hammer
CFS-0682	Large Tamping Foot, Ø146 mm
CFS-0683	Small Tamping Foot, Ø102 mm.
CFS-0684	Shank for CFS-0680
CFS-0610B.E	CBR Type Mould BS (modified proctor) / Vibrating Hammer Mould EN
CFS-0611B.E	C Spanner for CFS-0610B.E, 2 pcs
CFS-0612B.E	Assembly Tool for Base Plate for CFS-0610B.E

Standards

EN 13286-4; BS 1377:4, EN 12697-9, 12697-10, 12697-32

The CFS-0680 Vibratory compaction apparatus are used for preparing the test specimens of road base and sub base materials and bituminous mixtures

CFS-0681 Supporting frame for vibratory hammer, shank (CFS-0684) Ø146 mm large tamping foot (CFS-0682) and/or Ø102 mm small tamping foot (CFS-0683) should be ordered separately when ordering the vibratory hammer.

Also, CFS-0610B.E mould should be ordered separately and also when ordering this mould, CFS-0611B.E and CFS-0612B.E should be ordered separately for assembling and dissambling.

Dimensions	510x300x1120 mm
Weight (approx.)	75 kg (complete set)
Impact Rate	3000 - 1500
Power	1150 W (vibrating hammer)

MOISTURE vs. PENETRATION RESISTANCE

Product Code

CFS-0695	Spring Type Proctor Penetrometer
CFS-0696	Needle Set for Proctor Penetrometer (28.55, 24.79, 20.22, 16.54, 12.83, 9.07, 6.40, 5.23 and 4.52 mm diameters)

Standards

ASTM D1558

The CFS-0695 Spring Type Proctor Penetrometer is used for establishing the moisture-penetration resistance relation of fine-grained soils. The apparatus consists of a spring loading device which is graduated from 10 to150 lbf in 2 lbf subdivisions.

Needle Set for Proctor Penetrometer consist of interchangeable needle points of 28.55, 24.79, 20.22, 16.54, 12.83, 9.07, 6.40, 5.23, 4.52 mm diameters and a carrying case.

CFS-0695, CFS-0696 with special wooden case

Dimensions	Weight (approx.)
540x260x60 mm(packed)	5 kg

DENSITY-WATER CONTENT RELATIONSHIP
Relative Density Test

Product Code

CFS-0670A-C	Relative Density Test Set, ASTM, 380V 50Hz, 3 ph.
CFS-0672A	Relative Density Mould Set, ASTM, 0.5 ft 3
CFS-0673A	Relative Density Mould Set, ASTM, 0.1 ft 3
CFS-0674A	Relative Density Gauge Set, ASTM
CFS-0675	Pouring Funnel Set, for Relative Density Test.
CFS-0676	Compass Crane with Electric Motor
CFS-0678	Equipment for Calibration of Amplitude of Vibrating Table

Standards

ASTM D4253 (Method 1A-1B), D4254

Relative Density Test Set acc. to ASTM 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 impact method will generally be less than by vibratory method.

The test is applicable to soils that may contain up to 15 %, by dry mass, of soil particles passing a No 200 (75-µm) sieve, provided they still have cohesionless, free-draining characteristics. Further, these test methods are applicable to soils in which 100 %, by dry mass, of soil particles pass a 3-in. (75-mm) sieve.

CFS-0670A-C, Relative Density Test Set consists of a electromagnetic vibrating table with controller, relative density mold sets (0,1 ft.3 and 0,5 ft.3) and relative density gauge set.

CFS-0672A or CFS-0673A, Relative Density Mould Set consists of a mould, circular surcharge weight with handle, surcharge base plate with handle and detachable guide sleeve with clamp assembly.

CFS-0674A, Relative Density Gauge Set consists of a analog displacement dial gauge (50 x 0.01 mm division, 0-100 scale - CFGM-0132) with holder and calibration bar, metal 75 x 300 x 6mm set.

CFS-0676, Cross Crane with Elelectric Motor is used for handling of surcharge weights for user healty during the test. The Crane be anchored to a rigid wall and/or concrete ground.

CFS-0678, Equipment for Amplitude Calibration of Vibrating Table consists of a software for vibration amplitude measurement, data acquisition (1000 record/second) unit, electronic displacement transducer (accuracy 0.0005 in. - 0.015 mm) and mount for displacement transducer (for mounting the transducer at the top of the mold. during the calibration).

CFS-0675, CFS-0676 and CFS-0678 should be ordered seperately.

CFS-0673A Relative Density Mould Set

Vibration Frequency	50 Hz
Amplitude Range	Between about 0.20 mm and 0.48 mm
Vibrating Table Type	Electromagnetic

Product Code	Dimensions	Weight (approx.)
CFS-0670A-C	1400x760x570 mm	135 kg
CFS-0672A	390x390x490 mm	130 kg
CFS-0673A	240x240x490 mm	45 kg
CFS-0674A	100x100x320 mm	1,8 kg
CFS-0675	170x170x530 mm	8 kg
CFS-0676	2100x1850x400mm	95 kg

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Compacted Road Base and Subbase Soils

CBR MOULD & ACCESSORIES ASTM

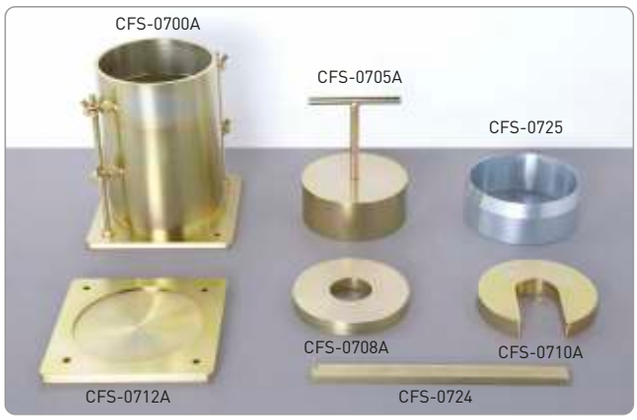
Product Code

CBR Mould and Accessories, ASTM

Standards

ASTM D1883; AASHTO T193

Each accessories listed below should be ordered separately.



Product Code	Description	Dimensions	Weight (approx.)
CFS-0700A	CBR Mould ASTM / AASHTO, plated steel mould body with 6" (152.4 mm) dia. x 7" (177.8 mm) height, supplied complete with extension collar and perforated base plate	200x200x450 mm	8.5 kg
CFS-0705A	Spacer Disc with T handle ASTM, 150.8 mm dia. x 61.4 mm height"	200x200x300 mm	7.5 kg
CFS-0708A	Annular Surcharge Weight ASTM, 2.27 kg	160x160x30 mm	2.3 kg
CFS-0710A	Slotted Surcharge Weight ASTM, 2.27 kg	160x160x300 mm	2.3 kg
CFS-0712A	CBR Solid Base Plate ASTM	200x200x100 mm	2.1 kg
CFS-0724	Straightedge 300x30x5 mm	300x30x5 mm	1.0 kg
CFS-0725	Cutting Edge	200x200x75mm	1.5 kg
CFS-0729	Filter Paper for CBR Test No:1 x 2.4 mm dia. (Pack of 100)	200x200x20 mm	0.3 kg
CFS-0730	Filter screen, 144 mm dia. 150 µm mesh ASTM	150x150x20 mm	0.1 kg

CBR MOULD & ACCESSORIES EN

Product Code

CBR Mould and Accessories EN

Standards

EN 13286-47

Each accessories listed below should be ordered separately.

Product Code	Description	Dimensions	Weight (approx.)
CFS-0610E	B type Proctor/CBR Mould EN, internal dia.: 150±1 mm, internal height: 120±1 mm, supplied complete with extension collar and solid base plate	200x200x180 mm	8.9 kg
CFS-0705E	Spacer Disc with T Handle, EN	200x200x60 mm	4.5 kg
CFS-0708E.B	Annular Surcharge Weight BS / EN, 2 kg	160x160x30 mm	2.6 kg
CFS-0709E.B	Split Surcharge Weight BS / EN, 2 kg	160x160x30 mm	2.6 kg
UTA-0713E	CBR Perforated Base Plate EN	200x200x100 mm	2 kg
CFS-0724	Straightedge 300x30x5 mm	300x30x5 mm	1.0 kg
CFS-0727	Filter papers for CBR test, No:1 x 150 mm dia.	200x200x20 mm	0.3 kg
CFS-0730	Filter screen, 144 mm dia. 150 µm mesh	150x150x20 mm	0.1 kg

CBR MOULD & ACCESSORIES BS

Product Code

CBR Mould and Accessories BS

Standards

BS 1377:4, 1924:2

Each accessories listed below should be ordered separately.

Product Code	Description	Dimensions	Weight (approx.)
CFS-0610B.E (*)	CBR Type Mould BS (modified proctor) / Vibrating Hammer Mould BS, EN, TS-1900-1 internal dia.: 152 mm, internal height: 127 mm, supplied complete with extension collar and solid base plate	200x200x450 mm	8.5 kg
CFS-0611B.E	C-Spanner for CFS-0610B.E, 2 pcs	200x200x300 mm	7.5 kg
CFS-0612B.E	Assembly tool for Base Plate for CFS-0610B.E	350x30x15 mm	1.0 kg
CFS-0704B	Cutting Collar, BS	200x200x75 mm	1,5 kg
CFS-0707B	Compaction plug with T handle BS, 150 mm dia. x 50 mm height	200x200x300 mm	1.5 kg
CFS-0708E.B	Annular Surcharge Weight BS/EN, 2 kg	160x160x30 mm	2.6 kg
CFS-0709E.B	Split Surcharge Weight BS/EN, 2 kg	160x160x30 mm	2.6 kg
CFS-0713B	CBR Perforated Base Plate BS	200x200x100 mm	2 kg
CFS-0724	Straightedge 300x30x5 mm	300x300x5 mm	1 kg
CFS-0727	Filter Paper for CBR Test No:1 x 150 mm dia. (Pack of 100)	200x200x20 mm	0.3 kg

(*) C-spanner (2pcs CFS-0611B.E) and Assembly Tool for Base Plate (CFS-CFS-0612B.E) should be oredered seperately. (Dismantling and installing the molds.)

CBR MOULD & ACCESSORIES AS

Product Code

CBR Mould and Accessories AS

Standards

AS 1289.6.1.1

Each accessories listed below should be ordered separately.

Product Code	Description	Dimensions (mm)	Weight (approx.)
CFS-0700AS	CBR Mould AS. Ø152 mm. Supplied complete with extension collar and perforated base plate.	200x200x180	9.0 kg
CFS-0703AS	Split CBR Mould AS. Ø152 mm. Supplied complete with extension collar and perforated base plate.	200x200x300	9.0 kg
CFS-0705AS	Spacer Disc with T handle, AS Ø150mm, 61 mm height.	200x200x100	9.0 kg
CFS-0708AS	Annular Surcharge Weight, AS 2.25 kg	160x160x30	2.7 kg
CFS-0710AS	Slotted Surcharge Weight, AS, 2.25 kg.	160x160x30	2.7 kg
CFS-0717AS	CBR Soak Weight, AS, 4.5 kg.	160x160x50	4.7 kg
CFS-0724	Straightedge 300x30x5 mm	300x30x5	1.0 kg
CFS-0729	Filter papers for CBR test, No:1x Ø152,4 mm (Pack of 100).	200x200x20	0.3 kg

CBR MOULD & ACCESSORIES NF

Product Code

CBR Mould and Accessories NF

Standards

NF P 94-078 (Alternative)

Each accessories listed below should be ordered separately.

Product Code	Description	Dimensions (mm)	Weight (approx.)
CFS-0610NF	Modified Proctor /CBR Type Mould, NF, Ø152 mm. Supplied complete with extension collar and solid base plate.	200x200x180	9.0 kg
CFS-0613NF	Split Modified Proctor /CBR Type Mould, NF, Ø152 mm. Supplied complete with extension collar and solid base plate.	200x200x300	9.0 kg
CFS-0705NF	Spacer Disc with T Handle, NF, Ø151 mm, 36 mm Height.	200x200x100	3.5 kg
CFS-0708NF	Annular Surcharge Weight, NF 2.3 kg	160x160x30	2.7 kg
CFS-0709NF	Split Surcharge Weight, NF, 2.3kg.	160x160x30	2.7 kg
CFS-0713NF	CBR Perforated Base Plate NF	200x200x75	1.5 kg
CFS-0724	Straightedge 300x30x5 mm	300x30x5	1.0 kg
CFS-0725	Cutting Edge	200x200x75	1.5 kg
CFS-0729	Filter papers for CBR test, No:1x Ø152,4mm (Pack of 100).	200x200x20	0.3 kg

CFU INTERNATIONAL TRADE & SERVICES INC.

Compacted Road Base and Subbase Soils

SWELLING

Product Code

CFS-0790 Adjustable Stem and Perforated Aluminum Plate for CBR Swelling Test
CFS-0790A Adjustable Stem and Perforated Brass Plate, ASTM, for CBR Swelling Test
CFS-0790NF Adjustable Stem and Perforated Plastic Plate,NF, for CBR Swelling Test
CFS-0790AS Adjustable Stem and Perforated Plate, AS, for CBR Swelling Test
CFS-0792A Tripod for CBR Swelling Test, ASTM, AS.For CFS-0700 and CFS-0740AS
CFS-0792E Tripod for CBR Swelling Test, EN, for CFS-0612
CFS-0792 Tripod for CBR Swelling Test, BS, NF, TS
CFGM-0120 Analog Gauge 30 mm Travel x 0.01 mm Division
CFGM-0148 Digital Dial Gauge 25x0,01 mm, LCD Display
CFGM-0152 Digital Dial Gauge 12,7x0,001 mm, LCD Display
CFS-0794 CBR Soaking Tank (6 pcs. CBR Mould Capacity)

Standards

EN 13286-47; ASTM D1183; AASHTO T193; BS 1377:4, 1924:2;
NF P 94-078; AS 1289.6.1.1

This equipment is used to monitor the swelling by placing it on top of the soil sample. The swell test consists of perforated plate (swell plate) with adjustable stem, dial gauge and dial gauge tripod for mounting swell dial gauge in position on CBR Mould Collar.

The prefered gauge and each other equipment should be ordered separately for swelling test.

