Tinius Olsen

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Testing Solutions for the Civil & Construction Industry

EQUIPMENT, SOFTWARE, CALIBRATION, SERVICE AND AFTER SALES SUPPORT

Tinius Olsen

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Contents

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.

FA Series

Fully Automatic Concrete Compression Testers

The machine pictured right is from the FA Series – Model TO317E-FA – with a maximum testing capacity of 450,000lbf or 2000kN. This machine is primarily designed for the testing of 4in (100mm) and 6in (150mm) concrete cubes, 100mm and 150mm concrete cylinders.

The Tinius Olsen FA Series of digital compression testers features highly robust frames for exceptional stability when testing concrete cylinders or cubes. These compact testers are made up of three core pieces: the heavy duty load frame, hydraulic pump, and control and display systems.

The large lower bearing block includes a bellows to prevent leaks caused by dust and debris getting into the loading piston. The other advantage of this large bearing block is that it allows for a wide horizontal entrance opening and plenty of ready access for loading and removing specimens.

This series also includes the rapid change platen system with which operators can quickly and easily change accessories, quickly switching between cylinder, block, cube and beam specimen testing.

The hydraulic pumping system is attached to the loadframe and connected to the piston by a high pressure hydraulic hose. The rate of loading and piston return on test completion is controlled automatically by the controller.

While these machines are ideally positioned to test cubes and cylinders, testing can be taken to another level by adding a flexure testing attachment that will work with the pumping unit in the TO317E-FA frame. After installing a simple manual valve system, you are ready to test the flexural strength of concrete beams, up to 100kN (22,000lbf) maximum load.

Alternatively, a different attachment for testing the compression of hollow prisms can be attached to the main test frame. This attachment, model TO314-LU-SPL, can test up to three stacks of hollow prisms.

The FA Series features front and rear doors for easy loading of cylinders and also brushing out of broken specimens to the rear. The rear also features a debris chute that doubles as protection for the hydraulic hose and valve connections.

Further safety features include physical limit switches, electronic limit switches and emergency panic button to ensure that your investment lasts for years of testing.

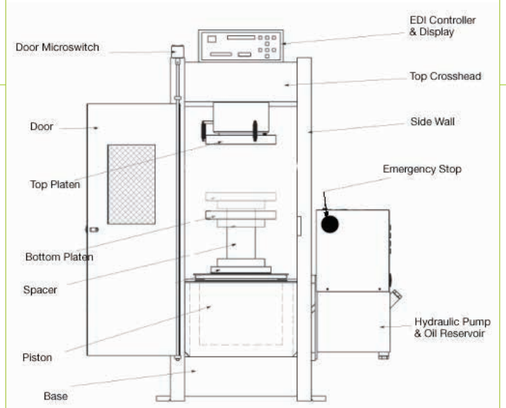
Key features

- Meets or exceeds key ASTM, EN, AASHTO standards.
- Manual pace rate control.
- Automatic stress determination and display.
- Interlocked safety doors with mesh window as standard.
- Overload and over travel safety protection.
- Self-aligning platen with fast accessory change capability.
- Menu driven interface.
- Automatic data logging.
- Peak load capture and recording.

The FA Series comes with three controller options:

- EDI, a straightforward design using a membrane keypad and an LCD display to let operators select the test parameters simply and efficiently.
- A more advanced system with 10in TFT resistive touchscreen display. Easy to read and operate, it features simple and logical input screens and displays a real-time graph of test load vs time.
- The FA Series can also be connected to a PC running TO's Horizon software and the test and machine controlled by computer. At the same time, Horizon software will generate and display load, or stress, vs time graphs; complete SPC analyses are also available.

Specifications



FA COMPRESSION TESTING MACHINES

Model	Capacity	Horizontal clearance	Vertical clearance	Piston stroke	Lower platen diameter
TO-302E	50kN/11,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-305E	100kN/22,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-308E	250kN/55,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-309E	25-250kN	230-260mm	230-390mm	50mm/2in	150mm
TO-311E	500kN/110,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	222mm/8.75in
TO-314E	1000kN/225,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	222mm/8.75in
TO-315E	1500kN/338,000lbf	305mm/12in	370mm/14.57in	50mm/2in	222mm/8.75in
TO-317E	2000kN/450,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-317E-STD	2000kN/450,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-320E	3000kN/675,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-320E-FA-CT-5000	5000kN	620mm	610mm	50mm/2in	341mm

Notes: 1. These models conform to all relevant European CE Health and Safety Directives EN 50081-1, 580081-1, 73/23/EEC, EN 61010-1. 2. Specifications are subject to change without notice. 3. Appropriate brick platens can be supplied as an option. 4. A set of spacers to suit stated specimen sizes is supplied with the machine.

Ordering

ORDERING INFORMATION

- **TO-302E-FA-01** 50kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-302E-FA-02** 50kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-302E-FA-03** 50kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-305E-FA-01** 100kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-305E-FA-02** 100kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-305E-FA-03** 100kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-308E-FA-01** 250kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-308E-FA-02** 250kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-308E-FA-03** 250kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-309E-FA-01** 25/250kN FA Compression Tester, dual mode, configured for 110VAC, 60Hz
- **TO-309E-FA-02** 25/250kN FA Compression Tester, dual mode, configured for 220VAC, 60Hz
- **TO-309E-FA-03** 25/250kN FA Compression Tester, dual mode, configured for 220VAC, 50Hz
- **TO-311E-FA-01** 500kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-311E-FA-02** 500kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-311E-FA-03** 500kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-314E-FA-01** 1000kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-314E-FA-02** 1000kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-314E-FA-03** 1000kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-315E-FA-01** 1500kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-315E-FA-02** 1500kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-315E-FA-03** 1500kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-317E-FA-01** 2000kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-317E-FA-02** 2000kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-317E-FA-03** 2000kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-317E-STD-FA-01** 2000kN FA Standard Compression Tester configured for 110VAC, 60Hz
- **TO-317E-STD-FA-02** 2000kN FA Standard Compression Tester configured for 220VAC, 60Hz
- **TO-317E-STD-FA-03** 2000kN FA Standard Compression Tester configured for 220VAC, 50Hz
- **TO-320E-FA-01** 3000kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-320E-FA-02** 3000kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-320E-FA-03** 3000kN FA Compression Tester configured for 220VAC, 50Hz
- **TO-320E-FA-CT-5000-01** 5000kN FA Compression Tester configured for 110VAC, 60Hz
- **TO-320E-FA-CT-5000-02** 5000kN FA Compression Tester configured for 220VAC, 60Hz
- **TO-320E-FA-CT-5000-03** 5000kN FA Compression Tester configured for 220VAC, 50Hz

Accessories

SUPPLIED AS STANDARD

- RS232 cable
- Spacers (150, 100, 60, 35mm)
- Lower platen
- Spherical seat with upper platen

OPTIONAL ACCESSORIES

- **TO-320-5500** Platen set for 6 x 12in concrete cylinders
- **TO-320-5502** Platen set for 4 x 8in concrete cylinders
- **TO-320-5504** Platen set for 3 x 6in concrete cylinders
- **TO-320-5510** Platen set for 2in cubes
- **TO-320-5512** Platen set for 6in cubes
- **TO-320-5518** Platen set for blocks up to 12in
- **TO-320-5519** Cylindrical Specimen caps – two caps per set
- **TO-320-5520** Rubber insert for 6in cap with 60 shore A hardness (bag of 10)
- **TO-320-5521** Compression frame jig assembly (without platens)
- **TO-320-5521-01** 50mm square platen set for TO 320-5521
- **TO-320-5521-02** 2in square platen for TO 320-5521
- **TO-320-5521-03** 40mm square platens
- **TO-320-5522** Flex jig/attachment
- **TO-320-5524** Cylindrical specimen cap, 4in dia – two per set
- **TO-320-5525** Rubber insert for 4in cap with 60 shore A hardness (bag of 10)
- **TO-320-5523** BSEN 12390 stability compliant oil-filled ball seat, platens
- **TO-320-5527** BSEN 12390 stability compliant oil-filled retrofit ball seating
- **TO-320-5528** Tensile split strength test attachment
- **TO-320-5529** RS232 cable
- **TO-320-5532** Rectangular platen set for prisms, 475 x 250mm
- **TO-320-5534** Platen set, 165mm dia., with concentric rings in upper platen
- **TO-31727-1** Strain measurement attachment
- **TO-33101-BS** Flexural test frame, 100kN, no pump, using CTM 2-way valve
- **TO-33101-ASTM** Flexural test frame, 100kN, no pump, using CTM 2-way valve
- **TO-314-LU-SPL** 1000kN loading frame for testing hollow prisms – three stack max.
- **TO-320-LU-SPL** Prism/block test frame 3000kN, no pump, uses CTM valve
- **TO-343** Mold in cast iron for 100mm cube
- **TO-344** Mold in cast iron for 150mm cube
- **TO-344-20** Mold in cast iron for 200mm cube
- **TO-417** Mold in cast iron for 50mm cube
- **TO-414** Mold in steel for 70.6mm cube
- **TO-417-CI** Three-gang mold in cast iron for 50mm cube
- **TO-417-3-NB** Three-gang mold in Navy Brass for 50mm cubes – per ASTM
- **TO-320-5541** Platen Handling Assembly w/250x445mm platen set for 2000kN or 3000kN CTM
- **TO-320-5542** Platen Handling Assembly w/250x750mm platen set for 3000kN CTM

Controller Options

The FA Series comes with three controller options:

- EDI – a straightforward design using a membrane keypad and an LCD display to let operators select the test parameters simply and efficiently.
- A more advanced system with 10in TFT resistive touchscreen display. Easy to read and operate, the controller features simple and logical input screens and displays a real-time graph of test load vs time.
- The FA Series can also be connected to a PC running TO's Horizon software and the test and machine controlled by computer. At the same time, Horizon software will generate and display load, or stress, vs time graphs.

Key features

- Test Method Library
- Test Editor
- Tabbed Test and Recall Area
- Multiple Machine Control
- Output Editor
- Multilingual
- Method Editor
- Result Editor
- Multifaceted security
- Touchscreen-enabled*

*Touchscreens require the use of Windows 8 operating system and a touchscreen.

Horizon Software

Tinius Olsen is proud to introduce the next evolution of testing software with our Horizon package.

As part of our development process, we have taken the best features of our existing software offerings, including Test Navigator, QMat, and EP600 software, added a host of report writing and data manipulation capabilities and in the process, created a new, unparalleled testing platform that 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.

One of the first features you will see within the Horizon software is its use of the most current Windows environments. These familiar formats make it easy to use and learn, especially since the same familiar functionality is maintained throughout the program.

ORDERING INFORMATION

- **21001104** Civil Engineering primary platform for Horizon software
- **21001146** Civil Engineering (concrete) library for Horizon software

Touchscreen-based Enhanced Digital Indicator

Tinius Olsen's new touchscreen-based EDI display is an enhancement of our existing EDI offering. It is an advanced digital control and display system with a 10in (diagonal) resistive touchscreen display, and is supplied complete with a stylus for easier operation for users wearing gloves.

This new touchscreen display is compatible with all test frames that use the existing EDI controller. Easy to read and operate, the controller features simple and logical input screens and displays a real-time graph of test load vs time.

ORDERING INFORMATION

- **TO-30235-DG-T** Touchscreen-based enhanced digital indicator for DG models
- **TO-30235-FA-T** Touchscreen-based enhanced digital indicator for FA models

Key features

- Touchscreen TFT with 800 x 480 pixels.
- Icon-driven software showing figures and diagrams for ease of use.
- Unique data storage options with both internal storage (of 200 tests) and direct to USB thumb drive storage.
- Optional integrated thermal printer.
- Simultaneous display of load vs time graph, stress and actual load rate.

Enhanced Digital Indicator

EDI is a straightforward design using a membrane keypad and an LCD to let operators select the test parameters simply and efficiently. The TO EDI head is supplied with all TO concrete Compression Testing Machines DG, FA models and the Flex Testing Machine DG model.

ORDERING INFORMATION

- **TO-30235-DG** Enhanced Digital Indicator with pressure sensor for digital compression testing machine
- **TO-30235-FA** Enhanced Digital Indicator with Pressure Sensor for fully automatic compression testing machine

Key features

- White backlit LCD display, four lines, 40 characters per line.
- Multi unit Force and Stress, Imperial, Metric, SI.
- Force calibration range 1% to 100% accuracy +\- 1% of applied force.
- Pace rate control indication.
- Peak Force and Stress results.
- Specimen area input from specimen menu.
- Parallel printer O\P dot matrix format any size paper.
- RS232 output – ASCII comma delimited results data.
- Two channel I\P to accommodate CTM and flex unit or CTM and Block test unit.
- Approximately 2000 stored results.
- Young's modulous and strain measurement can be calculated when accompanied by compressometer.

Accessories

Ball Seating and Platen Handling options enhance the system in support of test compliance and efficient specimen handling.

Ball Seating Platen

BS EN 12390 requires certified stability and alignment, which is achieved using an oil-filled ball seating and upper platen.

APPLICABLE STANDARD

- **BS EN 12390**

ORDERING INFORMATION

- **TO-320-5523** BSEN 12390 stability compliant oil-filled ball seat, platens
- **TO-320-5527** BSEN 12390 stability compliant oil-filled retrofit ball seating

Platen Handling Assembly

Block platens 460 x 280 x 75mm with sliding rail assembly can be installed for testing concrete blocks and other structural materials. Sliding rail assembly allows the platens to be easily installed without removing existing circular compression platens. They can be installed on all semi-auto and automatic compression machines. They must be factory installed.

Key features

- Improves laboratory efficiency.
- Reduces manual handling.
- Compatible with Semi-Automatic and Fully Automatic Compression Machines.

ORDERING INFORMATION

- **TO-320-5541** Platen Handling Assembly w/250 x 445mm platen set for 2000kN or 3000kN CTM
- **TO-320-5542** Platen Handling Assembly w/250 x 450mm platen set for 3000kN CTM

Compressometer & Extensometer

An extensometer is a device that is used to measure changes in the length of an object. It is useful for stress-strain measurements and tensile tests. Its name comes from 'extension-meter'. Compressometers are used for determining strain and deformation characteristics of concrete cylinders.

Longitudinal Compressometer

This apparatus is used for determining strain and deformation characteristics of standard concrete cylinders of 150mm diameter x 300mm length.

The compressometer consists of two frames for clamping to the specimen using five tightening screws with hardened and tapered ends. Two spacers hold the frames in position. An adjustable pivot rod rests on pivot screws.

A spring enables the pivot rod to remain in contact with pivot screws. The ball chain is for adjusting the tension of the spring. A dial gage, fixed to a bracket on the top frame, is used for making deformation measurements.

ORDERING INFORMATION

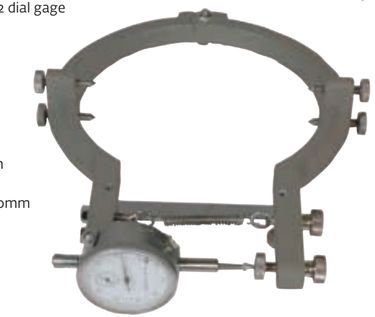
- **TO-372** Longitudinal Compressometer with TO-072 analog dial gage

OPTIONAL ACCESSORIES

- **TO-072** Analog dial gage, 5mm x 0.002mm
- **TO-072-DG** Digital gage, 5mm x 0.001mm

Lateral Extensometer

This is used to determine the lateral extension of 150mm diameter x 300mm high cement concrete cylinders while running a compression test. The extensometer consists of two movable frames pivoted at one end. A dial gage measures the lateral extension, and a removable spacer strip is for the initial setting of the dial gage. The extensometer is attached to the specimen by screws. Supplied complete with TO-072 dial gage or TO-072DG digital gage.



APPLICABLE STANDARD

- **ASTM C469**

ORDERING INFORMATION

- **TO-373** Lateral extensometer to fit 150 x 300mm cylinders with dial gage
- **TO-373-DG** Lateral extensometer to fit 150 x 300mm cylinders with digital gage

OPTIONAL ACCESSORIES

- **TO-072** Analog dial gage, 5 x 0.002mm
- **TO-072-DG** Digital gage, 5 x 0.001mm

Flexural Testing Machine

These machines are designed to test the flexural strength of concrete beams. Their design provides maximum rigidity throughout their working range as the downward movement of the piston applies load.

A spacer is provided for testing different size of beams and load is indicated on a digital indicator. For the 150 x 150 x 700mm beams, the support span is 600mm and the loading span is 200mm, whereas for the 100 x 100 x 500mm beams, the support span is 400mm and the loading span is 133mm.

One of the key considerations when using concrete in construction projects is how well the concrete is going to stand up to bending pressures and how often it needs to be supported. With concrete, the most effective way to study the destructive testing is the Flexural Test. On a specimen beam ideally of 150 x 150 x 750mm and/or 100 x 100 x 500mm, the maximum tensile stress reach at the bottom of the test beam is considered as the Flexural Strength/Modulus of Rupture of the material.

Key features

- Lightweight, rugged high strength frame.
- Self-aligning four-point loading roller assembly.
- Maximum capacity of either frame is 100kN (22,000lbf).
- For testing beams of 100 x 100 x 500mm and 150 x 150 x 700mm.

APPLICABLE STANDARDS

- **BS 1881; ASTM C78-02; BS EN 12390-5:2000**

ORDERING INFORMATION

- **TO-33101-ASTM** Flexure Testing Frame 100kN machine no pump for use with CTMs using 2-way valve
- **TO-33101-BS** Flexure Testing Frame 100kN machine no pump for use with CTMs using 2-way valve
- **TO-331-ASTM** Flexure Testing Manual Machine ECO, for 10 x 10 x 50cm & 15 x 15 x 70cm beams
- **TO-331-BS** Flexure Testing Manual Machine ECO, for 10 x 10 x 50cm & 15 x 15 x 70cm beams
- **TO-332-ASTM-01** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 110V, 60Hz
- **TO-332-ASTM-02** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 60Hz
- **TO-332-ASTM-03** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 50Hz
- **TO-332-BS-01** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 110V, 60Hz
- **TO-332-BS-02** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 60Hz
- **TO-332-BS-03** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 50Hz

Key features

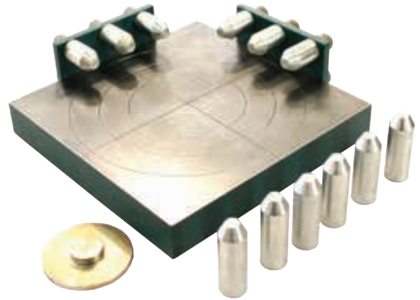
- 150mm and 200mm cubes.
- Adjustable spacer pins on two axes
- Specimen self-centers against the pins.
- Shorter middle pins for cylindrical specimens.
- Only for 2000kN and 3000kN machines.

Accessories

Other accessories that can be used with FA Series machines to assist with most of the processes of the Compression Tester.

Self-Centering Platen

The self-centering platen is a cubical platen with pins mounted on two sides that help the sample to center itself in position. These adjustable pins on two axes are of different sizes and are used based on the type and size of sample. The platens are specially designed and can only be used with 2000kN and 3000kN compression testers.



ORDERING INFORMATION

- **TO-320-5535** Self-centering 220mm square lower platen, suitable for use with 2000kN and 3000kN frames

Compression Frame Stand

All models in the series can be mounted on a machine stand to bring the testing area to a convenient and safe working height.

ORDERING INFORMATION

- **TO-STAN01** Compression Testing machine stand for 1000kN frame and below
- **TO-STAN02** Compression Testing machine stand for 2000kN frame
- **TO-STAN03** Compression Testing machine stand for 3000kN frame

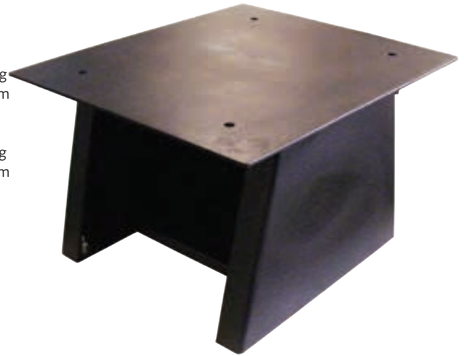
PACKAGING INFORMATION

1000kN & 2000kN CTM

- **Net weight:** 62kg; **gross weight:** 87kg
- **Packaging dimensions:** 76 x 73 x 68cm

3000kN CTM

- **Net weight:** 90kg; gross weight: 110kg
- **Packaging dimensions:** 89 x 73 x 74cm



DG Series

Semi Automatic Concrete Compression Testers

The machine pictured right is from the DG Series – Model TO317E-DG – with a maximum testing capacity of 450,000lbf or 2000kN. This machine is primarily designed for the testing of 4in (100mm) and 6in (150mm) concrete cubes, 100mm and 150mm concrete cylinders.

The Tinius Olsen DG Series of digital compression testers features highly robust frames for exceptional stability when testing concrete cylinders or cubes. These compact testers are made up of three core pieces: the heavy duty load frame, hydraulic pump, and control and display systems.

The large lower bearing block includes a bellows to prevent leaks caused by dust and debris getting into the loading piston. The other advantage of this large bearing block is that it allows for a wide horizontal entrance opening and plenty of ready access for loading and removing specimens.

This series also includes the rapid change platen system with which operators can quickly and easily change accessories, quickly switching between cylinder, block, cube and beam specimen testing.

The hydraulic pumping system is attached to the loadframe and connected to the piston by a high pressure hydraulic hose. The rate of loading and piston return on test completion is controlled automatically by the controller.

While these machines are ideally positioned to test cubes and cylinders, testing can be taken to another level by adding a flexure testing attachment that will work with the pumping unit in the TO317E-DG frame. After installing a simple manual valve system, you are ready to test the flexural strength of concrete beams, up to 100kN (22,000lbf) maximum load.

Alternatively, a different attachment for testing the compression of hollow prisms can be attached to the main test frame. This attachment, model TO314-LU-SPL, can test up to three stacks of hollow prisms.

The DG Series has front and rear doors for easy loading of cylinders and brushing out broken specimens. The rear also has a debris chute that doubles as protection for the hydraulic hose and valve connections.

Further safety features include physical and electronic limit switches and emergency panic button to ensure that your investment lasts for years.

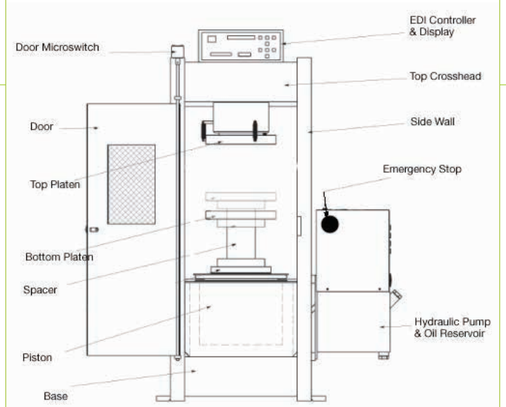
Key features

- Meets or exceeds key ASTM, EN, AASHTO standards.
- Manual pace rate control.
- Automatic stress determination and display.
- Interlocked safety doors with mesh window as standard.
- Overload and over travel safety protection.
- Self aligning platen with fast accessory change capability.
- Menu driven interface.
- Automatic data logging.
- Peak load capture and recording.

The DG Series comes with two controller options:

- EDI, a straightforward design using a membrane keypad and an LCD display to let operators select the test parameters simply and efficiently.
- A more advanced system with 10in TFT resistive touchscreen display. Easy to read and operate, it features simple and logical input screens and displays a real-time graph of test load vs time.

