Tinius Olsen

Tinius Olsen Testing Machine Company
1065 Easton Road, Horsham, PA 19044, US

Redhill, Surrey, UK • Noida, UP, India • Shanghai, PR China

www.tiniusolsen.com

info@tiniusolsen.com

Testing Solutions for the Civil & Construction Industry

EQUIPMENT, SOFTWARE, CALIBRATION, SERVICE AND AFTER SALES SUPPORT

Tinius Olsen

Tinius Olsen

Contents

Company Profile	2
Package Solutions	4
Turnkey Project Management	5
Systems Integration	6
Concrete	8
Cement, Lime, Plaster & Mortar	46
Sand, Aggregates & Fillers	59
Asphalt Quality Control	78
Soil	89
Mobile Laboratory Concept	126
Standards Reference Listing	127
Index	151

Specifications in this catalogue are subject to change without notice

Tinius Olsen

The industrial history of materials testing by machine can be traced to Tinius Olsen, a visionary inventor who built the first universal testing machine.

By 1880, he had proven and patented enough revolutionary ideas and designs to create an entire line of testing machines and launch his own company. Over the years, he introduced and innovated application-specific solutions for materials testing that spanned industrial manufacturing and construction.

After the turn of the century and the innovations of motor vehicles and modern highways, the scope of Tinius Olsen's offerings expanded to include a new product line dedicated to the testing of cement, concrete and road materials.

Nearly 140 years later and many of Tinius Olsen's original designs and technological approaches are still viewed as industry standards and are testament to his knowledge of the sciences, the natural and man-made materials that make up our world, and of best engineering practices.

At Tinius Olsen, we are proud of our founder's legacy and continue to seek to build on it with new and creative systems that combine the best of proven materials testing machine technologies with the latest in automation and in digital monitoring, control and analysis software.

We offer equipment for testing high performance metals, the latest engineering grades of plastics, the toughest textiles and the most exotic composites. Building on some of the early solutions of our founder, we also offer one of the industry's most comprehensive and reliable lines of products and services for testing construction-related materials.

The breadth of machines and testing resources on the following pages is supported by our technical team, which keeps our ever-growing customer base up and running with precisely-calibrated testing machinery.

Tinius Olsen

Tinius Olsen

Our Global Presence

Tinius Olsen proudly owns in US, UK, India and China:

- Customer service centers
- Training centers
- Showrooms
- Calibration facilities

Our global partner for the civil and construction industry is PowerCept Technologies. Contact details are:

PowerCept Middle East LLC
PO BOX 123489
Dubai – UAE

Website: www.powercept.com
Email: info@powercept.com

Key highlights of PowerCept are:

- Combines 45 years of regional knowledge and experience in the field of testing and measurement across the dynamic markets of the Middle East, Europe, India SAARC and Asia Pacific
- Specialises in packaged product and support solutions for civil engineering, education & research and manufacturing.
- Provides clients with comprehensive application advice, customer service, calibration, repair and training.
- Ensures value through close working relationships with regulatory bodies, technology partners and end users.
- Empowers local customers with proven track record of bringing diverse business cultures together with best-in-class engineering solutions.

Package Solutions

Turnkey Project Management

All Tinius Olsen Package Solutions include the following:

- Lab layouts and machine placements
- Power requirements
- Manpower requirements
- Comprehensive product training
- Application and technical support
- Calibration support
- Installation & commissioning
- Pre and post-sales support
- Certification and traceability
- User application training
- After sales and warranty support

Tinius Olsen offers Package Solutions as per BS/ASTM/EN/ISO/AASHTO International Standards for the following:

- Ready Mix Plant
- Pre Cast Factory
- Educational Laboratory
- Cement Plant
- Contractors Laboratory
- Accredited Commercial Laboratories for testing:
  - Rebar
  - Geotextiles
  - Membranes
  - Concrete
  - Aggregate
  - Soil
  - Asphalt
  - Cement
  - General Laboratory Testing

Horizon Software

Key features

- Test method library
- Test Editor
- Tabbed Test and Recall Area
- Multiple Machine Control
- Closed loop control of compression testers
- Output Editor
- Multilingual with translation
- Basic statistics
- Exporting (printing and ASCII)
- Central server capability and connectivity
- Help Desk access
- Multifaceted security
- Tinius Olsen Knowledge Center (requires internet access)

Tinius Olsen is proud to introduce the next evolution of its testing software with the Horizon package. As part of the development process, we have taken the best features of our existing software offerings, added a host of report writing and data manipulation capabilities and, in the process, created a new, unparalleled testing platform. This will make easy work of your materials testing programs, whether they're designed for the demanding rigors of R&D or the charting and analysis functions of QC testing.

Horizon software uses the most current Windows environments. These familiar formats make it easy to use and learn, especially because the same familiar functionality is maintained throughout the program.

Horizon software can accept data from not only our tension compression materials testing machines but it can also take manual data entry from equipment such as the Marshall tester, CBR, Soil Compactor, Speedy testers, Blaine apparatus, Sieve grading results and all types of Civil Engineering Equipment test results.

If your testing hardware has PC communication and control capabilities, then Horizon software can also automatically control the tests for you, in accordance with the appropriate testing specifications, gather the test data and calculate the required results. Horizon can then take these results and produce a consolidated testing report that can incorporate your or your customer's logo.

Modular in design, Horizon software can be configured in a number of different ways so that your immediate needs are addressed; further enhancements are readily available as your testing needs change and grow.

Talk to your sales engineer to see how Horizon software can best meet your needs.

MODEL TO-512

Universal Penetrometer

Penetrometers are used for testing a wide variety of materials such as grease, petroleum, bitumen, tar, asphalt, rubber, cement and soils.

In this test, a chosen force is applied over a given area for a known period of time and the depth of penetration or the depression made in the sample is measured in tenths of a millimetre, which is expressed as a penetration number.

An accurately fabricated steel base has been designed to facilitate penetration tests to be made over a wide surface area of the sample. Adjustable feet are provided in the base for levelling. The display and penetration arm are adjustable to permit the testing of samples immersed in a thermostat bath.

The unit is compact with in-built timer to control the duration of penetration, which is preset in the factory to five seconds. The instrument is provided with levelling screws. Each penetrometer is supplied with a plunger weighing 47.5g for testing bituminous product, one 50g weight and one 100g weight. It also includes the cone and penetration unit.