Product Code	Dimensions	Weight
CFS-0790	180x180x160 mm	2.5 kg
CFS-0790NF	180x180x160 mm	0,5 kg
CFS-0792	200x200x300 mm	1 kg
CFGM-0120	150x100x80 mm	0.5 kg
CFS-0794	500x700x400 mm	3 kg

CFGM-0120

CFS-0792A

CFGE-0148

CFS-0792E

CFS-0794

CFS-0790

CBR TEST MACHINES

Product Code

CFS-0852 CBR Test Machine with Load Ring, 50 kN capacity

Models for 220-240V 50-60 Hz, 1 ph.	CFS-0852
Models for 110-120V 60 Hz, 1 ph.	CFS-0852-N

Standards

EN 13286-47; BS 1377:4; ASTM D1883; AASHTO T193;
NF P94-078; AS 1289.6.1.1; UNI CNR 10009

The CFS-0852 is designed for performing laboratory evaluation of the CBR value of highway sub bases and subgrade and for the determination of strength of cohesive materials which have maximum particle sizes less than 19 mm (3/4").

The CFS-0852 is designed to load the penetration piston into the soil sample at a constant rate to measure the applied load and piston penetration at predetermined intervals.

The machine is designed to be mounted on a suitable bench and comprises of a robust and compact two column frame with adjustable upper cross beam. The frame has 50 kN capacity. The test speed is 1.27 mm/min. for ASTM/EN/AASHTO/BS/NF tests. Loading and unloading are down from the front panel by UP/DOWN buttons. Unloading speed is udjusted 5 mm/min for easy re-testing.

The CBR Test Machine is supplied complete with;
- Load Ring, 50 kN
- DDigital dial gauge 25 x 0.01 mm (CFGM-0148) with holder (CFS-0853)
- Penetration Piston (CFS-0870)

Dimensions	480x650x1150 mm
Weight (approx.)	110 kg
Power	370 W

CBR TEST MACHINES

Product Code

CFS-0856.ACPR Automatic CBR Test Machine with U-Touch PRO Control Unit

Models for 220-240V 50-60 Hz, 1 ph.	CFS-0856.ACPR
Models for 110-120V 60 Hz, 1 ph.	CFS-0856.ACPR-N

Standards

EN 13286-47; BS 1377:4; ASTM D1883; AASHTO T193; NF P94-078; AS 1289.6.1.1; UNI CNR 10009

The CFS-0856.ACPR Automatic CBR Test Machine is designed for performing laboratory evaluation of the CBR value of highway sub-bases and sub-grade, and determination of the strength of cohesive materials which have maximum particle sizes less than 19 mm (3/4").

The CFS-0856.ACPR is composed of a robust and compact two column frame with adjustable upper crossbeam driven by an electromechanical ram with a maximum capacity of 50 kN and a data acquisition and processing system.

The CFS-0856.ACPR is designed to load the penetration piston into the soil sample at a constant rate to measure the applied load and piston penetration at predetermined intervals. This main feature allows the user to perform tests complying to BS, EN, ASTM or AASHTO standards with the same machine.

Rapid adjustment of the platen is also provided by up and down buttons which are located on the front panel of the machine. The CFS-0856.ACPR is supplied complete with a 50 kN load cell, penetration piston, linear potentiometric displacement transducer (25 mm x 0.001 mm).

U-Touch PRO Control Unit

U-Touch PRO Control Unit is designed to control CBR test machine CFS-0856ACPR to perform acc. to EN,ASTM/AASHTO and BS standards.

The Unit can perform CBR tests as a stand-alone without the use of a PC or with the USOFT-0856 software and a PC. Control of machine, acquisition of load and displacement data in real time are provided by the unit

The control unit has easy to use menu options. It displays all menu option listings simultaneously, allowing the operator to access the required option in a seemless manner to activate the option or enter a numeric value to set the test parameters and see all the data while the test running.

Control Unit offers many addition unique features. You can save test results in its internal memory and can be controlled remotely from anywhere around the world.

The CBR Test Machine is supplied complete with;
- Load Cell, 50 kN
- Penetration Piston (CFS-0870)
- Linear potentiometric displacement transducer 25 mm x 0.001 mm (CFGM-0062) with holder (CFM-0114)
- Computer Software
- LAN Connection Cable

Dimensions	480x650x1150 mm
Weight (approx.)	110 kg
Power	370 W

Main Features

- **Can make the test with displacement control**
- **Real time display of test graph.**
- **4 analog channels for load cell and displacement sensors**
- **Can control second frame**
- **Calibration function for channels.**
- **Programmable digital gain adjustment for load-cell and potentiometric sensors, voltage and current transmitters**
- **Closed-loop PID for steady pace rate**
- **Calculates corrected CBR value at 2.5 and 5 mm the digital unit saves the load value at user defined displacement values such as 0.625, 1.25, 1.875, 2.5, 3.75, 5, 7.5,10, 12.5 mm**
- **The load corresponds to the displacements corrected respect to the linear region of the data has also saved**
- **The % CBR at 2.5 mm and % CBR at 5 mm is also automatically calculated and saved**

PLEASE see the pages of "General/Data Aqusition and Control Units" for details of the properties of software and hardware of U-Touch PRO Control Unit

USOFT-0856 CFU Software for CBR Test

USOFT-0856.CBR Test Software is developed for EN/ASTM/AASHTO/BS CBR Test. The software includes control of machine, acquisition of load and displacement data, generating and saving reports.

The software prepares a summary result for the user that will only need some specific loads such as at 0.625 mm, 1.25 mm, 2.5 mm and 5 mm. The software continously updates load, stress and displacement till the end of test. Sofware can automatically draw the best tangent line and perform the upward concave correction as suggested by ASTM D 1883.

The corrected stress values are then calculated respect to this offset.The CBR value at 2.5mm and 5.0mm are calculated by using the standart load values at those penetrations. On the general information tab, by entering necessary information, dry density calculations can be made through the software. The software supports metric, SI and Imperial unit system.

See the pages of "CFU Softwares" for details of the properties of software and hardware.

FIELD CBR TEST SET

Product Code

CFS-0865B In-situ CBR Test Apparatus
CFS-866 Extension Rod, 1m, for CFS-0865, (Supplied with a nipple)
CFS-0867 Conversion Frame

Standards

BS 1377:9; 1924:2

CFS-0865B

CFS-0867

CFS-0865B with CFS-0867

The CFS-0865B In-situ CBR Test Apparatus, 50 kN capacity,is used for the on-site determination of the bearing capacity of soils used in road construction.

The set consists of:

- 50 kN capacity mechanical jack with ball seating
- 50 kN capacity load ring with an adaptor
- Analog penetration dial gauge (30 mm travel x 0.01 mm) with connection part
- CBR Penetration piston (CFS-0870)
- Set of extension rods
  (2 pcs. 110 mm, 1 pcs. 300 mm and 1 pcs. 600 mm length)
  3 pcs. nipples, a height adjustment bolt and its nut)
- Datum bar assembly with two tripod stands
- 4.5 kg annular surcharge weight
- 4.5 Kg slotted surcharge weight (2 pcs.)
- 9 kg slotted surcharge weight (2 pcs.)
- Vehicle bracket
- Wooden carrying case

In-situ CBR Test Apparatus, used for the in-situ determination of the bearing capacity of soils.The CFS-0867 Conversion Frame is used to convert the IN-situ CBR test to a mechanical laboratory CBR test machine.

The system is easily assembled onto the conversion frame with the addition of some of the accessories included in CFS-0865. The frame is used with the jack, load ring, CBR mould and penetration piston.

Supplied complete with wooden box. 10 kN load ring, 1m extension rod with nipple(CFS-0866) should be ordered seperately.

Product Code	Dimensions	Weight (approx.)
CFS-0865B	240x1630x230 mm (case)	52 kg
CFS-0867	380x270x1180 mm	26 kg

Wooden Carrying Case
for CFS-0865B

IN-SITU DENSITY TESTS

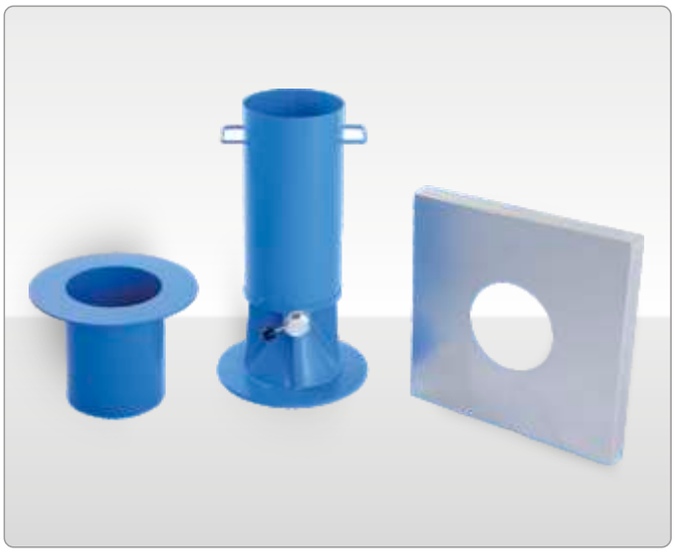
Product Code

CFS-0900 Sand Replacement Test Set 100 mm BS
CFS-0901 Sand Pouring Cylinder 100 mm dia. for CFS-0900
CFS-0902 Calibration Container for CFS-0900
CFS-0903 Metal Tray for CFS-0900
CFS-0910 Sand Replacement Test Set 150 mm BS
CFS-0911 Sand Pouring Cylinder 150 mm dia. for CFS-0910
CFS-0912 Calibration Container for CFS-0910
CFS-0913 Metal Tray for CFS-0910
CFS-0920 Sand Replacement Test Set 200 mm BS
CFS-0921 Sand Pouring Cylinder 200 mm dia. for CFS-0920
CFS-0922 Calibration Container for CFS-0920
CFS-0923 Metal Tray for CFS-0920

Standards

BS 1377:9, 1924:2

The Sand Replacement Test Set is used for the determination of the degree of compaction on site. The Complete set consists of a pouring cylinder, calibration container and tray. The sand pouring cylinder is made of cast aluminum and precisely machined; the calibration container and tray are made of plated sheet steel. The test set is available in three different sizes.



CFS-0910

Product Code	Dimensions	Weight (approx.)
CFS-0900	300x300x440 mm	8 kg
CFS-0910	300x300x500 mm	14 kg
CFS-0920	500x500x660 mm	27 kg

IN-SITU DENSITY TESTS

Product Code

CFS-0950 Sand Cone Set 6.5"
CFS-0960 Sand Cone Set 12"
CFS-0952 Plastic Sand Jar 5 L, for CFS-0950
CFS-0954 Calibration Container for CFS-0950
CFS-0962 Density Cylinder, 12"

Standards

ASTM D1556; AASHTO T181, T191

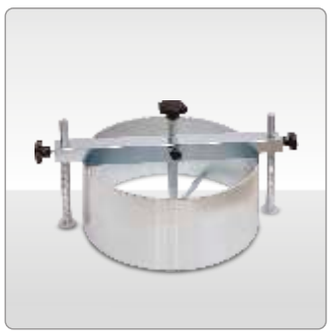
The CFS-0950 and CFS-0960 Sand Cone Sets are used for the determination of the degree of compaction on site. CFS-0950 includes double cone, plastic sand jar and base flat with flanged hole. Calibration container should be ordered seperately.

CFS-0962 Density Cylinder is used for determining in place density of compacted base courses containing large sizes of coarse aggregates. Density cylinder should be ordered seperately.

CFS-0950

CFS-0960

CFS-0952



CFS-0962

Product Code	Dimensions	Weight (approx.)
CFS-0950	300x300x550 mm	4 kg
CFS-0960	600x600x650 mm	15 kg
CFS-0962	470x320x260 mm	10 kg

IN-SITU DENSITY TESTS

Product Code

CFS-0965	Surface Soil Sampler (Core Cutter), 3" dia. ASTM
CFS-0966	Spare Sampling Tube (Drive Cylinder), 3" (76.2 mm) x 70 mm high, ASTM, for CFS-0965
CFS-0967	Surface Soil Sampler (Core Cutter), 4" dia. ASTM
CFS-0968	Spare Sampling Tube (Drive Cylinder), 4" (101.6 mm) x 127 mm high, ASTM, for CFS-0967
CFS-0970	Surface Soil Sampler (Core Cutter) Set, 100 mm dia., BS
CFS-0975	Surface Soil Sampler (Core Cutter) Set, 150 mm dia., BS

Standards

ASTM D2937; CNR No.22; BS 1377:9

Surface Soil Sampler (Core Cutter) is used to determine the in-situ density of soil by taking a standard volume of soil sample from the ground which is then removed, trimmed and weighed.

The ASTM/CNR version, CFS-0965 and CFS-0967 Surface Soil Sampler (Core Cutter) consists of a drive head, 5 kg drive hammer and a thin wall sampling tube. 5 kg sliding weight drop hammer makes a free-fall on to the driving head which is placed on top of the sampling tube. Manufactured from steel and plated for corrosion resistance.

CFS-0970 BS Type 100 mm Surface Soil Sampler (Core Cutter) Set consists of a driving dolly, 13,5 kg driving rammer and 100 mm dia. x 130 mm high core cutter. CFS-0975 BS Type 150 mm Surface Soil Sampler (Core Cutter) Set BS consits of a driving dolly, 16 kg driving rammer and 150 mm diax 180 mm high core cutter.

CFS-0965 CFS-0970

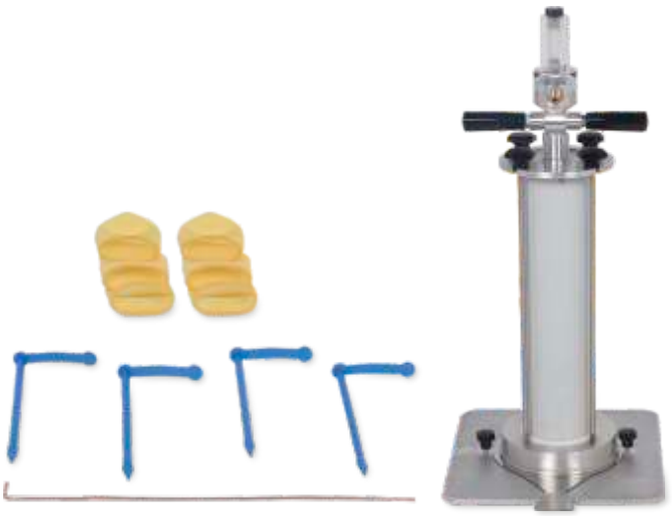
IN-SITU DENSITY TESTS

Product Code

CFS-0990A	Balloon Density Apparatus 1600 ml ASTM
CFS-0993NF	Balloon Density Apparatus 3000 ml NF
CFS-0996NF	Balloon Density Apparatus 6000 ml, NF
CFS-1000NF	Balloon Density Apparatus 10000 ml, NF

Standards

ASTM D2167; NF P94-061-2: AASHTO T205



Balloon Density Apparatus are used for the on-site determination of the density of well bonded soil according to the ASTM and French standards respectively.