Specifications



FA COMPRESSION TESTING MACHINES

Model	Capacity	Horizontal clearance	Vertical clearance	Piston stroke	Lower platen diameter
TO-302E	50kN/11,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-305E	100kN/22,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-308E	250kN/55,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	150mm/5.9in
TO-309E	25-250kN	230-260mm	230-390mm	50mm/2in	150mm
TO-311E	500kN/110,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	222mm/8.75in
TO-314E	1000kN/225,000lbf	260mm/10.24in	390mm/15.35in	50mm/2in	222mm/8.75in
TO-315E	1500kN/338,000lbf	305mm/12in	370mm/14.57in	50mm/2in	222mm/8.75in
TO-317E	2000kN/450,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-317E-STD	2000kN/450,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-320E	3000kN/675,000lbf	340mm/13.4in	340mm/13.4in	50mm/2in	222mm/8.75in
TO-320E-DG-CT-5000	5000kN	620mm	610mm	50mm/2in	341mm

Notes: 1. These models conform to all relevant European CE Health and Safety Directives EN 50081-1, 580081-1, 73/23/EEC, EN 61010-1. 2. Specifications are subject to change without notice. 3. Appropriate brick platens can be supplied as an option. 4. A set of spacers to suit stated specimen sizes are supplied with the machine.

Ordering

ORDERING INFORMATION

- **TO-302E-DG-01** 50kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-302E-DG-02** 50kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-302E-DG-03** 50kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-305E-DG-01** 100kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-305E-DG-02** 100kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-305E-DG-03** 100kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-308E-DG-01** 250kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-308E-DG-02** 250kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-308E-DG-03** 250kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-309E-DG-01** 25/250kN DG Compression Tester, dual mode, configured for 110VAC, 60Hz
- **TO-309E-DG-02** 25/250kN DG Compression Tester, dual mode, configured for 220VAC, 60Hz
- **TO-309E-DG-03** 25/250kN DG Compression Tester, dual mode, configured for 220VAC, 50Hz
- **TO-311E-DG-01** 500kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-311E-DG-02** 500kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-311E-DG-03** 500kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-314E-DG-01** 1000kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-314E-DG-02** 1000kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-314E-DG-03** 1000kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-315E-DG-01** 1500kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-315E-DG-02** 1500kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-315E-DG-03** 1500kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-316E-DG-01** 1500kN, Pillar type Digital Compression Tester configured for 110VAC, 60Hz
- **TO-316E-DG-02** 1500kN, Pillar type Digital Compression Tester configured for 220VAC, 60Hz
- **TO-316E-DG-03** 1500kN, Pillar type Digital Compression Tester configured for 220VAC, 50Hz
- **TO-317E-DG-01** 2000kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-317E-DG-02** 2000kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-317E-DG-03** 2000kN DG Compression Tester configured for 220VAC, 50Hz
- **TO-317E-STD-DG-01** 2000kN DG Standard Compression Tester configured for 110VAC, 60Hz
- **TO-317E-STD-DG-02** 2000kN DG Standard Compression Tester configured for 220VAC, 60Hz
- **TO-317E-STD-DG-03** 2000kN DG Standard Compression Tester configured for 220VAC, 50Hz
- **TO-320E-DG-01** 3000kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-320E-DG-02** 3000kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-320E-DG-03** 3000kN DG Compression Tester configured for 220VAC, 50Hz

Accessories

- **TO-320E-DG-CT-5000-01** 5000kN DG Compression Tester configured for 110VAC, 60Hz
- **TO-320E-DG-CT-5000-02** 5000kN DG Compression Tester configured for 220VAC, 60Hz
- **TO-320E-DG-CT-5000-03** 5000kN DG Compression Tester configured for 220VAC, 50Hz

SUPPLIED AS STANDARD

- RS232 cable
- Spacers (150, 100, 60, 35mm)
- Lower platen
- Spherical seat with upper platen

OPTIONAL ACCESSORIES

- **TO-320-5500** Platen set for 6 x 12in concrete cylinders
- **TO-320-5502** Platen set for 4 x 8in concrete cylinders
- **TO-320-5504** Platen set for 3 x 6in concrete cylinders
- **TO-320-5510** Platen set for 2in cubes
- **TO-320-5512** Platen set for 6in cubes
- **TO-320-5518** Platen set for blocks up to 12in
- **TO-320-5519** Cylindrical Specimen caps – two caps per set
- **TO-320-5520** Rubber insert for 6in cap with 60 shore A hardness (bag of 10)
- **TO-320-5521** Compression frame jig assembly (without platens)
- **TO-320-5521-01** 50mm square platen set for TO 320-5521
- **TO-320-5521-02** 2in square platen for TO 320-5521
- **TO-320-5521-03** 40mm square platens
- **TO-320-5522** Flex jig/attachment
- **TO-320-5524** Cylindrical specimen cap, 4in dia – two per set
- **TO-320-5525** Rubber insert for 4in cap with 60 shore A hardness (bag of 10)
- **TO-320-5523** BSEN 12390 stability compliant oil-filled ball seat, platens
- **TO-320-5527** BSEN 12390 stability compliant oil-filled retrofit ball seating
- **TO-320-5528** Tensile split strength test attachment
- **TO-320-5529** RS232 cable
- **TO-320-5532** Rectangular platen set for prisms, 475 x 250mm
- **TO-320-5534** Platen set, 165mm dia., with concentric rings in upper platen
- **TO-31727-1** Strain measurement attachment
- **TO-33101-BS** Flexural test frame, 100kN, no pump, using CTM 2-way valve
- **TO-33101-ASTM** Flexural test frame, 100kN, no pump, using CTM 2-way valve
- **TO-314-LU-SPL** 1000kN loading frame for testing hollow prisms – three stack max.
- **TO-320-LU-SPL** Prism/block test frame 3000kN, no pump, uses CTM valve
- **TO-343** Mold in cast iron for 100mm cube
- **TO-344** Mold in cast iron for 150mm cube
- **TO-344-20** Mold in cast iron for 200mm cube
- **TO-417** Mold in cast iron for 50mm cube
- **TO-414** Mold in steel for 70.6mm cube
- **TO-417-CI** Three-gang mold in cast iron for 50mm cube
- **TO-417-3-NB** Three-gang mold in Navy Brass for 50mm cubes – per ASTM
- **TO-320-5541** Platen Handling Assembly w/250x445mm platen set for 2000kN or 3000kN CTM
- **TO-320-5542** Platen Handling Assembly w/250x750mm platen set for 3000kN CTM

DG Series

500kN frame

2000kN frame

5000kN frame

The DG Series now comes with two controller options:

- EDI – a straightforward design using a membrane keypad and an LCD display to let operators select the test parameters simply and efficiently.
- A more advanced system with 10in TFT resistive touchscreen display. Easy to read and operate, the controller features simple and logical input screens and displays a real-time graph of test load vs time.

Controller Options

Touchscreen-based Enhanced Digital Indicator

Tinius Olsen's new touchscreen-based EDI display is an enhancement of its existing EDI offering. It is an advanced digital control and display system with a 10in (diagonal) resistive touchscreen display, and is supplied complete with a stylus for easier operation for users wearing gloves.

This new touchscreen display is compatible with all test frames that use the existing EDI controller. Easy to read and operate, the controller features simple and logical input screens and displays a real-time graph of test load vs time.

Key features

- Touchscreen TFT with 800 x 480 pixels.
- Icon-driven software showing figures and diagrams for ease of use.
- Unique data storage options with both internal storage (of 200 tests) and direct to USB thumb drive storage.
- Optional integrated thermal printer.
- Simultaneous display of load vs time graph, stress and actual load rate.

ORDERING INFORMATION

- **TO-30235-DG-T** Touchscreen-based enhanced digital indicator for DG models
- **TO-30235-FA-T** Touchscreen-based enhanced digital indicator for FA models

Enhanced Digital Indicator

EDI is a straightforward design using a membrane keypad and an LCD to let operators select the test parameters simply and efficiently. The TO EDI head is supplied with all TO concrete Compression Testing Machines DG, FA models and the Flex Testing Machine DG model.

Key features

- White backlit LCD display, four lines, 40 characters per line.
- Multi unit Force and Stress, Imperial, Metric, SI.
- Force calibration range 1% to 100% accuracy +\- 1% of applied force.
- Pace rate control indication.
- Peak Force and Stress results.
- Specimen area input from specimen menu.
- Parallel printer O\P dot matrix format any size paper.
- RS232 output – ASCII comma delimited results data.
- Two channel I\P to accommodate CTM and flex unit or CTM and Block test unit.
- Approximately 2000 stored results.
- Young's modulous and strain measurement can be calculated when accompanied by compressometer.

ORDERING INFORMATION

- **TO-30235-DG** Enhanced Digital Indicator with pressure sensor for digital compression testing machine
- **TO-30235-FA** Enhanced Digital Indicator with Pressure Sensor for fully automatic compression testing machine

Accessories

Ball Seating and Platen Handling options enhance the system in support of test compliance and efficient specimen handling.

Ball Seating Platen

BS EN 12390 requires certified stability and alignment, which is achieved using an oil-filled ball seating and upper platen.

APPLICABLE STANDARD

- **BS EN 12390**

ORDERING INFORMATION

- **TO-320-5523** BSEN 12390 stability compliant oil-filled ball seat, platens
- **TO-320-5527** BSEN 12390 stability compliant oil-filled retrofit ball seating

Platen Handling Assembly

Block Platens 460 x 280 x 75mm with sliding rail assembly can be installed for testing concrete blocks and other structural materials. Sliding rail assembly allows the platens to be easily installed without removing existing circular compression platens. They can be installed on all semi-auto and automatic compression machines. They must be factory installed.

ORDERING INFORMATION

- **TO-320-5541** Platen Handling Assembly w/250 x 445mm platen set for 2000kN or 3000kN CTM
- **TO-320-5542** Platen Handling Assembly w/250 x 450mm platen set for 3000kN CTM

Key features

- Improves laboratory efficiency.
- Reduces manual handling.
- Compatible with Semi-Automatic and Fully Automatic Compression Machines.

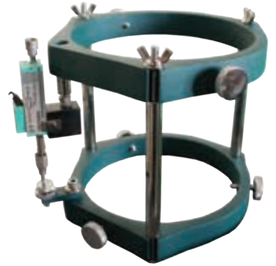
Compressometer and Extensometer

An extensometer is a device that is used to measure changes in the length of an object. It is useful for stress-strain measurements and tensile tests. Its name comes from 'extension-meter'. Compressometers are used for determining strain and deformation characteristics of concrete cylinders.

Longitudinal Compressometer

This apparatus is used for determining strain and deformation characteristics of standard concrete cylinders of 150mm diameter x 300mm length. The compressometer consists of two frames for clamping to the specimen using five tightening screws with hardened and tapered ends. Two spacers hold the frames in position. An adjustable pivot rod rests on pivot screws.

A spring enables the pivot rod to remain in contact with pivot screws. The ball chain is for adjusting the tension of the spring. A dial gage, fixed to a bracket on the top frame, is used for making deformation measurements.



ORDERING INFORMATION

- **TO-372** Longitudinal Compressometer with TO-072 analog dial gage

OPTIONAL ACCESSORIES

- **TO-072** Analog dial gage, 5mm x 0.002mm
- **TO-072**-DG Digital gage, 5mm x 0.001mm

Lateral Extensometer

This is used to determine the lateral extension of 150mm diameter x 300mm high cement concrete cylinders while running a compression test. The extensometer consists of two movable frames pivoted at one end. A dial gage measures the lateral extension, and a removable spacer strip is for the initial setting of the dial gage. The extensometer is attached to the specimen by screws. Supplied complete with TO-072 dial gage or TO-072DG digital gage.

APPLICABLE STANDARD

- **ASTM C469**

ORDERING INFORMATION

- **TO-373** Lateral extensometer to fit 150 x 300mm cylinders with dial gage
- **TO-373-DG** Lateral extensometer to fit 150 x 300mm cylinders with digital gage

OPTIONAL ACCESSORIES

- **TO-072** Analog dial gage, 5 x 0.002mm
- **TO-072**-DG Digital gage, 5 x 0.001mm

Accessories

These machines are designed to test the flexural strength of concrete beams. Their design provides maximum rigidity throughout their working range as the downward movement of the piston applies load. A spacer is provided for testing different size of beams and load is indicated on a digital indicator. For the 150 x 150 x 700mm beams, the support span is 600mm and the loading span is 200mm, whereas for the 100 x 100 x 500mm beams, the support span is 400mm and the loading span is 133mm.

One of the key considerations when using concrete in construction projects is how well the concrete is going to stand up to bending pressures and how often it needs to be supported. With concrete, the most effective way to study the destructive testing is the Flexural Test. On a specimen beam ideally of 150 x 150 x 750mm and/or 100 x 100 x 500mm, the maximum tensile stress reach at the bottom of the test beam is considered as the Flexural Strength/Modulus of Rupture of the material.

Key features

- Lightweight, rugged high strength frame.
- Self-aligning four-point loading roller assembly.
- Maximum capacity of either frame is 100kN (22,000lbf).
- For testing beams of 100 x 100 x 500mm and 150 x 150 x 700mm.

APPLICABLE STANDARDS

- **BS 1881; ASTM C78-02; BS EN 12390-5:2000**

ORDERING INFORMATION

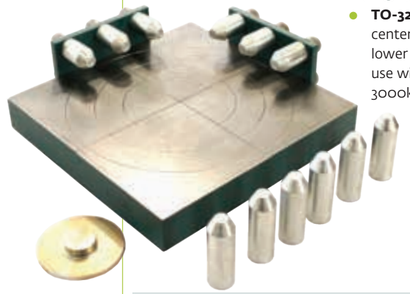
- **TO-33101-ASTM** Flexure Testing Frame 100kN machine no pump for use with CTMs using 2-way valve
- **TO-33101-BS** Flexure Testing Frame 100kN machine no pump for use with CTMs using 2-way valve
- **TO-331-ASTM** Flexure Testing Manual Machine ECO, for 10 x 10 x 50cm & 15 x 15 x 70cm beams
- **TO-331-BS** Flexure Testing Manual Machine ECO, for 10 x 10 x 50cm & 15 x 15 x 70cm beams
- **TO-332-ASTM-01** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 110V, 60Hz
- **TO-332-ASTM-02** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 60Hz
- **TO-332-ASTM-03** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 50Hz
- **TO-332-BS-01** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 110V, 60Hz
- **TO-332-BS-02** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 60Hz
- **TO-332-BS-03** Flexure Testing Machine, 100kN, for 10 x 10 x 50cm & 15 x 15 x 70cm beams DG EDI, 220V, 50Hz

Accessories

Other accessories that can be used with DG Series machines to assist with most of the processes of the Compression Tester.

Self Centering Platen

The self-centering platen is a cubical platen with pins mounted on two sides that help the sample to center itself in position. These adjustable pins on two axes are of different sizes and are used based on the type and size of sample. The platens are specially designed and can only be used with 2000kN and 3000kN compression testers.

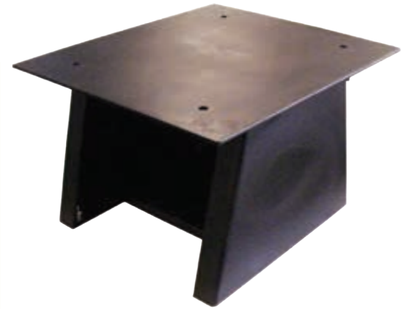


ORDERING INFORMATION

- **TO-320-5535** Self-centering 220mm square lower platen, suitable for use with 2000kN and 3000kN frames

Key features

- 150mm and 200mm cubes.
- Adjustable spacer pins on two axes
- Specimen self-centers against the pins.
- Shorter middle pins for cylindrical specimens.
- Only for 2000kN and 3000kN machines.



Compression Frame Stand

All models in the series can be mounted on a machine stand to bring the testing area to a convenient and safe working height.

ORDERING INFORMATION

- **TO-STAN01** Compression Testing machine stand for 1000kN frame and below
- **TO-STAN02** Compression Testing machine stand for 2000kN frame
- **TO-STAN03** Compression Testing machine stand for 3000kN frame

PACKAGING INFORMATION

1000kN & 2000kN CTM

- **Net weight:** 62kg; gross weight: 87kg
- **Packaging dimensions:** 76 x 73 x 68cm

3000kN CTM

- **Net weight:** 90kg; **gross weight:** 110kg
- **Packaging dimensions:** 89 x 73 x 74cm

MODEL TO-340-A

Air Entrainment Meter – Type A

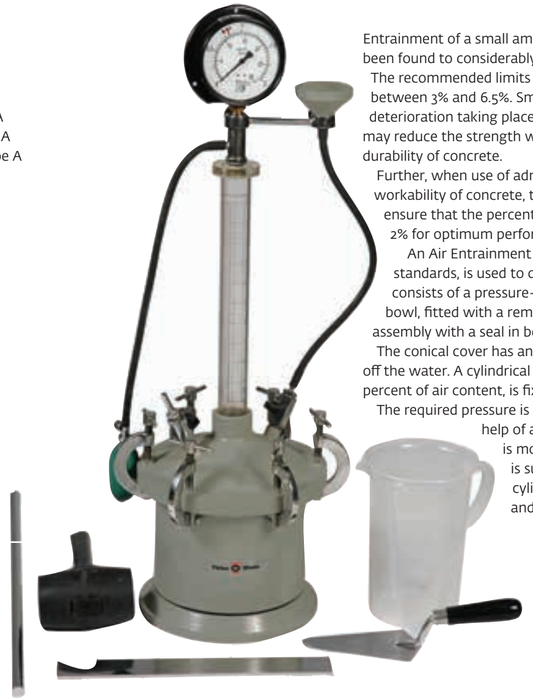
APPLICABLE STANDARDS
- **EN 12350-7; ASTM C231**

ORDERING INFORMATION
- **TO-340-A** Air Entrainment Meter Type A
- **TO-341-A** Air Entrainment 10 liters Type A
- **TO-342-A** Air Entrainment 100 liters Type A

STANDARD FEATURES
- Calibration kit
- Rubber mallet
- Tamping rod
- Gaging trowel
- Measuring cylinder
- Straight edge

OPTIONAL ACCESSORIES
- – Calibration kit
- – Rubber mallet
- **TO-345** Tamping rod
- **TO-428** Gaging trowel
- – Measuring cylinder
- – Straight edge
- – Syringe

PACKAGING INFORMATION
- **Net weight:** 22kg; **gross weight:** 34kg
- **Packaging dimensions:** 41 x 91 x 41cm



Entrainment of a small amount of air in cement concrete has been found to considerably improve the durability of concrete.

The recommended limits specified for the air content are between 3% and 6.5%. Smaller percentages may result in deterioration taking place more quickly and larger percentages may reduce the strength without any improvement in the durability of concrete.

Further, when use of admixtures is made to increase workability of concrete, the air content should be checked to ensure that the percentage of air remains between 1% and 2% for optimum performance of the concrete structure.

An Air Entrainment Meter, as specified in ASTM standards, is used to determine these percentages. It consists of a pressure-tight flanged cylindrical measuring bowl, fitted with a removable flanged and conical cover assembly with a seal in between.

The conical cover has an air valve and a pet cock for bleeding off the water. A cylindrical stand pipe, which is graduated in percent of air content, is fixed on the conical cover assembly.

The required pressure is applied to the specimen with the help of a pressure bulb. The whole assembly is mounted on a flat base. Each apparatus is supplied complete with a calibrating cylinder, pressure gage, funnel, trowel and tamping bar.

MODEL TO-340-B

Air Entrainment Meter – Type B

Key features
- Seven-liter capacity.
- Shock-proof pressure gage mounting.
- Lightweight aluminum construction.
- Heavy-duty plastic carrying case for easy transport to site.

The proper control of entrained air in concrete is recognized as one of the most important functions in modern concrete manufacture. To the concrete engineer and technician, the Air Entrainment Meter offers an instrument for use in the testing and designing of concrete mixes.

The instrument is designed so that the operating parts form an integral unit. The container is rigid, thus providing an accurate device for the performance of unit weight testing. For convenience, the tare weight in grams is stamped on the bottom. When used with the supplied monograph, the air meter provides quick and easy particle density and percent of free moisture in aggregate determinations.

The Air Entrainment Meter's multi-range feature accurately measures entrained air up to 22%. It is supplied complete with straight edge, syringe and carrying case.

MODEL TO-340-B SPECIFICATIONS

Dimensions	248 x 337mm
Capacity	7 liters
Readings	Up to 22% entrained air
Accuracy	±0.25% full scale
Aggregate size	50mm maximum
Container	Tare weight stamped on bottom; two-piece clamping device for positive seal
Pressure gage	In shockproof mounting
Weight	6.8kg

APPLICABLE STANDARDS
- **EN 12350-7; ASTM C231, ASTM C213; AASHTO T152**

ORDERING INFORMATION
- **TO-340-B** Air Entrainment Meter Type B

STANDARD FEATURES
- – Calibration kit
- – Rubber mallet
- **TO-345** Tamping rod
- **TO-428** Gaging trowel
- – Measuring cylinder
- – Straight edge

OPTIONAL ACCESSORIES
- – Calibration kit
- – Rubber mallet
- **TO-345** Tamping rod
- **TO-428** Gaging trowel
- – Measuring cylinder
- – Straight edge
- – Syringe

MODEL TO-334

Slump Cone Test

The Sheet Steel Slump Cone is filled with freshly mixed concrete and tamped with a tamping bar in four layers. The top of the concrete is levelled off with the top of the slump cone; the cone is lifted off the base and the slump of the sample is immediately measured.

This test is considered suitable for cohesive and plastic mixes of concrete containing aggregate smaller than 50mm.

The cone is supplied complete with a base plate that has cleats and a swivel handle, and a 16mm-diameter x 600mm-long tamping rod (part number TO-345).

APPLICABLE STANDARDS

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

ORDERING INFORMATION

- **TO-334** Slump test apparatus with tamping rod

STANDARD FEATURES

- **TO-33401** Slump cone
- **TO-33402** Standard slump test base plate with swivel handle
- **TO-345** Tamping rod, steel, 16mm diameter, 600mm long

OPTIONAL ACCESSORIES

- **TO-33401** Slump cone
- **TO-33402** Standard slump test base plate with swivel handle
- **TO-33403** Slump cone funnel
- **TO-33404** Extended slump test base plate with two handles, 400x600mm
- **TO-345** Tamping rod, steel, 16mm diameter, 600mm long

PACKAGING INFORMATION

- **Net weight:** 8kg; **gross weight:** 9kg
- **Packaging dimensions:** 41 x 41 x 39cm

Key features

- Base has cleats on its underside to help dig into the ground surface.
- Positive clamping of slump cone to the base while filling and tamping the concrete.
- A combination swivel carrying handle also serves as the datum, making the conventional and somewhat awkward measuring procedure of using a rule and a datum bar a thing of the past.

MODEL TO-336

Motorized Flow Table

The Flow Table is designed for determining the workability of Portland cement concrete.

The 76.2cm diameter table top is finely machined from a solid brass casting; the stand is made from cast iron. Operation is simple, whereby the ground and hardened steel cam is designed to drop the table by 12.5mm.

APPLICABLE STANDARD

- **AASHTO T126**

ORDERING INFORMATION

- **TO-336-01** Motorized Flow Table, 110V, 60Hz
- **TO-336-02** Motorized Flow Table, 220V, 60Hz
- **TO-336-03** Motorized Flow Table, 220V, 50Hz

PACKAGING INFORMATION

- **Net weight:** 135kg; **gross weight:** 175kg
- **Packaging dimensions:** 102 x 83 x 89cm

MODEL TO-337

Compaction Factor Apparatus

The Compaction Factor Apparatus consists of a hopper and receiver assembly: TO-345 tamping rod measuring 16mm diameter x 60cm long with a hopper and two trowels.