APPLICABLE STANDARDS

- **EN 12350-2; ASTM C143**

ORDERING INFORMATION

- **TO-512-01** Universal Penetrometer with timer, 110V, 60Hz
- **TO-512-02** Universal Penetrometer with timer, 220V, 60Hz
- **TO-512-03** Universal Penetrometer with timer, 220V, 50Hz

STANDARD FEATURES

- **TO-515** Penetrometer cone
- **TO-516** Bitumen penetration kit

OPTIONAL ACCESSORIES

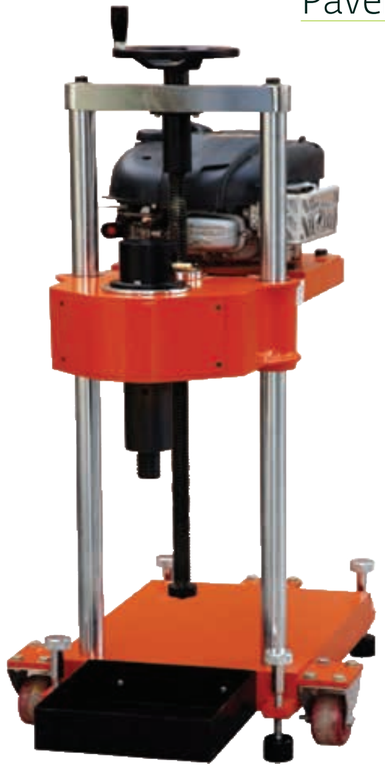
- **TO-515** Penetrometer cone
- **TO-518** Bitumen penetration kit
- **TO-51801** Penetration needle
- **TO-51802** Transfer dish (copper)
- **TO-51803** Aluminium sample containers
- **TO-04201** Penetration test cone
- **TO-04202** Penetration test cup

PACKAGING INFORMATION

- **Net weight:** 8kg; **gross weight:** 15kg
- **Packaging dimensions:** 80 x 37 x 47cm

MODEL TO-551

Pavement Core Drilling Machine



This gasoline engine-powered road building drill has been designed specifically for the purpose of drilling test cores from holes in roads, airport runways, bridges, etc.

The machine consists of two vertical support columns, which carry the drill head/engine assembly accurately with the help of a screwed spindle.

The 6HP gasoline engine with pulley mechanism works with minimum vibrations. The double precision bit advances with a screwed spindle, which provides a constant, accurate drill pressure, minimum core chipping and long bit life.

The complete assembly is supplied on a rigid metal base with leveling facility, and is suitable for coring applications in a vertical downwards motion only.

APPLICABLE STANDARD

- **EN 12504-1**

MODEL TO-551 SPECIFICATIONS	
Bit diameter	150mm
Length	350mm
Maximum depth of core	450mm
Drill speed	Variable speed from 200 to 900rpm
Drive motor	6HP gasoline engine
Guide shafts	40mm diameter
Screwed spindle	20mm diameter
Water tap	12mm
Drill wrenches	Included

ORDERING INFORMATION

- **TO-551** Pavement Core Drilling Machine with engine but without diamond core bits

OPTIONAL ACCESSORIES

- **TO-55101** Core Bit 50mm dia x 200m long
- **TO-55102** Core Bit 50mm dia x 450m long
- **TO-55103** Core Bit 75mm dia x 200m long
- **TO-55104** Core Bit 75mm dia x 450m long
- **TO-55106** Core Bit 100mm dia x 450m long
- **TO-55109** Core Bit 150mm dia x 200m long
- **TO-55110** Core Bit 150mm dia x 450m long

MODEL TO-553

Automatic Compactor for Bituminous Mixes – Light Compaction

The Automatic Compactor eliminates the laborious process of manual compaction and results in consistent laboratory specimens.

The equipment consists of a drive mechanism that lifts a 4.5kg weight and drops it through a height of 457mm. A removable rammer foot facilitates preheating. A compaction pedestal with specimen holder is fixed to the base.

An automatic blow counter enables the number of blows to be preset before each test and automatically stops the machine on completion.

Key features

- Rugged construction to withstand hard work.
- Fully automatic and easy to operate.
- Uniform compaction.
- Automatic blow counter.

APPLICABLE STANDARDS

- **BS598-107; EN 12697-10, -30; AASHTO T245**

ORDERING INFORMATION

- **TO-553-1-01** Automatic Compactor for Bituminous Mixes of 100mm dia sample, 110V, 60Hz
- **TO-553-1-02** Automatic Compactor for Bituminous Mixes of 100mm dia sample, 220V, 60Hz
- **TO-553-1-03** Automatic Compactor for Bituminous Mixes of 100mm dia sample, 220V, 50Hz

SUPPLIED AS STANDARD

- **TO-55002** Compaction mold
- **TO-55003** Base plate
- **TO-55004** Extension collar

OPTIONAL ACCESSORIES

- **TO-55002** Compaction mold
- **TO-55003** Base plate
- **TO-55004** Extension collar

PACKAGING INFORMATION

- **Net weight:** 222kg; **gross weight:** 347kg
- **Packaging dimensions:** 206 x 63 x 88cm

MODEL TO-561

Softening Point – Ring and Ball Apparatus

This equipment is used to determine the temperature at which a sample of bituminous material loaded by a 9.5mm diameter steel ball drops a specified distance when heated under specified conditions.

The Ring and Ball Apparatus has a magnetic stirrer with adjustable heating facility and digital display of temperature. Each unit comes with a bath of heat-resistant glass, tapered rings, ball centering guide, steel balls, ring holder and a hot plate.

APPLICABLE STANDARDS

- **ASTM D36, E28; STPTC PT 3; AASHTO T53; BS:2000; EN 1427**

PACKAGING INFORMATION

- **Net weight:** 3kg; **gross weight:** 4kg
- **Packaging dimensions:** 20 x 24 x 17cm

ORDERING INFORMATION

- **TO-561-EN-01** Ring and Ball Apparatus, electrical heating, 110V, 60Hz
- **TO-561-EN-02** Ring and Ball Apparatus, electrical heating, 220V, 60Hz
- **TO-561-EN-03** Ring and Ball Apparatus, electrical heating, 220V, 50Hz
- **TO-561-ASTM-01** Ring and Ball Apparatus, electrical heating, 110V, 60Hz
- **TO-561-ASTM-02** Ring and Ball Apparatus, electrical heating, 220V, 60Hz
- **TO-561-ASTM-03** Ring and Ball Apparatus, electrical heating, 220V, 50Hz

SUPPLIED AS STANDARD

- **TO-56101** Tampered rings (set of two)
- **TO-56102** Ball centering guide (set of two)
- **TO-56103** Steel ball of 9.5mm dia (set of two)
- **TO-56104** Ring holder
- **TO-56105** Electric hot plate

OPTIONAL ACCESSORIES

- **TO-56101** Tampered rings (set of two)
- **TO-56102** Ball centering guide (set of two)
- **TO-56103** Steel ball of 9.5mm dia (set of two)
- **TO-56104** Ring holder
- **TO-56105** Electric hot plate

MODEL TO-563

Centrifuge Extractor Apparatus

This equipment is used to determine the bitumen percentage in bituminous paving mixtures.