CFS-0990A consists of a graduated cylinder of 1596 ml capacity housed inside an aluminium guard, a reversible rubber aspirator pump, a density plate 9 inches square, and 12 rubber balloons. The principle of operation is similar to the sand replacement but the hole is filled by a rubber balloon where water is pumped. The amount of water can be easily determined by the graduation of the cylinder.

According to NF standard, a metal cylinder is filled with water which is then pumped into a rubber membrane mounted on the base of the cylinder. The water pressure is controlled by a pressure gauge and the volume of the balloon is measured on the graduated piston stem.

NF Type Balloon Density Apparatus are supplied complete with complete with;
- Reinforced Membranes, 6 pcs./pack
- Base Plate
- Locking Clamps, 4 pcs. (6 pcs. for CFS-1000NF)

ASTM Type Balloon Density Apparatus is supplied complete with complete with;
- A graduated cylinder, 1596 mL capacity housed inside an aluminum guard
- A reversible rubber aspirator pump
- Density plate
- Rubber balloons, 12 pcs.

Product Code	Dimensions	Weight (approx.)
CFS-0990	250x250x700 mm	7 kg
CFS-0992	360x360x1000 mm	10 kg

NON-NUCLEAR SOIL DENSITY GAUGE

Product Code

CFS -1060 Non-Nuclear Soil Density Gauge

Non-Nuclear Soil Density Gauge is used for detecting density of Soil specimens with non nuclear type. CFS-1280 is fully equipped with a touch screen and user friendly graphical menu interface, running Microsoft Windows silently in the backround for flowless operation, easy software are upgrades and enchanced user support.

The instruments general specifications are;

- Full colour graphics driven interface, 480 x 640 VGA touch screen display with LED backlight for easy visibility.
- Displays GPS status, available battery voltage, low battery and date/time,
- Rugged case design made from aluminum, powder-coated gloss black with orange reflective vinyl graphics increasing driver awareness to road workers at night
- Data Management Feature, quickly access, can be downloaded and deleted project data,
- Required files can be downloaded to CFS-1280 via. USB,
- Fast, reliable, accurate, and repeatable in real time, User Friendly, in-process, cost effective tool for any user,
- The most inpoftant point is; Non-Nuclear means no Badges or Lisances and no storage or transport concerns.

OPERATIONAL FEATURES

- Display: Full color graphics driven user interface, 480x640 VGA touch screen display with LED backlight for easy visibility in daylight or dark situations.
- Status Bar: Displays GPS status, Data Save status, battery voltage, low battery and date and time
- Project Details: Stores up to 20 projects with details,
- Material Details: Stores up to 20 materials, details include Material Name, Description, Max Dry Density, Opt. Moisture, Dry Density Offset, % Moisture Offset, % Greater than 3", % Greater than 3/4", % Gravel, % Sand, % Fines, PL, LL, Cu and Cc
- Data Logging: Ability to store all measurements
- Reports: Easily download data to be imported into Excel
- GPS Control: When activated will display latitude and longitude positions, number of satellites the gauge is connected to as well as the UTC date and time, also available in CFM format. GPS information will store with each measurement when Data Save and GPS feature is enabled, (Status Bar Icon)
- Update Software: One touch upload of new software using a USB memory stick
- Data Management: Quickly access, download or delete your project data
- Set Time & Date: Quick time and date setup, MM/DD/YY and DD/MM/YY formats
- Units: Interchangeable settings for Density (kq/rn^3, Ib/ft^3), Temp (°C,°F)
- Standardization: While gauge is still in the case, a quick one touch measurement will insure the gauge is still in proper working mode
- Calculator: Built in four function calculator
- Enhanced Customer Support: Diagnostic screen to aid in factory support
- User Programmable Target Density: Used for calculating % compaction

Operational Specification	
Measurement Mode	
• Average	Averages five (5) readings and stores data including location date and time. Stores thousands of records
• Continuous	Instantaneous density readings.
Function Mode	
• Wet & Dry Density, % Compaction, % Moisture	
Soil Specification	
• Designed to operate with standard soils used in civil construction projects.	
• Requires inpCFS from standard	- Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)
	- Particle Size Distribution (ASTM D422)
	- Proctor Test (ASTM D698 and D1557)
Mechanical Specification	
• Unit Weight	14.2 lbs (6.44kg)
• Unit Dimensions	11"x11"x12" High (27,9 cm x 27,9 cm x 30,4 cm) with handle extension 29" High (73,6 cm)
• Shipping Weight w/ Case	42,5 lbs (19,27 kg)
• Shipping Dimensions	24" x 19,5" x 14" (60,9 cm x 49,5 cm x 35,5 cm)
Measurement Specification	
• Sensing Area	11 in. (27.9cm) dia. base allows optimum measurement on fine and coarse material types
• Measurement Depth	Designed for use on a standard 12" (30cm) un-compacted layer of soil during or after compaction.
• Measurement Display	Dry Density, % Compaction, % Moisture, GPSData, Material Information and Project Name
Electrical Specification	
• Microprocessor Controlled	
• CE Mark	Complies with EN 61000-4-2, 61000-4-3, 61000-4-8
• Battery	14.0 Amp-hr NiMH, 7.2 V
• Recharge Time	4 hours
• Battery Charger	Self Contained CE & UL Certified Universal AC Charger, DC Charger
• Computer Ports	1 USB Port

NUCLEAR DENSITY GAUGE

Product Code

CFS-1050 RoadReader Nuclear Density Gauges Model 3440P

Standards

ASTM D 2950, C 1040, D 6938

The Troxler RoadReader nuclear moisture / density gauges are used by many contractors, engineers and highway departments for compaction control of soil, aggregate, concrete and full asphalt. The ASTM standarts numbers D 2922, D 3017, D 2950 and C 1040 are met or exceeded by these gauges. Two test models are avaliable for density determination: Direct transmission and Backscatter. The operator selects the mode depending on the material type and thickness of the layer being tested. The model 3430 is avaliable with keypad, display and operator's manual in languages and is the siplest most economical gauge offered by Troxler. The Model 3440 provides 30 special functions, storage of up to 1000 test records, an 18-month warranty and many more options that make it simple to operate and a necessity for all technicians.

Three Test Modes

BACKSCATTER

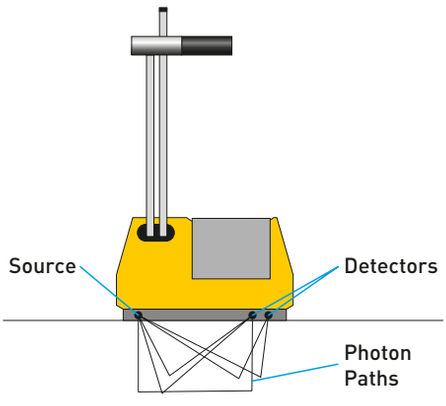
Backscatter is rapid and nondestructive. The gamma source and detectors remain inside the gauge which rests on the surface of the test material. Gamma rays enter the test material and those scattered through the material and reaching the detectors are counted. Backscatter is primarily used to determine density on layers of asphalt and concrete approximately 4" thick.

DIRECT TRANSMISSION

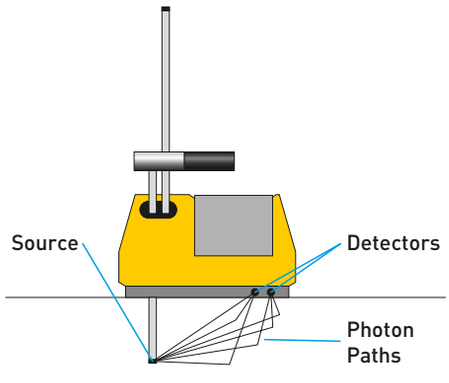
The gamma source is positioned at a specific depth within the test material by insertion into an access hole. Gamma rays are transmitted through the test material to detectors located within the gauge. The average density between the gamma source and the detectors is then determined. Erros resulting from surface roughness and chemical composition of the test material are greatly reduced and aguge accuracy is improved. Direct transmission is used for testing lifts of soil, aggreaget, asphalts and concrete up to 12" depth.

MOISTURE DETECTION

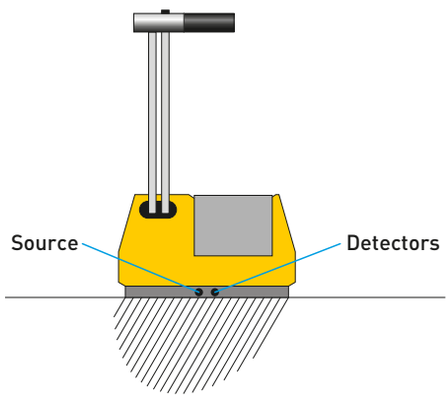
The moisture measurement is nondestructive with the neutron source and detector located inside the gauge just above the surface of the test material. Fast neutrons enter the test material and are slowed after colliding with the hydrogen atoms present. The helium 3 detector in the gauge counts the number of thermalized (slowed) neutrons which relates directly to the amount of moisture in the sample.



Backscatter



Direct Transmission



Moisture Detection

Both Models Offer

- Direct readout of wet density, dry density, moisture, %moisture, %voids and %compaction.
- Lightweight
- Powered by rechargeable nicad batteries or backup alkaline batteries
- Prompts user through steps of operation
- Software allows for moisture, density and trench offsets

3440 Features

- **Data storage**- stores up to 1000 complete test records which canbe downloaded to a printer or computer.
- **Extended storag**e-gauge allows notes to be stored with test record.
- **Automatic indexing**-eliminates a mjor source of operator error by automatically sensing depth of measurement.
- **30 special functions provided**-self test and service programs, selected precision and field calibration for special materials.
- Calculator mode with storage.
- Nomograph method for measurement of asphalt overlays.

Specifications

Measurement (U.S. Customary Units)

Direct Transmission Density (6") Pcf=lb/ft3	15 sec.	1 min.	4 min.
Precision at 120 pcf	±0.42 pcf	±0.21 pcf	±0.11 pcf
Composition error at 120 pcf	±1.25 pcf	±1.25 pcf	±1.25 pcf
Surface error (0.05", 100% Void)	-1.1 pcf	-1.1 pcf	-1.1 pcf
Backscatter (98%) (4")	15 sec.	1 min.	4 min.
Precision at 120 pcf	±1.00 pcf	±0.50 pcf	±0.25 pcf
Composition error at 120 pcf	±2.50 pcf	±2.50 pcf	±2.50 pcf
Surface error (0.05", 100% Void)	-4.7 pcf	-4.7 pcf	-4.7 pcf
Moisture at 15 pcf	15 sec.	1 min.	4 min.
Precision at 15 pcf	±0.64 pcf	±0.32 pcf	±0.16 pcf
Surface error (0.05", 100% Void) Depth of measurement @ 15 pcf (8.45")	-1.12 pcf	-1.12 pcf	-1.12 pcf

Measurement (S.I. Units)

Direct Transmission Density-150mm	15 sec.	1 min.	4 min.
Precision at 2000 kg/m^3	±6.8 kg/m^3	±3.4 kg/m^3	±1.7 kg/m^3
Composition error at 2000 kg/m^3	±20.0 kg/m^3	±20.0 kg/m^3	±20.0 kg/m^3
Surface error (1.25mm, 100% Void)	-17.0 kg/m^3	-17.0 kg/m^3	-17.0 kg/m^3
Backscatter (98%) (100mm)	15 sec.	1 min.	4 min.
Precision at 2000 kg/m^3	±16.0 kg/m^3	±8.0 kg/m^3	±4.0 kg/m^3
Composition error at 2000 kg/m^3	±40.0 kg/m^3	±40.0 kg/m^3	±40.0 kg/m^3
Surface error (1.25mm, 100% Void)	-75.0 kg/m^3	-75.0 kg/m^3	-75.0 kg/m^3
Moisture	15 sec.	1 min.	4 min.
Precision at 250 kg/m^3	±10.3 kg/m^3	±5.1 kg/m^3	±2.6 kg/m^3
Surface error (1.25mm, 100% Void) Meas. Depth @ 250 kg/m^3- 212.5mm	-18.0 kg/m^3	-18.0 kg/m^3	-18.0 kg/m^3

Radiological

Gamma Source	8 mCi ±10% Cs-137
Neutron Source	0.060 mCi ±10% Cf-252 or 40 mCi ±10% Am-241:Be
Source Housing	Stainless Steel Encapsulation
Shielding	Tungsten, lead and cadmium
Surface Dose Rates	20.5 mrem/hr max., neutron and gamma
Source Rod Material	Stainless Steel
Shipping Case	DOT 7A, Type A

Mechanical

Case	High Impact Plastic 75 L x 35 W x 42 T in.
Vibration Test	0.1 in. (2.5 mm) @ 12.5 hz
Drop Test	300 mm on 25 mm diameter steel ball
Operating Temp:	Ambient: 14 to 158°F (-10 to 70°C) Surface: 350°F (175°C)
Storage Temp.	-70 to 185°F (-55 to 85°C)
Weight	29 lbs. (13.2 kg)
Shipping Weight	90 lbs. (40.8 kgs) w/case
Available Models	8" or 12" index rod with 1" or 2" increments (200 or 300 mm index rod with 25 or 50 mm increments)

Electrical

Time Accuracy and Stability	0.005%, 0.0002% / °C
Power Supply Stability	0.01% / °C
Stored Power	30 watt hours
Battery Recharge Time	14-16 hours (automatic cutoff)
Charger	110/220 V ac, 50-60 Hz or 12-14 V dc
Readout	2 x 16 alpha-numeric liquid crystal display

Notes

Gauge returns to Gauge Ready (power saving mode) after two minutes of inactivity, except in standard, stat test, drift test, and in nomograph programs when a 30-minute delay is provided. After 5 hours of inactivity, gauge performs complete power shut-down.