APPLICABLE STANDARDS
- **ASTM C403; AASHTO T197**

ORDERING INFORMATION
- **TO-337** Compaction Factor Apparatus

STANDARD FEATURES
- **TO-428** Two gaging trowels
- **TO-345** Tamping rod, steel, 16mm diameter

OPTIONAL ACCESSORIES
- **TO-428** Two gaging trowels
- **TO-345** Tamping rod, steel, 16mm diameter

PACKAGING INFORMATION
- **Net weight:** 50kg; **gross weight:** 85kg
- **Packaging dimensions:** 76 x 53 x 155cm

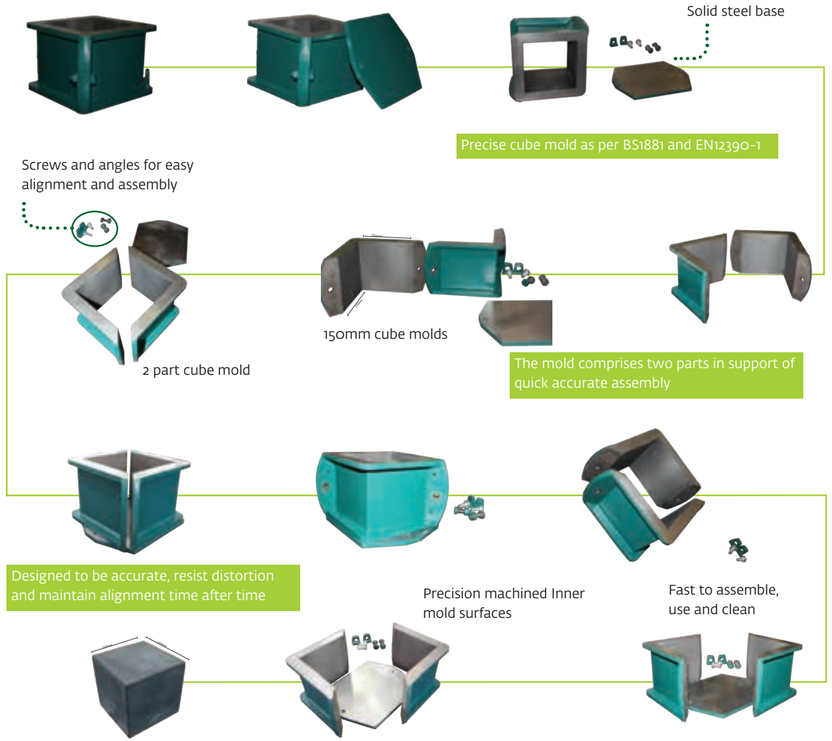
ORDERING INFORMATION
- Cube molds
- **TO-344-1** Two Part Cast Iron 150mm cube mold

APPLICABLE STANDARDS
- **BS 1881**
- **EN 12390-1**
- **ASTM C31, ASTM C192**

SPECIFICATIONS
- Multiple use
- Light weight 15.5kg
- Designed for quick striking of the mold with no damage to the cube
- 150mm x 150mm cube mold
- Temperature range 10-40°C
- Simply clean after use with running water

2-PART CAST IRON

Cube



MODEL TO-355

Accelerated Curing Tank

ORDERING INFORMATION

- **TO-355-1-ACB-02** Accelerated Curing Tank for six molds of 150mm size ambient to 100°C, 415V, 60Hz, 3ph
- **TO-355-1-ACB-03** Accelerated Curing Tank for six molds of 150mm size ambient to 100°C, 415V, 50Hz, 3ph
- **TO-355-1-ACW-02** Accelerated Curing Tank for six molds of 150mm size ambient to 55°C, 415V, 60Hz, 3ph
- **TO-355-1-ACW-03** Accelerated Curing Tank for six molds of 150mm size ambient to 55°C, 415V, 50Hz, 3ph
- **TO-355-2-ACB-02** Accelerated Curing Tank for 12 molds of 150mm size ambient to 100°C, 415V, 60Hz, 3ph
- **TO-355-2-ACB-03** Accelerated Curing Tank for 12 molds of 150mm size ambient to 100°C, 415V, 50Hz, 3ph
- **TO-355-2-ACW-02** Accelerated Curing Tank for 12 molds of 150mm size ambient to 55°C, 415V, 60Hz, 3ph
- **TO-355-2-ACW-03** Accelerated Curing Tank for 12 molds of 150mm size ambient to 55°C, 415V, 50Hz, 3ph

APPLICABLE STANDARDS

- **EN 12390-2; ASTM C31, C192; AASHTO T23**

Key features

- Warm water method.
- Temperature range: 55 ± 2°C.
- Boiling water option where temperature range is 100 ± 2°C.
- Accelerated curing tanks with refrigeration system for low temperature are also available on special request.

Curing is the process of maintaining satisfactory moisture content and temperature in freshly cast concrete for a definite period of time immediately following placement.

This serves two major purposes: it prevents or replenishes the loss of moisture from the concrete and maintains a favorable temperature for hydration to occur for a definite period

The fully insulated water tank holds standard cast cubes that are placed on two removable racks with sufficient free circulation of water around each cube.

The pump, drain valves, heater, thermostat and recirculation pump are housed in a compartment at one end of the tank. The models can cure in warm, cold and boiling water.

MODEL TO-364

Vibrating Table

Tinius Olsen's Vibrating Table is ideal for this type of compaction and capable of securing four 150 mm cube molds at once. In addition to the securing clamp, the table has ridges along its edges to prevent molds from sliding off during operation. The specially designed vibro motor means vibration frequency can be varied from 60Hz to 43Hz. Maximum load capacity is 140kg.

ORDERING INFORMATION

- **TO-364-01** Vibrating Table, table top 750 x 750mm, 110V, 60Hz
- **TO-364-02** Vibrating Table, table top 750 x 750mm, 220V, 60Hz
- **TO-364-03** Vibrating Table, table top 750 x 750mm, 220V, 50Hz
- **TO-365-01** Vibrating Table, table top 500 x 500mm, capacity 140kg, 110V, 60Hz
- **TO-365-02** Vibrating Table, table top 500 x 500mm, capacity 140kg, 220V, 60Hz
- **TO-365-03** Vibrating Table, table top 500 x 500mm, capacity 140kg, 220V, 50Hz
- **TO-366-01** Vibrating Table, table top 2 x 1m, 110V, 60Hz
- **TO-366-02** Vibrating Table, table top 2 x 1m, 220V, 60Hz
- **TO-366-03** Vibrating Table, table top 2 x 1m, 220V, 50Hz
- **TO-367-01** Vibrating Table, table top 1 x 1m, 110V, 60Hz
- **TO-367-02** Vibrating Table, table top 1 x 1m, 220V, 60Hz
- **TO-367-03** Vibrating Table, table top 1 x 1m, 220V, 50Hz

PACKAGING INFORMATION

For 750 x 750mm

- **Net weight:** 107kg; **gross weight:** 135kg
- **Packaging dimensions:** 86 x 86 x 75cm

For 500 x 500mm

- **Net weight:** 70kg; **gross weight:** 105kg

MODEL TO-368

Core Case Apparatus

Tinius Olsen's Core Case is for drilling concrete cores and to keep the surface clean and cool; it also allows the core drill to easily produce cores up to 100mm in diameter without the use of a frame and feed.

Water is fed into the jacket and flows through a manifold, into a drill spindle and continues to the inside of the diamond core bit. The water jacket surrounding the core barrel is flanged so that it can be clamped to the surface to be drilled with the supplied clamping pliers and anchors.

A rubber O-ring, fitted on this flange, seals the assembly against the concrete surface, enabling return flushing water containing the cuttings to be hosed away from the site.

Drill feed assembly is common to all models and makes the system adaptable to all core diameters with simple conversion kits. Core Case is a portable, self-contained system, easily carried by one person in a standard briefcase.

Caution
1. Coring is not possible on concrete reinforced with steel.
2. Not to be used on M60-strength concrete because this may overload the motor and damage the drill bit.

APPLICABLE STANDARDS
- **EN 12350-7; ASTM C231, ASTM C213**

ORDERING INFORMATION
- **TO-368-01** Core case, 110V, 60Hz
- **TO-368-02** Core case, 220V, 60Hz
- **TO-368-03** Core case, 220V, 50Hz

STANDARD FEATURES
- Electric drill machine
- Feed assembly
- Hammer drill bit 8mm
- Anchor bolt (one set)
- Two x rubber coupling
- 15 x fasteners
- Clamp for holding water jacket (one set)

OPTIONAL ACCESSORIES
- **TO-36801** Core bit and water jacket, 25mm diameter x 75mm long
- **TO-36802** Core bit and water jacket, 38mm diameter x 100mm long
- **TO-36803** Core bit and water jacket, 50mm diameter x 100mm long
- **TO-36804** Core bit and water jacket, 75mm diameter x 100mm long
- **TO-36805** Core bit and water jacket, 100mm diameter x 100mm long
- **TO-36810** Core bit 50mm diameter x 200mm long
- **TO-36811** Core bit 75mm diameter x 200mm long
- **TO-36812** Core bit 100mm diameter x 200mm long
- **TO-36807** Feed assembly
- **TO-36813** Hammer drill bit 8mm
- **TO-36816** Anchor bolt (one set)
- **TO-36817** Two x rubber coupling
- **TO-36820** Clamp for water jacket (one set)
- **TO-36823** 15 x fasteners

Notes: To obtain 200mm-long core samples, 100mm-long core bits of the corresponding diameter should be used first and replaced with 200mm-long core bits in the same water jacket to advance the core length.

CAST IRON MOLDS

For Cubes, Beams and Cylinders

International specifications require test specimens to be cast in a number of standard sizes for compressive and flexural strength determinations. Tinius Olsen offers Cube molds, Cylindrical molds and Beam molds of various sizes as listed below.

Cube Molds
Tinius Olsen's quality grade metal molds are strong enough to resist distortion and retain their shape and size under harsh conditions. These molds have the required quality surface finish and are designed so that they maintain superior alignment despite constant dismantling and re-assembly.

APPLICABLE STANDARDS
- **BS 1881; EN 12390-1,-2; ASTM C31, C192; DIN 51229**

ORDERING INFORMATION
- **TO-343** Cast iron mold for 100mm cube
- **TO-344** Cast iron mold for 150mm cube
- **TO-344-20** Cast iron mold for 200mm cube

Cube Molds – 2-Part
Tinius Olsen also offers a 2-part mold weighing 15.5kg. These quality grade metal molds are strong enough to resist distortion and retain their shape and size under harsh conditions.

APPLICABLE STANDARDS
- **BS 1881; EN 12390-1,-2; ASTM C31, C192; DIN 51229**

ORDERING INFORMATION
- **TO-344-1** Cast iron 2-part mold 150mm cube

Beam Molds
Tinius Olsen has two standard molds for casting test specimens for flexural strength determination. These steel molds are supplied complete with a base plate.

APPLICABLE STANDARDS
- **BS 1881; EN 12390-1,-2; ASTM C31, C192; DIN 51229**

ORDERING INFORMATION
- **TO-346** Cast iron mold for 100 x 100 x 500mm beam
- **TO-347** Cast iron mold for 150 x 150 x 700mm beam

Cylindrical Molds
Tinius Olsen's longitudinally split cast iron cylindrical molds are supplied complete with a base plate and top plate.

APPLICABLE STANDARDS
- **BS 1881; BS EN 12390-5: 2000; ASTM C78-02**

PACKAGING INFORMATION
- Net weight: 22kg; gross weight: 24kg

ORDERING INFORMATION
- **TO-349** Cast iron mold, split lengthwise, for 150mm diameter x 300mm high cylinder
- **TO-350** Cast iron mold, split lengthwise, for 100mm diameter x 200mm high cylinder
- **TO-351** Cast iron mold, split lengthwise, for 100mm diameter x 100mm high cylinder
- **TO-352** Cast iron mold, split lengthwise, for 150mm diameter x 150mm high cylinder
- **TO-354** Cast iron mold, split lengthwise, for 300mm diameter x 300mm high cylinder

MODEL TO-9891

Pan Type Concrete Mixer

For quality specimens to be manufactured, efficient mixing of concrete prior to molding is essential. Efficient mixing helps by coating the surface of all aggregate particles with cement paste and also creates uniformity in the mixture. The pan model is suitable for mixing small quantities of concrete, typically used in laboratories.

The design of the paddles ensures uniform and efficient mixing of cement, aggregate and other materials, in both wet and dry conditions. The lid and mixing paddles can be easily removed, giving operators maximum access and convenience when loading and emptying the pan. This mixer has wheels and is truly mobile.

Key features

- Motorized Unit
- Portable and compact
- Adjustable blades
- Simple to clean and maintain
- Easy to operate

MODEL TO-9891 SPECIFICATIONS	
Mixing capacity	40 litres
Overall dimension	910 x 875 x 1250mm
Motor	2HP, 3ph AC, 960rpm

APPLICABLE STANDARD

- **BS 1881 Part 125:1986**

ORDERING INFORMATION

- **TO-9891-01** Pan Mixer, 40-liter capacity, 415V, 60Hz, 3ph
- **TO-9891-02** Pan Mixer, 40-liter capacity, 415V, 50Hz, 3ph

MODEL TO-320-55XX

Cylindrical Specimen Caps and Rubber Pads

An alternative to Tinius Olsen's capping equipment is our steel caps and rubber pads; these are quicker and simpler to set up and use.

ORDERING INFORMATION

- **TO-320-5519** Cylindrical specimen for 6in cap
- **TO-320-5520** Rubber insert for 6in cap (pack of 10)
- **TO-320-5524** Cylindrical specimen for 4in cap
- **TO-320-5525** Rubber insert for 4in cap (pack of 10)

MODEL TO-335

Consistometer

This method is a mechanical variation of the simple slump test that includes determination of the workability of concrete. The concrete is formed in a slump cone positioned in a container. It is vibrated at a fixed amplitude and frequency after the cone is removed, on a small vibrating table. A plastic spacer disc on the top surface of the wet concrete allows the operator to judge when the compaction is complete. The time to complete the required vibrations gives an indication of the workability of the concrete, which is expressed in Vee-Bee degrees. The consistometer includes a vibrating table, specimen pot, slump cone, graduated rod, and acrylic plate.

APPLICABLE STANDARDS

- **BS 1881 (Part 104:1983); AASHTO T126; BS EN 12350-3; ASTM C1170; AS 1012 (Part 3)**

ORDERING INFORMATION

ASTM

- **TO-335-02-ASTM** Consistometer per ASTM 415V, 60Hz
- **TO-335-03-ASTM** Consistometer per ASTM 415V, 50Hz

BS

- **TO-335-02-BS** Consistometer per BS 415V, 60Hz
- **TO-335-03-BS** Consistometer per BS 415V, 50Hz

PACKAGING INFORMATION

- **Net weight:** 88kg; **gross weight:** 118kg
- **Packaging dimensions:** 76 x 53 x 99cm

MODEL TO-338

Spring Type Concrete Penetrometer

The penetrometer consists of a cylindrical spring housing with a plunger attached to the top of the spring. The penetration needle is attached to the other end of the spring housing. The plunger is graduated in 1kg divisions, to a maximum capacity of 60kg, which can be read with respect to the top end of the spring housing. A set of six needle points with areas of 645, 323, 161, 65, 32 and 16mm² is provided. It is supplied complete in a carrying case.

APPLICABLE STANDARDS

- **ASTM C403; ASSHTO T197**

ORDERING INFORMATION

- **TO-338-Imp** Concrete penetrometer, spring type, lb
- **TO-338-SI** Concrete penetrometer, spring type, kg

MODEL TO-339
Bulk Density Measures

These are used to determine the weight per cubic meter of freshly mixed concrete. Formulae are provided for calculating the volume of concrete per batch, the yield per bag of cement, and the cement factor. Bulk Density Measures, set of two, conform to ASTM/BS Standards. The set comprises one each of 20 and 10 liter Bulk Density Measure.

APPLICABLE STANDARDS
- **BS 812, EN 1097-3; EN 12350-6; ASTM C138**

ORDERING INFORMATION
- **TO-339** Bulk density apparatus

SUPPLIED AS STANDARD
- **TO-33901** Bulk density 20 liter
- **TO-33902** Bulk density 10 liter

OPTIONAL ACCESSORIES
- **TO-33901** Bulk density 20 liter
- **TO-33902** Bulk density 10 liter
- **TO-345** Tamping rod, steel, 16mm dia

MODEL TO-355
Curing Tank

The fully insulated water tank holds up to 36 150mm cast cubes or 72 70.6mm cast cubes as standard. These cubes are placed on two removable racks with sufficient free circulation of water around each cube. An immersion heater heats the tank and the temperature is controlled at 35°C or 100°C ±2°C or, optionally, a refrigeration system can be used to cure grey cement. The pump, drain valves, heater, thermostat and recirculation pump are housed in a compartment located at one end of the tank.

Key features
- 24-hour cycle from time of mixing.
- Temperature range: Ambient + 5 to 100°C.
- Accuracy of ± 2°C.

APPLICABLE STANDARDS
- **EN 12390-2; ASTM C31, C192; AASHTO T23**

PACKAGING INFORMATION
- **Net weight:** 175kg; **gross weight:** 221kg
- **Packaging dimensions:** 165 x 78 x 105cm

ORDERING INFORMATION
- **TO-355-1-01** Curing tank for 6/12 molds of 150mm/70.6mm size, 110V, 60Hz
- **TO-355-1-02** Curing tank for 6/12 molds of 150mm/70.6mm size, 220V, 60Hz
- **TO-355-1-03** Curing tank for 6/12 molds of 150mm/70.6mm size, 220V, 50Hz
- **TO-355-2-01** Curing tank for 12/24 molds of 150mm/70.6mm size, 110V, 60Hz
- **TO-355-2-02** Curing tank for 12/24 molds of 150mm/70.6mm size, 220V, 60Hz
- **TO-355-2-03** Curing tank for 12/24 molds of 150mm/70.6mm size, 220V, 50Hz
- **TO-355-3-02** Curing tank for 24/48 molds of 150mm/70.6mm size, 415V, 60Hz
- **TO-355-3-03** Curing tank for 24/48 molds of 150mm/70.6mm size, 415V, 50Hz
- **TO-355-4-02** Curing tank for 36/72 molds of 150mm/70.6mm size, 415V, 60Hz
- **TO-355-4-03** Curing tank for 36/72 molds of 150mm/70.6mm size, 415V, 50Hz

MODEL TO-357

Cylindrical Specimen Capping Equipment

It is essential that the ends of concrete cylinder specimens are flat and parallel for compressive strength tests; if they aren't, the end surfaces must be capped with capping compound, using capping sets to achieve this. These capping sets are designed for use both in the field and in the laboratory.

The capping set comprises a base with an upright, which serves as a guide for positioning the capping plate and a cylinder. The capping plate is machined to keep molten compound precise, and to position the cylinder. The set is supplied complete with cylinder carrier and ladle.

APPLICABLE STANDARDS

- **EN 12390-3; ASTM C617; AASHTO T231**

PACKAGING INFORMATION

Capping Set

- **Net weight:** 5.2kg; **gross weight:** 5.3kg
- **Packaging dimensions:** 28 x 24 x 17cm

Capping Mold

- **Net weight:** 16.4kg; **gross weight:** 17.7kg
- **Packaging dimensions:** 32 x 30 x 24cm

ORDERING INFORMATION

- **TO-357** Capping set, vertical, for capping 150mm dia cylinders and cores
- **TO-357-1** Capping set, vertical, for capping 150mm dia cylinders and cores, no handle
- **TO-358** Capping set, vertical, for capping 100mm dia cylinders and cores
- **TO-358-1** Capping set, vertical, for capping 100mm dia cylinders and cores, no handle
- **TO-35901** Capping mold, for capping 150mm dia concrete cylinders
- **TO-35902** Capping mold, for capping 100mm dia concrete cylinders

OPTIONAL ACCESSORIES

- **TO-35701** Capping compound, pack of 5kg
- **TO-35702** Warmer for melting the capping compound
- **TO-35703** Bowl, metallic for carrying the capping compound
- **TO-35704** Ladle, metallic for pouring the molten capping compound

MODEL TO-375

Volume Change Apparatus and Length Comparator

Length Comparator with reference bar

Prism mold

The apparatus consists of a mold of 75 x 75 x 285mm gauge length (distance between innermost points of reference points) with base plate and four reference points of standard length. Supplied with TO-374 Length Comparator, which consists of a frame with adjustable cross head. The base is a stainless steel circular platen with recessed seating and 300mm + 0.5mm long steel reference bar with coefficient of thermal expansion less than 2 x 10^{-6}mm/°C with 6mm diameter steel balls mounted at the ends. The frame is supplied with TO-072 0.002 x 5mm dial gage or TO-072-DG 0.001 x 5mm digital gage.

APPLICABLE STANDARDS

- **BS 6073-1, 812-120; EN 1367-4; ASTM C490, C151, C157, C531; AASHTO T107, T160**

ORDERING INFORMATION

- **TO-375** Volume change apparatus
- **TO-374-DG** Length comparator, Digital 0.001-5mm

SUPPLIED AS STANDARD

- **TO-37401** Reference bar 300mm long
- **TO-072** Dial gage (analog) - with TO-374
- **TO-072-DG** Digital gage - with TO-374-DG
- **TO-376** Prism mold 75 x 75 x 285mm

OPTIONAL ACCESSORIES

- **TO-37401** Reference bar 300mm long
- **TO-072** Dial gage (analog)
- **TO-072-DG** Digital gage
- **TO-376** Prism mold 75 x 75 x 285mm
- **TO-37601** Prism mold 100 x 100 x 285mm
- **TO-374-DG** Length comparator

PACKAGING INFORMATION

- **Net weight:** 9.2kg; **gross weight:** 9.5kg
- **Packaging dimensions:** 30 x 28 x 58cm

MODEL TO-391
Auto Blaine Apparatus

Tinius Olsen's Automatic Blaine Apparatus is an automated version of Blaine apparatus and follows international standards. It is used to determine the fineness of cement using the Blaine air-permeability apparatus, in terms of specific surface expressed as total surface area in square centimetres per gram, or square metres per kilogram, of cement.

APPLICABLE STANDARDS

- **ASTM C204; AASHTO T153; BS 4359, 4550; UNI 7374; EN196; NF P15 442; UNE 80.106**

ORDERING INFORMATION

BS/EN Standards

- **TO 391-3-EN-01** Automatic Blaine apparatus with standalone data acquisition at 110VAC, 60Hz
- **TO 391-3-EN-02** Automatic Blaine apparatus with standalone data acquisition at 220VAC, 60Hz
- **TO 391-3-EN-03** Automatic Blaine apparatus with standalone data acquisition at 220VAC, 50Hz

ASTM Standards:

- **TO 391-3-ASTM-01** Automatic Blaine apparatus with standalone data acquisition at 110VAC, 60Hz
- **TO 391-3-ASTM-02** Automatic Blaine apparatus with standalone data acquisition at 220VAC, 60Hz
- **TO 391-3-ASTM-03** Automatic Blaine apparatus with standalone data acquisition at 220VAC, 50Hz

STANDARD features

- **TO-391-301** One Air Permeability Apparatus (Blaine type) consisting of one manometer tube mounted on a stand with sensor
- **TO-391-302-01** Data Acquisition System with vacuum pump fitted in a box at 110VAC, 60Hz
- **TO-391-302-02** Data Acquisition System with vacuum pump fitted in a box at 220VAC, 60Hz
- **TO-391-302-03** Data Acquisition System with vacuum pump fitted in a box at 220VAC, 50Hz
- **TO-39001** Permeability cell with plunger
- **TO-39003** Perforated metal disc
- **TO-39006** Rubber tube
- **TO-39007** Filter paper discs (set of 12)
- **TO-39008** Dibutylphthalate liquid
- **TO-39009** Punch
- **TO-39010** Non-perforated metal disc
- **TO-39011** Syringe fitted with nylon tube
- **TO-320-5529** RS232 cable

Key features

- Single touch operation.
- Automatic control of fluid movement.
- Automatic sensing to ensure error-free, repeatable, measurements.
- Automatic measurement of temperature during the test.
- Automatic formula correction for the calculation of the Blaine value with variation in temperature (as per ASTM and EN).
- Facility to configure and monitor various cement types.
- Timing accuracy up to 200mSec.
- Storage of up to 10,000 data points.
- Easy, tamper-proof calibration using a lockable ball valve.