It has a removable, precision machined, aluminum rotor bowl, mounted on a vertical shaft. A filter paper disc is pressed in between the rotor bowl and cover plate by tightening a knurled nut.

The bowl assembly is enclosed in a housing mounted on a cast body. In the electrical operating model, the rotor bowl is coupled to a motor. The solvent may be introduced during test through a cup on the housing cover.

This equipment is electrically operated with an in-built dimmerstat for speed variation from orpm to 3600rpm. Each unit is supplied with a set of 25 filter paper discs.

APPLICABLE STANDARDS

- **ASTM D2172; AASHTO T58, T164; EN 12697-1**

ORDERING INFORMATION

- **TO-563-1-01** Centrifuge Extractor, electrically operated, capacity 1500kg, 110V, 60Hz
- **TO-563-1-02** Centrifuge Extractor, electrically operated, capacity 1500kg, 220V, 60Hz
- **TO-563-1-03** Centrifuge Extractor, electrically operated, capacity 1500kg, 220V, 50Hz
- **TO-563-2-01** Centrifuge Extractor, electrically operated, capacity 3000kg, 110V, 60Hz
- **TO-563-2-02** Centrifuge Extractor, electrically operated, capacity 3000kg, 220V, 60Hz
- **TO-563-2-03** Centrifuge Extractor, electrically operated, capacity 3000kg, 220V, 50Hz

OPTIONAL ACCESSORIES

- **TO-56301** Filter paper disc (set of 25) for TO-563-1
- **TO-56302** Filter paper disc (set of 25) for TO-563-2

MODEL TO-565

Ductility Testing Machine

Bituminous surfaces exposed to varying temperature conditions undergo a great deal of expansion and contraction. An important characteristic of the binder is its ductility and the degree of ductility has an effect on the cracking of bituminous surfaces caused by traffic stress.

The ductility of bitumen is expressed as the distance in centimeters by which a standard briquette can be elongated before the thread formed breaks under specified conditions. A molten bitumen sample is pored into a standard mold, allowed to cool to room temperature and then placed in a water bath so that the briquette can be brought to test temperature before mounting in the testing machine.

Designed to test three specimens simultaneously, the machine consists of a carriage moving over a lead screw. An electric motor driven reduction gear unit ensures smooth constant speed and continuous operation. The entire assembly is mounted with a water bath completely encased in metal bound hardwood. It is equipped with an electric pump circulator and heater. The temperature is controlled by a digital temperature controller. Two rates of travel – 5 cm/min and 1cm/min –are provided. The machine is supplied complete with four ductility molds, each with a base plate.

APPLICABLE STANDARDS

- **ASTM D113; AASHTO T51**

PACKAGING INFORMATION

- **Net weight:** 120kg; **gross weight:** 235kg
- **Packaging dimensions:** 228 x 79 x 53cm

ORDERING INFORMATION

- **TO-565-DG-01** Ductility Testing Machine, electrically operated, 110V, 60Hz
- **TO-565-DG-02** Ductility Testing Machine, electrically operated, 220V, 60Hz
- **TO-565-DG-03** Ductility Testing Machine, electrically operated, 220V, 50Hz
- **TO-565-DG-C-01** Ductility Testing Machine with cooling, electrically operated, 110V, 60Hz
- **TO-565-DG-C-02** Ductility Testing Machine with cooling, electrically operated, 220V, 60Hz
- **TO-565-DG-C-02** Ductility Testing Machine with cooling, electrically operated, 220V, 50Hz

SUPPLIED AS STANDARD

- **TO-56501** Three ductility molds

OPTIONAL ACCESSORIES

- **TO-560501** Three ductility molds

MODEL TO-566

Benkelman Beam

The Benkelman Beam uses a balanced beam in conjunction with a suitable vehicle to measure road flexure. It is a convenient, accurate device for measuring the deflection of flexible pavements under moving wheel loads.

Operating on a simple lever arm principle, the unit consists of a reference beam, body, two-part probe beam and rear zero adjust. The equipment is supplied with a wooden carrying case.

ORDERING INFORMATION

- **TO-566-1** Benkelman beam with dial gage
- **TO-566-1D** Benkelman beam with digital gage

SUPPLIED AS STANDARD

- Dial gage with TO-566-1
- Digital gage with TO-566-1D

OPTIONAL ACCESSORIES

- **TO-072** Dial gage for TO-566-1
- **TO-072-DG** Digital gage for TO-566-1D

PACKAGING INFORMATION

- **Net weight:** 25kg; **gross weight:** 50kg
- **Packaging dimensions:** 172 x 35 x 48cm

APPLICABLE STANDARD

- **AASHTO T256**

Key features

- Lightweight aluminum construction.
- Easy to transport.
- Unique telescopic design to simplify field set-up.
- Compact, reduced storage space needed.

MODEL TO-567

Pavement Dynamic Cone Penetrometer

The Pavement Dynamic Cone Penetrometer (DCP) is a very robust instrument, designed for rapid in-situ evaluation of strength of sub-grade and the bases for roads and runway pavements. Continuous measurements can be made down to a depth of 800mm or, when an extension is fitted, to a depth of 1200mm. Where pavement layers have different strengths, the boundaries can be identified and the thickness of the layers determined.

A typical test takes only a few minutes, so this instrument provides a very efficient method of obtaining information that would normally require test pits. Correlations have been established between measurements with DCP and California Bearing Ratio (CBR) so that the results can be interpreted and compared with CBR specifications for pavement design. Agreement is generally good over most of the range but differences are apparent at low values of CBR, especially for fine grained materials.

The design of the pavement DCP is similar to the one described by Kleyn, Maree and Savage (1982) in their paper "The application of the pavement DCP to determine the bearing properties and performance of road pavements", published in proceedings of International Symposium on Bearing Capacity of Roads and Airfields, Vol.1. (The Norwegian Institute of Technology) and developed by TRRL, UK.

It incorporates an 8kg weight dropping through a height of 575mm and a 60° cone with a diameter of 20mm. It is supplied complete with assembly tools and weighs about 20kg.

The DCP needs three operators, one to hold the instrument, another to raise and drop the weight and a technician to record the results. The instrument is held vertically and the weight carefully raised to the handle limit and then allowed to fall onto the anvil.

This equipment is supplied with top bottom rod, handle, hammer, scale, cone and anvil with a wooden carrying case.