Battery packs are fully protected against overcharge and overdischarge.

Emergency Use - Capable of operation with D size alkaline batteries.

BEARING CAPACITY ON SITE

Product Code

CFS-1101	100 kN (22500 lbf) Plate Loading Test Set with Digital Dial Gauges and LPI Digital Readout Unit
CFS-1102	200 kN (45000 lbf) Plate Loading Test Set with Digital Dial Gauges and LPI Digital Readout Unit
CFS-1105	500 kN (112400 lbf) Plate Loading Test Set with Digital Dial Gauges & LPI Digital Readout Unit
CFS-1111	100 kN (22500 lbf) Plate Loading Test Set with Displacement Transducers and Data Logger
CFS-1112	200 kN (45000 lbf) Plate Loading Test Set with Displacement Transducers and Data Logger
CFS-1115	500 kN (112400 lbf) Plate Loading Test Set with Displacement Transducers and Data Logger
CFS-1121	Hydraulic Jack with Load Transfer Arm, 100 kN (22500 lbf) capacity for Plate Load Bearing Test Set
CFS-1122	Hydraulic Jack with Load Transfer Arm, 200 kN (45000 lbf) capacity for Plate Load Bearing Test Set
CFS-1125	Hydraulic Jack with Load Transfer Arm, 500 kN (112400 lbf) capacity for Plate Load Bearing Test Set
CFS-1133	Loading Plate, Ø52mm (6"), for Plate Loading Test
CFS-1134	Loading Plate, Ø160mm (6,3"), for Plate Loading Test
CFS- 1136	Loading Plate Ø305mm (12") for Plate Loading Test
CFS-1137	Loading Plate Ø457mm (18") for Plate Loading Test
CFS-1138	Loading Plate Ø610mm (24") for Plate Loading Test
CFS-1139	Loading Plate Ø762mm (30") for Plate Loading Test
CFS-1140	Loading Plate Set for Plate Loading Test. ASTM, Ø152 mm (6"), Ø305 mm (12"), Ø457 mm (18"), Ø610 mm (24") and Ø762 mm (30") plates
CFGE-3800	Hydraulic Hand Pump, 700 bar

Standards

ASTM D1195, D1196; BS 1377:9

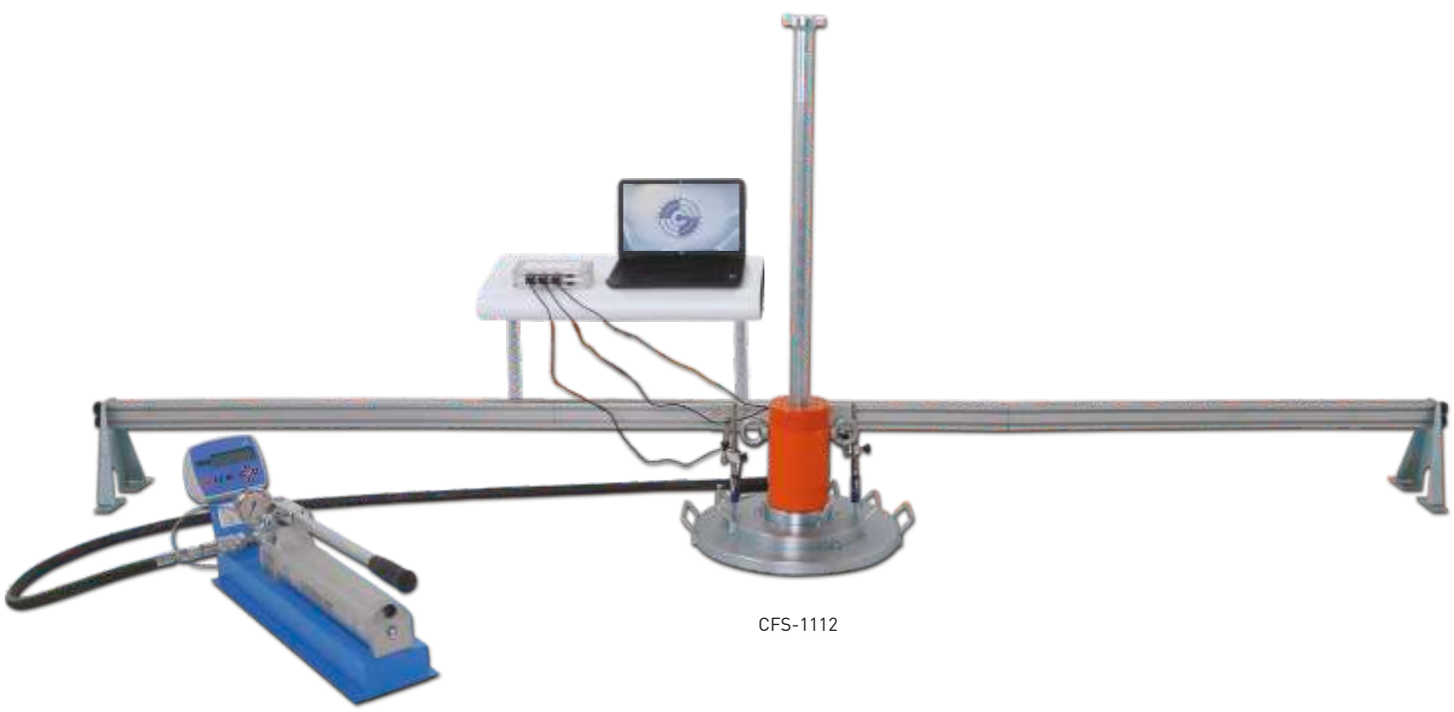
Plate load test sets can be used to determine the ultimate bearing capacity of subgrade soils and compacted pavement components. Plate load tests provide data for use in the evaluation and design of rigid and flexible-type airport and highway pavements.

CFS-1102

The test is performed by pressing a steel bearing plate into the layer to be measured by the help of a hydraulic jack and measuring the resulting deformation taking place on the layer. This deformation value can also be used to obtain modulus of subgrade reaction which can be correlated to resilient modulus as proposed by "1993 AASHTO Guide for Design of Pavement Structures"

CFU provides two grup for plate load testing sets: Models, CFS-1101, CFS-1102 and CFS-1105 with capacities, 100 kN (22 500 lbf), 200 kN (45 000 lbf) and 500 kN (112400 lbf) comprise three 25 x 0.01 mm digital dial gauges and a LPI Digital Readout Unit. Models CFS-1111, CFS-1112 and CFS-1115 comprise three 25 x 0.001 mm linear potentiometric displacement transducers and a data logger. All models are supplied complete with the load plates stated below and flexible hose with quick release coupling and CFGE-3800 hydraulic hand pump.

CFS-1101 Plate Loading Test Set consists of a 100 kN (22 500 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 x 0.01 mm digital dial gauges with dial supports, hydraulic hand pump with pressure transducer and digital readout unit, 1,5 m (4,9 ft) flexible hose with quick release coupling, 2.5 m (8,2 ft) long datum bar with base support, Ø160mm(6,3") and Ø305 mm(12") loading plates and a wooden carrying case.



CFS-1112

CFS-1102 Plate Loading Test Set consists of a 200 kN (45 000 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 x 0.01 mm digital dial gauges with dial supports, hydraulic hand pump with pressure transducer and digital readout unit, 1,5 m (4,9 ft) flexible hose with quick release coupling, 2.5 m (8,2 ft) long datum bar with base support, Ø160mm(6,3") and Ø305 mm(12") loading plates and a wooden carrying case.
CFS-1105 Plate Loading Test Set, ASTM, consists of a 500 kN (112400 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 x 0.01 mm digital dial gauges with dial supports, hydraulic hand pump with pressure transducer and digital readout unit, 1,5 m (4,9 ft) flexible hose with quick release coupling, 5.5 m (18 ft) long datum bar with base support Ø152mm(6"), Ø305 mm(12"), Ø457 mm(18"), Ø610 mm(24") and Ø762mm(30") loading plates and a wooden carrying case.

Detail of CFS-1102

Detail of CFS-1112

CFS-1111 Plate Loading Test Set consists of a 100 kN (22 500 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 x 0.001 mm linear potentiometric displacement transducers and their supports, hydraulic hand pump with pressure transducer, 4 channel interface unit for data acquisition1,5 m (4,9 ft) flexible hose with quick release coupling, 2.5 m (8,2 ft) long datum bar with base support, Ø160mm(6,3") and Ø305 mm(12") loading plates, converter DC 12 V to DC 24 V, a wooden carrying case and CFU software. PC is not included and have to be ordered separately
CFS-1112 Plate Loading Test Set consists of a 200 kN (45 000 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 mm x 0.001 mm linear potentiometric displacement transducers and their supports, hydraulic hand pump with pressure transducer, 4 channel interface unit for data acquisition,, 1,5 m (4,9 ft) flexible hose with quick release coupling, 2.5 m (8,2 ft) long datum bar with base support, Ø160mm(6,3") and Ø305 mm(12") loading plates, converter DC 12V to DC 24V, a wooden carrying case and CFU software. PC is not included and have to be ordered separately
CFS-1115 Plate Loading Test Set, ASTM, consists of a 500 kN (112 400 lbf) capacity hydraulic jack with load transfer arm, 3pcs. 25 x 0.001 mm linear potentiometric displacement transducers and their supports, hydraulic hand pump with pressure transducer, 4 channel interface unit for data acquisition, 1,5 m (4,9 ft) flexible hose with quick release coupling, 5.5 m (18 ft) long datum bar with base support, Ø152mm(6"), Ø305 mm(12"), Ø457 mm(18"), Ø610 mm(24") and Ø762mm(30") loading plates, converter DC 12V to DC 24V, a wooden carrying case and CFU software. PC is not included and have to be ordered separately
USOFT-1111 CFU Software for Plate Loading Test is used with CFS-1111, CFS-1112 and CFS-1115 Plate loading test sets.

Product Code	Dimensions (mm)	Weight (approx.) (kg)
CFS-1133	30x152x152	4.2
CFS-1134	30x160x160	4.7
CFS-1136	30x305x305	17.5
CFS-1137	30x457x457	39
CFS-1138	30x610x610	69
CFS-1139	30x762x762	105
CFS-1140	150x762x762	235

Plate Load Test Set	Capacity	Automatic Data Logging and PC Software Support	Load Plates Included
CFS-1101	100 kN	----	Ø160 mm (CFS-1134) Ø305 mm (CFS-1136)
CFS-1111		✓	
CFS-1102	200 kN	----	Ø160 mm (CFS-1134) Ø305 mm (CFS-1136)
CFS-1112		✓	
CFS-1105	500 kN (112400 lbf)	----	Ø152 mm 6" (CFS-1133) Ø305 mm 12" (CFS-1136)
CFS-1115		✓	Ø457 mm 18" (CFS-1137) Ø610 mm 24" (CFS-1138) Ø762 mm 30" (CFS-1139)

LIGHT WEIGHT DEFLECTOMETER

Product Code

CFS-1250 Light Weight Deflectometer

Standards

ASTM E2835-11

The Light Weight Deflectometer makes it possible to quickly determine, in an uncomplicated manner, the soil bearing capacity and compaction quality of soils, non-cohesive sub-bases, and pavement improvements. The dynamic plate load tester is described in the Engineering Code for Soil and Rock in Road Construction.

In this way testing inbuilt soil layers can be carried out very quickly and without requiring a vehicle, which means it is also suitable for sites that are difficult to access. The machine is used in many areas - in road construction, railway engineering and earthworks for quality protection in canal construction and utility trenches, and in the examination of roadbeds and foundation fillings.

Due to the easy handling and the immediately available measurement results. The Light Weight Deflectometer is especially suitable for in house self-monitoring.

The deflectometer is a very reliable device with a ergonomic design and special structure. It can be transported and operated easily by only one person. The transportation lock on the drop weight ensures safety.

The load plate is equipped with practical handgrips, and the bubble level helps with the exact alignment of the loading mechanism. Despite this precision, the Light Weight Deflectometer (LWD) is very robust and long-lived: it is made using only the very best of materials. Naturally, the measurement device is splash proof and can be used in all weather conditions.

WATER PERMEABILITY

Product Code

CFS-1302A Constant Head Permeability Cell, ASTM 80 mm dia. (nominal) with transparent plexy body
CFS-1303A Constant Head Permeability Cell, ASTM 120 mm dia. (nominal) with transparent plexy body
CFS-1305A Wall Type Metal Manometer Panel with Two Tubes
CFS-1306A Sliding Tamper, ASTM, for Constant Head Permeability Test
CFS-1309A Constant-Head Filter Tank, 4 L. (Supplied without sand)
CFS-1311A Constant Head Permeability Cell, ASTM 63 mm (2.5") dia. with metal body
CFS-1312A Constant Head Permeability Cell, ASTM 76 mm (3.0") dia. with metal body
CFS-1313A Constant Head Permeability Cell, ASTM 114 mm (4.5") dia. with metal body
CFS-1314A Constant Head Permeability Cell, ASTM 152 mm (6") dia. with metal body
CFS-1315A Constant Head Permeability Cell, ASTM 229 mm(9") dia. with metal body
CFGP-1140 Plastic Hose, Ø8 mm OD, 3 m

Standards

ASTM D 2434

Constant Head Permeability Cells are used to study the behaviour of soil, relatively coarse-grained soil such as sands and gravel, in its natural conditions with respect to water flow.

The cells have an transparent plexy or metal body with 2 pressure points at different level and aluminium base and head.

CFS-1305A Wall type metal manometer panel is fitted with 2 manometer tubes each being 1000 mm long. Each tube has its own valve.

CFS-1309A Constant-Head Filter Tank, made of transparent plexy, has separate valves for inlet, outlet and overflow. Supplied with metal carriying case for wall mounting.

The Manometers Panel, Sliding Tamper, CFS-1309A Constant-Head Filter Tank and The Equipment for De-Airing Water should be ordered separately.

The Constant Head Permeability Cells are supplied complete with;

- Perforated plates and No.100 screen (each 2 pcs.)