OPTIONAL ACCESSORIES

- **TO-39001** Permeability cell with plunger
- **TO-39003** Perforated metal disc
- **TO-39006** Rubber tube
- **TO-39007** Filter paper discs (set of 12)
- **TO-39008** Dibutylphthalate liquid
- **TO-39009** Punch
- **TO-39010** Non-perforated metal disc

PACKAGING INFORMATION

- **Net weight:** 20kg; **gross weight**: 50kg
- **Packaging dimensions:** 76 x 53 x 84cm

MODEL TO-408
Cement Autoclave

The Cement Autoclave is ideal for conducting accelerated soundness tests on cement and consists of a stainless steel pressure vessel with insulated outer shell. The temperature and pressure are measured by RTD probes and the system controlled by a PID controller, but the system has a spring-loaded pressure release safety valve to maintain safe operation.

APPLICABLE STANDARDS

- **ASTM C188, C141, C151, C155; AASHTO T107**

ORDERING INFORMATION

- **TO-408-1-01** Cement Autoclave, 110VAC, 60Hz
- **TO-408-1-02** Cement Autoclave, 220VAC, 60Hz
- **TO-408-1-03** Cement Autoclave, 220VAC, 50Hz

OPTIONAL ACCESSORIES

- **TO-40801** Heating elements
- **TO-40802** Silicon rubber lid gasket
- **TO-40803** Spring loaded, safety loaded, safety valve

MODEL TO-408 SPECIFICATIONS

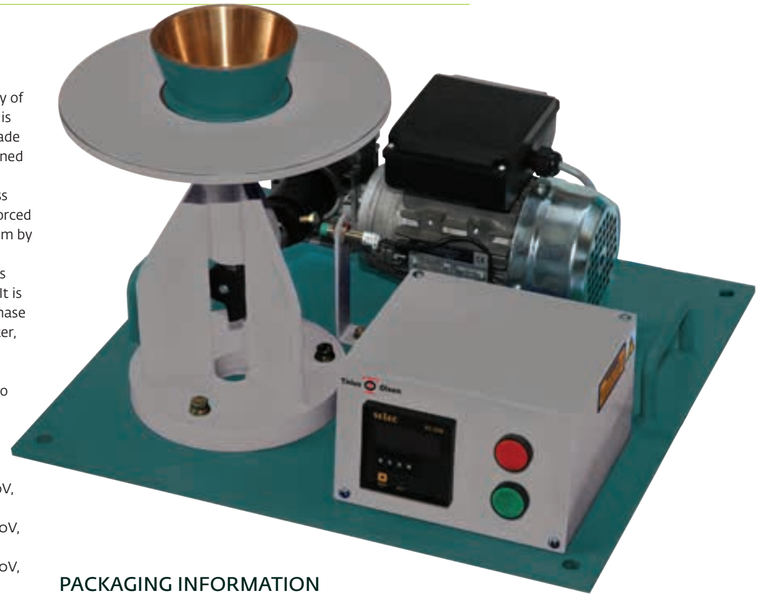
Working pressure	21 ± 1kg/cm² at 215°C (300psi at 419°F)
Pressure vessel	150 x 500mm depth
Weight	70kg
Heater	2000W

Key features

- Rustproof stainless steel pressure vessel and enclosure.
- Microprocessor-based PID controller for accurate control of temperature and pressure.
- Three-part safety mechanism to protect the operator and equipment.
- Simple to use.

MODEL TO-411

Flow Table



The Flow Table is designed for determining the workability of Portland cement concrete. The 70mm diameter table top is finely machined from a solid brass casting; the stand is made from cast iron. Operation is simple: the ground and hardened steel cam is designed to drop the table by 50mm.

The Flow Table consists of a 250 ± 2.5mm diameter brass table top, mounted on a rigid stand. The table top is reinforced with equally spaced ribs and allowed to drop through 12mm by a ground and hardened cam.

The motor drive assembly using the geared motor box is designed to rotate the cam through the shaft at 100rpm. It is suitable for operation on 220V, 50Hz/110V, 60Hz, single phase AC supply. Complete with flow mold 100mm base diameter, 70mm top diameter and 50mm high.

Note: A manually operated version of this flow table is also available.

ORDERING INFORMATION

- **TO-411-ASTM-01** Flow Table, electrically operated, 110V, 60Hz
- **TO-411-ASTM-02** Flow Table, electrically operated, 220V, 60Hz
- **TO-411-ASTM-03** Flow Table, electrically operated, 220V, 50Hz
- **TO-411-BS-01** Flow Table, electrically operated, 110V, 60Hz
- **TO-411-BS-02** Flow Table, electrically operated, 220V, 60Hz
- **TO-411-BS-03** Flow Table, electrically operated, 220V, 50Hz
- **TO-410-BS/ASTM** Flow Table, manually operated, as per ASTM and BS

PACKAGING INFORMATION

- **Net weight:** 58kg; **gross weight:** 82kg
- **Packaging dimensions:** 76 x 56 x 53cm

APPLICABLE STANDARDS

- **BS 4551-1, 3892-1; ASTM C87, C109, C185, C230, C243, C348; AASHTO T71, T106, T137**

MODEL TO-412

Mortar Mixer

This mixer is designed to mix mortars and cement paste to standard requirements and can be operated in either manual or automatic mode.

The mixer features microprocessor control of the speed and mixing program and employs an elliptical mixing motion for thorough and efficient mixing.

APPLICABLE STANDARDS

- **BS 3892-1, 3892-3, 6463-103, 4551-1; ISO 679; EN 196-1, 196-3, 413-3, 459-2, 1744-1, 13286, 1015-2, 13395-1, 13454-2**

ORDERING INFORMATION

- **TO-412-01** Mortar Mixer with sand and water dispenser, 110VAC, 60Hz
- **TO-412-02** Mortar Mixer with sand and water dispenser, 220VAC, 60Hz
- **TO-412-03** Mortar Mixer with sand and water dispenser, 220VAC, 50Hz

STANDARD FEATURES

- Mixing bowl
- Paddle
- Scraper
- Sand dispenser
- Water burette

PACKAGING INFORMATION

- **Net weight:** 54kg; **gross weight:** 88kg
- **Packaging dimensions:** 76 x 53 x 90cm

MODEL TO-412 SPECIFICATIONS

Speed (rpm)	Paddle	Mixing Head
Low	140 ± 5	62 ± 5
High	285 ± 10	125 ± 10

Rated power	180W
Bowl capacity	5 liters
Weight	55kg
Dimension (LxWxH)	760 x 520 x 900mm

MODEL TO-418

Vibration Machine

The custom Vibration Machine is used for vibrating molds with mortar mix at a frequency of 200 + 7Hz. The simple design of the machine allows easy assembly and dismantling of the cube molds after vibration. Each machine is certified for its frequency and is supplied with one TO 414 cube mold.

APPLICABLE STANDARD

- **BS 4550**

ORDERING INFORMATION

- **TO-418-01** Vibration machine with built-in digital timer, 110VAC, 60Hz
- **TO-418-02** Vibration machine with built-in digital timer, 220VAC, 60Hz
- **TO-418-03** Vibration machine with built-in digital timer, 220VAC, 50Hz

STANDARD ACCESSORIES

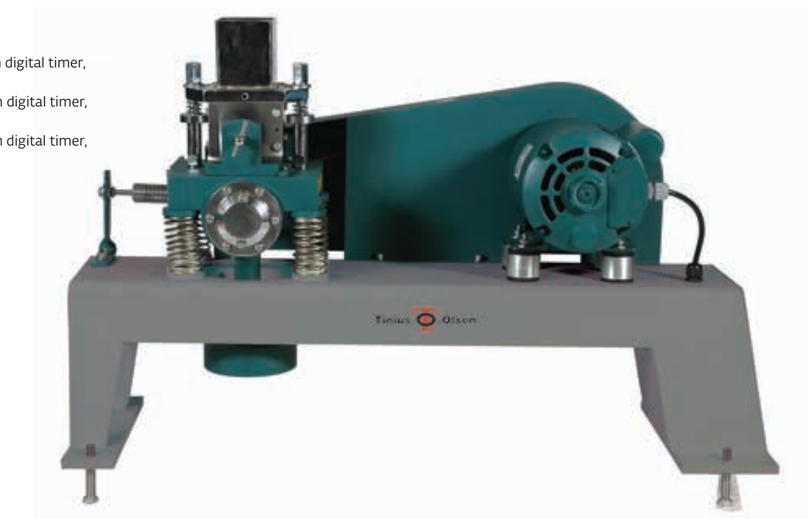
- **TO-414** Cube mold 70.6mm

OPTIONAL ACCESSORIES

- **TO-414** Cube mold 70.6mm
- **TO-417** Cube mold 50mm
- **TO-417-3-CI** Three-gang mold 50mm made from cast iron
- **TO-414-3-NB** Three-gang mold 2in made from naval brass

PACKAGING INFORMATION

- **Net weight:** 85kg; **gross weight:** 115kg
- **Packaging dimensions:** 102 x 47 x 90cm



MODEL TO-421

Jolting Apparatus

The Jolting Apparatus is used for making standard rectangular specimens measuring 40.1 x 40 x 160mm of Portland and Pozzolana cement mortar for determining transverse strength.

This machine consists of a mold table, which is seated on a rotating cam driven at 60rpm. The rectangular mold table is connected by two support arms to the spindle.

The three-gang mold on the top is clamped rigidly to the mold table using the supplied hopper. The hopper supports the mold while free fall of the table is stopped by the cam.

The machine is supplied with one mold and hopper.

Key features

- Easy and quick to start.
- Automatic function.
- No attention required during test.
- Easy clamping and unclamping of mold on table.

APPLICABLE STANDARDS

- **BS 3892-1, 4551-1; EN 196-1, 413-2, 459-2, 1774-1, 1015-10, 1015-11, 13454-2; ISO 679**

ORDERING INFORMATION

- **TO-421-01** Jolting Apparatus, 110V 60Hz
- **TO-421-02** Jolting Apparatus, 220V 60Hz
- **TO-421-03** Jolting Apparatus, 220V 50Hz

STANDARD FEATURES

- **TO-422** Three-gang mold 40.1 x 40 x 160mm, feeding hopper

PACKAGING INFORMATION

- **Net weight:** 106kg; **gross weight:** 131kg
- **Packaging dimensions:** 122 x 53 x 56cm

MODEL TO-320-5521

Compression Frame Jig Assembly

This attachment is designed for testing the compressive strength of mortar cubes, or the block resulting from a flex test specimen. The attachment must be used with the appropriate compression and is designed for use with the DG and FA Series of machines.

APPLICABLE STANDARDS

- **BS 3892-1; EN 196-1, 459-2, 1015-11, 13454-2; ASTM C109**

ORDERING INFORMATION

- **TO-320-5521** Compression frame attachment
- **TO-320-5521-03** 40mm square platen set for TO-320-5521

MODEL TO-320-5522

Flex/Bend Attachment

This attachment is designed for the flexural testing of 40 x 40 x 160mm mortar cubes.

APPLICABLE STANDARDS

- **BS 4551-1; EN 196-1, 1015-11, 13454-2**

ORDERING INFORMATION

- **TO-320-5522** Flexural attachment for use with DG & FA series of compression testers

MODEL TO-390

Air Permeability Apparatus (Blaine type)

This is a variable flow type air permeability apparatus and consists of permeability cell, 'U' tube manometer, perforated/ non-perforated metal disc, plunger, rubber tube/stopper, filter paper, dibutyl phthalate liquid and punch.

APPLICABLE STANDARDS

- **ASTM C204; BS:4359 Part 2, Appendix A; AASHTO T153; EN196-6, 459-2, 13286-44**

ORDERING INFORMATION

- **TO-390** Air permeability apparatus (Blaine type)

SUPPLIED AS STANDARD

- **TO-39001** Permeability cell
- **TO-39002** U tube manometer mounted on stand
- **TO-39003** Perforated metal disc
- **TO-39004** Plunger
- **TO-39005** Rubber stopper
- **TO-39006** Rubber tube 20cm long
- **TO-39007** Filter paper discs (set of 12)
- **TO-39008** Dibutyl ºßphthalate liquid
- **TO-39009** Punch
- **TO-39010** Non-perforated metal disc

OPTIONAL ACCESSORIES

- **TO-39001** Permeability cell
- **TO-39002** U tube manometer mounted on stand
- **TO-39003** Perforated metal disc
- **TO-39004** Plunger
- **TO-39005** Rubber stopper
- **TO-39006** Rubber tube 20cm long
- **TO-39007** Filter paper discs (set of 12)
- **TO-39008** Dibutyl phthalate liquid
- **TO-39009** Punch
- **TO-39010** Non-perforated metal disc

PACKAGING INFORMATION

- **Net weight:** 2.2kg; **gross weight:** 2.4kg
- **Packaging dimensions:** 24 x 21 x 43cm

MODEL TO-394

Vicat Apparatus

The test is used to determine the quantity of water required to produce a cement paste of "standard" consistency; standard consistency is attained when the 10mm plunger of the Vicat apparatus penetrates the cement paste to a predetermined depth under free-fall. A new sample is prepared and tested with initial and final needles in accordance with the procedure detailed in the standard being used. The Vicat Apparatus consists of Vicat mould, glass plate, initial and final needle, mild steel baseplate, and Vicat split mold.

ORDERING INFORMATION

- **TO-394-EN** Vicat apparatus with dashpot to EN standards
- **TO-394-ASTM** Vicat apparatus with dashpot to ASTM standards

SUPPLIED AS STANDARD

For EN Standards

- **TO-39301-EN** Vicat mold
- **TO-39302** Glass plate
- **TO-39303-EN** Initial needle
- **TO-39304-EN** Final needle
- **TO-39305** Consistency plunger
- **TO-39306** Mild steel base plate
- **TO-39307** Vicat mold split type with clamping ring

For ASTM Standards

- **TO-39301-ASTM** Vicat mold
- **TO-39302** Glass plate
- **TO-39303-ASTM** Initial needle
- **TO-39304-ASTM** Final needle
- **TO-39305** Consistency plunger
- **TO-39306** Mild steel base plate
- **TO-39307** Vicat mold split type with clamping ring

OPTIONAL ACCESSORIES

- **TO-39301-EN** Vicat mold
- **TO-39301-ASTM** Vicat mold
- **TO-39302** Glass plate
- **TO-39303-EN** Initial needle
- **TO-39303-ASTM** Initial needle
- **TO-39304-EN** Final needle
- **TO-39304-ASTM** Final needle
- **TO-39305** Consistency plunger
- **TO-39306** Mild steel base plate
- **TO-39307** Vicat mold split type with clamping ring

APPLICABLE STANDARDS

- **BS 12, 146, 915, 1370, 4027, 4246, 4248; ASTM C191, C141, C187, C308, C359, C472; AASHTO T129, E131; EN 196-3, 13454-2**

PACKAGING INFORMATION

- **Net weight:** 4.8kg; **gross weight:** 5kg
- **Packaging dimensions:** 21 x 17 x 36cm

MODEL TO-400
Le-Chatelier Mold & Apparatus

The Le-Chatelier Mold consists of a small split cylinder that, when assembled, forms a mold with an internal diameter of 30mm and a height of 30mm. On either side of the split cylinder, two parallel indicating arms with pointed ends are fixed. The mold construction is such that when a mass of 300g is applied, this will increase the distance between these indicator arms by 17.5mm ± 2.5mm without permanent deformation of the mold.

Two rings are soldered to the upper half of the mold on each side of the central split to make it easier to split the hardened mold at the end of the test.

APPLICABLE STANDARDS
- **BS 6463; EN 196-3, 459-2**

Le-Chatelier flask
Used to determine the specific gravity of hydraulic cement.

ORDERING INFORMATION
- **TO-400** Le-Chatelier mold
- **TO-400-S** Extensibility of mold apparatus
- **TO-401** Le-Chatelier flask

Resistance of mold test apparatus
Le-Chatelier molds need to be checked and calibrated periodically with this unit to check the state of the split cylinder. This unit consists of a metal sleeve with a hook and set screw to fit over one of the mold pointers, and a clamp to fit on to the other pointer of the mold.

APPLICABLE STANDARD
- **EN 196**

MODEL TO-428
Gauging Trowel

Gauging trowels from Tinius Olsen feature a 100-150mm or 200mm long blade with straight edge. They weigh 210+10g.

ORDERING INFORMATION
- **TO-428** Gauging trowel, 100-150mm long blade
- **TO-429** Gauging trowel, 200mm long blade

MODEL TO-402
Shrinkage Bar Mold

The use of shrinkage bar molds is also recommended to determine cement soundness; any shrinkage of the specimen is determined by a Length Comparator (listed in the concrete section of this catalog). Two models are offered: one has smooth stainless steel reference points and the other has knurled and threaded reference points. Both models are available as single mold and multiple mold compartments. Each mold is supplied complete with base plate and two reference points per compartment of mold. Each mold size is a 25 x 25mm section and 250mm effective length (distance between two innermost reference points).

APPLICABLE STANDARD
- **ASTM C151**

ORDERING INFORMATION
- **TO-402** Mold, one compartment with smooth reference points
- **TO-403** Mold, two compartments with smooth reference points
- **TO-404** Mold, four compartments with smooth reference points
- **TO-405** Mold, one compartment with knurled and threaded reference points
- **TO-406** Mold, two compartments with knurled and threaded reference points
- **TO-407** Mold, four compartments with knurled and threaded reference points

OPTIONAL ACCESSORIES
- **TO-40201** Set of 20, smooth reference points
- **TO-40501** Set of 20, knurled and threaded reference points

MODEL TO-414

Cement Molds

Cube Molds

Tinius Olsen offers two sizes of cube molds: 50mm cast iron molds and 70.6mm steel steel molds

APPLICABLE STANDARDS

- **BS 1881-131; ASTM C109**

The accurate preparation and molding of prisms, cubes and briquettes is vital for successful testing. Molds should be manufactured from a material capable of retaining its form under heavy usage.

Three-gang molds

Tinius Olsen also offers three-gang molds for 40.1 x 40 x 160mm mortar prisms, supplied with a glass plate. Weight 12.2kg.

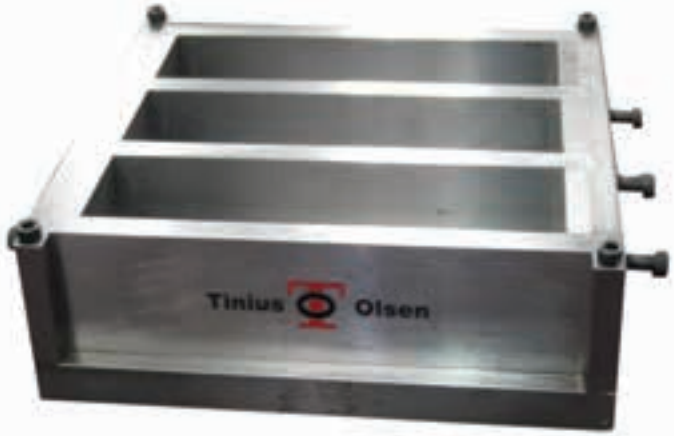
ORDERING INFORMATION

- **TO-414** Steel mold for 70.6mm cube
- **TO-417** Cast iron mold for 50mm cube
- **TO-417-3-CI** Three-gang, cast iron mold for 50mm cube
- **TO-417-3-NB** Three-gang, naval brass mold for 2in cube
- **TO-422** Three-gang, steel mold for flexural prism, 40 x 40 x 160mm
- **TO-457** Three-gang, prism mold, 50 x 50 x 200mm

Three-gang, naval brass mold for 2in cube

Three-gang, cast iron mold for 50mm cube

Three-gang, steel mold



MODEL TO-203

Accelerated Polishing Machine

Tinius Olsen manufactures state-of-the-art Aggregate Polishing Machines. Specimens are manufactured in accurately machined and matched molds. They are then removed from the molds and located on the 'road wheel'.

The wheel is then rotated and enters into contact with a spring-loaded solid rubber tire. Abrasive charges are continuously fed by mechanical feeders at a fixed speed. Feed rates for corn emery and flour emery are as per British and American standards. The water is supplied at a controlled rate through a water container. Used water and abrasives are collected in a large removable tray.

Key features

- High safety standards.
- Sealed long life bearings.
- Sealed control bearings.
- Heavy welded steel mainframe with adjustable pads.
- Specimens manufactured and easily removed from accurately machined moulds.
- Water gravity fed from high level tank through calibrated flow meter.

APPLICABLE STANDARDS

- **BS 812; ASTM D331**

ORDERING INFORMATION

- **TO-203-01-BS** Accelerated Polishing Machine as per BS, 110VAC, 60Hz
- **TO-203-02-BS** Accelerated Polishing Machine as per BS, 220VAC, 60Hz
- **TO-203-03-BS** Accelerated Polishing Machine as per BS, 220VAC, 50Hz
- **TO-203-01-ASTM** Accelerated Polishing Machine as per ASTM, 110VAC, 60Hz
- **TO-203-02-ASTM** Accelerated Polishing Machine as per ASTM, 220VAC, 60Hz
- **TO-203-03-ASTM** Accelerated Polishing Machine as per ASTM, 220VAC, 50Hz

MODEL TO-441

Laboratory Ball Mill

The Laboratory Ball Mill is primarily designed for grinding pigments and cement. The material is ground at a specific speed for a specific period using a specific quantity of grinding steel balls. The size range of balls provided to support the tests is from 12.5 to 40mm. The size of ball varies with the requirement of the tests and complied standard. The Laboratory Ball Mill capacity also varies according to the application and ranges from 5-20kg.

The equipment is provided with a counter for recording the number of revolutions.

Apart from the cement industry, it is also used in the paint, plastic, granite and tile industries.