ORDERING INFORMATION

- **TO-567** Pavement Dynamic Cone Penetrometer with carrying case

SUPPLIED AS STANDARD

- **TO-56701** Top and bottom rod
- **TO-56702** Handle
- **TO-56703** Hammer
- **TO-56704** Scale
- **TO-56705** Cone 60°
- **TO-56706** Anvil

OPTIONAL ACCESSORIES

- **TO-56701** Top and bottom rod
- **TO-56702** Handle
- **TO-56703** Hammer
- **TO-56704** Scale
- **TO-56705** Cone 60°
- **TO-56706** Anvil
- **TO-56707** Bottom rod

PACKAGING INFORMATION

- **Net weight:** 45kg; **gross weight:** 70kg
- **Packaging dimensions:** 129 x 33 x 38cm

Key features

- Simple and robust for rapid in-situ measurement of the structural properties of road pavements.
- Fast and efficient method of obtaining information.
- For continuous measurements up to a depth of 800mm and 1200mm with the extension rod.
- Portable and can be accommodated in a carrying case.

MODEL TO-550-1

Marshall Stability Test Machine – Analog

Marshall Stability Test Equipment is used by highway departments, contractors, engineers, testing laboratories and other government agencies to test the stability of bituminous samples.

It is used for the measurement of resistance to plastic flow of cylindrical specimens of bituminous paving mixture loaded on the lateral surface.

The machine can provide measurement data for use with hot mixture containing asphalt or tar and aggregate up to 25.4mm maximum size. The equipment comprises a bench top loading frame with a screw-driven adjustable crosshead.

The Marshall Stability Test Machines are available in two models: digital, using a loadcell to measure force and an LVDT to measure displacement; and a non-digital version that uses a proving ring to measure force and a micrometer to measure displacement.

MODEL TO-550-1 SPECIFICATIONS	
Maximum vertical clearance	470mm
Minimum vertical clearance	250mm
Horizontal clearance	265mm
Platen diameter	133mm
Platen travel	25mm
Platen speed	50.8mm/min
Rated power	375W
Dimension (LxWxH)	550 x 400 x 870mm
Weight	60kg

APPLICABLE STANDARDS

- **ASTM D1559; BS 598-107; EN 12697-34; AASHTO T245**

ORDERING INFORMATION

- **TO-550-1-01** Marshall Stability Apparatus, single-speed machine including machine mounted 50kN proving ring and dial gage, 110VAC, 60Hz
- **TO-550-1-02** Marshall Stability Apparatus, single-speed machine including machine mounted 50kN proving ring and dial gage, 220VAC, 60Hz
- **TO-550-1-03** Marshall Stability Apparatus, single-speed machine including machine mounted 50kN proving ring and dial gage, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-55001** Breaking head assembly
- **TO-274 50kN** Proving ring
- **TO-072** Dial gage

OPTIONAL ACCESSORIES

- **TO-55002** Compaction mold
- **TO-55003** Base plate
- **TO-55004** Extension collar
- **TO-55005** Compaction pedestal suitable for 4in dia specimen
- **TO-55006** Compaction rammer 10lb
- **TO-55018-1** Sample ejector (hydraulic) for 4in dia specimen

PACKAGING INFORMATION

- **Net weight:** 91kg; **gross weight:** 121kg
- **Packaging dimensions:** 76 x 53 x 128cm

Key features

- Single speed, bench top load frame.
- Maximum loading capacity of 50kN.
- Geared screw jack and motor drive.
- Precise speed.
- Limit switch protection for both upward and downward movement.

MODEL TO-550-2

Marshall Stability Test Machine – Digital

Marshall Stability Test Equipment is used by highway departments, contractors, engineers, testing laboratories and other government agencies to test the stability of bituminous samples.

It is used for the measurement of resistance to plastic flow of cylindrical specimens of bituminous paving mixture loaded on the lateral surface.

The machine can provide measurement data for use with hot mixture containing asphalt or tar and aggregate up to 25.4mm maximum size. The equipment comprises a bench top loading frame with a screw-driven adjustable crosshead.

The Marshall Stability Test Machines are available in two models: digital, using a loadcell to measure force and an LVDT to measure displacement; and a non-digital version that uses a proving ring to measure force and a micrometer to measure displacement.

MODEL TO-550-2 SPECIFICATIONS	
Maximum vertical clearance	470mm
Minimum vertical clearance	250mm
Horizontal clearance	265mm
Platen diameter	133mm
Platen travel	25mm
Platen speed	50.8mm/min
Rated power	375W
Dimension (LxWxH)	550 x 400 x 870mm
Weight	60kg

APPLICABLE STANDARDS

- **ASTM D1559; BS 598-107; EN 12697-34; AASHTO T245**

ORDERING INFORMATION

- **TO-550-2-01** Digital Marshall Apparatus, including 50kN loadcell and LVDT displacement transducer, 110VAC, 60Hz
- **TO-550-2-02** Digital Marshall Apparatus, including 50kN loadcell and LVDT displacement transducer, 220VAC, 60Hz
- **TO-550-2-03** Digital Marshall Apparatus, including 50kN loadcell and LVDT displacement transducer, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-55001** Breaking head assembly
- **TO-55020** Data acquisition system comprising:
  - Digital indicatorß
  - Load cell 50kN
- Displacement transducer 0-20mm

OPTIONAL ACCESSORIES

- **TO-55002** Compaction mold
- **TO-55003** Base plate
- **TO-55004** Extension collar
- **TO-55005** Compaction pedestal suitable for 4in dia specimen
- **TO-55006** Compaction rammer 10lbs
- **TO-55018-1** Sample ejector (hydraulic) for 4in dia specimen

PACKAGING INFORMATION

- **Net weight:** 91kg; **gross weight:** 121kg
- **Packaging dimensions:** 76 x 53 x 128cm

Key features

- Single speed, bench top load frame.
- Maximum loading capacity of 50kN.
- Geared screw jack and motor drive.
- Precise speed.
- Limit switch protection for both upward and downward movement.

MODEL TO-515

Penetration Cone

This cone is used for empirical estimation of the consistency of lubricating grease and petroleum. It is made of brass with a hardened steel tip. The stem of the cone is interchangeable with all types of Tinius Olsen penetrometers manufactured to close tolerances, providing a unified cone and ensuring that there is no shoulder between the tip and the body.

APPLICABLE STANDARDS

- **BS 1377, 1924.3; EN DDENV 1997-2**

ORDERING INFORMATION

- **TO-515** Penetration cone

WEIGHT

- 102.5 + 0.05g

MODEL TO-518

Bitumen Penetration Kit

Our Bitumen Penetration Kit consists of a penetration needle, transfer dish and aluminium sample containers.