CFS-1302B

CFS-1305A

Product Code	Dimensions	Weight (approx.)
CFS-1302A	140x220x420 mm	3.5 kg
CFS-1303A	180x250x640 mm	7 kg
CFS-1305A	150x40x1200 mm	4 kg
CFS-1306A	70x70x640 mm	2.2 kg
CFS-1309A	205x210x290 mm	2.6 kg
CFS-13113A	120x200x305 mm	2.4 kg
CFS-1312A	140x220x330 mm	3.2 kg
CFS-1313A	200x270x370 mm	5.1 kg
CFS-1314A	240x310x420 mm	9.1 kg
CFS-1315A	330x400x510 mm	21 kg

WATER PERMEABILITY

Product Code

CFS-1300B Constant Head Permeability Set, BS, for Ø 80 mm(nominal) Transparent Plastic Cell
CFS-1301B Constant Head Permeability Set, BS, for Ø 120 mm(nominal)Transparent Plastic Cell
CFS-1302B Constant Head Permeability Cell, BS, 80 mm (nominal) dia. Transparent Plastic Body
CFS-1303B Constant Head Permeability Cell, BS, 120 mm (nominal) dia. Transparent Plastic Body
CFS-1305B Wooden Stand with 3 Manometer Tubes
CFS-1308 Constant Level Water Tank, 7 L.
CFA-0645 Tamping Rod Ø 8x300 mm

Standards

BS 1377:5

The CFS-1300B and CFS-1301B Constant Head Permeability Set are used to study the behaviour of soil, relatively coarse-grained soil such as sands and gravel, in its natural conditions with respect to water flow.

Two models are available according to cell dimensions. CFS-1302B cell has 3 pressure points and CFS-1303B cell has 12 pressure points (6 poinst for take-off and 6 points blanked-off)

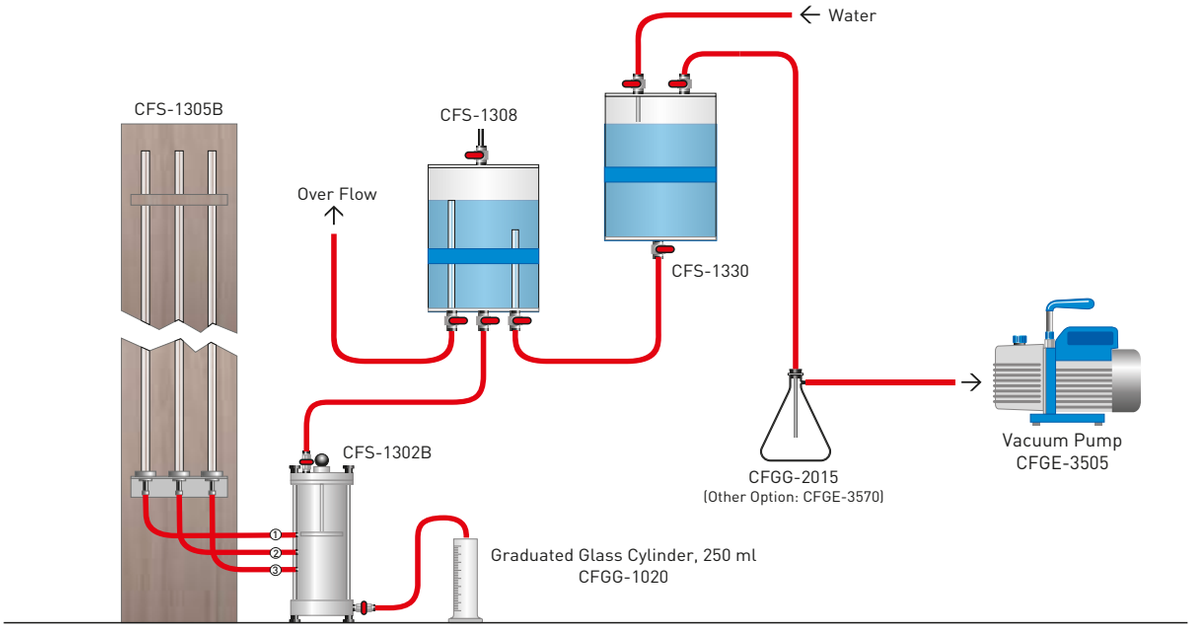
CFS-1305B Wooden stand is fitted with 3 glass manometer tubes each being 1000 mm long.

CFS-1308 Constant Level Tank 7 L, made of transparent plastic, is used to provide constant water level in the manometer tubes.

Optional Equipment For De-Airing Water and Tamping Rod should be ordered separately.

The Constant Head Permeability Sets are supplied complete with;
- Ø 80 mm or Ø 120 mm Permeability Cell (with 2 pcs. aluminum plates and 2 pcs. wire gauzes)
- Constant Level Water Tank (CFS-1308)
- Wooden Stand with 3 manometer tubes (two pcs. for CFS-1301B)
- 3 m Hose (CFGP-1140)

Product Code	Dimensions	Weight (approx.)
CFS-1302B	140x220x420 mm	3.5 kg
CFS-1303B	180x250x640 mm	7 kg
CFS-1305B	220x70x1700 mm	5.6 kg
CFS-1308	300x200x250 mm	3 kg
CFS-0645	Ø 8x300 mm	0.5 kg



Constant Head Permeability Test with De-Airing Water System

WATER PERMEABILITY

Product Code

CFS-1334A	Falling Head Permeability Cell, ASTM, 80 mm (nominal) dia. with transparent plastic body
CFS-1336A	Falling Head Permeability Cell, ASTM, 120 mm (nominal) dia. with transparent plastic body
CFS-1343A	Falling head permeability cell, ASTM, 63 mm (2.5") dia. with metal body.
CFS-1344A	Falling head permeability cell, ASTM, 76 mm (3.0") dia. with metal body.
CFS-1345A	Falling head permeability cell, ASTM, 114 mm (4.5") dia. with metal body.
CFS-1346A	Falling head permeability cell, ASTM, 152 mm (6") dia. with metal body.
CFS-1347A	Falling head permeability cell, ASTM, 229 mm (9") dia. with metal body.
CFS-1324	Wooden Stand with 4 Manometer Tubes

Standards

ASTM D 2434

Falling Head Permeablity Cells are used to study the behaviour of soil, particularly finegrained soils such as clay-like or silty soils, with respect to water flow.

The Cells include a spring incorporated into top cap to apply 5-10 lbs. force against screen to prevent soil density changes and also have an transparent plexy or metal body and anodized aluminium upper and lower plates.

The CFS-1324 Wooden Stand is fitted with 4 glass Manometer Tubes of each 1500 mm long with inside diameters of about 21 mm, 12 mm, 5 mm and 3.5 mm. All tubes have connection valves.

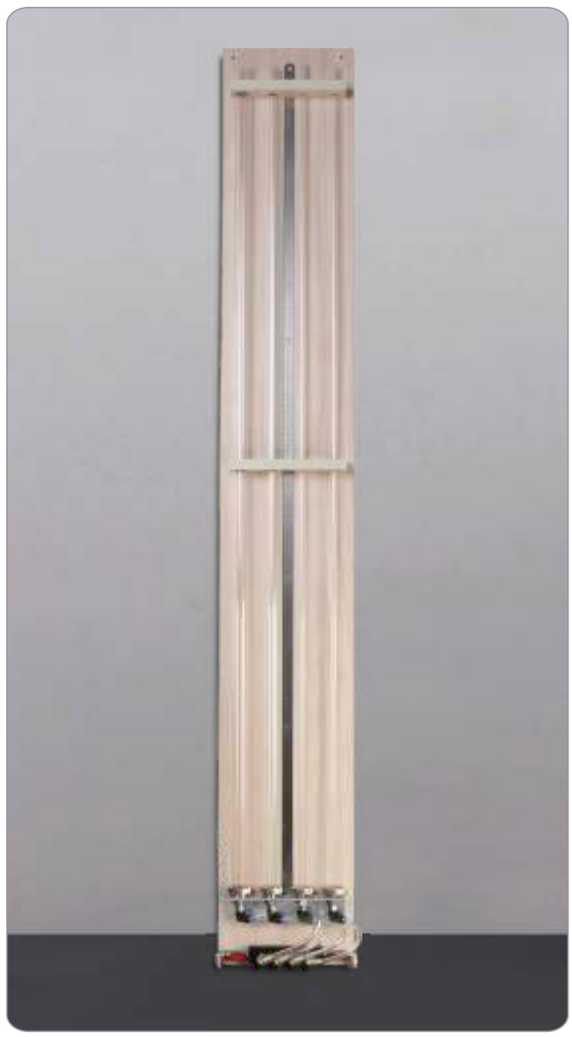
Optional Equipment For De-Airing Water should be ordered separately.

Falling Head Permeability Cells are supplied complete with;

- Perforated plates and No.100 screen (each 2pcs.).

Product Code	Dimensions	Weight (approx.)
CFS-1334A	140x220x350 mm	3.5 kg
CFS-1336A	180x260x450 mm	7 kg
CFS-1343A	120x200x305 mm	2.4 kg
CFS-1344A	140x220x330 mm	3.2 kg
CFS-1345A	200x270x370 mm	5.1 kg
CFS-1346A	240x310x420 mm	9.1 kg
CFS-1347A	330x400x510 mm	21 kg
CFS-1324	230x100x1700 mm	6.6 kg

CFS-1343A



CFS-1324

WATER PERMEABILITY

Product Code

CFS-1320 **Falling Head Permeability Set**
CFS-1322 **Falling Head Permeability Cell 100 mm dia.**
CFS-1324 **Wooden Stand with 4 Manometer Tubes**
CFS-1326 **Soaking Reservoir Tank**

The CFS-1320 Falling Head Permeability Set is used to study the behaviour of soil, particularly finegrained soils such as clay-like or silty soils, with respect to water flow.

The CFS-1322 Falling Head Permeability Cell is manufactured from plated steel with an inside diameter of 100 mm.

The CFS-1324 Wooden Stand is fitted with 4 glass Manometer Tubes of each 1500 mm long with inside diameters of about 21 mm, 12 mm, 5 mm and 3.5 mm. All tubes have connection valves.

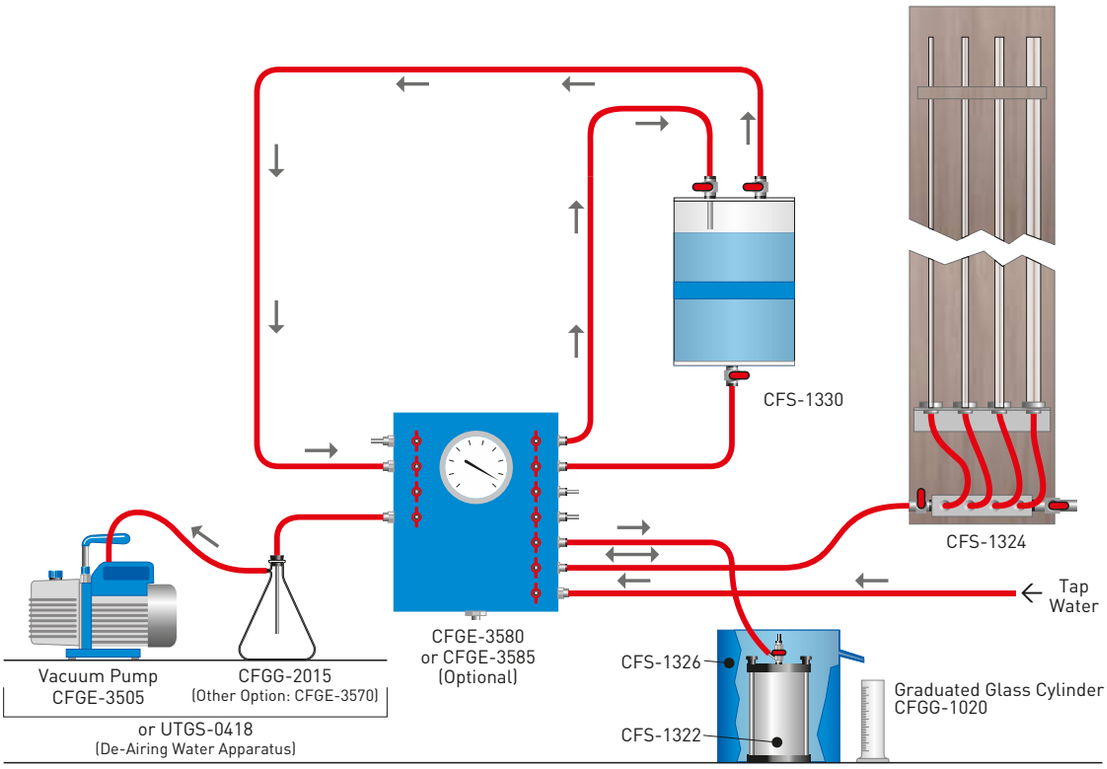
The CFS-1326 Soaking Reservoir Tank is manufactured from plated steel with an over-flow tube and is used for containing the permeability cell during the test.

Optional Equipment For De-Airing Water should be ordered separately.

The CFS-1320 Falling Head Permeability Set is supplied complete with

- Ø 100 mm Falling Head Permeability Cell
- Wooden Stand with 4 manometer tubes
- Soaking Reservoir Tank
- 3 m Hose (CFGP-1140)

Product Code	Dimensions	Weight (approx.)
CFS-1322	150x150x260 mm	3 kg
CFS-1324	230x100x1700 mm	6.6 kg
CFS-1326	320x320x250 mm	3.6 kg



Falling Head Permeability Test with De-Airing Water System

Soil Permability & Dispersibility

WATER PERMEABILITY of COMPACTED SOILS

Product Code

CFS-1401 Compaction Permeameter Mould with Swell Ring. Ø 4"
CFS-1402 Compaction Permeameter Mould with Swell Ring. Ø 6"
CFS-1403 Compaction Permeameter Mould without Swell Ring. Ø 4"
CFS-1404 Compaction Permeameter Mould without Swell Ring. Ø 6"
CFS-1407 Compaction Permeameter Mould without Swell Ring, Ø105 mm
CFS-1420 Stand Type Metal Manometer Panel with Two Tubes
CFGP-1140 Plastic Hose, Ø8 mm OD, 3 m

Standards

ASTM D5856

The Compaction Permeameter Moulds are used together with CFS-1400 Stand type metal manometer panel for determining the water permeability of compacted soil specimens like clay, sand, gravel etc.
Stand Type Metal Manometer Panel is 1000 mm in lenght and graduated in mm.Each tube has its own valve.
Stand type metal manometer panel (CFS-1412) and plastic hose should be ordered seperately. The moulds are supplied with perforated plates and No.100 screen (each 2pcs.).