ORDERING INFORMATION

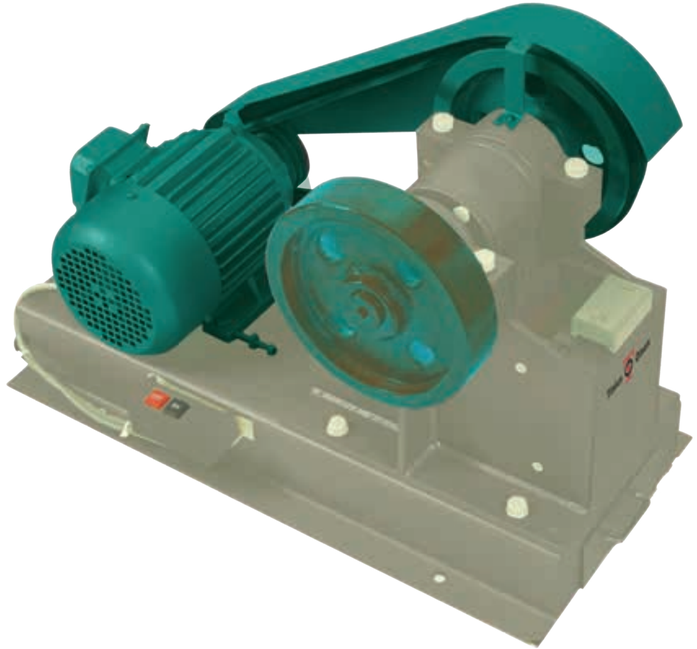
- **TO-441-02** Laboratory Ball Mill, 5kg capacity without steel balls, 415V, 60Hz, 3ph
- **TO-441-03** Laboratory Ball Mill, 5kg capacity without steel balls, 415V, 50Hz, 3ph
- **TO-441-10-02** Laboratory Ball Mill, 10kg capacity without steel balls, 415V, 60Hz, 3ph
- **TO-441-10-03** Laboratory Ball Mill, 10kg capacity without steel balls, 415V, 50Hz, 3ph
- **TO-441-20-02** Laboratory Ball Mill, 20kg capacity without steel balls, 415V, 60Hz, 3ph
- **TO-441-20-03** Laboratory Ball Mill, 20kg capacity, without steel balls, 415V, 50Hz, 3ph

OPTIONAL ACCESSORIES

- **TO-44101** Steel ball 40mm, single ball
- **TO-44102** Steel ball 30mm, single ball
- **TO-44103** Steel ball 25mm, single ball
- **TO-44104** Steel ball 19mm, single ball
- **TO-44105** Steel ball 12.5mm, single ball

MODEL TO-442

Jaw Crusher



Jaw crushers were one of the earliest crushing machines to be developed in the materials industry, before it began to modify functionalities and introduce new types to the market. With a simple and solid structure, reliable operation, easy maintenance and repair, and low production and construction fees, jaw crushers have long been widely used for coarse, medium and fine crushing of various kinds of ores and rocks in many industrial sectors such as metallurgy, chemistry, building material, power plant and transportation.

The Tinius Olsen Jaw Crusher is compact and of rugged construction for general laboratory use in small pilot plant operations. Two jaws of manganese steel are provided and the moveable jaw produces two blows for every revolution to reduce oversizing to a minimum.

ORDERING INFORMATION

- **TO-442-01** Jaw Crusher, 110V 60Hz
- **TO-442-02** Jaw Crusher, 220V 60Hz
- **TO-442-03** Jaw Crusher, 220V 50Hz

PACKAGING INFORMATION

- **Net weight:** 125kg; **gross weight:** 155kg
- **Packaging dimensions:** 92 x 53 x 78cm

Key features

- Designed to speed up crushing of aggregates, ore, mineral, coal and similar materials.
- Compact and rugged for laboratory and small production units.
- Manganese steel jaws adjustable up to 6mm opening.
- Supported with strong steel frame.

MODEL TO-443

Pulverizer

Pulverizers are used specifically for grinding soft and brittle material into fine powder. Aimed at the cement industry, this machine helps in crushing or grinding up any stone up to 45mm size to powder for better quality cement. The strong steel frame of this machine offers longer duration of run time and helps in crushing approximately 250kg of materials in eight hours.

This machine, used for crushing materials to produce fine mesh samples, is a self-contained grinder with a rotating disc that has planetary movement in vertical plane.

Key features

- Designed for grinding materials to produce fine mesh samples.
- Ideal for use in cement and chemical industries.
- Self-contained grinder with a rotating disc features planetary movement in vertical plane.
- 250kg materials can be crushed in approximately eight hours.
- Discharging opening adjustment range: 3-10mm.
- Suitable for crushing any type of stone up to 45mm.

ORDERING INFORMATION

- **TO-443-01** Pulverizer, 110V, 60Hz
- **TO-443-02** Pulverizer, 220V, 60Hz
- **TO-443-03** Pulverizer, 220V, 50Hz

MODEL TO-456

Aggregate Impact Tester with Blow Counter

The Aggregate Impact Tester with Blow Counter is used to determine aggregate impact value and has been designed in accordance with ASTM and BS Standards. The sturdy construction consists of a base and support columns that form a rigid framework around the quick release trigger mechanism to ensure an effective free-fall of the hammer during test. The free-fall can be adjusted through 380 + 5mm. The hammer is provided with a locking arrangement.

APPLICABLE STANDARD

- **BS 812-112**

ORDERING INFORMATION

- **TO-456-BS** Aggregate Impact Tester with Blow Counter as per BS specification

SUPPLIED AS STANDARD

- **TO-45601** Cylindrical Cup
- **TO-45602** Metal measure, 75mm ID x 50mm deep
- **TO-45603** Tamping rod
- **TO-45604** Automatic blow counter

OPTIONAL ACCESSORIES

- **TO-45601** Cylindrical cup
- **TO-45602** Metal measure, 75mm ID x 50mm deep
- **TO-45603** Tamping rod
- **TO-45604** Automatic Blow counter

Key features

- ASTM & BS compliant.
- Blow counter.
- Sturdy frame.
- Adjustable free-fall.

PACKAGING INFORMATION

- **Net weight:** 55kg; **gross weight:** 90kg
- **Packaging dimensions:** 76 x 53 x 115cm

MODEL TO-458

Los Angeles Abrasion Apparatus

The Los Angeles Abrasion Machine comprises a heavy steel cylinder, rotated about a horizontal axis. The cylinder incorporates a removable internal shelf. Two alternative shelf positions are provided: one for ASTM and one for the EN test method. The heavy duty steel cylinder is manufactured from structural steel plate. The filling aperture is provided with a cover. The machine is fitted with a digital revolution counter and steel tray for specimen unloading. It is also supplied with one set of abrasive charges as standard.

APPLICABLE STANDARDS

- **ASTM C131, C535; EN 1097-2; AASHTO T96**

ORDERING INFORMATION

BS/EN Standards

- **TO-458-01-EN** Los Angeles Abrasion Testing Machine with abrasive charge, 110V 60Hz
- **TO-458-02-EN** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 60Hz
- **TO-458-03-EN** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 50Hz

ASTM Standards

- **TO-458-01-ASTM** Los Angeles Abrasion Testing Machine with abrasive charge, 110V 60Hz
- **TO-458-02-ASTM** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 60Hz
- **TO-458-03-ASTM** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 50Hz

AUS Standards

- **TO-458-01-AS** Los Angeles Abrasion Testing Machine with abrasive charge, 110V 60Hz
- **TO-458-02-AS** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 60Hz
- **TO-458-03-AS** Los Angeles Abrasion Testing Machine with abrasive charge, 220V 50Hz

STANDARD FEATURES

BS/EN Standards

- **TO-45801-EN** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter

ASTM Standards

- **TO-45801-ASTM** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter

AUS Standards

- **TO-45801-AS** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter

OPTIONAL ACCESSORIES

- **TO-45801-EN** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter
- **TO-45801-ASTM** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter
- **TO-45801-AS** Abrasive charge, consisting of a set of 12 hardened steel balls of 48mm diameter

PACKAGING INFORMATION

- **Net weight:** 407kg; **gross weight:** 477kg
- **Packaging dimensions:** 112 x 120 x 99cm

Key features

- European and ASTM methods.
- Revolution counter.
- Full width cover.
- Cabinet option is also available with Los Angeles.

MODEL AIRJET

Airjet Sizer

For sieving difficult, electrostatic and very fine dry particles from 20µm and greater, the Airjet Sizer is recommended. It is easy to use, extremely efficient and provides accurate reproducible results. Most sieving operations can be accomplished in just a matter of minutes. It is supplied complete with its own separate vacuum source that connects to the back of the sizer. Electrical power for the vacuum unit is supplied by a single on/off switch. connector. A safety microswitch ensures that the unit cannot operate unless a sieve is in place on the sieve mounting plate.

WEIGHT

- 12kg

ORDERING INFORMATION

- **Airjet sizer(B)** Automatic sieve

AIRJET SPECIFICATIONS	
Dimension	345 x 375 x 295mm (WxDxH)
Air volume	480 liter/min (maximum)
Air pressure	Adjustable from 10-85milibar (negative pressure)
Time range	0-10mins
Sieve diameter	200mm airjet sieves
Aperture range	20µm-1mm
Operating voltage	220-240V 50/60Hz
Power consumption	25VA plus (extraction units available)
Capacity	Up to eight full height 200mm (8in) sieves

MODEL TO-D200

Octagon D200 Digital

Ideal for laboratory or on site use, the Octagon D200 Digital is a robust, compact, and portable shaker for 20mm and 8in diameter sieves. A digital display takes the guesswork out of user settings.

Powered by an electromagnetic drive, the Octagon D200 Digital has no rotating parts to wear, making it maintenance-free. It is extremely quiet in operation.

Vibratory action moves the sample over the sieve in a unique way to produce faster, more efficient sieving. Rapid vertical movements help to keep the apertures from clogging.

Controls include process timer, an amplitude setting, and continuous or intermittent vibration.

The shaker is fitted with a unique clamp that ensures sieves are held firmly without over-tightening, yet are easily removed or replaced. Non-metallic springs and anti-vibration mountings prevent excessive vibrations and reduce noise.

A wet sieving conversion kit is available as an option. It includes a top clamping plate, Perspex cover, spray rose, watertight seals and stainless steel receiver with drainage spout.

MODEL TO-D200 SPECIFICATIONS	
Height	210mm (excluding rods)
Diameter	410mm (handles, 2 x 35mm)
Power	230V, 50Hz, 300VA 115V, 60Hz, 300VA
Capacity	up to eight full height and 18 half height 200mm (8in) diameter sieves plus lid and receiver

WEIGHT

- 55kg (packed); 43kg (unpacked)

ORDERING INFORMATION

- Octagon D200 digital automatic sieve shaker
- Octagon D200 wet sieving conversion kit

MODEL TO-D450

D450 Digital

The D450 Digital uses the same dynamic control panel as the Octagon D200. The main difference between these units is that the complete vibration system of the D450 has been built to handle the sample weights of larger diameter sieves.

Like the Octagon D200, the D450 offers total operator control, no mechanical moving parts, and the ability to do wet or dry sieving.

MODEL TO-D450 SPECIFICATIONS	
Height	280mm (excluding rods)
Diameter	685mm
Power	230V, 50Hz, 1280VA 115V, 60Hz, 1600VA (other voltages on request)
Capacity	Up to 11 x 250mm sieves, nine x 300mm, nine x 315mm, 11 x 350mm, 10 x 400mm or seven x 450mm; plus lid and receiver (or inch equivalent). Capacity increased with half height sieves

WEIGHT

- 170kg (packed); 140kg(unpacked)

ORDERING INFORMATION

- **D450** Digital automatic sieve shaker

MODEL EFL2000

EFL2000 Sieve Shaker

This heavy-duty shaker is for sieves up to 315mm and 12in in diameter. The EFL2000 is equipped with a dynamic power source that ensures the right vibration is imparted to the sample for fast, accurate, and reproducible tests.

Vertical movement is fixed to ensure that the sample spends maximum time seeking apertures rather than being suspended in mid-air. Unique vibratory action keeps the sieve's apertures from clogging. A special clamping device holds sieves firmly in place; conversely, they can be removed and replaced quickly and easily.

The EFL2000's timer can be pre-set for any duration up to 60 minutes or continuously. The shaker has non-corrodible, non-metallic springs. It can be used for both wet or dry sieving.

WEIGHT

- 100kg (packed); 83kg (unpacked)

ORDERING INFORMATION

- **EFL2000** Automatic sieve shaker

MODEL EFL2000 SPECIFICATIONS	
Diameter	510mm (handles 2 x 35mm)
Timer	0-60min or continuous
Power	230V, 50Hz, 485VA 115V, 60Hz, 390VA (other voltages on request)
Capacity	up to 12 full height, 24 half height sieves of 250mm/8in or six full height or 12 half sieves of 315mm; includes lid and receiver

MODEL TO-M200

Sieve Analysis by Endecotts

This sieve combines low cost with the benefits of a well designed and engineered shaker. The Minor M200 is suitable for 200mm/8in or 100mm diameter sleeves (sold separately). It is ideal for either the laboratory or plant because it is compact and genuinely portable, weighing just 17kg. There are no rotating parts, so it is quiet and maintenance-free.

The sieve stack is held firmly in position between the location and clamp plates by straps that allow the unit to fit in spaces less than 200mm high. For continuous timed sieving, set the 0 to 60 minute timer and select "I". The vibrating action imparts a precise movement to the sieve stack, ensuring efficient sieving and excellent repeatability. Anti-vibration feet ensure good stability.

WEIGHT

- 17kg

ORDERING INFORMATION

- **Minor M200 (B)** Automatic sieve shaker

MODEL TO-M200 SPECIFICATIONS	
Height	180mm(excluding sieve stack)
Timer	0-60min or continuous
Power	230V, 50Hz, 80VA 115V, 60Hz, 60VA
Capacity	Up to eight full height 200mm (8in) sieve

MODEL SIEVE

Sieves

Tinius Olsen offers a wide range of sieve models from the Endecotts line. Most are brass or stainless steel. The following tables include the most popular ones, which are based on the most widely used ISO, BSI and ASTM standards.

Wire mesh series ISO 3310-1:2000 BS 410-1:2000 Nominal aperture sizes

mm									
125.00	112.00	106.00	100.00	90.00	80.00	75.00	71.00	63.00	56.00
53.00	50.00	45.00	40.00	37.50	35.50	31.50	28.00	26.50	25.00
22.40	20.00	19.00	18.00	16.00	14.00	13.20	12.50	11.20	10.00
9.50	8.00	7.10	6.70	6.30	5.60	5.00	4.75	4.50	4.00
3.55	3.35	3.15	2.80	2.50	2.36	2.24	2.00	1.80	1.70
1.60	1.40	1.25	1.18	1.12	1.00				
µm									
900	850	800	710	630	600	560	500	450	425
400	355	315	300	250	224	212	200	180	160
150	140	125	112	106	100	90	80	75	71
63	56	53	50	45	40	38	36	32	25
20									

International test sieve series ISO 3310:2000 British standard sieve series BS 410:2000

Perforated plate series ISO 3310-2:1999 BS 410-2:2000 Nominal aperture sizes

mm	mm	µm
125.00	20.00	3.55
112.00	19.00	3.35
106.00	18.00	3.15
100.00	16.00	2.80
90.00	14.00	2.50
80.00	13.20	2.36
75.00	12.50	2.24
71.00	11.20	2.00
63.00	10.00	1.80
56.00	9.50	1.70
53.00	9.00	1.60
50.00	8.00	1.40
45.00	7.10	1.25
40.00	6.70	1.18
37.50	6.30	1.12
31.50	5.60	1.00
28.00	5.00	
26.50	4.75	
25.00	4.50	
22.40	4.00	

Sieve diameters and frame materials

Diameter	Height	Depth to mesh or plate	Frame material
mm		mm	
38.00	Full	19.00	Br or SS
100.00	Full	40.00	Br or SS
100.00	Half	20.00	Br or SS
150.00	Full	38.00	SS
200.00	Full	50.00	Br or SS
200.00	Half	25.00	Br or SS
250.00	Full	60.00	SS
300.00	Full	75.00	Br or SS
300.00	Half	40.00	Br or SS
315.00	Full	75.00	SS
350.00	Full	60.00	SS
400.00	Full	65.00	SS
450.00	Full	100.00	SS

American standard sieve series ASTM E11:95

Sieve diameters and frame materials

Diameter	Height	Depth to mesh or plate	Frame material
inches		inches	
3	Full	1-1/4	Br or SS
8	Full	2	Br or SS
8	Half	1	Br or SS
12	Full	3	Br or SS
12	Half	1	Br or SS
18	Full	3-1/2	SS

Wire mesh series Designation

Standard	Alternative	Standard	Alternative
mm	inch or no.	µm	inch or no.
125.00	5.00	850	No. 20
106.00	4.24	710	No. 25
100.00	4	600	No. 30
90.00	3-1/2	500	No. 35
75.00	3	425	No. 40
63.00	2-1/2	355	No. 45
53.00	2.12	300	No. 50
50.00	2	250	No. 60
45.00	1-3/4	212	No. 70
37.00	1-1/2	180	No. 80
31.50	1-1/4	150	No. 100
26.50	1.06	125	No. 120
25.00	1	106	No. 140
22.40	7/8	90	No. 170
19.00	3/4	75	No. 200
16.00	5/8	63	No. 230
13.20	0.530	53	No. 270

Standard	Alternative	Standard	Alternative
mm	inch or no.	µm	inch or no.
12.50	1/2	45	No. 325
11.20	7/16	38	No. 400
9.50	3/8	32	No. 450
8.00	5/16	25	No. 500
6.70	0.265	20	No. 635
6.30	1/4		
5.60	No. 3-1/2		
4.75	No. 4		
4.00	No. 5		
3.35	No. 6		
2.80	No. 7		
2.36	No. 8		
2.00	No. 10		
1.70	No. 12		
1.40	No. 14		
1.18	No. 16		
1.00	No. 18		

AGGREGATE/SAND

MODEL TO-051

Particle Size Sieve Analysis

Tinius Olsen offers the following range of equipment for performing particle size analysis:

APPLICABLE STANDARDS

- **ASTM D422; AASHTO T88**

Options

Aperture size(mm)	TO-051 (45cm dia)	TO-052 (30cm dia)
125.00	TO-05101	-
106.00	TO-05102	-
100.00	TO-05103	TO-05230
90.00	TO-05104	TO-05225
80.00	TO-05105	-
75.00	TO-05106	TO-05202
63.00	TO-05107	TO-05203
53.00	TO-05108	TO-05204
50.00	TO-05109	TO-05205
45.00	TO-05110	TO-05206
40.00	TO-05111	TO-05207
37.50	TO-05112	TO-05208
31.50	TO-05113	TO-05209
26.50	TO-05114	TO-05210
25.00	TO-05115	TO-05211
22.40	TO-05116	TO-05212
20.00	TO-05117	TO-05213
19.00	TO-05118	TO-05214
16.00	TO-05119	TO-05215
14.00	-	TO-05235
13.20	TO-05120	TO-05216
12.50	TO-05121	TO-05217
11.20	TO-05122	TO-05218
10.00	TO-05123	TO-05219
9.50	TO-05124	TO-05220
8.60	TO-05125	-
8.00	TO-05126	TO-05221
6.70	-	TO-05224
6.30	TO-05128	TO-05222
6.00	-	TO-05236
5.00	TO-05129	TO-05223
4.75	TO-05130	TO-05224
4.00	-	TO-05224-SI
3.35	-	TO-05226
2.80	TO-05131	TO-05233
3.36	TO-05132	TO-05232
2.00	-	TO-05237
Pan & cover	TO-05150	TO-05250

ORDERING INFORMATION

- **TO-051** Sieve, GI frame of 45cm diameter
- **TO-052** Sieve, GI frame of 30cm diameter

MODEL TO-339

Bulk Density, Voids and Bulking

The shape of aggregate particles is very important. This is because it affects the ease of handling the mixture of aggregate and binder, for example, the workability of concrete or the stability of mixtures that depends on the interlocking of particles. The bulk density and voids in between aggregates can be ascertained using Cylindrical Metal Measures.

APPLICABLE STANDARDS

- **BS 812; ASTM C29, C138**

ORDERING INFORMATION

- **TO-339** Bulk density apparatus
- **TO-454** Measures, set of three

SUPPLIED AS STANDARD

- **TO-45401** Measures, 3 liter
- **TO-45402** Measures, 15 liter
- **TO-45403** Measures, 30 liter
- **TO-354** Steel tamping rod, 16mm dia

OPTIONAL ACCESSORIES

- **TO-33901** Bulk density, 20 liter
- **TO-33902** Bulk density, 10 liter
- **TO-354** Steel tamping rod, 16mm dia
- **TO-45401** Measures, 3 liter
- **TO-45402** Measures, 15 liter
- **TO-45403** Measures, 30 liter
- **TO-45404** Measures, 7 liter

MODEL TO-445

Riffle Sample Divider

The Riffle Sample Divider consists of a metal box, fitted with a series of chutes of equal width, which discharge the material alternatively in opposite directions into separate pans. The chutes of the riffle are steep enough to allow rapid flowing of the material. Supplied complete with three containers.

APPLICABLE STANDARDS

- **BS 1377, 1924, 812; EN 932-1**

DIMENSION

- 910 x 530 x 1190mm (L x W x H)

ORDERING INFORMATION

- **TO-445** Riffle Sample Divider 13mm slot width, 14 slots, approx 2.1dm³ capacity
- **TO-446** Riffle Sample Divider 25mm slot width, 16 slots, approx 4.4dm³ capacity

MODEL TO-450

Determination of Flakiness and Elongation

Aggregates that are flaky and/or elongated will often lower the workability of a concrete mix, and may also affect long term durability. In bituminous mixtures, flaky aggregates make for a harsh mix and may also crack and break up during compacting by rolling. The flakiness of aggregate is determined by measuring the thickness of individual particles. We offer both a thickness gauge and length gauge to check the flakiness index and elongation index of the aggregate respectively.

APPLICABLE STANDARD

- **BS 812**

ORDERING INFORMATION

- **TO-450** Thickness gage constructed from heavy gage sheet steel
- **TO-451** Length gage constructed from steel, mounted on a hardwood base

MODEL TO-453

Density Basket

Ruggedly constructed from galvanized wire mesh, 20cm dia x 20cm high (approximate).

APPLICABLE STANDARDS

- **ASTM C127; AASHTO T85**

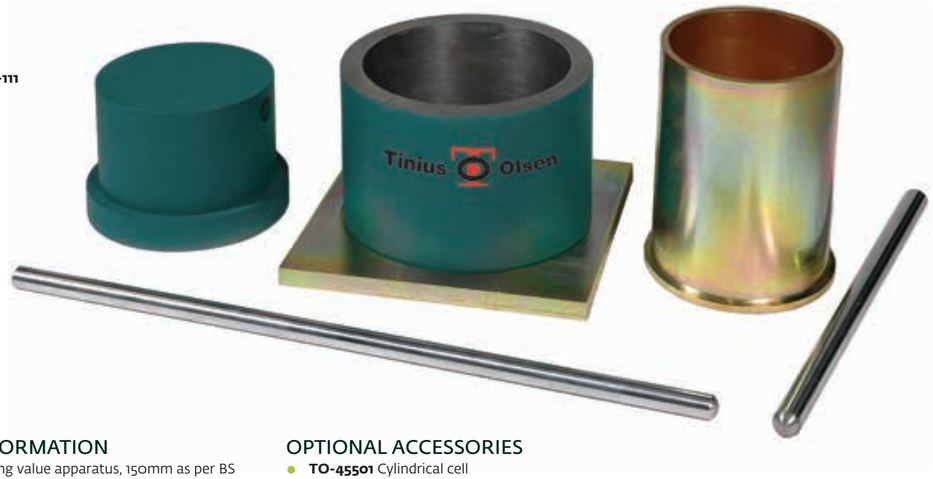
ORDERING INFORMATION

- **TO-453** Density basket

MODEL TO-455-BS

Crushing value equipment

This equipment is used for measuring the crushing resistance of an aggregate.