APPLICABLE STANDARDS

- **ASTM D5; BS 2000 (D-49); EN 1426, 13179-2; AASHTO T49, IP49**

ORDERING INFORMATION

- **TO-518** Bitumen Penetration Kit

OPTIONAL ACCESSORIES

- **TO-515** Penetration cone
- **TO-518** Bitumen penetration kit
- **TO-51801** Penetration needle
- **TO-04201** Penetration test cone
- **TO-04202** Penetration test cup

Standards Reference Listing

AASHTO

Standard	Title	Equipment Reference	Page
E131	Test is used to determine the quantity of water required to produce a cement paste of 'standard' consistency	Vicat Apparatus	55
IP49	In this test, a chosen force is applied over a given area for a know period of time and the depth of penetration or the depression made in the sample is measured in tenths of a millimeter, which is expressed as a penetration number	Bitumen Penetration Kit	88
T22	Standard method of test for compressive strength of cylindrical concrete specimens	DG Series Semi Automatic Concrete Compression Testers	18
		FA Series Fully Automatic Concrete Compression Testers	8
T23	Making and curing concrete compression and flexural test specimens in the field	Curing Tank	34, 43
T49	Standard method of test for penetration of bituminous materials	Bitumen Penetration Kit	88
T51	Standard method of test for ductility of asphalt materials	Ductility Testing Machine	83
T53	Standard method of test for softening point of bitumen (ring-and-ball apparatus)	Softening Point – Ring and Ball Apparatus	81
T58	Test for determining bitumen percentage in bituminous paving mixtures	Centrifuge Extractor Apparatus	82
T71	Standard method of test for effect of organic impurities in fine aggregate on strength of mortar	Flow Table	48
T85	Standard method of test for specific gravity and absorption of coarse aggregate	Density Basket	76

AASHTO

Standard	Title	Equipment Reference	Page
T88	Standard method of test for particle size analysis of soils	High Speed Stirrer	117
		Particle Size Sieve Analysis	72
T89	Test for determining the liquid limit of soils	Liquid Limit Device	89
T90	Standard method of test for determining the plastic limit and plasticity index of soils	Liquid Limit Device	89
T92	Standard method of test for determining the shrinkage factors of soils	Shrinkage Limit	115
T96	Standard method of test for resistance to degradation of small-size coarse aggregate by abrasion and impact in the Los Angeles machine	Los Angeles Abrasion Apparatus	64
T99	These methods of test are intended for determining the relation between the moisture content and density of soils compacted in a mold of a given size with a 2.5kg (5.5lb) rammer dropped from a height of 305mm (12in)	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T100	This method covers determination of the specific gravity of soils by means of a pycnometer	Pycnometer	116
T106	Standard method of test for compressive strength of hydraulic cement mortar	Flow Table	48
T107	Standard method of test for autoclave expansion of hydraulic cement	Cement Autoclave	47
		Volume Change Apparatus with Length Comparator	45
T126	Standard method of test for making and curing concrete test specimens in the laboratory	Consistometer	40
		Motorized Flow Table	31

AASHTO

Standard	Title	Equipment Reference	Page
T129	Standard method of test for normal consistency of hydraulic cement	Vicat Apparatus	55
T134	Standard method of test for moisture density relations of soil-cement mixtures	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T135	Standard method of test for wetting-and drying test of compacted soil-cement	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T136	Standard method of test for freezing-and thawing tests of compacted soil-cement mixtures	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T137	Standard method of test for air content of hydraulic cement mortar	Flow Table	48
T152	Standard method of test for air content of freshly mixed concrete by the pressure method	Air Entrainment Meter – Type B	29
T153	Standard method of test for fineness of hydraulic cement by air permeability apparatus	Air Permeability Apparatus (Blaine type)	54
		Auto Blaine Apparatus	46
T160	Standard method of test for length change of hardened hydraulic cement mortar and concrete	Volume Change Apparatus with Length Comparator	45
T164	Standard method of test for quantitative extraction of asphalt binder from hot mix asphalt (HMA)	Centrifuge Extractor Apparatus	82

AASHTO

Standard	Title	Equipment Reference	Page
T180	This method of test is intended for determining the relationship between the moisture content and density of soils when compacted in a given mold of a given size with a 4.54kg (10lb) rammer dropped from a height of 457mm (18in)	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T193	Standard method of test for the California Bearing Ratio	CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
		Triaxial Test Load Frame	91
T197	Standard method of test for time of setting of concrete mixtures by penetration resistance	Spring Type Concrete Penetrometer	41
T215	Standard method of test for permeability of granular soils (constant head)	Laboratory Permeability Apparatus (Falling Head)	120
T216	Standard method of test for one-dimensional consolidation properties of soils	Consolidation Apparatus – Analog	107
		Consolidation Apparatus – Digital	108
T217	This test is used to determine the moisture content of soils by means of a calcium carbide gas pressure moisture tester in the field. The tester is referred to as the "Speedy"	Speedy Moisture Meter	113
T231	Standard practice for capping cylindrical concrete specimens	Cylindrical Specimen Capping Equipment	44
T245	Standard method of test for resistance to plastic flow of bituminous mixtures using Marshall Apparatus	Automatic Compactor for Bituminous Mixes – Light Compaction	80
		Marshall Stability Test Machine – Analog	86
		Marshall Stability Test Machine – Digital	87
T256	Standard method of test for pavement deflection measurements	Benkelman Beam	84

AS

Standard	Title	Equipment Reference	Page
1012	Methods of testing concrete — sampling of fresh concrete	Consistometer	40

ASTM

Standard	Title	Equipment Reference	Page
C29	Standard test method for bulk density (unit weight) and voids in aggregate	Bulk Density, Voids and Bulking	73
C31	Standard practice for making and curing concrete test specimens in the field	Beam Molds	33
		Cube Molds	33
		Curing Tank	34, 43
C39	Standard test method for compressive strength of cylindrical concrete specimens	DG Series Semi Automatic Concrete Compression Testers	18
		FA Series Fully Automatic Concrete Compression Testers	8
C78-02	Standard test method for flexural strength of concrete (using simple beam with third-point loading), beams, concrete, flexural strength testing	Cylindrical Molds	33
		Flexural Testing Machine	16, 26
C87	Standard test method for effect of organic impurities in fine aggregate on strength of mortar	Flow Table	48
C109	Standard test method for compressive strength of hydraulic cement mortars (using 2in or 50mm cube specimens)	Cement Molds	58
		Compression Frame Jig	52
		Flow Table	48