Product Code	Dimensions	Weight (approx.)
CFS-1400	200x100x1100mm	6 kg
CFS-1401	150x150x250 mm	8 kg
CFS-1402	200x200x300 mm	16 kg
CFS-1403	150x150x220 mm	7.5 kg
CFS-1404	200x200x700 mm	15 kg

DISPERSIBILITY of COMPACTED SOILS

Product Code

CFS-1500 Pinhole Test Apparatus, Ø 33 mm ID
CFS-1504 Pinhole Test Apparatus, Ø 44 mm ID
CFS-1308 Constant Level Water Tank, 7 L.

Standards

BS 1377:5; ASTM D4647; TS 1900-2

Water flowing through fine-grained soils with high sodium content makes them highly erodible.

The CFS-1500 and CFS-1504 Pinhole Test Apparatus are used for evaluating the erodibility of clay soils by flowing water through a small hole that is drilled through the compacted specimen.

The apparatus consist of a cylindrical plexiglass body (container) fitted top cap with a water inlet and the base cap with an outlet connection, a plastic nipple, a plastic centering guide, a wire punch (1.0 mm), a stand to support the apparatus with 1100 mm scale and standpipe tube(Ø4mm IDx6mm OD), four pcs wire mesh, 1,5 m pvc tubing with a valve, 10ml, 25ml and 50 ml graduated glass measuring cylinders and an anvil with a tamper (fit with the body of ordered apparatus).

Constant level water tank (CFS-1308) and de-airing water equipment should be ordered separately.

If required, different inner diameter plexiglass bodys with caps can be produced.

Product Code	CFS-1500	CFS-1504
Dimensions	150x200x1200 mm	150x200x1200 mm
Weight (approx.)	3,5 kg	4 kg

FULLY-AUTOMATED TRIAXIAL AND STRESS PATH SYSTEM

Product Code

LoadTrac II
FlowTrac II

The LoadTrac II/FlowTrac II system for triaxial testing fully automates the conduct of CU, CD and any possible stress path triaxial test on soils. Once a soil sample is in place, and the test conditions are selected, the LoadTrac II/FlowTrac II system will run the entire triaxial test from start to finish. This system is operated by software which automates the initialization, saturation, consolidation (isotropic, anisotropic or Ko) and shear phases of the test.

The system comes as a complete, self-contained unit with all of the equipment required to perform fully automated triaxial and stress path tests. The LoadTrac II/ FlowTrac II system utilizes high speed, precision micro stepper motors to apply the vertical load and pressures to the soil specimen. It includes one load frame for vertical stress, one flow pump for cell pressure and one flow pump for back pressure. The system is capable of applying a constant rate of strain at any displacement rate from 0.00003 up to 15 mm per minute (0.000001 to 0.6 inches per minute).

Sensor readings are displayed in SI or English units and stored in memory. With the network communications module and appropriate software, the entire test can be automatically controlled, data captured and displayed in real-time, and test reports prepared on a PC.

Optional software running in Windows® 2000, XP, Vista, 7 completely automates running the test, reducing the data and preparing test results.

Models

FlowTrac II Models	
FTII-250-nn	250 cc capacity
FTII-750-nn	750 cc capacity
LoadTrac II Models	
LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity
LTII-50,000	222 kN (50,000 lbs.) frame capacity

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 15 mm per minute (0.000001 to 0.6 in. per minute)
Flow Range	0.000006 to 3 cc per second
Power	110/220 V, 50/60 Hz, 1phase

	Dimensions	Weight (approx.)
LoadTrac II	464 x 546 x1206 mm (18 x 21.5 x 47.5 in.)	55 kg
FlowTrac II	203 x 406 x 470 mm (8 x 16 x 18.5 in.)	14 kg

Accessories

- Triaxial cells up to 305mm (12.00 in.) diameter, membranes, porous stones and sample preparation accessories upon request.

Applicable Test Standards

- ASTM D-4767
- AASHTO T-297
- COE EM 1110 / Consolidated Undrained Compression / Extension tests, Consolidated Drained Compression / Extension tests, Stress Path tests
- BS (British Standard)

User Benefits

- Choose load capacity to fit user needs from 22, 44,and 88kN (5,000, 10,000, and 20,000 lbs.) models
- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Geo-NET compatibility lets unit be accessed and controlled over a computer network
- Generate columns of data for easy reduction using your own spreadsheet software
- Choose volume capacity to fit user needs from 250, and 750 cc models
- Accurate displacement rate control from 0.00003 to 35 mm per minute (0.000001 to 1.3 in. per minute)
- Accurate pressure and volume measurements with integrated sensors
- Stand alone through front keypad and LCD menu capability

FULLY AUTOMATED UNCONFINED COMPRESSION SYSTEM

Product Code

LoadTrac II

The LoadTrac II load frame provides compression/extension testing for a number of geotechnical tests that must have accurate control of the rate of dis-placement during loading. With acces-sories, the unit can perform uncon-fined compression, CBR, and triaxial shear phase testing.

The base unit includes a stepper mo-tor, lead screw, vertical tension rods and crosshead, displacement trans-ducer, electronic controls and network communications. Versions of the unit are available to test loads up to 90 kN (20,000 lbs.). Displacement rates can be set to any value between 0.00003 and 15 mm per minutes (0.000001 to 0.6 inches per minute).

The base unit can run in stand-alone mode without a computer. It includes built-in data acquisition and display capability. Sensor readings are dis-played in Sl or English units and stored in memory.

Optional software running in Win-dows® 2000, XP, Vista, 7 completely automates the test, reducing the data and preparing test results.

Applicable Test Standards

- ASTM D-2166, AASHTO T-208 Unconfined Compression Testing of Soils
- ASTM D-1663 Compressive Strength of Molded Soil-Cement Cylinders

User Benefits

- Choose capacity to fit user needs from 22, 45 and 90 kN (5,000, 10,000 and 20,000 lbs.) models
- Total automation of data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Generate columns of data for easy reduction using your own spreadsheet software
- Ability to access and control the unit over a computer network using Geo-Net option

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 15 mm per minute (0.000001 to 0.6 in. per minute)
Power	110/220 V, 50/60 Hz, 1phase

Dimensions	464x546 x1206 mm
Weight (approx.)	55 kg

Models

LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity
LTII-50,000	222 kN (50,000 lbs.) frame capacity

Accessories

7020	75 mm (3.0 in) platen with load cell adaptor
Geo NET™	Network/Communication card and cable to link load frame to PC.
UC	Software package to automatically run and report UC tests

Option

UC Report	Editing/reporting software for multiple tests

FULLY-AUTOMATED CALIFORNIA BEARING RATIO SYSTEM

Product Code

LoadTrac II

The LoadTrac II loadframe provides compression / extension testing for a number of geotechnical tests that must have accurate control of the rate of displacement during loading. With accessories, the unit can perform CBR, unconfined compression and triaxial shear phase testing.

The base unit includes a stepper motor, lead screw, vertical tension rods and crosshead, displacement transducer, electronic controls and network communications. Versions of the unit are available to test loads up to 90 kN (20,000 lbs.). Displacement rates can be set to any value between 0.00003 and 15 mm per minutes (0.000001 to 0.6 inches per minute). CBR displacement rate is set through software at 1.27 mm/min. (0.05 in./min.) in accordance with ASTM D 1883.

The base unit can run in stand-alone mode without a computer. It includes builtin data acquisition and display capability. Sensor readings are displayed in Sl or English units and stored in memory.

Optional software running in Windows® 2000, XP, Vista, 7 completely automates the test, reducing the data and preparing test results.

Applicable Test Standards

- ASTM D-1883 "Standard Method for CBR (California Bearing Ratio) of Laboratory- Compacted Soils"
- AASHTO T-193

User Benefits

- Choose capacity to fit user needs from 22, 45 and 90 kN (5,000, 10,000 and 20,000 lbs.) models
- Total automation of data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Generate columns of data for easy reduction using your own spreadsheet software
- Ability to access and control the unit over a computer network using Geo-Net option

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 15 mm per minute (0.000001 to 0.6 in. per minute)
Power	110/220 V, 50/60 Hz, 1phase

Dimensions	464x546 x1206 mm
Weight (approx.)	55 kg

Models

LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity
LTII-50,000	222 kN (50,000 lbs.) frame capacity

Accessories

7010	CBR plunger with load cell adapter.
Geo NET™	Network/Communication card and cable to link load frame to PC.
CBR	Software package to automatically run and report CBR tests
Options	UC, consolidation, and triaxial testing modules

FULLY-AUTOMATED CONSTANT RATE of STRAIN CONSOLIDATION SYSTEM

Product Code

LoadTrac II
FlowTrac II

The LoadTrac-II/FlowTrac-II system fully automates the performance of a Controlled Strain Loading Consolidation (CSL) test. Once a soil sample is in place, and the test conditions selected, the LoadTrac-II/ FlowTrac-II system will run the entire CRCS test from start to finish. The LoadTrac II/ FlowTrac-II system consolidates the sample through a loading path specified by the user using constant rate of strain loading. To avoid running the test too fast (excess pore pressures become too large for the transducer) or too slow (the test takes too long), LoadTrac II/FlowTrac-II uses Excess Pore Pressure Ratio Limits. If the measured excess pore pressure divided by the current total vertical stress exceeds the Upper Pore Pressure Ratio Limit, the current strain rate is automatically decreased by a factor of 2. If the measured excess pore pressure divided by the current total vertical stress falls below the Lower Pore Pressure Ratio Limit, the current strain rate is increased by a factor of 2. These limits give the user a great deal of control over how a constant strain rate test is run.

The FlowTrac II is used during back pressure saturation as well as maintaining a constant cell pressure during the consolidation phase of the test. A typical consolidation test can be completed in 24 to 36 hrs. on most materials.

Applicable Test Standards

- ASTM D-4186 One-Dimensional Consolidation
- Properties of Soils Using Controlled - Strain Loading

User Benefits

- Choose capacity to fit user needs from 22, 45 and 90 kN (5,000, 10,000 and 20,000 lbs.) models
- Total automation of data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Generate columns of data for easy reduction using your own spreadsheet software
- Ability to access and control the unit over a computer network using Geo-Net option

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 15 mm per minute (0.000001 to 0.6 in. per minute)
Flow Range	0.000006 to 3 cc per second
Power	110/220 V, 50/60 Hz, 1phase

Models

FlowTrac II Models	
FTII-250-nn	250 cc capacity
FTII-750-nn	750 cc capacity
LoadTrac II Models	
LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity
LTII-50,000	222 kN (50,000 lbs.) frame capacity

Accessories

1230	All stainless steel consolidation cell with backpressure saturation capability, 62.5mm (2.5 in.) sample diameter standard. External stainless steel pressure sensor. Other sample sizes are available upon request

	Dimensions	Weight (approx.)
LoadTrac II	464 x 546 x1206 mm (18 x 21.5 x 47.5 in.)	55 kg
FlowTrac II	203 x 406 x 470 mm (8 x 16 x 18.5 in.)	14 kg

FULLY AUTOMATED CONSOLIDATION & SWELL SYSTEM

Product Code

LoadTrac III (Mini-LoadTrac)

LoadTrac III system for incremental consolidation and swell testing fully automates an entire consolidation test. Constant load and constant volume swell tests can be run automatically. Once a sample is placed into the load frame, the test conditions programmed, and the test started, the LoadTrac III system performs the complete test up to 32 steps without intervention by the user. The computer automatically increments to the next stress by using conditions specified by the user. Incremental consolidation test can be completed in 24 to 48 hours on most materials.

The LoadTrac III system utilizes a high speed, precision microstepper motor to apply the vertical load to the soil specimen. An embedded control board with a dedicated CPU takes readings from the force transducer and displacement transducer to control the stepper motor.

The base unit includes built-in data acquisition and display capability. Sensor readings are displayed in SI or English units and stored in memory. For incremental consolidation, the base unit is linked to a PC using the network communications module and the appropriate software.

Optional software running in Windows® 2000, XP, Vista, 7 completely automates the test, reducing the data and preparing test results.

Other options include running constant rate of consolidation, unconfined compression and triaxial on a 50 mm (2.00 in.) or less diameter sample.

Applicable Test Standards

- ASTM D-2435 Incremental Consolidation
- AASHTO T-216 Incremental Consolidation
- ASTM D-4546 One dimensional swell or settlement potential of cohesive soils

User Benefits

- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Generate columns of data for easy reduction using your own spreadsheet software
- Ability to access and control the unit over a computer network using Geo-Net option

Technical Specifications

Capacity	11 kN (2,500 lbs.)
Motor	Stepper motor with built-in controls
Travel	25 mm (1.0 inches) resolved to 0.0025 mm (0.0001 inches)
Clearance	180 mm (7 inches) horizontal between uprights, 150 mm (6 inches) vertical platen to crosshead standard
Power	110/220 V, 50/60 Hz, 1phase

Accessories

1220	All stainless steel consolidation cell includes 63.5 mm (2.5 in.) sample ring, top cap, top and bottom porous stones.
1230	Consolidation cell with back pressure saturation capability, 62.5 mm (2.5 in.) sample diameter standard. Other sizes available upon request with optional external stainless steel pressure sensor.
Geo NET™	Network/Communication card and cable to link load frame to PC.
ICONP	Software package to automatically run incremental consolidation test and swell tests with built-in editing reporting option.

Dimensions	305 x 381 x 838 mm
Weight (approx.)	20 kg

FULLY-AUTOMATED PERMEABILITY SYSTEM

Product Code

LoadTrac II
FlowTrac II

The LoadTrac II/FlowTrac II flow pump provides a unique and versatile way to run flexible wall permeability tests on a wide variety of materials quickly and accurately. By adjusting the gradient or the flow rate across the sample, the system can measure permeabilities of cohesive soils varying from 10-4 cm/sec to 10-9 cm/sec. With the appropriate test cells, this one system can determine the permeability of some silty clays within minutes.