APPLICABLE STANDARDS

- **BS 812-110, BS 812-111**

ORDERING INFORMATION

- **TO-455-BS** Crushing value apparatus, 150mm as per BS

SUPPLIED AS STANDARD

- **TO-45501** Cylindrical cell
- **TO-45502** Plunger
- **TO-45503** Base plate
- **TO-45504** Tamping rod, 16mm dia, 600mm length
- **TO-45505** Metal measure

OPTIONAL ACCESSORIES

- **TO-45501** Cylindrical cell
- **TO-45502** Plunger
- **TO-45503** Base plate
- **TO-45504** Tamping rod, 16mm dia, 600mm length
- **TO-45505** Metal measure
- **TO-455-BS-1** Crushing value apparatus, 75mm

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

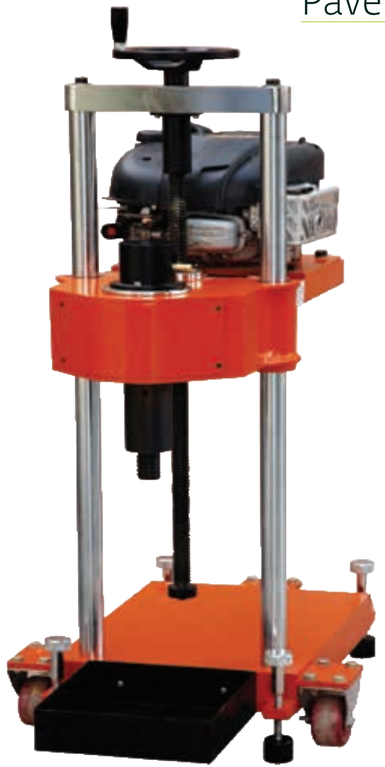
- **TO-515** Penetrometer cone
- **TO-518** Bitumen penetration kit
- **TO-51801** Penetration needle
- **TO-51802** Transfer dish (copper)
- **TO-51803** Aluminium sample containers
- **TO-04201** Penetration test cone
- **TO-04202** Penetration test cup

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.

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

APPLICABLE STANDARDS

- **ASTM D113; AASHTO T51**

PACKAGING INFORMATION

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

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

MODEL TO-040 & TO-041

Liquid Limit Device

The liquid limit is the level of water content at which soil changes from liquid to a plastic state. From an instrumentation perspective, the liquid limit is measured as the point where two halves of a soil sample flow together when jolted in a particular fashion. The equipment consists of a brass cup, which is repeatedly dropped a distance of 1cm onto a hard rubber base.

Typical procedure

The soil sample is placed in the cup and a groove applied down the centre of the sample using the Casagrande grooving tool and gage block. The cup is raised and allowed to fall a distance of 1cm onto a hard rubber base, at a rate of two drops per second, during which the groove closes up gradually as result of the impact. The number of drops required for the groove to close is recorded.

Key features

- High quality design that ensures consistent results.
- Compliant with most relevant international standards.
- Motorized version with an integrated counter available.

APPLICABLE STANDARDS

- **ASTM D4318; AASHTO T89, T90; BS 1377; IS 9259**

ORDERING INFORMATION

BS Standards

- **TO-040-BS-01** Motorized Liquid Limit Device for 110V, 60Hz
- **TO-040-BS-02** Motorized Liquid Limit Device for 220V, 60Hz
- **TO-040-BS-03** Motorized Liquid Limit Device for 220V, 50Hz
- **TO-041-BS** Manual Liquid Limit Device

ASTM Standards

- **TO-040-ASTM-01** Motorized Liquid Limit Device for 110V, 60Hz
- **TO-040-ASTM-02** Motorized Liquid Limit Device for 220V, 60Hz
- **TO-040-ASTM-03** Motorized Liquid Limit Device for 220V, 50Hz
- **TO-041-ASTM** Manual Liquid Limit Device

STANDARD FEATURES

- **TO-04102** Grooving tool and gage for BS
- **TO-04101** ASTM grooving tool

OPTIONAL ACCESSORIES

- **TO-04102** Grooving tool and gage for BS
- **TO-04101** ASTM grooving tool

MODEL TO-054

Motorized Sieve Shaker

A motorized sieve shaker along with digital timer delivers more accurate results compared to mechanical sieves. A compact and lightweight design makes it easy for handling operations and noise reduction makes it more eco-friendly.

Electrically operated mechanical Sieve Shakers are offered for dry sieving. These produce accurate results and eliminate personal errors involved in manual sieving. The Sieve Shakers are popular not only in soil laboratories but also in a number of industries where sieving is required, such as for ores, refractory materials, minor aggregates, pigments, powdered coal, soap, cement, roofing materials, plastic molding powders and pharmaceuticals.

The design is compact and lightweight and can be mounted on a bench top. This eliminates the use of concrete foundation. A digital timer adjustable from 0-99 minutes is incorporated as an integral part of the equipment.

The Sieve Shaker can carry up to eight sieves of 20cm diameter. It is driven by a ¼ HP geared motor. The table is inclined from the vertical axis and the direction of inclination changes progressively in a clockwise direction. In addition to the gyratory motion of the table, there is a tapping motion as well.

APPLICABLE STANDARD

- **EN 932-5**

Key features

- Ideal for dry sieving.
- Used for ores, refractory materials, minor aggregates, pigments, powdered coal, soap, cement, roofing materials, plastic molding powders, and pharmaceuticals.
- Compact and lightweight for benchtop use.
- Employs noise reduction technology.

ORDERING INFORMATION

- **TO-054** Motorized sieve shaker

SUPPLIED AS STANDARD

- Adaptor for 20cm dia sieve
- Digital timer
- Geared motorized unit

OPTIONAL ACCESSORIES

- **TO-05401** Adapter for 30cm diameter sieve

PACKAGING INFORMATION

- **Net weight:** 53kg; **gross weight:** 73kg
- **Packaging dimensions:** 76 x 64 x 53cm

MODEL TO-064

Triaxial Test Load Frame

Triaxial tests

Tinius Olsen's triaxial test system is modular in design and can be tailored to suit a wide range of customer requirements.

The system is made up of various components, with the major items being:

- A 50kN (11,200lbf) capacity load frame.
- Triaxial cell complete with accessories for drained and undrained testing of 2.8in or 70mm diameter specimens to confining pressures of up to 145psi (1,000kPa).
- Data acquisition system.
- Set of electronic measurement transducers for load, displacement, pressure and volume change.
- Data system triaxial software for recording, analysis and report generation in English or Metric units.
- De-aired water tank system for precise application of confining, back and saturation pressures.

This 50kN capacity machine is supplied complete with integral electronic kit for triaxial testing of soil specimens up to 100mm diameter x 200mm long.

It consists of a rigid twin-column construction with an integral, fully variable microprocessor controlled drive unit and LCD display with a touch sensitive keyboard. It is bench-mounted for ease of installation and operation.

Key features

- Microprocessor control.
- Large on-board LED screen display.
- Direct entry via a touch sensitive keyboard.
- Rapid approach and return to datum of platen.
- Fully variable speed to 9.99mm/min.
- Samples up to 100mm diameter.

The use of a microprocessor controlled drive system and keyboard entry provides the load frame with a wide variety of features, including pause and speed reset during test, RS232 interface for computer control, operator programming of speed and control functions, and self-test diagnostics.

A robustly constructed steel case houses the motor drive system and protects against water and dirt. All operating controls are mounted on the front panel of the machine, which is angled and recessed to prevent physical and environmental damage.

APPLICABLE STANDARDS

- **BS 598, 1377, 1924; EN 12697-23, 24, 13286-47; ASTM D1883; AASHTO T193**

ORDERING INFORMATION

- **TO-064E-01** Triaxial Test Load Frame, 110VAC, 60Hz
- **TO-064E-02** Triaxial Test Load Frame, 220VAC, 60Hz
- **TO-064E-03** Triaxial Test Load Frame, 220VAC, 50Hz

MODEL TO-064 SPECIFICATIONS	
Capacity	50kN
Type	Microprocessor-controlled stepper motor drive
Platen speed range	Up to 9.99mm/min
Rapid approach speed	25mm/min
Horizontal clearance	364mm
Maximum vertical clearance	910mm
Maximum platen travel	100mm
Specimen diameter	38mm (50, 75 and 100mm can also be used)

MODEL TO-075

Triaxial Cells

The cells are for testing specimens measuring 38mm diameter x 76mm long and 50mm diameter x 100mm long.

The Triaxial Cell consists of a perspex (acrylic plastic) chamber with an anvil and a loading plunger. Releasing four tie rods easily splits the cell. It is leakproof up to 10 bar (10kg/cm) fluid pressure. Cells that withstand pressures of 20 bar can be made on request.

An oil plug and air vent are provided for introducing a thin layer of oil over water. This provides effective sealing at the plunger for long duration tests. The cell is also fitted with four ball valves of no-volume change type, at the base.

APPLICABLE STANDARDS

- **BS 1377; ASTM D2850, D4767**

SUPPLIED AS STANDARD

38mm Triaxial Cells

- **TO-07501** Top loading pad, perspex, 38mm diameter
- **TO-07502** Plain perspex disc 38mm diameter x 6mm thick
- **TO-07503** Porous stone 38mm diameter x 6mm thick
- **TO-07504** Sheath stretcher for 38mm diameter specimen
- **TO-07505** Sand former for 38mm diameter (1 qty)
- **TO-07506** Rubber sheath for 38mm diameter specimen (set of 12)
- **TO-07507** 4 x drainage tube (short), 38mm diameter
- **TO-07508** 4 x drainage tube (long), 38mm diameter
- **TO-07509** 'O' rings for 38mm diameter specimen (set of 4)
- **TO-03105** Split mold, 38mm diameter

SUPPLIED AS STANDARD

50mm Triaxial Cells

- **TO-07501** Top loading pad, perspex, 38mm diameter
- **TO-07502** Plain perspex disc, 38mm diameter x 6mm thick
- **TO-07503** Porous stone 38mm diameter x 6mm thick
- **TO-07504** Sheath stretcher for 38mm diameter specimen
- **TO-07505** Sand former for 38mm diameter (1 qty)
- **TO-07506** Rubber sheath for 38mm diameter specimen (set of 12)
- **TO-07507** 4 x drainage tube (short), 38mm diameter
- **TO-07508** 4 x drainage tube (long), 38mm diameter
- **TO-07509** 'O' rings for 38mm diameter specimen (set of 4)
- **TO-07510** Brass pedestal 38mm diameter
- **TO-07521** Top loading pad, perspex, 50mm diameter

SUPPLIED AS STANDARD

50mm Triaxial Cells (continued)

- **TO-07522** Plain perspex disc 50mm diameter x 6mm thick
- **TO-07523** Porous stone 50mm diameter x 6mm thick
- **TO-07524** Sheath stretcher for 50mm diameter specimen
- **TO-07525** Sand former for 50mm diameter
- **TO-07526** Rubber sheath for 50mm diameter specimen (set of 12)
- **TO-07527** 4 x drainage tube (short), 50mm diameter
- **TO-07528** 4 x drainage tube (long), 50mm diameter
- **TO-07529** 'O' rings for 50mm diameter specimen (set of 4)
- **TO-07530** Brass pedestal, 50mm diameter
- **TO-03105** Split mold, 38mm diameter
- **TO-03301** Split mold, 50mm diameter
- **TO-07540** Top loading pad, 38mm diameter (plain)
- **TO-07541** Top loading pad, 50mm diameter (plain)

ORDERING INFORMATION

- **TO-075** Triaxial cell suitable for 38mm and 50mm diameter specimens
- **TO-075-38** Triaxial cell suitable for 38mm diameter specimens

OPTIONAL ACCESSORIES

- **TO-07501** Top loading pad, perspex, 38mm diameter
- **TO-07502** Plain perspex disc, 38mm diameter x 6mm thick
- **TO-07503** Porous stone, 38mm diameter x 6mm thick
- **TO-07504** Sheath stretcher for 38mm diameter specimen
- **TO-07505** Sand former for 38mm diameter (1 qty)
- **TO-07506** Rubber sheath for 38mm diameter specimen (set of 12)
- **TO-07507** 4 x drainage tube (short), 38mm diameter
- **TO-07508** 4 x drainage tube (long), 38mm diameter
- **TO-07509** 'O' rings for 38mm diameter specimen (set of 4)
- **TO-07510** Brass pedestal, 38mm diameter
- **TO-07521** Top loading pad, perspex, 50mm diameter
- **TO-07522** Plain perspex disc, 50mm diameter x 6mm thick
- **TO-07523** Porous stone 50mm diameter x 6mm thick
- **TO-07524** Sheath stretcher for 50mm diameter specimen
- **TO-07525** Sand former for 50mm diameter
- **TO-07526** Rubber sheath for 50mm diameter specimen (set of 12)
- **TO-07527** 4 x drainage tube (short), 50mm diameter
- **TO-07528** 4 x drainage tube (long), 50mm diameter
- **TO-07529** 'O' rings for 50mm diameter specimen (set of 4)
- **TO-07530** Brass pedestal, 50mm diameter
- **TO-03105** Split mold, 38mm diameter
- **TO-03301** Split mold, 50mm diameter
- **TO-07540** Top loading pad, 38mm diameter (plain)
- **TO-07541** Top loading pad, 50mm diameter (plain)

MODEL TO-081

Oil Water Constant Pressure System

The Oil Water Constant Pressure System is an extremely versatile apparatus that can be used for a wide range of applications.

This system provides an effective alternative to a Mercury and Water Constant Pressure system, especially where space is at a minimum. The apparatus is designed to provide confining pressure up to 16 bar to triaxial cells.

The system consists of an oil pump, driven by an electric motor during the entire period of operation to maintain the desired pressure. The unit provides variable pressure up to 16 bar, which can be increased or decreased simply by turning a control knob. A transparent oil water interchange vessel is provided to transmit water pressure to the test apparatus.

ORDERING INFORMATION

- **TO-081-1-01** Constant Pressure System, oil/water type, 110VAC, 60Hz
- **TO-081-1-02** Constant Pressure System, oil/water type, 220VAC, 60Hz
- **TO-081-1-03** Constant Pressure System, oil/water type, 220VAC, 50Hz
- **TO-081-2-01** Oil Water Constant Pressure System with two cells, oil/water type, 110VAC, 60Hz
- **TO-081-2-02** Oil Water Constant Pressure System with two cells, oil/water type, 220VAC, 60Hz
- **TO-081-2-03** Oil Water Constant Pressure System with two cells, oil/water type, 220VAC, 50Hz

MODEL TO-081 SPECIFICATIONS	
Range	10 bar (10kg/cm²)
Resolution	0.05 bar (0.05kg/cm²)
Accuracy pressure	± 1% of the indicated

Note: Supplied complete with pressure gages, flow valves and connecting pressure hose.

Key features

- Use of mercury is eliminated.
- Maintains constant pressure continuously.
- Pressure capacity, 10 bar (10kg/cm).
- Also suitable for mobile laboratories.

MODEL TO-085

Data Acquisition System

The Triaxial Data Acquisition System comprises a 10kN (1000kgf) capacity external load cell, a 20 bar (20kg/cm) capacity pore pressure transducer, an LVDT displacement sensor with a range of +10mm, and a 3-channel digital indicator that has been specially designed to meet the requirements of triaxial testing.

ORDERING INFORMATION

- **TO-085-01** Triaxial Data Acquisition System, 110VAC, 60Hz
- **TO-085-02** Triaxial Data Acquisition System, 220VAC, 60Hz
- **TO-085-03** Triaxial Data Acquisition System, 220VAC, 50Hz

MODEL TO-085 SPECIFICATIONS	
TO-08501	**3-channel digital indicator**
Mode of display	Micro-controller multi-line alpha numeric VFD display for all simultaneous channels – no need for channel selection
TO-08502	**External load cell**
Capacity	10kN (1000kgf)
Load cell excitation	5V, DC
Resolution	0.01kN (1kgf)
Sensing element	Strain gages in full bridge configuration
TO-08503	**Pore pressure transducer**
Capacity	20 bar (20kg/cm²)
Pressure cell excitation	5V, DC
Resolution	0.01 bar (0.01kg/cm²)
Sensing element	Strain gages in full bridge configuration
TO-08504	**LVDT displacement transducer**
Range	±10mm
Sensing element	LVDT

MODEL TO-097

De-aired Water Apparatus

The De-aired Water Apparatus works on the principle of removal of dissolved air from the water present in the soil in order to measure the pore pressure. It is used to study the levels of dissolved oxygen acceptable for geotechnical test methods for soil.

Benefits include:

- Time to consolidate soil samples is reduced
- Simultaneous flushing of many hydraulic piezometer lines in dams and earthworks considerably reduces labor and disturbance at the top ends.

Note Any dissolved air in the water will lead to errors in the measurement of pore pressure, particularly at low pressure, and also gives slow or incorrect saturation results.

APPLICABLE STANDARD

- **BS 1377**

ORDERING INFORMATION

- **TO-097-1-01** De-aired Water Apparatus, 110VAC, 60Hz
- **TO-097-1-02** De-aired Water Apparatus, 220VAC, 60Hz
- **TO-097-1-03** De-aired Water Apparatus, 220VAC, 50Hz

OPTIONAL ACCESSORIES

- Pressurized storage tank, capacity 20 liters
- Valves and pressure gage (for storing de-aired water to be used in the field)
- Water pump

Key features

- Fully microprocessor controlled.
- Real time clock function included.
- Oil free-vacuum pump.
- The unit is fully automatic and shuts off when the de-airing program is complete.

MODEL TO-105-2

Direct Shear Test Apparatus

Every building or structure imposes loads on the soil supporting the foundation and this develops stress among the soil particles; failure of this stress leads to the sliding of one body of soil relative to the surrounding mass.

Tinius Olsen's direct shear test apparatus is a motorized dead weight testing machine designed for direct and residual shear testing on undisturbed and remolded soil specimens. The machine uses a 10:1 beam loading device to control confining pressures, a load cell with readout measures shear pressure and a displacement transducer to measure shear and vertical displacement.

ORDERING INFORMATION

- **TO-105-2-01** Direct Shear Test Apparatus, 2kN with data acquisition unit, 110VAC, 60Hz
- **TO-105-2-02** Direct Shear Test Apparatus, 2kN with data acquisition unit, 220VAC, 60Hz
- **TO-105-2-03** Direct Shear Test Apparatus, 2kN with data acquisition unit, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-10401** Shear box assembly
- **TO-10402** Shear box housing with linear bearing case
- **TO-10405** Specimen cutter
- **TO-10410** Weight set to attain 3kg/cm² stress on sample
- **TO-10501** Data acquisition system

MODEL TO-105-2 SPECIFICATIONS

Mode of display	Micro-controller multi-line alpha numeric display for all simultaneous channels
Capacity	2kN (200kgf) load cell
Range	± 20 mm. LVDT displacement sensor with 3m long cable
Shear measurement	Direct/residual
Fast forward/ reverse speed	10mm/min
Rates of strain	Up to 9.99mm/minute
Specimen size	60 x 60 x 25mm

APPLICABLE STANDARDS

- **BS 1377; EN 1997-2; ASTM D3080**

Key features

- Microprocessor control.
- Rapid approach and return to start datum.
- Fully variable speed, up to 9.99mm/min.
- Reduced operator involvement.
- Direct entry through keyboard.
- Direct reading in engineering units.
- Modular transducer system.

OPTIONAL ACCESSORIES

- **TO-10401** Shear box assembly
- **TO-10402** Shear box housing with linear bearing case
- **TO-10405** Specimen cutter
- **TO-10410** Weight set to attain 3kg/cm² stress on sample

MODEL TO-114

Automatic Soil Compactor

Preparing specimens for compaction studies can be costly and time consuming. The Tinius Olsen Compactor automatically compacts soil specimens, eliminating the effort of hand compaction. The height and weight of the hammer is adjustable to suit test requirements. An automatic blow pattern ensures optimum compaction for each layer of soil. The hammer itself travels across the mold and the table rotates the mold in equal steps on a base that is extremely stable. The number of blows per layer can be set at the beginning of the test by means of the simple digital counter system.

STANDARD FEATURES

BS Standards

- **TO-11201** Proctor compaction mold for light compaction – 105mm ID x 115.5mm high
- **TO-11201-H** Compaction mold for heavy compaction – 152mm ID x 127mm high

ASTM Standards

- **TO-11301** Compaction mold for light compaction – 101.6mm ID x 116.4mm high
- **TO-11301-H** Compaction mold for heavy compaction – 152mm ID x 116.4mm high

AUS Standards

- **TO-11201-AS** Light compaction mold
- **TO-11201-H-AS** Heavy compaction mold

PACKAGING INFORMATION

- **Net weight:** 131kg; **gross weight:** 183kg
- **Packaging dimensions:** 165 x 48 x 88cm

APPLICABLE STANDARDS

- **BS 1377; EN 1997-2, 1924; ASTM D558, D560, D698, D1557; AASHTO T99, T134, T135, T136, T180**

OPTIONAL ACCESSORIES

- **TO-11201** Proctor compaction mold for light compaction – 105mm ID x 115.5mm high
- **TO-11201-H** Compaction mold for heavy compaction – 152mm ID x 127mm high
- **TO-11301** Compaction mold for light compaction – 101.6mm ID x 116.4mm high
- **TO-11301-H** Compaction mold for heavy compaction – 152mm ID x 116.4mm high
- **TO-11201-AS** Light compaction mold – 400 x 600mm
- **TO-11201-H-AS** Heavy compaction mold – 400 x 600mm

ORDERING INFORMATION

- **TO-114-BS-01** Automatic Soil Compactor, to BS EN standards, configured for operation at 110VAC, 60Hz
- **TO-114-BS-02** Automatic Soil Compactor, to BS EN standards, configured for operation at 220VAC, 60Hz
- **TO-114-BS-03** Automatic Soil Compactor, to BS EN standards, configured for operation at 220VAC, 50Hz
- **TO-114-ASTM-01** Automatic Soil Compactor, to ASTM standards, configured for operation at 110VAC, 60Hz
- **TO-114-ASTM-02** Automatic Soil Compactor, to ASTM standards, configured for operation at 220VAC, 60Hz
- **TO-114-ASTM-03** Automatic Soil Compactor, to ASTM standards, configured for operation at 220VAC, 50Hz
- **TO-114-AS-01** Automatic Soil Compactor, to AUS standards, configured for operation at 110VAC, 60Hz
- **TO-114-AS-02** Automatic Soil Compactor, to AUS standards, configured for operation at 220VAC, 60Hz
- **TO-114-AS-03** Automatic Soil Compactor, to AUS standards, configured for operation at 220VAC, 50Hz
- **TO-114-ASTM-03** Automatic Soil Compactor, to ASTM standards, configured for operation at 220VAC, 50Hz
- **TO-114-AS-01** Automatic Soil Compactor, to AUS standards, configured for operation at 110VAC, 60Hz
- **TO-114-AS-02** Automatic Soil Compactor, to AUS standards, configured for operation at 220VAC, 60Hz
- **TO-114-AS-03** Automatic Soil Compactor, to AUS standards, configured for operation at 220VAC, 50Hz

MODEL TO-114 SPECIFICATIONS	
Rammer	Circular faced, 50.8mm/2in diameter foot; adjustable to either 2.5kg/5.5lb or 4.5kg/10lb weight
Drop	Adjustable to either 305mm/12in or 457mm/18in
Controls	Digital counter system, selector switch for either standard proctor test or modified proctor/CBR testing
Dimensions	(WxDxH) 250 x 430 x 1400mm/ 10 x 17 x 55in
Weight (net)	190kg/419lb
Note: Compaction molds are not included and must be ordered separately	

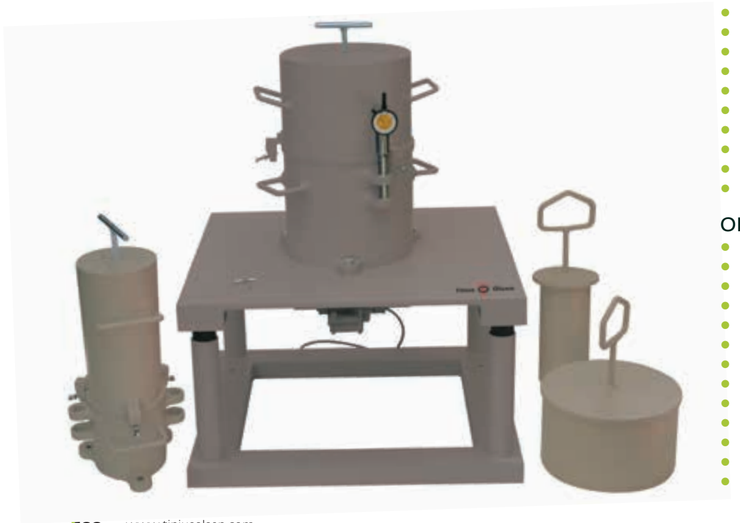
Key features

- Pre-set blow pattern ensures even compaction.
- Solid state controls for reliability and ease of maintenance.
- Automatic counter reset after completion of blow pattern.