STANDARDS REFERENCE LISTING

ASTM

Standard	Title	Equipment Reference	Page
C127	Standard test method for density, relative density (specific gravity), and absorption of coarse aggregate	Density Basket	76
C131	Standard specification for liquid membrane forming compounds having special properties for curing and sealing concrete, acid resistance	Los Angeles Abrasion Apparatus	64
C138	Standard test method for density (unit weight), yield and air content (gravimetric) of concrete	Bulk Density Measures	42
C141	Standard specification for hydraulic hydrated lime for structural purposes	Cement Autoclave	47
		Vicat Apparatus	55
C143	Standard test method for slump of hydraulic-cement concrete	Slump Cone Test	30
		Universal Penetrometer	78
C151	Standard test method for autoclave expansion of hydraulic cement	Cement Autoclave	47
		Shrinkage Bar Mold	57
		Volume Change Apparatus with Length Comparator	45
C155	Standard classification of insulating firebrick	Cement Autoclave	47
C157	Standard test method for length change of hardened hydraulic-cement mortar and concrete	Volume Change Apparatus with Length Comparator	45

ASTM

Standard	Title	Equipment Reference	Page
C185	Standard test method for air content of hydraulic cement mortar	Flow Table	48
C187	Standard test method for normal consistency of hydraulic cement	Vicat Apparatus	55
C188	Standard test method for density of hydraulic cement	Cement Autoclave	47
C191	Standard test method for time of setting of hydraulic cement by Vicat needle	Vicat Apparatus	55
C192	Standard practice for making and curing concrete test specimens in the laboratory	Beam Molds	33
		Cube Molds	33
		Curing Tank	34, 43
C204	Standard test methods for fineness of hydraulic cement by air-permeability apparatus	Air Permeability Apparatus (Blaine type)	54
		Auto Blaine Apparatus	46
C213	Specification for alumina-silica castable refractories for boiler furnaces and incinerators	Air Entrainment Meter – Type B	29
		Core Case Apparatus	36
C230	Standard specification for flow table for use in tests of hydraulic cement	Flow Table	48

ASTM

Standard	Title	Equipment Reference	Page
C231	Standard test method for air content of freshly mixed concrete by the pressure method	Air Entrainment Meter –Type A	28
		Air Entrainment Meter – Type B	29
		Core Case Apparatus	36
C243	Standard test method for bleeding of cement pastes and mortars	Flow Table	48
C308	Standard test methods for working, initial setting and service strength setting times of chemical-resistant resin mortars	Vicat Apparatus	55
C348	Standard test method for flexural strength of hydraulic-cement mortars	Flow Table	48
C359	Standard test method for early stiffening of hydraulic cement (mortar method)	Vicat Apparatus	55
C403	Standard test method for time of setting of concrete mixtures by penetration resistance	Spring Type Concrete Penetrometer	41
C469	Standard test method for static modulus of elasticity and Poisson's ratio of concrete in compression	Lateral Extensometer	15, 25
C472	Standard test methods for physical testing of gypsum, gypsum plasters and gypsum concrete	Vicat Apparatus	55
C490	Standard practice for use of apparatus for the determination of length change of hardened cement paste, mortar, and concrete	Volume Change Apparatus with Length Comparator	45
C531	Standard test method for linear shrinkage and coefficient of thermal expansion of chemical resistant mortars, grouts, monolithic surfacings and polymer concretes	Volume Change Apparatus with Length Comparator	45

ASTM

Standard	Title	Equipment Reference	Page
C535	Standard test method for resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles machine	Los Angeles Abrasion Apparatus	64
C617	Standard practice for capping cylindrical concrete specimens	Cylindrical Specimen Capping Equipment	44
C1170	Standard test method for determining consistency and density of roller-compacted concrete using a vibrating table	Consistometer	40
D36	Standard test method for softening point of bitumen (ring-and-ball apparatus)	Softening Point – Ring and Ball Apparatus	81
D113	Standard test method for ductility of bituminous materials	Ductility Testing Machine	83
D422	Standard test method for particle-size analysis of soils	High Speed Stirrer	117
		Particle Size Sieve Analysis	72
D427	Test method for shrinkage factors of soils by the mercury method	Shrinkage Limit	115
D558	Standard test methods for moisture-density (unit weight) relations of soil-cement mixtures	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
D559	Standard test methods for wetting and drying compacted soil-cement mixtures	Proctor Compaction Apparatus	119
D560	Standard test methods for freezing and thawing compacted soil-cement mixtures	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119

ASTM

Standard	Title	Equipment Reference	Page
D698	Standard test methods for laboratory compaction characteristics of soil using standard effort (12,400 ft-lbf/ft3 (600kN-m/m3))	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
D854	Standard test methods for specific gravity of soil solids by water pycnometer	Pycnometer	116
D1194	Standard test method for bearing capacity of soil for static load and spread footings	Plate Bearing Test Apparatus	109
D1195	Standard test method for repetitive static plate load tests of soils and flexible pavement components, for use in evaluation and design of airport and highway pavements	Plate Bearing Test Apparatus	109
D1196	Standard test method for non-repetitive static plate load tests of soils and flexible pavement components, for use in evaluation and design of airport and highway pavements	Plate Bearing Test Apparatus	109
D1557	Standard test methods for laboratory compaction characteristics of soil using modified effort	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
D1558	Standard test method for moisture content penetration resistance relationships of fine grained soils	Proctor Penetrometer	123
D1559	Test method for resistance of plastic flow of bituminous mixtures using Marshall apparatus	Marshall Stability Test Machine – Analog	86
		Marshall Stability Test Machine – Digital	87

ASTM

Standard	Title	Equipment Reference	Page
D1883	Standard test method for CBR (California Bearing Ratio) of laboratory-compacted soils	CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
		Triaxial Test Load Frame	91
D2172	Standard test methods for quantitative extraction of bitumen from bituminous paving mixtures	Centrifuge Extractor Apparatus	82
D2434	Standard test method for permeability of granular soils (constant head)	Laboratory Permeability Apparatus (Falling Head)	120
D2435	Standard test methods for one-dimensional consolidation properties of soils using incremental loading	Consolidation Apparatus – Analog	107
		Consolidation Apparatus – Digital	108
D2850	Standard test method for unconsolidated undrained triaxial compression test on cohesive soils	Triaxial Cells	92
D3080	Standard test method for direct shear test of soils under consolidated drained conditions	Direct Shear Test Apparatus	97
D4318	Standard test methods for liquid limit, plastic limit, and plasticity index of soils	Liquid Limit Device	89
D4767	Standard test method for consolidated undrained triaxial compression test for cohesive soils	Triaxial Cells	92
D4944	Standard test method for field determination of water (moisture) content of soil by the calcium carbide gas pressure tester	Speedy Moisture Meter	113
E28	Standard test methods for softening point of resins derived from naval stores by ring-and-ball apparatus	Softening Point – Ring and Ball Apparatus	81