The FlowTrac-II base unit includes a stepper motor, lead screw, pressure chamber and piston, pressure transducer, electronic controls and network communications. Versions of the unit are available with flow volumes of 250 cc and 750 cc. Flow rates can be set to any value between 0.000006 cc/sec. and 3.0 cc/sec. Flexible wall tests are run in a fully automated mode with three flow pumps and one LoadTrac-II; the FlowTrac-II's controls cell pressure and flow of cell, bottom sample and top sample. This configuration allows great versatility to run fully automated permeability tests with isotropic, anisotropic or Ko consolidation.

With the network communications module and the appropriate software, the entire test can be automatically controlled, data captured and displayed in real time, and test reports prepared on a PC. With GeoNet-LAN option, the test can be monitored and data reported from any PC located on a LAN to which the LoadTrac II/FlowTrac II system is connected.

Control and editing software runs in Windows® 2000, XP, Vista 7

Applicable Test Standards

- ASTM D-5084 - Flexible wall permeability
- ASTM D-2434 - Rigid wall permeability

User Benefits

- Choose load capacity to fit user needs from 10, 22, 45, and 90kN (2,000, 5,000,10,000, and 20,000 lbs.) models
- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Geo-NET compatibility lets unit be accessed and controlled over a computer network
- Generate columns of data for easy reduction using your own spreadsheet software
- Choose volume capacity to fit user needs from 250, and 750 cc models
- Accurate displacement rate control from 0.00003 to15 mm per minute (0.000001 to 0.6 in. per minute)
- Accurate pressure and volume measurements with integrated sensors
- Stand alone through front keypad and LCD menu

Accessories

- Triaxial/Permeability cells up to 150mm (6.00 in.) diameter, membranes, porous stones and sample preparation accessories upon request.
- Geo-NET PC network card and cable to link LoadTrac II / FlowTrac II to PC

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 15 mm per minute (0.000001 to 0.6 in. per minute)
Flow Range	0.000006 to 3 cc per second
Power	110/220 V, 50/60 Hz, 1phase

	Dimensions	Weight (approx.)
LoadTrac II	464 x 546 x1206 mm (18 x 21.5 x 47.5 in.)	55 kg
FlowTrac II	203 x 406 x 470 mm (8 x 16 x 18.5 in.)	14 kg

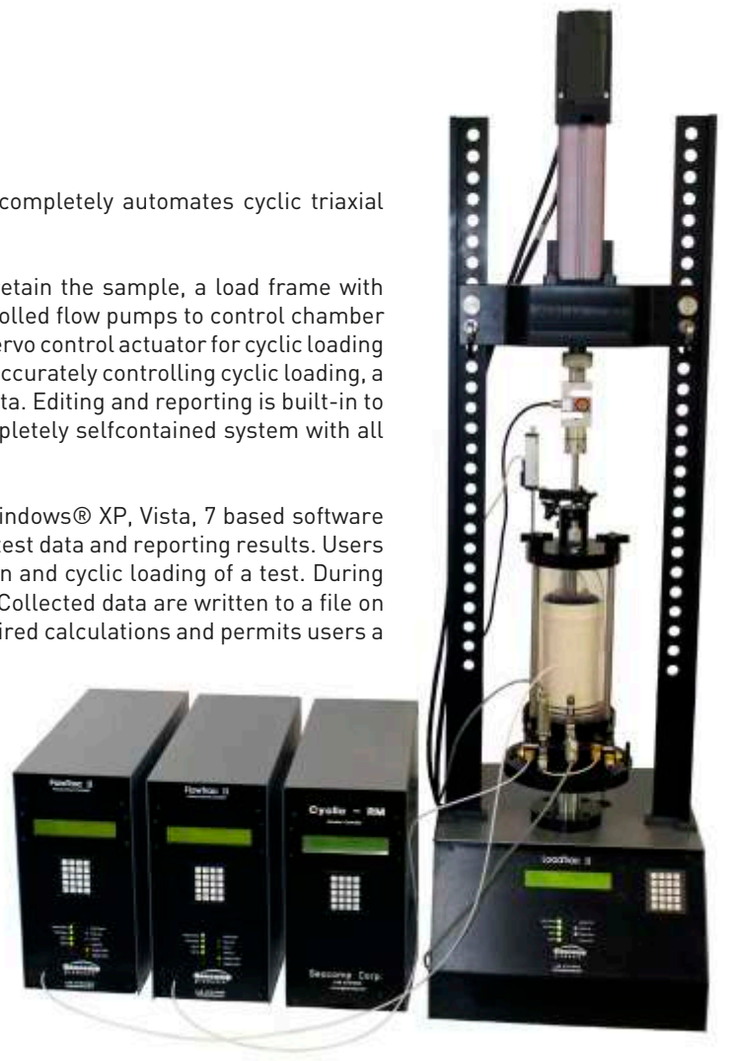
Models

FlowTrac II Models	
FTII-250-nn	250 cc capacity
FTII-750-nn	750 cc capacity
LoadTrac II Models	
LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity
LTII-50,000	222 kN (50,000 lbs.) frame capacity

FULLY-AUTOMATED CYCLIC TRIXIAL SYSTEM

Product Code

LoadTrac II
FlowTrac II Cyclic



The LoadTrac II/FlowTrac II Cyclic system automated test unit completely automates cyclic triaxial testing of soils. Minimum mantime is required.

The LoadTrac II/FlowTrac-II Cyclic consists of a triaxial cell to retain the sample, a load frame with computercontrolled platen for static loading, two computer controlled flow pumps to control chamber pressure and back pressure, a high performance linear actuator servo control actuator for cyclic loading with update rates of 500 times per second, a micro-processor for accurately controlling cyclic loading, a PC with a Pentium processor to control the test, and to log test data. Editing and reporting is built-in to the test and control software program. The unit arrives in a completely selfcontained system with all necessary equipment.

The LoadTrac II/FlowTrac II Cyclic system is menu driven. The Windows® XP, Vista, 7 based software allows users to define the conditions for running the test, logging test data and reporting results. Users can specify the values for controlling the saturation, consolidation and cyclic loading of a test. During testing, current data and system status information is displayed. Collected data are written to a file on the system's hard drive. The reporting software performs all required calculations and permits users a variety of options in graphing and generating test data.

Applicable Test Standards

- ASTM D-3999 Determination of the Modulus Properties
- ASTM D-5311 Load Controlled Cyclic Triaxial Testing of Soils

Benefits and Features

- Reduces time required for testing
- Run tests on isotropically, anisotropically and Ko consolidated samples
- Select number of data points logged per cycle from 10 to 500 readings per second
- Reduce test error and improve quality control
- Operates in a Windows® XP/2000/Vista/7 environment

Technical Specifications

Cyclic Loading System	High performance custom linear actuator 1.8kW peak, low inertia servo-drive system for fast response time. High resolution feedback system for precise and accurate control of load and speed. 4.4 kN (1000lbs force) continuous load at speeds in excess of 200 mm (8") /sec Self-contained and maintenance free Single Phase 208 VAC/60Hz (US) / 220VAC/50Hz (international)
Type Of Cyclic Loading	Load controlled sinusoidal shape
Cyclic Rate	Up to 10 Hz
Options To End Test	Maximum number of cycles Maximum strain
Reporting Options	Load, displacement, sample, and cell vs. cycle number, Shear stress, strain, p-p strain, excess pore pressure vs. cycle number, Shear stress vs. axial strain, Shear stress vs. normal stress, Automatic or user specified scaling on any of above plots, Plotting to monitor, printer, plotter, or file
Test Cell	Modified triaxial cell with accessories
Unit Systems	U.S., English, metric and SI changeable at any time before, during and after test
Sample Diameter	50, 70, up to 100 mm (2/2.8/4 inches) Custom sizes by special order
Transducers	Force: 2, 5,10 kN (500, 1000, 2500 lbf.) Displacement: 50mm (2.0 in.) range Cell and sample pressures: 0-1400 kPa (0-200 psi)

FULLY-AUTOMATED RESONANT COLUMN & TORSIONAL SHEAR SYSTEM

Geocomp's resonant column and torsional system is based on the Long-Tor Resonant Column Apparatus developed by Dr. Vincent P. Drnevich (patent 1974) at Purdue University. The term Long-Tor denotes the capability of the apparatus to vibrate specimens in ei- ther a longitudinal or torsional mode of vibration. The basic principle of the resonant column device is to excite one end of a confined cylindrical soil specimen in a fundamental mode of vibration by means of torsional or longitudinal excitation. Once the fundamental mode of resonance frequency is established, measurements are made of the resonance frequency and amplitude of vibration from which wave propagation velocities and strain amplitudes are calculated using the theory of elasticity. The shear modulus is determined from the derived velocity and the density of the specimen.

The resonant column test is used to measure shear modulus (G) and the damping ratio (D) at small shear strains. These values are a function of strain level. In the test, the shear strain level is increased step-by-step and the shear modulus and damping ratio are measured. The result of the test is a relationship between shear modulus and shear strain and between damping ratio and shear strain over a shear strain magnitude of 10-6 to 10-4 percent. Higher strain levels associated with extreme loads such as earthquakes and wave loading can not be achieved by resonant column testing using the electromagnetic force actuator to twist the specimen. For higher shear strains, our device can be switched to shearing in torsion. The torsional shear phase can be run to obtain shear modulus and damping up to shear strains of 10% depending on the stiffness of the soil. We can also subsequently shear the specimen along any stress path possible in a triaxial cell. Specimens can be consolidated isotropically or anisotropically.

A typical resonant column-torsional shear test on a specimen involves the following steps:

- Consolidation to the first stress condition
- Measurement of G and D versus shear strain at end of primary consolidation and at 3 times during secondary consolidation
- Consolidation to the second stress condition
- Measurement of G and D versus shear strain at end of primary consolidation and at 3 times during secondary consolidation
- Repeat above through final stress condition. Run torsional shear test to 10% strain to measure G and D for higher shear strain levels. Run triaxial compression test to measure shear strength of the specimen, drained or undrained.

Testing Capabilities

Geocomp's resonant column torsional shear testing system is a complete system capable of performing the following tests:

- Resonance in torsion.
- Damping Ratio in torsion.
- Torsional shear up to 2 Hz
- Triaxial or stress path after torsional shear

Geocomp RCTS turnkey system consists of the following:

- LoadTrac-II
- Two FlowTrac-II's
- Electro-Magnetic Drive System
- Torsional Shear System
- All built-in electronics and data acquisition
- Full automation through all phases of a test

Applicable Standards

- ASTM D4015
- ASTM D-4767
- AASHTO T-297

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 35 mm per minute (0.000001 to 1.3 in. per minute)
Flow Range	0.000006 to 3 cc per second
Power	110/220 V, 50/60 Hz, 1phase

	Dimensions	Weight (approx.)
LoadTrac II	464 x 546 x1206 mm (18 x 21.5 x 47.5 in.)	55 kg
FlowTrac II	203 x 406 x 470 mm (8 x 16 x 18.5 in.)	14 kg

Models

FlowTrac II Models	
FTII-250-nn	250 cc capacity
FTII-750-nn	750 cc capacity
nn	Maximum pressure range for system: 1400 and 3500 kPa (200 and 500 psi) available (resolution of pressure will be 0.00005 times the range)
LoadTrac II Models	
LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity

Accessories

Triaxial cells to test samples up to 305mm (12.00 in.) diameter, membranes, porous stones and sample preparation accessories upon request.

FULLY-AUTOMATED RESILIENT MODULUS UNIT

Product Code

LoadTrac II-RM

Geocomp's LoadTrac II Resilient Modulus unit fully automates resilient modulus tests on base/subbase/subgrade materials. The LoadTrac II meets or exceeds all specifications for Resilient Modulus Testing of Base/Subbase/Subgrade Materials by AASHTO T-294/T-307 and SHRP Protocol P46. It minimizes man time during testing and offers a versatile platform for performing additional geotechnical tests.

User Features and Benefits

ADDITIONAL TESTING CAPABILITIES

Geocomp's load frame does more than just Resilient Modulus testing. With software and accessories, the following tests can also be done:

- California Bearing Ratio
- Compression Testing of Weak Rocks and Cement Mixtures
- Constant Rate of Strain Consolidation Testing
- Cyclic Triaxial Testing
- Incremental consolidation
- Triaxial Testing
- Unconfined Compression.

FULLY AUTOMATED MINIMUM INTERVENTION ON YOUR PART

The LoadTrac II performs resilient modulus tests from beginning to end according to the latest AASHTO standards without human intervention.

APPLIES AN ACCURATE LOAD THROUGHOUT TESTING

Resilient modulus testing is a complicated test in which the stiffness of the sample changes with loading. Since the performance of cyclic loading systems depends on the stiffness of the sample, most systems fail to apply the correct load throughout the test. Our system uses real-time adjustment of a PID controller to adjust the system control parameters as the stiffness of the specimen changes. This feature permits our system to apply an accurate load from the beginning to the end of the test.

Our system meets the rigid AASHTO specs for precision on loading to a haversine shape.

OPERATES IN A WINDOWS® ENVIRONMENT

Training time is short, as most people are familiar with the Windows operat- ing environment. Users can configure a wide variety of graphical screens to display the test results including tabular and graphical display of channel values with time, graphical display of stresses, strains, displacements and resilient modulus values.

TEST DATA...THE WAY YOU WANT IT

Our system generates data in a variety of formats, so users get the most use out of the data.

Options include:

- A complete final test report with all appropriate calculations on the data and constitutive relationships based on Publication
- No. FHWA-RD-97-083
- A text file of raw data and a text file of data in engineering units.

Either can be easily loaded into a spreadsheet for further data analysis.

Complete reporting software is included. This software creates reduced test results that are printed in tabular and graphical form instantly after testing. Results are available in any set of units, regardless of which set of units the test was run.

Geocomp's Resilient Modulus Testing System is efficient and reliable. Many details of the test cell, instrumentation and loading system have been optimized thorough inhouse testing on a wide variety of materials utilizing over fifteen years of R&D experience. We continually improve our systems based on new technology and the experiences of our customers.