MODEL TO-115

Relative Density Apparatus

Relative density relates the dry density of cohesionless soil to the maximum and minimum densities. The degree of compaction of cohesion or less soil can be stated in terms of relative density.



ORDERING INFORMATION

- **TO-115-01** Relative Density Apparatus 110V, 60Hz
- **TO-115-02** Relative Density Apparatus 220V, 60Hz
- **TO-115-03** Relative Density Apparatus 240V, 50Hz

SUPPLIED AS STANDARD

- **TO-11501** Vibrating table, frequency 3600rpm
- **TO-11502** Cylindrical metal mold volume 3000ml
- **TO-11503** Guide sleeve for TO-11502
- **TO-11504** Surcharge base plate for TO-11502
- **TO-11505** Handle for TO-11504 and TO-11509
- **TO-11506** Surcharge weight for TO-11502
- **TO-11507** Cylinder metal mold volume 15000ml
- **TO-11508** Guide sleeve for TO-11507
- **TO-11509** Surcharge base plate for TO-11507
- **TO-11510** Surcharge weight for TO-11507
- **TO-11511** Dial gage holder
- **TO-11512** Calibrating bar 75 x 300 x 3 mm
- **TO-072** Dial gage

OPTIONAL ACCESSORIES

- **TO-11501** Vibrating table, frequency 3600rpm
- **TO-11502** Cylindrical metal mold volume 3000ml
- **TO-11503** Guide sleeve for TO-11502
- **TO-11504** Surcharge base plate for TO-11502
- **TO-11505** Handle for TO-11504 & TO-11509
- **TO-11506** Surcharge weight for TO-11502
- **TO-11507** Cylinder metal mold volume 15000ml
- **TO-11508** Guide sleeve for TO-11507
- **TO-11509** Surcharge base plate for TO-11507
- **TO-11510** Surcharge weight for TO-11507
- **TO-11511** Dial gage holder
- **TO-11512** Calibrating bar 75 x 300 x 3mm
- **TO-072** Analog dial gage

MODEL TO-120

CBR Test Apparatus – Analog

The California Bearing Ratio test (usually called CBR test) is an empirical test developed in California, USA. It determines the relative bearing ratio and expansion characteristics under known surcharge weight of base, sub base and sub grade soils for the design of roads, pavements and runways. The CBR test is used extensively in selection of materials and control of sub grades.

The test can be performed in the laboratory on prepared samples or in-situ on location. Because of the empirical nature of the test, it is valid only for the application for which it was developed i.e., the design of highway base thickness.

This load frame is designed for conducting Unconfined, Triaxial, CBR and other routine tests.

The loading system comprises of a screw jack with detachable handle. The lower platen moves up and down. The top bracket is adjustable for vertical clearance and has an adaptor for connecting standard proving rings. A dial gage mounting bracket is provided on one of the two pillars. Rate of strain: 1.00 and 1.27mm/min.

MODEL TO-120 SPECIFICATIONS	
Dimensions	550 x 400 x 1220mm
Maximum vertical clearance	800mm
Horizontal clearance	255mm
Platen diameter	133mm
Platen travel	105mm
Weight	80kg
Note: This test, being of an empirical nature, is valid only for the application for which it was developed, i.e. the design of highway base thicknesses.	

APPLICABLE STANDARDS

- **BS 1377, 1924; EN 13286-47; ASTM D1883; AASHTO T193**

PACKAGING INFORMATION

- **Net weight:** 125kg; **gross weight:** 198kg
- **Packaging dimensions:** 76 x 53 x 150cm

Key features

- Two-speed machine (BS/EN and ASTM).
- Rapid platen adjustment.
- Complete with stabilizing bar.
- Compact, bench-mounting design.
- Options for mechanical or electronic measurement.

SUPPLIED AS STANDARD

- **TO-274** Proving ring 50kN
- **TO-072** Dial gage 0.25 x 0.01mm

See the next two pages for more details of the standard accessories supplied with the main unit.

Differences according to standards		
	BS/EN standards	**ASTM/AASHTO standards**
Mold	152 x 127mm (inside dia x height)	152.4 x 177.8mm (inside dia x height)
Collar	51mm height, fits both ends of mold	50.8mm height, fits both ends of mold
Base plate	Solid, fits both ends of mold	Perforated
Construction	All steel, plated	All steel, plated
Weight	7.3kg	9kg

MODEL TO-120

CBR Test Apparatus – Analog (continued)

BS 1377, 1924; EN 13286-4, EN 1997-2

ORDERING INFORMATION

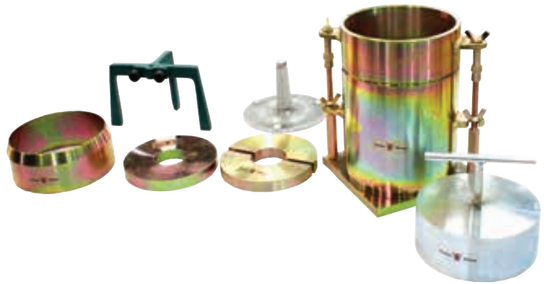
- **TO-120-1-01-BS** CBR Test Apparatus complete with accessories, 110VAC, 60Hz
- **TO-120-1-02-BS** CBR Test Apparatus complete with accessories, 220VAC, 60Hz
- **TO-120-1-03-BS** CBR Test Apparatus complete with accessories, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-12001-BS** BS CBR mold complete with collar and base plate
- **TO-12002-BS** BS CBR base plate
- **TO-12003-BS** BS CBR extension collar
- **TO-12004-BS** Penetration piston as per BS
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-BS** BS spacing compacting disc
- **TO-12007-BS** BS Annular surcharge weight 2kg
- **TO-12008-BS** BS Split surcharge weight 2kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-BS** BS CBR cutting collar
- **TO-274** Proving ring, 50kN
- **TO-072** Dial gage 25mm travel x 0.01mm least count
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall

OPTIONAL ACCESSORIES

- **TO-12001-BS** BS CBR mold complete with collar and base plate
- **TO-12002-BS** BS CBR base plate
- **TO-12003-BS** BS CBR extension collar
- **TO-12004-BS** Penetration piston as per BS
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-BS** BS spacing compacting disc
- **TO-12007-BS** BS Annular surcharge weight 2kg
- **TO-12008-BS** BS Split surcharge weight 2kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-BS** BS CBR cutting collar
- **TO-072** Dial gage 25mm travel x 0.01mm least count
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall



ASTM D1883; AASHTO T193

ORDERING INFORMATION

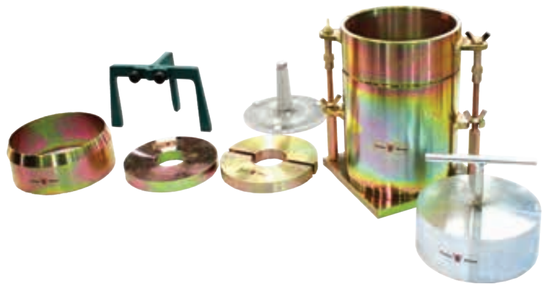
- **TO-120-1-01-ASTM** CBR Test Apparatus complete with accessories, 110VAC, 60Hz
- **TO-120-1-02-ASTM** CBR Test Apparatus complete with accessories, 220VAC, 60Hz
- **TO-120-1-03-ASTM** CBR Test Apparatus complete with accessories, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-12001-ASTM** ASTM CBR mold complete with collar and base plate
- **TO-12002-ASTM** ASTM CBR base plate
- **TO-12003-ASTM** ASTM CBR extension collar
- **TO-12004-ASTM** Penetration piston as per ASTM
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-ASTM** ASTM spacing compacting disc
- **TO-12007-ASTM** ASTM Annular surcharge weight 2.27kg
- **TO-12008-ASTM** ASTM Split surcharge weight 2.27kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-ASTM** ASTM CBR cutting collar
- **TO-274** Proving ring, 50kN
- **TO-072** Dial gage 25mm travel x 0.01mm least count
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall

OPTIONAL ACCESSORIES

- **TO-12001-ASTM** ASTM CBR mold complete with collar and base plate
- **TO-12002-ASTM** ASTM CBR base plate
- **TO-12003-ASTM** ASTM CBR extension collar
- **TO-12004-ASTM** Penetration piston as per ASTM
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-ASTM** ASTM spacing compacting disc
- **TO-12007-ASTM** ASTM Annular surcharge weight 2.27kg
- **TO-12008-ASTM** ASTM Split surcharge weight 2.27kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-ASTM** ASTM CBR cutting collar
- **TO-072** Dial gage 25mm travel x 0.01mm least count
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall



MODEL TO-121

CBR Test Apparatus – Digital

The California Bearing Ratio test (usually called CBR test) is an empirical test developed in California, USA. It determines the relative bearing ratio and expansion characteristics under known surcharge weight of base, sub base and sub grade soils for the design of roads, pavements and runways. The CBR test is used extensively in selection of materials and control of sub grades.

The test can be performed in the laboratory on prepared samples or in-situ on location. Because of the empirical nature of the test, it is valid only for the application for which it was developed i.e., the design of highway base thickness.

This load frame is designed for conducting Unconfined, Triaxial, CBR and other routine tests.

The loading system comprises of a screw jack with detachable handle. The lower platen moves up and down. The top bracket is adjustable for vertical clearance and has an adaptor for connecting standard load cells. A display sensor mounting bracket is provided on one of the two pillars and a data acquisition system accompanies the equipment. Rate of strain: 1.00 and 1.27 mm/min.

SUPPLIED AS STANDARD

- **TO-12101** Data acquisition system comprises digital indicator, load cell 50kN, displacement sensor 0.20mm

See the next two page for more details of the standard accessories supplied with the main unit.

APPLICABLE STANDARDS

- **BS 1377, 1924; EN 13286-47; ASTM D1883; AASHTO T193**

Key features

- Two-speed machine (BS/EN and ASTM).
- Rapid platen adjustment.
- Complete with stabilizing bar.
- Compact, bench-mounting design.
- Options for mechanical or electronic measurement.

Differences according to standards

	BS/EN standards	ASTM/AASHTO standards
Mold	152 x 127mm (inside dia x height)	152.4 x 177.8mm (inside dia x height)
Collar	51mm height, fits both ends of mold	50.8mm height, fits both ends of mold
Base plate	Solid, fits both ends of mold	Perforated
Construction	All steel, plated	All steel, plated
Weight	7.3kg	9kg

MODEL TO-121 SPECIFICATIONS

Dimensions	550 x 400 x 1220mm
Maximum vertical clearance	800mm
Horizontal clearance	255mm
Platen diameter	133mm
Platen travel	105mm
Weight	80kg

Note: This test, being of an empirical nature, is valid only for the application for which it was developed, i.e. the design of highway base thicknesses.

PACKAGING INFORMATION

- **Net weight:** 75kg; g**ross weight:** 123kg
- **Packaging dimensions:** 76 x 53 x 150cm

BS 1377, 1924; EN 13286-4, EN 1997-2

ORDERING INFORMATION

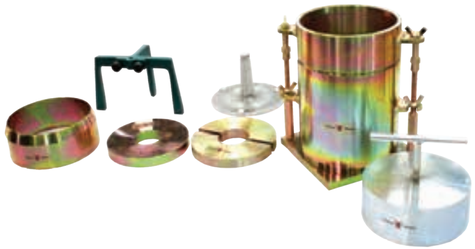
- **TO-121-1-01-BS** CBR Test Apparatus with accessories, 110VAC, 60Hz
- **TO-121-1-02-BS** CBR Test Apparatus with accessories, 220VAC, 60Hz
- **TO-121-1-03-BS** CBR Test Apparatus with accessories, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-12001-BS** BS CBR mold with collar and base plate
- **TO-12002-BS** BS CBR base plate
- **TO-12003-BS** BS CBR extension collar
- **TO-12004-BS** Penetration piston as per BS
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-BS** BS spacing compacting disc
- **TO-12007-BS** BS annular surcharge weight 2kg
- **TO-12008-BS** BS split surcharge weight 2kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-BS** BS CBR cutting collar
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN load cell and 20mm LVDT, 110VAC, 60Hz
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN load cell and 20mm LVDT, 220VAC, 60Hz
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN load cell and 20mm LVDT, 220VAC, 50Hz
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall

OPTIONAL ACCESSORIES

- **TO-12001-BS** BS CBR mold with collar and base plate
- **TO-12002-BS** BS CBR base plate
- **TO-12003-BS** BS CBR extension collar
- **TO-12004-BS** Penetration piston as per BS
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-BS** BS spacing compacting disc
- **TO-12007-BS** BS annular surcharge weight 2kg
- **TO-12008-BS** BS Split surcharge weight 2kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-BS** BS CBR cutting collar
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall



MODEL TO-121

CBR Test Apparatus – Digital (continued)

ASTM D1883; AASHTO T193

ORDERING INFORMATION

- **TO-121-1-01-ASTM** CBR Test Apparatus with accessories, 110VAC, 60Hz
- **TO-121-1-02-ASTM** CBR Test Apparatus with accessories, 220VAC, 60Hz
- **TO-121-1-03-ASTM** CBR Test Apparatus with accessories, 220VAC, 50Hz

SUPPLIED AS STANDARD

- **TO-12001-ASTM** ASTM CBR mold with collar and base plate
- **TO-12002-ASTM** ASTM CBR base plate
- **TO-12003-ASTM** ASTM CBR extension collar
- **TO-12004-ASTM** Penetration piston as per ASTM
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-ASTM** ASTM spacing compacting disc
- **TO-12007-ASTM** ASTM annular surcharge weight 2.27kg
- **TO-12008-ASTM** ASTM split surcharge weight 2.27kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-ASTM** ASTM CBR cutting collar
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN load cell and 20mm LVDT, 110VAC, 60Hz
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN Load cell and 20mm LVDT, 220VAC, 60Hz
- **TO-12101-01** Electronic CBR kit; digital indicator, 50kN Load cell and 20mm LVDT, 220VAC, 50Hz
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall

OPTIONAL ACCESSORIES

- **TO-12001-ASTM** ASTM CBR mold with collar and base plate
- **TO-12002-ASTM** ASTM CBR base plate
- **TO-12003-ASTM** ASTM CBR extension collar
- **TO-12004-ASTM** Penetration piston as per ASTM
- **TO-12005** Adjustable bracket for penetration dial gage
- **TO-12006-ASTM** ASTM spacing compacting disc
- **TO-12007-ASTM** ASTM annular surcharge weight 2.27kg
- **TO-12008-ASTM** ASTM Split surcharge weight 2.27kg
- **TO-12009** Perforated swell plate
- **TO-12010** Metal tripod for dial gage
- **TO-12011-ASTM** ASTM CBR cutting collar
- **TO-11202** Compacting rammer for light compaction 2.5kg x 300mm fall
- **TO-11202-H** Compacting rammer for heavy compaction 4.5kg x 450mm fall

MODEL TO-126

Consolidation Apparatus – Analog

Key features

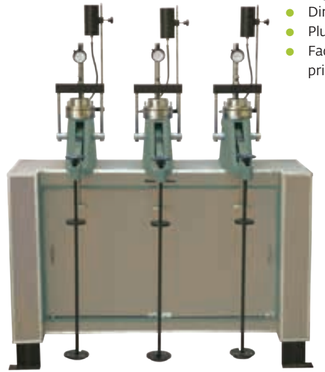
- High capacity – 8800kPa on 50mm diameter specimens using 11:1 beam ratio.
- Triple beam ratio, 9:1, 10:1, 11:1.
- Compact unit ensures maximum space saving.

The Consolidation Apparatus consists of a fixed ring type of consolidometer cell for testing specimens of 60mm dia x 20mm thick, but a variety of specimen sizes from 50 to 100mm dia can also be tested. Additionally, the same loading unit can be used with optional floating ring consolidometer cells.

The standard consolidation apparatus is supplied with a weight set to achieve a total pressure of 10kg/cm² (in addition to the seating load of 0.05kg/cm² on the specimen), but an additional set of weights is required to reach the full capacity of 20kg/cm².

The consolidation is measured by conventional dial gages or digital gages and common configurations include a single and three-gang consolidometers, with a six-gang version available on special request.

- Digital readout reduces the possibility of operator error.
- Direct reading in mm.
- Plug-in transducer module system.
- Facility for connecting readout unit to compatible logging or printing system.



ORDERING INFORMATION

- **TO-126-1-AN** Consolidation stage, single station, with TO-070 analog dial gage
- **TO-126-3-AN** Consolidation stage, three station, with three TO-070 analog dial gages

SUPPLIED AS STANDARD

- **TO-12501** Consolidation unit
- **TO-12502** Cell assembly complete with all accessories suitable for 60mm diameter x 20mm thick specimens
- **TO-12503** Set of 29 weights to generate 10kg/cm² stress on 60mm diameter specimen
- **TO-12504** Water reservoir with tube, T connection and pinch cock

OPTIONAL ACCESSORIES

- **TO-12502** Cell assembly complete with all accessories suitable for 60mm diameter x 20mm thick specimens
- **TO-12503** Set of 29 weights to generate 10kg/cm² stress on 60mm diameter specimen
- **TO-12504** Water reservoir with tube, T connection and pinch cock
- **TO-070** Dial gage, 5mm x 0.002mm

APPLICABLE STANDARDS

- **BS 1377; EN 1997-2; ASTM D2435, D4546; AASHTO T216**

MODEL TO-126

Consolidation Apparatus – Digital

The Consolidation Apparatus consists of a fixed ring type of consolidometer cell for testing specimens of 60mm dia x 20mm thick, but a variety of specimen sizes from 50 to 100mm dia can also be tested. Additionally, the same loading unit can be used with optional floating ring consolidometer cells.

The standard consolidation apparatus is supplied with a weight set to achieve a total pressure of 10kg/cm² (in addition to the seating load of 0.05kg/cm² on the specimen), but an additional set of weights is required to reach the full capacity of 20kg/cm².

The consolidation is measured by conventional dial gages or digital gages and common configurations include a single and three-gang consolidometers, with a six-gang version available on special request.

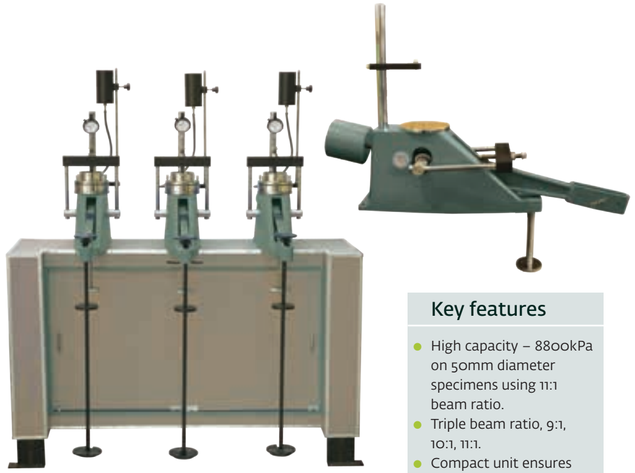
- Digital readout reduces the possibility of operator error.
- Direct reading in mm.
- Plug-in transducer module system.
- Facility for connecting readout unit to compatible logging or printing system.

ORDERING INFORMATION

- **TO-126-1-DG** Consolidation stage, single station, with TO-072DG digital gage
- **TO-126-3-DG** Consolidation stage, three station, with three TO-072DG digital gages

SUPPLIED AS STANDARD

- **TO-12501** Consolidation Unit
- **TO-12502** Cell assembly complete with all accessories suitable for 60mm diameter x 20mm thick specimens
- **TO-12503** Set of 29 weights to generate 10kg/cm² stress on 60mm diameter specimen
- **TO-12504** Water reservoir with tube, T connection and pinch cock



Key features

- High capacity – 8800kPa on 50mm diameter specimens using 11:1 beam ratio.
- Triple beam ratio, 9:1, 10:1, 11:1.
- Compact unit ensures maximum space saving.

OPTIONAL ACCESSORIES

- **TO-12502** Cell assembly complete with all accessories suitable for 60mm diameter x 20mm thick specimens
- **TO-12503** Set of 29 weights to generate 10kg/cm² stress on 60mm diameter specimen
- **TO-12504** Water reservoir with tube, T connection and pinch cock
- **TO-070** Dial gage, 5mm x 0.002mm
- **TO-12801** Digital displacement sensor, 0-10mm
- **TO-12802** Digital indicator for single channel
- **TO-13001** Digital indicator for three channels

APPLICABLE STANDARDS

- **BS 1377; EN 1997-2; ASTM D2435, D4546; AASHTO T216**

MODEL TO-157

Plate Bearing Test Apparatus

The Plate Bearing Test is essentially a model test of foundations. It gives the load deformation characteristics for determining the ultimate bearing capacity of foundations. This test is a standard technique for determining bearing capacity of soils and the results of other methods are compared and calibrated with the values obtained from the plate bearing test. In this method, a steel plate is subjected to a gradual increment of load and the corresponding settlement is noted. The ultimate bearing capacity is taken as the load at which the settlement increases at a rapid rate.

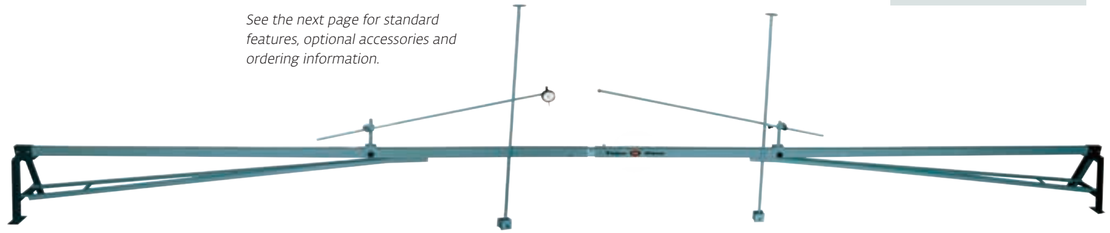
See the next page for standard features, optional accessories and ordering information.

APPLICABLE STANDARDS

- **BS 1377; EN 1997-3; ASTM D1194, D1195, D1196**

Key features

- Determination of bearing capacity of the soil in-situ.
- Designing for static loads on spread footings.
- Repetitive and non-repetitive plate loading tests of soils and flexible pavements.