BS

Standard	Title	Equipment Reference	Page
12	Specification for Portland cement	Vicat Apparatus	55
146	Specification for Portland blastfurnace cements	Vicat Apparatus	55
598-107	Sampling and examination of bituminous mixtures for roads and other paved areas	Automatic Compactor for Bituminous Mixes – Light Compaction	80
		Marshall Stability Test Machine – Analog	86
		Marshall Stability Test Machine – Digital	87
		Triaxial Test Load Frame	91
812, -2, -110, -111, -112,-120 (continued on next page)	Testing aggregates	Accelerated Polishing Machine	59
		Aggregate Impact Tester with Blow Counter	63
		Bulk Density Measures	42
		Bulk Density, Voids and Bulking	73
		Crushing value equipment	77
		Determination of Flakiness and Elongation	75
		Pycnometer	116
		Riffle Sample Divider	74

BS

Standard	Title	Equipment Reference	Page
812, -2, -110, -111, -112,-120 (...continued)	Testing aggregates	Speedy Moisture Meter	113
		Volume Change Apparatus with Length Comparator	45
915	Specification for high alumina cement. Metric units	Vicat Apparatus	55
1370	Specification for low heat Portland cemen	Vicat Apparatus	55
1377, -4, -7 (continued on next page)	BS methods of test for soils for civil engineering purposes	Automatic Soil Compactor	98
		CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
		Consolidation Apparatus – Analog	107
		Consolidation Apparatus – Digital	108
		Core Cutter	121
		De-aired Water Apparatus	96
		Direct Shear Test Apparatus	97

BS

Standard	Title	Equipment Reference	Page
1377, -4, -7 (...continued)	BS methods of test for soils for civil engineering purposes	High Speed Stirrer	117
		Laboratory Permeability Apparatus (Falling Head)	120
		Liquid Limit Device	89
		Penetration Cone	88
		Plate Bearing Test Apparatus	109
		Proctor Compaction Apparatus (BS)	118
		Pycnometer	116
		Riffle Sample Divider	74
		Sand Pouring Cylinder Apparatus	122
		Shrinkage Limit	115
		Soil Cone Penetrometer	114
		Triaxial Cells	92
		Triaxial Test Load Frame	91

BS

Standard	Title	Equipment Reference	Page
1881-131	Testing concrete	Beam Molds	22
		Cement Molds	58
		Consistometer	40
		Cube Molds	33
		Cylindrical Molds	33
		Flexural Testing Machine	16, 26
		Pan Type Concrete Mixer	38
1924, -2, -3 (continued on next page)	Stabilized materials for civil engineering purposes	CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
		Penetration Cone	88
		Proctor Compaction Apparatus (BS)	118
		Riffle Sample Divider	74

BS

Standard	Title	Equipment Reference	Page
1924, -2, -3 (...continued)	Stabilized materials for civil engineering purposes	Sand Pouring Cylinder Apparatus	122
		Soil Cone Penetrometer	114
		Triaxial Test Load Frame	91
2000 (Part 49)	Methods of test for petroleum and its products	Bitumen Penetration Kit	88
		Softening Point – Ring and Ball Apparatus	81
3892-1, -3	Specification for pulverized fuel ash for use with Portland cement	Assembly Flow Table	48
		Compression Frame Jig	52
		Jolting Apparatus	51
		Mortar Mixer	49
4027	Specification for sulfate-resisting Portland cement	Vicat Apparatus	55
4246	Specification for high slag blast furnace cement	Vicat Apparatus	55
4248	Specification for supersulphated cement	Vicat Apparatus	55

BS

Standard	Title	Equipment Reference	Page
4359 Part 2, App A	Methods for determination of specific surface of powders. Part 2: Recommended air permeability methods	Air Permeability Apparatus (Blaine type)	54
		Auto Blaine Apparatus	46
4550	Methods of testing cement	Auto Blaine Apparatus	46
		Vibration Machine	50
4551-1	Mortar. Methods of test for mortar. Chemical analysis and physical testing	Flex/Bend Attachment	53
		Flow Table	48
		Jolting Apparatus	51
		Mortar Mixer	49
6073-1	Guide for specifying precast concrete masonry units	Volume Change Apparatus with Length Comparator	45
6463, -103	Quicklime, hydrated lime and natural calcium carbonate. Methods for physical testing	Le-Chatelier Mold	56
		Mortar Mixer	49

DIN

Standard	Title	Equipment Reference	Page
51229	Molds for cube-shaped and cylindrical concrete test specimens	Beam Molds	33
		Cube Molds	33

EN

Standard	Title	Equipment Reference	Page
196, -3, -6	Methods of testing cement. Part 3: Determination of setting times and soundness. Part 6: Determination of fineness	Air Permeability Apparatus (Blaine type)	54
		Auto Blaine Apparatus	46
		Compression Frame Jig	52
		Flex/Bend Attachment	53
		Jolting Apparatus	51
		Le-Chatelier Mold	56
		Mortar Mixer	49
		Vicat Apparatus	55
413-2, -3	Masonry cement. Part 2: Test methods	Jolting Apparatus	51
		Mortar Mixer	49

EN

Standard	Title	Equipment Reference	Page
459-2	The chemical and physical test procedures for building lime	Air Permeability Apparatus (Blaine type)	54
		Compression Frame Jig	52
		Jolting Apparatus	51
		Le-Chatelier Mold	56
		Mortar Mixer	49
932-1, -5	Tests for general properties of aggregates. Part 5: Common equipment and calibration	Motorized Sieve Shaker	90
		Riffle Sample Divider	74
1015-2, -10, -11	Methods of test for mortar for masonry. Part 2: Bulk sampling of mortars and preparation of test mortars. Part 10: Determination of dry bulk density of hardened mortar. Part 11: Determination of flexural and compressive strength of hardened mortar	Compression Frame Jig	52
		Flex/Bend Attachment	53
		Jolting Apparatus	51
		Mortar Mixer	49

EN

Standard	Title	Equipment Reference	Page
1097-2, -3, -7	Tests for mechanical and physical properties of aggregates. Part 2: Methods for the determination of resistance to fragmentation. Part 3: Determination of loose bulk density and voids. Part 7: Determination of the particle density of filler. Pycnometer method	Bulk Density Measures	42
		Los Angeles Abrasion Apparatus	64
		Pycnometer	116
1367-4	Tests for thermal and weathering properties of aggregates. Part 4: Determination of drying shrinkage	Volume Change Apparatus with Length Comparator	45
1426	Method for determining the consistency of bitumen and bituminous binders	Bitumen Penetration Kit	88
1427	Bitumen and bituminous binders. Determination of the softening point. Ring-and-ball method	Softening Point – Ring and Ball Apparatus	81
1744-1	Tests for chemical properties of aggregates. Preparation of eluates by leaching of aggregates	Jolting Apparatus	51
		Mortar Mixer	49
1924	Methods of test for stabilized soils	Automatic Soil Compactor	98
1997-2, -3 (continued on next page)	Geotechnical design. Part 1: General rules for geotechnical design	Automatic Soil Compactor	98
		Consolidation Apparatus – Analog	107
		Consolidation Apparatus – Digital	108