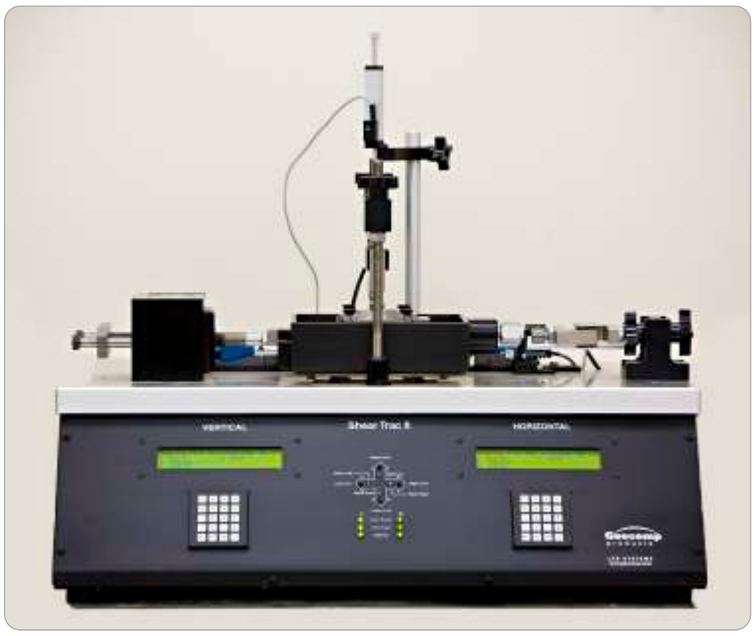
Technical Specifications

Cell Pressure	Automatically applied, maintained and incremented with electro-pneumatic air pressure regulator
Type Of Cyclic Loading	Haversine pulse
Cyclic Rate	0.1 sec per pulse, 1 pulse per second and any slower values given by user
Cyclic Loading	• High performance custom linear actuator • 2.8kW peak, low inertia servo-drive system for fast response time. • High resolution feedback system for pre- cise and accurate control of load and speed. • 22 kN (5000lbs force) continuous load at speeds in excess of 200 mm (8") /sec • Self-contained and maintenance free • Single Phase 208 VAC/60Hz (US) / 220 VAC/50Hz (international)
Options To End Test	Maximum number of cycles Maximum strain
Reporting Options	• Shear stress versus pulse number • Axial strain versus pulse number • Resilient Modulus versus pulse number • Resilient Modulus versus deviator stress • Resilient Modulus versus confining stress • Automatic or user specified scaling on any of above plots • Plotting to monitor, printer, plotter, or file
Test Cell	Modified triaxial cell with sample preparation accessories
Unit Systems	U.S., English, metric and SI changeable at any time before, during and after test
Sample Diameter	70, 100, and 150 mm (2.8/4/6 inches) Custom sizes by special order
Transducers	Force: 2, 5, 10 kN (500, 1000, 2500 lbf.) Displacement: 0.5 inch range, +25.4 mm (+1.00 in.) Cell pressure: 0-500 kPa (0-70 psi)
System Requirements	System is delivered complete to perform tests, store data, reduce data and report the test results. System will be calibrated and ready to begin testing immediately after installation.
Documentation	Full documentation and user's manuals are provided. HELP screens are available at every point in all software

FULLY-AUTOMATED DIRECT RESIDUAL SHEAR SYSTEM

Product Code

ShearTrac II



The ShearTrac II system is capable of performing the consolidation and shearing phases of a standard direct shear and residual shear test under full automatic control. The system consists of a computer-controlled unit that utilizes micro-stepper motors to apply the vertical and horizontal loads to the soil specimen. Versions of the unit are available to produce vertical and horizontal loads up to 10 kN (2000 lbs.).

The system is capable of running a consolidation phase for up to 32 increments automatically. Horizontal shearing can be applied at a specified rate of deformation or at a specified rate of horizontal force change, or at a specified set of force steps of a specified duration. The system is capable of displaying the current status of a test and graphically portraying the progress of the test in real time. The system includes the capability for the operator to alter the test process and conditions at any stage of the test. The system is also capable of performing repeated direct shear tests to determine residual strength based on a specified number of repeated cycles.

The system comes complete with hardware and software for recording all test input data and settings of selected test parameters, performing standard engineering calculations on the data, and producing graphically plotted and printed output in the standard Corps format.

Applicable Test Standards

- ASTM D3080/T236 Direct Shear testing of soils under Consolidated Drained Conditions.

User Benefits

- Choose load capacity to fit user needs up to 10kN (2,000 lbs.)
- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Geo-NET compatibility lets unit be accessed and controlled over a computer network
- Generate columns of data for easy reduction using your own spreadsheet software
- Accurate displacement rate control from 0.00003 to15 mm per minute (0.000001 to 0.6 in. per minute)
- Full automation of residual shear testing
- Stand alone through front keypad and LCD menu capability

Technical Specifications

Capacity	Up to 10 kN (2,000 lbs.)
Vertical Motor	Stepper motor with built-in controls for vertical load
Horizontal Mot.	Stepper motor with built-in controls for horizontal load
Speed Range	0.00003 to 15 mm per min. (0.000001 to 0.6 in per minute
Vertical Travel	25.45 mm (1.00 in.) resolved to 0.0013 mm (0.00005 inches)
Horizontal Travel	±12.5 mm (±0.50 in.) resolved to 0.0013 mm (0.00005 inches)
Power	110/220 V, 50/60 Hz, 1phase

ShearTrac II	Load Capacity
ST-1000	4.4kN(1000lb.)

Accessories

- ShearTrac II accessories including ShearTrac II box to test square or round samples up to 101 mm (4 in.) dimension/ diameter,includes top and bottom porous stones.
- Geo-NET-PC Network card and cable to link ShearTrac II to PC.
- SHEAR Software package to automatically run and report direct /residual shear test on ShearTrac II.

Dimensions	228 mm x 560 mm x 762 mm (9 in. x 22 in. x 30 in.)
Weight (approx.)	63 kg (140 lbs.)

FULLY-AUTOMATED DIRECT SIMPLE SHEAR SYSTEM

Product Code

ShearTrac II-DSS

The ShearTrac II-DSS system is a universal shear system capable of performing the consolidation and shear phases of a direct simple shear test under full automatic control.

The direct simple shear device is a way to measure undrained shear strength of soils that reflects the average shear strength mobilized in the field during failure of embankments on soft soil foundations and deep excavations in clay The DSS test generates a fairly homogeneous state of shear stress throughout the specimen, which provides initial stress condition, stress path, and deformation configuration that models numerous field loading conditions more closely than any other test systems such as triaxial. The system consists of a computer controlled unit that utilizes micro-stepper motors to apply the vertical and horizontal loads to the soil specimen.

The system is capable of running a consolidation phase for up to 32 increments automatically. Horizontal shearing can be applied at a specified rate of deformation or at a specified rate of horizontal force change. The constant volume condition during the shear is maintained through a closed loop computer control with the vertical displacement sensor as the feedback. The system is capable of displaying the current status of a test and graphically portraying the progress of the test in real time. The system includes the capability for the operator to alter the test process and conditions at any stage of the test.

Applicable Test Standards

- ASTM D 6528 Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils
- ASTM D2435/T216 One-Dimensional Consolidation Properties of Soils

User Benefits

- Choose load capacity to fit user needs up to 10kN (2,000 lbs.)
- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Geo-NET compatibility lets unit be accessed and controlled over a computer network
- Generate columns of data for easy reduction using your own spreadsheet software
- Accurate displacement rate control from 0.00003 to15 mm per minute (0.000001 to 0.6 in. per minute)
- Stand alone through front keypad and LCD menu capability

Accessories

- ShearTrac II-DSS accessories includes shear box to test round samples up to 100 mm (4 in.) diameter, top and bottom porous stones with Teflon® coated stacked rings.
- Geo-NET-PC Network card and cable to link ShearTrac II to PC.
- DSS Software package to automatically run and report direct simple shear tests.

Models

ST-DSS-500	2.5 kN (500 lbs.)
ST-DSS-1000	5 kN (1000 lbs.)
ST-DSS-2000	10 kN (2000 lbs.)

Technical Specifications

Capacity	Up to 11 kN (2,500 lbs.)
Vertical Motor	Stepper motor with built-in controls for vertical load
Horizontal Mot.	Stepper motor with built-in controls for horizontal load
Speed Range	0.00003 to 15 mm per min. (0.000001 to 0.6 in per minute
Vertical Travel	12.5 mm (0.5 in.) resolved to 0.0013 mm (0.00005 inches)
Horizontal Travel	±12.5 mm (±0.50 in.) resolved to 0.0013 mm (0.00005 inches)
Power	110/220 V, 50/60 Hz, 1phase

FULLY-AUTOMATED CYCLIC SIMPLE SHEAR SYSTEM

Product Code

ShearTrac II-DSS-CY

The ShearTrac II-DSS-CY system is a universal shear system capable of performing the consolidation, static and cyclic direct simple shear phases under full automatic control. This system is of the type developed at NGI in the mid 1960's. The DSS test generates a fairly homogeneous state of shear stress throughout the specimen, which provides initial stress condition, stress path, and deformation configuration that models numerous field loading conditions more closely than any other strength tests such as triaxial. The system consists of a computer controlled unit that utilizes micro-stepper motors to apply the vertical and horizontal loads to the soil specimen.

The system is capable of running a consolidation phase for up to 32 increments automatically. Stress controlled cyclic can be applied up to a frequency of 1 Hz that can be followed by simple shearing at a specified rate of deformation or force. The constant volume condition is maintained through a closed loop computer control with the vertical displacement sensor as the feed back. The system is capable of displaying the current status of a test and graphically portraying the progress of the test in real time. The system includes the capability for the operator to alter the test process and conditions at any stage of the test.

The system comes complete with hardware and software for recording all test input data and settings of selected test parameters, performing standard engineering calculations on the data, and producing graphically plotted and printed output.

Applicable Test Standards

- ASTM D 6528 Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils
- ASTM D2435/T216 One-Dimensional Consolidation Properties of Soils

User Benefits

- Choose load capacity to fit user needs up to 5kN (1,000 lbs.)
- Total automation, control, data collection and reporting of test results
- Prepare tables and plots of report quality within minutes of completing a test
- Geo-NET compatibility lets unit be accessed and controlled over a computer network
- Generate columns of data for easy reduction using your own spreadsheet software
- Accurate displacement rate control from 0.00003 to15 mm per minute (0.000001 to 0.6 in. per minute)
- Select number of data points logged per cycle form 10 to 500 readings per second
- Manual control capability through front keypad and LCD menus
- Versatile system

SOIL SPECIMEN DIMENSIONS:

Diameter: 2.5 in. (63.5 mm) up to 4.0 in.(101.5 mm)

Dimensions	228 mm x 560 mm x 762 mm (9 in. x 22 in. x 30 in.)
Weight (approx.)	63 kg (140 lbs.)

Accessories	Geo-NET-PC Network/Communication card to link ShearTrac II-DSS to PC. Teflon- coated stacked rings, and stainless steel trimming ring
Software Module	Cyclic DSS Software package to automatically run and edit cyclic and static direct simple shear test
Options	Direct/Residual Shear, Incremental Consolidation, and CRC options available upon request

Technical Specifications

Capacity	Up to 10 kN (2,000 lbs.)
Vertical Force	Stepper motor with built-in controls for vertical load and displacement
Horizontal Force	Stepper motor with built-in controls for horizontal load and displacement
Speed Range	0.00003 to 15 mm per min. (0.000001 to 0.6 in per minute
Frequency Range	Up to 1 Hz.
Vertical Travel	25.45 mm (1.00 in.) resolved to 0.0013 mm (0.00005 inches)
Horizontal Travel	±12.5 mm (±0.50 in.) resolved to 0.0013 mm (0.00005 inches)
Power	Single Phase 208 VAC/60Hz (US) / 220 VAC/50Hz (international)

FULLY-AUTOMATED SHEARTRAC III SYSTEM

Product Code

ShearTrac III

The ShearTrac IIITM system is capable of performing the consolidation and shear- ing phases of a 305 mm x 305 mm (12 x 12 in. by 200mm(8.0 in) height direct shear test under automatic control for soils and geosynthetics (geomembrane, geotextile, GCL, geogrid, etc.) as well as for deter- mining the interface frictional properties of soil and geosynthetics, and internal friction of GCLs.

The system consists of a computer con- trolled unit that utilizes a micro stepper motor to apply the horizontal loads. Ver- sions of the unit are available to test loads up to 50 kN (10,000 lbs). Built-in elec- tronics control test and display data in real time. The system is capable of applying a constant rate of strain or stress at any displacement rate up to 15mm (0.6 inch) per minute. The computer controlled program runs under latest Windows. It includes the capability to display the current status of latest and graphically portray the progress of the test in real time. The system also includes the capa- bility for the operator to alter the test process and conditions at any stage during the test.

This is a turnkey system that includes hardware and software for recording all test input data and settings of selected test parameters, performing standard engineering calculations on the data, and producing graphically plotted and printed output in the standard Corps format, in accordance with ASTM D5321, D6243 and BS 1377 standards.

Applicable Test Standards

- ASTM D-5321 and D-6243
- ASTM 3080/T236
- BS 1377

Features / Benefits

- Built-in end clamps for geosynthetics testing
- Optional grip plates for true internal friction determination for GCLs
- Linear bearings for minimum horizontal friction
- Two sets of limit switches to prevent over traveling
- Built-in 4-channel data acquisition with 16-bit resolution
- Two LCD display
- Two displacement transducers with 100 mm (4.00 in.) range and 0.002 mm (0.00008 in.) resolution
- Two universal shear web type load cells
- Accurate displacement rate control from 0.00003 to 10 mm per minute (0.000001 to 0.4 in. per minute)
- Built-in electronic controls for automatic display of data and control of test
- Windows XP, or Vista, 7 friendly user interface
- Fully incremental consolidation test capability

Technical Specifications

Capacity	50 kN (10,500 lbs.)
Vertical Motor	Stepper motor with built-in controls for vertical load
Horizontal Mot.	Stepper motor with built-in controls for horizontal load
Speed Range	0.00003 to 10 mm per min. (0.000001 to 0.4 in per minute
Vertical Travel	90 mm (3.5 in.) resolved to 0.002 mm (0.00008 inches)
Horizontal Travel	90 mm (3.5 in.) resolved to 0.002 mm (0.00008 inches)
Power	110/220 V, 50/60 Hz, 1phase

Models

ST-10000	50 kN (10,000 lbs.) frame capacity in both directions.

Accessories

Geo-NET™-PC	Network card and cable to link ShearTrac III to PC
Shear	Software package to automatically run consolidation and direct shear test on ShearTrac III
Shear.report	Editing/reporting software package
Gripping Plates	Optional for GCL testing