EN

Standard	Title	Equipment Reference	Page
1997-2, -3 (...continued)	Geotechnical design. Part 1: General rules for geotechnical design	Direct Shear Test Apparatus	97
		Laboratory Permeability Apparatus (Falling Head)	120
		Penetration Cone	88
		Plate Bearing Test Apparatus	109
		Proctor Compaction Apparatus (BS)	118
		Pycnometer	116
		Soil Cone Penetrometer	114
12350-2, -3, -6, -7 (continued on next page)	Testing fresh concrete	Air Entrainment Meter – Type A	28
		Air Entrainment Meter – Type B	29
		Bulk Density Measures	42
		Consistometer	40
		Core Case Apparatus	36

EN

Standard	Title	Equipment Reference	Page
12350-2, -3, -6, -7 (...continued)	Testing fresh concrete	Slump Cone Test	30
		Universal Penetrometer	78
12390-1, -2, -3, -4, -5	Test resistance of hardened concrete to compression	Accelerated Curing Tank	34
		Ball Seating Platen	14, 24
		Beam Molds	33
		Curing Tank	43
		Cube Molds	33
		Cylindrical Molds	33
		Cylindrical Specimen Capping Equipment	44
		Flexural Testing Machine	16, 26
12697-1, -10, -23, -24, -30, -34 (continued on next page)	Bituminous mixtures – Test methods for hot mix asphalt. Part 22: Wheel tracking	Automatic Compactor for Bituminous Mixes – Light Compaction	80
		Centrifuge Extractor Apparatus	82

EN

Standard	Title	Equipment Reference	Page
12697-1, -10, -23, -24, -30, -34 (...continued)	Bituminous mixtures – Test methods for hot mix asphalt. Part 22: Wheel tracking	Marshall Stability Test Machine – Analog	86
		Marshall Stability Test Machine – Digital	87
		Triaxial Test Load Frame	91
13179-2	Tests for filler aggregate used in bituminous mixtures. Part 1: Delta ring-and-ball test	Bitumen Penetration Kit	88
13286-4, -44, -47	Unbound and hydraulically bound mixtures	Air Permeability Apparatus (Blaine type)	54
		CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
		Mortar Mixer	49
		Triaxial Test Load Frame	91
13395-1	Products and systems for the protection and repair of concrete structures. Test methods. Determination of workability. Test for flow of thixotropic mortars	Mortar Mixer	49
13454-2 (continued on next page)	Binders, composite binders and factory made mixtures for floor screeds based on calcium sulfate	Compression Frame Jig	52
		Flex/Bend Attachment	53

EN

Standard	Title	Equipment Reference	Page
13454-2 (...continued)	Binders, composite binders and factory made mixtures for floor screeds based on calcium sulfate	Jolting Apparatus	51
		Mortar Mixer	49
		Vicat Apparatus	55
DDENV 1997-2	Soil engineering – testing, design, and remediation	Point Load Index Tester	111

ISO

Standard	Title	Equipment Reference	Page
679	Method of determining the compressive and, optionally, the flexural strength of cement mortar containing one part by mass of cement, three parts by mass of ISO standard sand and one half part of water	Jolting Apparatus	51
		Mortar Mixer	49

Index

	Page
Aggregate impact tester with blow counter	63
Air entrainment meter:	
Type A	28
Type B	29
Air permeability apparatus (Blaine type)	54
Airjet sizer	65
Auto Blaine Apparatus	46
Autoclave, cement	47
Ball mill, laboratory	60
Benkelman beam	84
Bulk density, voids and bulking	73
Capping equipment, cylindrical specimen	44
Caps and rubber pads, cylindrical specimen	39
CBR test apparatus:	
Analog	101
Digital	104
Centrifuge extractor apparatus	82
Compaction factor apparatus	32
Compactor for bituminous mixes, automatic, light compaction	80
Compression frame jig assembly	52
Compression frame stand	16, 27
Compression tester for rocks, unconfined	112
Compressometer, longitudinal	15, 25
Concrete mixer, pan type	38
Consistometer	40
Consolidation apparatus:	
Analog	107
Digital	108
Compaction apparatus, Proctor:	
BS	118
ASTM	119
Core case apparatus	36
Core cutter	121
Core cutting and grinding	124
Crushing value equipment	77
Curing tank	43
Curing tank, accelerated	34
Data acquisition system	95
Density basket	76
Density measures, bulk	42
Determination of flakiness and elongation	75
DG Series semi automatic concrete compression testers	18
Direct shear test apparatus	97
Ductility testing machine	83
Enhanced digital indicator:	
Touchscreen-based	12, 23
Pressure sensor	13, 23
Extensometer, lateral	15, 25
FA Series fully automatic concrete compression testers	8
Flexural testing machine	16
Flex/bend attachment	53
Jaw crusher	61
Los Angeles Abrasion Apparatus	64
Molds, cast iron:	
Beam molds	37
Cube	37
Cube, two-part	33, 37
Cylindrical	37

Index

	Page
Molds, cement	
Cube	58
Three-gang	58
Mold, shrinkage bar	57
Jolting apparatus	51
Laboratory permeability apparatus (falling head)	120
Le-Chatelier mold & apparatus	56
Marshall stability test machine:	
Analog	86
Digital	87
Mobile laboratory	126
Moisture meter, Speedy	113
Mortar mixer	49
Oil water constant pressure system	94
Particle size sieve analysis	72
Pavement core drilling machine	79
Penetration kit, bitumen	88
Penetration cone	88
Penetrometer:	
Pavement dynamic cone	85
Proctor	123
Soil cone	114
Spring type concrete	41
Universal	78
Plate bearing test apparatus	109
Platens:	
Ball seating	14
Self-centering	17, 27
Platen handling assembly	14, 22
Point load index tester	111

	Page
Polishing machine, accelerated	59
Proving rings, integral	125
Pulverizer	62
Pycnometer	116
Relative density apparatus	100
Riffle sample divider	74
Sand pouring cylinder apparatus	122
Sieve analysis by Endecotts	69
Sieve shaker:	
Octagon D200 digital	66
D450 digital	67
EFL2000	68
Motorized	90
Shrinkage limit	115
Sieves	70
Slump cone test	30
Softening point – ring and ball apparatus	81
Soil compactor, automatic	98
Stirrer, high speed	117
Table:	
Flow	48
Flow, motorized	31
Vibrating	35
Triaxial cells	92
Triaxial test load frame	91
Vibration machine	50
Vicat apparatus	55
Volume change apparatus with length comparator	45
Water apparatus	96