MODEL TO-157 SPECIFICATIONS	
Loading jack	500kN capacity with integral ball seating
Pump	Hand-operated, single speed with integral oil reservoir
Hose	3m long. Maximum pressure 70MPa with quick release couplings
Gage	100mm dia with quick release couplings and graphs to convert readings to kN, kgf and lbf
Weights	Loading jack 24kg, pressure system 12.5kg
Note: The equipment is used in conjunction with a reaction beam. This is not supplied with the equipment.	

MODEL TO-157

Plate Bearing Test Apparatus (continued)

ORDERING INFORMATION

- **TO-157** Plate bearing test apparatus

SUPPLIED AS STANDARD

- **TO-15715** Grooved M.S. Plate, 30cm x 30cm dia square x 25mm thick
- **TO-15716** Grooved M.S. Plate, 45cm x 45cm dia square x 25mm thick
- **TO-15717** Grooved M.S. Plate, 60cm x 60cm dia square x 25mm thick
- **TO-15718** Grooved M.S. Plate, 75cm x 75cm dia square x 25mm thick
- **TO-15721** Plain M.S. Plate, 30cm x 30cm dia square x 25mm thick
- **TO-15722** Plain M.S. Plate, 45cm x 45cm dia square x 25mm thick
- **TO-15723** Plain M.S. Plate, 60cm x 60cm dia square x 25mm thick
- **TO-15724** Plain M.S. Plate, 75cm x 75cm dia square x 25mm thick

OPTIONAL ACCESSORIES

- **TO-46801** Hand operated hydraulic jack, capacity 500kN (50,000kgf)
- **TO-475** Hydraulic hand operated pump with 200mm dia load gage capacity 500kN (50,000kgf)
- **TO-47503** High pressure flexible metallic pipe 5m long
- **TO-15702** Ball and socket arrangement consisting of two steel plates, with one steel ball in between the plates
- **TO-15703** Extension rod long, 12mm dia x 25cm for taking dial gage readings (16 sets)
- **TO-15704** Magnetic base with female threaded on top, for holding extension rod (four sets)
- **TO-15705** Top end plate 50mm dia with male thread, for fitting onto the extension rods and positioning the dial gage plunger (four sets)
- **TO-15706** Column 15cm dia x 25cm long, with flanges, complete with four bolts and nuts (two sets)
- **TO-15707** Column 15cm dia x 50cm long, with flanges, complete with four bolts and nuts
- **TO-15708** Datum bar lightweight, portable, total span 5m height approximately 30cm, mounted on two removable legs. It is made in two parts. Provision exists for datum bar of 2.5m span to be used. A spare leg is provided for the purpose. Complete with two quick release clamps for positioning and holding the dial gage brackets (two sets)
- **TO-15705** Top end plate 50mm dia with male thread, for fitting onto the extension rods and positioning the dial gage plunger (four sets)
- **TO-15709** Anchor spikes (set of 10)
- **TO-15711** Quickly release clamp for positioning dial gage bracket (set of four)
- **TO-072** Dial gage 0-25 x 0.01mm (set of four)

MODEL TO-206

Point Load Index Tester

The Point Load Index Tester is used to determine the Diametral Point Load Strength Index of rock cores and irregular lumps, which can be tested without any treatment. The Point Load Test is primarily an index test for strength classification of rock materials. This instrument is mainly intended for field measurements on rock specimens but it can also be used in the laboratory. The results of the test may also be used to predict the uniaxial compressive strength of rock from correlations. The apparatus is light and portable.

Key features

- Rock core specimens can be tested without any preparation.
- The instrument can be used in the laboratory as well as at the drilling site.
- Results may also be used to predict the uniaxial compressive strength of rock.
- A wide range of core sizes can be tested.
- The selected engineering unit (which is any one unit via SI, Metric or Imperial fixed) will be displayed on the front panel through LED.
- Peak load displayed on sample failure.
- Four key buttons to Program, Start and Stop, Set Break Point, and Zero.
- Battery or mains operation.
- Failure detection definable.

APPLICABLE STANDARDS

- **EN DD ENV 1997-2; ASTM D5731**

ORDERING INFORMATION

- **TO-206-1-ECO** Point Load Index Tester with ECO digital read-out

MODEL TO-217

Unconfined Compression Tester for Rocks

This equipment is used for determining unconfined compressive strength of intact rock core specimens. The rock sample is cut to length and the ends are machined flat. The specimen is placed in a loading frame and, if required, heated to the desired test temperature. Axial load is continuously increased on the specimen until peak load and failure are obtained.

The load frame is extremely versatile and designed to conduct Triaxial Unconfined test and Unconfined compression test on rock specimens with diameters from 38-100mm and AX, BX, NX specimens.

The instrument consists of a cabinet that houses the gear system and motor with sturdy angle iron frame. Loading is done through the bottom loading platen, which is carried on a lead screw that advances upwards. The top load bracket, which slides over two upright pillars, can be positioned at any desired height and locked. It carries a screw adaptor for standard proving rings or load cells.

The loading part of the unit is detachable from the main unit for ease of transport and to avoid damage to the tension rods.

- Rates of strain: 12 fixed speeds between 1.25 and 0.0064mm/min.
- Suitable for operation on 230V, 50Hz, single phase, AC supply.

ORDERING INFORMATION

- **TO-217-S2-SP2-03** Unconfined Compression Tester 200kN with 200kN load cell and 25mm LVDT with data acquisition

STANDARD FEATURES

- **TO-065** Load frame, 200kN capacity 12-speed
- **TO-21701** Loading platen as per ASTM standard
- **TO-21704** Electronic conversion kit with 200kN load cell and 25mm LVDT with data acquisition

APPLICABLE STANDARDS

- **ASTM 2938, D7012**

DAQ – SPECIFICATIONS

- Keypad for data logger configuration.
- Inbuilt RTC for the real-time in standalone mode.
- Standalone and real-time data acquisition.
- LCD display of four lines, 20 characters, with back light.
- Operating temperature range of -45-70°C. Live channel data
- Peak hold facility
- Inbuilt battery for real-time clock
- Input as analog voltage
- Analog inputs: maximum four channels
- Maximum input voltage: 0-5V, +/-5V
- Accuracy
- Memory communication: internal storage minimum capacity should be 128MB or store on a PC that is configurable.
- Should be compatible with USB/RS232.
- Communication interfaces: Ethernet, RS232, USB, web server, Modbus server (slave)

Key features

- Two-pillar type.
- Enclosed motor and gear system.
- Jewel lamps indicating direction of motion.
- Operational ease.

MODEL TO-036

Speedy Moisture Meter

MODEL TO-036 SPECIFICATIONS	
Model No.	**TO-036-1**
Moisture range	0-25%
Gage division	0.5%
Sample weight	6g
Model No.	**TO-037-1**
Moisture range	0-50%
Gage division	1%
Sample weight	6g

Tinius Olsen's Speedy Moisture Meter is used for determining the water (moisture) content of soil by chemical reaction. A measurement is made of the gas pressure produced when a specified mass of wet or moist soil is placed in a testing device with an appropriate volume of reagent and mixed.

The Speedy Moisture Meter is supplied as a complete kit, which consists of a digital balance, scoop, aluminum bottle fitted with a moisture gage, calcium carbide reagent, steel pulverizing balls and cleaning brushes. The complete kit is supplied in a customized case.

APPLICABLE STANDARDS

- **BS 812; ASTM D4944; AASHTO T217**

ORDERING INFORMATION

- **TO-036-1** Speedy Moisture Meter with 25% moisture range
- **TO-037-1** Speedy Moisture Meter with 50% moisture range

SUPPLIED AS STANDARD

- **TO-03601** Calcium carbide reagent (supplied in a pack of six bottles)
- **TO-03602** Moisture gage, 0-25% Å~ 0.5%
- **TO-03603** Digital Balance, 50g
- **TO-03604** Sample container
- **TO-03701** Moisture gage, 0-50% Å~ 1%

OPTIONAL ACCESSORIES

- **TO-03601** Calcium carbide reagent (supplied in a pack of six bottles)
- **TO-03602** Moisture gage, 0-25% Å~ 0.5%
- **TO-03603** Digital Balance, 50g
- **TO-03604** Sample container
- **TO-03701** Moisture gage, 0-50% Å~ 1%

PACKAGING INFORMATION

- **Net weight:** 4.6kg; **gross weight:** 5.5kg

Key features

- Reliable and accurate moisture measurement.
- Direct reading in percent moisture.
- Rapid results for quick turnaround.
- Robust construction ideal for field use.
- Heavy duty carrying case with portable electronic balance.

MODEL TO-042

Soil Cone Penetrometer

The Soil Cone Penetrometer enables simple and rapid determination of liquid limit. The unit is supplied complete with a 35mm long stainless steel penetration test cone with a smooth polished surface and an angle of 30°. Cone height can be a adjusted in relation to the specimen.

APPLICABLE STANDARDS

- **BS 1377, 1924-2; EN 1997-2**

ORDERING INFORMATION

- **TO-042-1-01** Soil cone penetrometer for 110V, 60Hz
- **TO-042-1-02** Soil cone penetrometer for 220V, 60Hz
- **TO-042-1-03** Soil cone penetrometer for 220V, 50Hz

SUPPLIED AS STANDARD

- **TO-04201** Penetration test cone
- **TO-04202** Penetration test cup

OPTIONAL ACCESSORIES

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

Key features

Advantages over the Casagrande method include:

- Results do not depend on the apparatus design.
- Applicable on a wider range of soil type.
- Reduction of operator error.
- Reproducible test results based on soil shear strength.

MODEL TO-045

Shrinkage Limit

The shrinkage limit in soil refers to the upper limit of moisture content in soil after which further reduction of moisture does not cause any reduction in volume. In this phenomenon the water content in fine grained soil is reduced below the plastic limit leading to shrinkage of the soil mass until it achieves its shrinkage limit.

Note: Shrinkage limit is significant in clays but less so in silts and sands

APPLICABLE STANDARDS

- **BS 1377; ASTM D427; AASHTO T92**

ORDERING INFORMATION

- **TO-045** Shrinkage Limit set

SUPPLIED AS STANDARD

- **TO-04501** Porcelain evaporating dish
- **TO-04502** Shrinkage dish
- **TO-04503** Glass cup
- **TO-04504** Perspex plate, with three metal prongs
- **TO-04505** Perspex plain plate
- **TO-04506** Spatula
- **TO-04507** Glass cylinder, graduated, 25ml
- **TO-04509** Straight edge

OPTIONAL ACCESSORIES

- **TO-04501** Porcelain evaporating dish
- **TO-04502** Shrinkage dish
- **TO-04503** Glass cup
- **TO-04504** Perspex plate, with three metal prongs
- **TO-04505** Perspex plain plate
- **TO-04506** Spatula
- **TO-04507** Glass cylinder, graduated, 25ml
- **TO-04509** Straight edge

MODEL TO-046

Pycnometer

A pycnometer works on the principle of Specific Gravity, which defines the weight ratio of a given volume of material in air with respect to an equal volume of distilled water at the same stated temperature. Powdered soil is added to the pycnometer and weighed; the pycnometer is filled with a liquid of known density, in which the soil is completely insoluble and weighed. The weight of the displaced liquid can be determined and hence the specific gravity of the soil.

APPLICABLE STANDARDS

- **BS 1377, 812-2; EN 1097-7, 1997-2; ASTM D854; AASHTO T100**

ORDERING INFORMATION

- **TO-046** Pycnometer

OPTIONAL ACCESSORIES

- Rubber seal

Key features

- Tests a wide range of materials from clay to sand and gravel, smaller than 10mm.
- Supplied as a set of six.
- Each consists of 1kg glass jar with brass cone, locking ring and rubber seal.

MODEL TO-056

High Speed Stirrer

The High Speed Stirrer with dispersion cup and baffle is mainly used for the pretreatment stage of soils before particle size analysis. Suitable for operation on 220V, 50Hz, single phase, AC power supply.

APPLICABLE STANDARDS

- **BS 1377; ASTM D422; AASHTO T88**

ORDERING INFORMATION

- **TO-056-1-01** High Speed Stirrer with dispersion cup and baffle, 110V, 60Hz
- **TO-056-1-02** High Speed Stirrer with dispersion cup and baffle, 220V, 60Hz
- **TO-056-1-03** High Speed Stirrer with dispersion cup and baffle, 220V, 50Hz

Key features

- Compact bench-mounted design.
- Pretreats soils before particle size analysis.
- Anti-splashing baffle improves mixing efficiency.

MODEL TO-112

Proctor Compaction Apparatus (BS)

Compaction test 2.5kg

This test method utilizes a 2.5kg hand compaction hammer and compaction molds are made of corrosion protected steel. Often referred to as the 'Proctor' test, it is suitable for soils containing particles no larger than 20mm.
Note: Both hand compaction hammer and compaction molds are made of corrosion protected steel to withstand the heavy usage involved in the test.

ORDERING INFORMATION

- **TO-11201** Proctor compaction mold for light compaction, 105mm ID x 115.5mm high to BS standards
- **TO-11202** Compaction rammer for light compaction 2.5kg x 300mm fall to BS standards

Key features

- Hand compaction hammer.
- Compaction mold.

APPLICABLE STANDARDS

- **BS 1377-4, 1924-2; EN 1997-2**

MOLD SPECIFICATIONS	
Mold volume	1000ml
Dimensions	105mm ID x 115.5mm high
Construction	All steel, with plated threaded studs and wing nuts

RAMMER SPECIFICATIONS	
Rammer weight	2.5kg
Drop height	300mm
Guide sleeve	Machined steel tubing with air pressure release holes
Finish	Corrosion resistant

Compaction test 4.5kg

This test method utilizes a 4.5kg hand rammer resulting in approximately 4.5 times greater compactive energy being applied to the sample with the heavier rammer. This method is often specified where higher levels of compaction are necessary in a structure, e.g. an airfield sub-base material.
Note: Manufactured from corrosion protected steel components, the 4.5 kg rammer is designed to withstand heavy usage involved in the test method.

ORDERING INFORMATION

- **TO-11201-H** Compaction mold for heavy compaction, 152mm ID x 127mm high to BS standards
- **TO-11202-H** Compaction rammer for heavy compaction 4.5kg x 450mm fall to BS standards

MOLD SPECIFICATIONS	
Mold volume	2305ml
Dimensions	152mm ID x 127mm high
Construction	All steel, with plated threaded studs and wing nuts

RAMMER SPECIFICATIONS	
Rammer weight	4.5kg
Drop height	450mm
Guide sleeve	Machined steel tubing with air pressure release holes
Finish	Corrosion resistant

MODEL TO-113

Proctor Compaction Apparatus (ASTM)

Compaction test 2.5kg

ORDERING INFORMATION

- **TO-11301** Compaction mold for light compaction, 101.6mm ID x 116.4mm high to ASTM standards
- **TO-11302** Compaction rammer for light compaction 2.49kg x 305mm fall to ASTM standards

MOLD SPECIFICATIONS	
Mold volume	994ml
Dimensions	101.60mm ID x 116.40mm high
Construction	All steel, with plated threaded studs and wing nuts

RAMMER SPECIFICATIONS	
Rammer weight	2.49kg
Drop high	305mm
Guide sleeve	Machined steel tubing with air pressure release holes
Finish	Corrosion resistant

Compaction test 4.54kg

ORDERING INFORMATION

- **TO-11301-H** Compaction mold for heavy compaction, 152mm ID x 116.4mm high to ASTM
- **TO-11302-H** Compaction rammer for heavy compaction 4.54kg x 457mm tall

Key features

- Hand compaction hammer.
- Compaction mold.

MOLD SPECIFICATIONS	
Mold volume	2124ml
Dimensions	152mm ID x 116.4mm high
Construction	All steel, with plated threaded studs and wing nuts

RAMMER SPECIFICATIONS	
Rammer weight	4.54kg
Drop height	457mm
Guide sleeve	Machined steel tubing with air pressure release holes
Finish	Corrosion resistant

Note: Molds are available in either Gun Metal or Mild Steels. When ordering, use GM suffix for gun metal and MS for mild steel, i.e., 11201-GM, 11201-MS, 11201-H-GM, 11201-H-MS

APPLICABLE STANDARDS

- **ASTM D558, D559, D560, D698, D1557; AASHTO T99, T134, T135, T136, T180**

ORDERING INFORMATION

- **TO-112** Proctor compaction apparatus as per BS
- **TO-11201** Proctor mold, 105mm ID x 115.5mm high, 1000ml
- **TO-11202** 2.5kg x 300mm fall
- **TO-112-H** Compaction apparatus for heavy compaction as per BS code
- **TO-11201-H** Proctor mold, 152mm ID x 127mm high, 2305ml
- **TO-11202-H** 4.5kg x 450mm fall
- **TO-113** Compaction apparatus for light compaction as per ASTM code
- **TO-11301** Compaction mold, 101.6mm ID x 116.4mm high, 944ml
- **TO-11302** 2.49kg x 305mm fall
- **TO-113-H** Proctor compaction apparatus as per ASTM code
- **TO-11301-H** Compaction mold, 152mm ID x 116.4mm high, 2124ml
- **TO-11302** 4.54kg x 457mm fall

MODEL TO-131-BS

Laboratory Permeability Apparatus (Falling Head)

Key features

- Plated steel chamber head assembly.
- Corrosion-resistant cast aluminum base assembly.
- Includes accessories for conducting both constant and falling head permeability studies.

APPLICABLE STANDARDS

- **BS 1377; EN 1997-2; ASTM D2434; AASHTO T215**

Permeability is a property of soil that permits flow of water through its interconnecting voids. Permeability is an important engineering property that governs the rate of settlement of saturated compressible soil layers and the rate of flow of aquifer. Permeability is taken into account for pumping ground water, spacing well points for de-watering foundation sites for excavation, retention of water in reservoirs, design of dams and selection of soils to be used for various zones of embankments of dams and reservoirs.

Falling Head Permeameters are used for testing remolded or undisturbed fine grained soil having less than 10cm/sec coefficient of permeability and Constant Head Permeameters are used for coarse grained cohesion less soils.

ORDERING INFORMATION

- **TO-131-BS** Laboratory permeability apparatus (falling head method)

SUPPLIED AS STANDARD

- **TO-13101** Stand with three glass tubes of 6, 10 and 20mm dia approx.
- **TO-13102** Metallic mold 100mm dia x 127.3mm high, 1000ml volume
- **TO-13103** Extension collar 100mm dia x 60mm high
- **TO-13104** Drainage base plate with a recess for porous stone and an outlet valve
- **TO-13105** Metallic clamping ring
- **TO-13106** Drainage cap with recess for a porous stone and fitted with inlet valve and air release valve
- **TO-13107** Dummy plate to serve as false bottom during compaction
- **TO-13108** Porous stone for drainage base plate
- **TO-13109** Porous stone for drainage cap
- **TO-13110** Rubber connection tube 3m long, with pinch cock

MODEL TO-131-BS SPECIFICATIONS	
Cell	Plated seamless tube 100mm diameter x 130mm high
Base	Porous plate with three tie rods
Construction	Machined to accept smaller tubes

OPTIONAL ACCESSORIES

- **TO-13101** Stand with three glass tubes of 6, 10 and 20mm dia approx
- **TO-13102** Metallic mold 100mm dia x 127.3mm high, 1000ml volume
- **TO-13103** Extension collar 100mm dia x 60mm high
- **TO-13104** Drainage base plate with a recess for porous stone and an outlet valve
- **TO-13105** Metallic clamping ring
- **TO-13106** Drainage cap with recess for a porous stone and fitted with inlet valve and air release valve
- **TO-13107** Dummy plate to serve as false bottom during compaction
- **TO-13108** Porous stone for drainage base plate
- **TO-13109** Porous stone for drainage cap
- **TO-13110** Rubber connection tube 3m long, with pinch cock

Note: It is essential that soils of very low permeability are sealed inside the cylinder to prevent seepage along the sides of the specimen. Before testing, the specimen must be completely saturated with water as the presence of air will restrict the flow of water.

MODEL TO-161

Core Cutter

For quality control of compacted earth fill, the measurement of in-situ density is essential. All types of earthwork constructions such as embankments, dams, roads, airfields and trenches need density determination. For quick determination of in-situ density of soil, a core-cutter of known volume is driven into the soil by a rammer. The core-cutter is removed, trimmed and the soil obtained is weighed and dried for a moisture and density check.

Note: Compaction molds not included, order separately.

Key features

- Cylindrical core cutter made of steel, 100mm dia x 130mm long.
- Steel dolly 25mm high and 100mm dia.
- Rammer with steel rod.

ORDERING INFORMATION

- **TO-161-BS** Core Cutter complete with dolly and rammer

SUPPLIED AS STANDARD

- **TO-16101** Cylindrical core cutter
- **TO-16102** Steel dolly
- **TO-16103** Rammer with steel rod

OPTIONAL ACCESSORIES

- **TO-16101** Cylindrical core cutter
- **TO-16102** Steel dolly
- **TO-16103** Rammer with steel rod

APPLICABLE STANDARD

- **BS 1377**

MODEL TO-162

Sand Pouring Cylinder Apparatus

This Apparatus is used to determine the dry density of compact, fine, medium grained soils and for layers not exceeding 50cm thickness. A circular hole is dug into the ground, all the soil from within it collected, weighed and dried, and the hole back-filled with a standard uniform sand or fine gravel, poured from a calibrated container for calculating the volume of hole.

APPLICABLE STANDARDS

- **BS 1377, 1924**

ORDERING INFORMATION

- **TO-162-1-BS** Sand Pouring Cylinder 100mm complete with calibrating container and metal tray
- **TO-162-2-BS** Sand Pouring Cylinder 150mm complete with calibrating container and metal tray
- **TO-162-3-BS** Sand Pouring Cylinder 200mm complete with calibrating container and metal tray
- **TO-16201-1-BS** Sand Pouring Cylinder 100mm without calibrating container and metal tray
- **TO-16201-2-BS** Sand Pouring Cylinder 150mm without calibrating container and metal tray
- **TO-16201-3-BS** Sand Pouring Cylinder 200mm without calibrating container and metal tray

Key features

- Sand pouring cylinder fitted with conical funnel and shutter, 3 liter capacity.
- Cylindrical calibration container 100mm ID x 150mm high.
- Metal tray size 30 x 30 x 4cm, with 10cm central hole.

MODEL TO-164

Proctor Penetrometer

Compaction control in the field is exercised by determining the moisture content and dry density. Quick evaluation of this is done by developing curves in the laboratory, showing the relationship between moisture content versus dry density and penetration resistance, using Proctor Needles while conducting the Standard Compaction tests.

The penetrometer consists of a body housing a spring, a plunger calibrated to read 0-40kg x 1kg and a handle. Two stems are provided, a larger stem and a shorter stem, both graduated at 12.5mm intervals, to indicate the depth of penetration. The larger stem and the smaller stem are used with needles of larger and smaller areas respectively.

Key features

- Spring-type penetrometer.
- Calibrated cylinder.
- Sliding collar.

APPLICABLE STANDARD

- **ASTM D1558**

ORDERING INFORMATION

- **TO-164** Proctor penetrometer

MODEL TO-202

Core Cutting and Grinding

This machine is designed for cutting and grinding cylindrical rock specimens up to NX size. Includes a 200mm diameter diamond cutting wheel, a fine diamond impregnated grinding wheel, a water supply system and sample holder. Clamps to hold the samples up to 55mm dia x 140mm are included. Core cutting and grinding machines for 100mm and 150mm diameter samples can be provided.

Key features

- Table mounted.
- Stable construction.
- Feed arrangement for cutting.
- Cooling water arrangement.
- Heavy duty, AC, single phase motor.

ORDERING INFORMATION

- **TO-202-02** Core Cutting and Grinding for up to 55mm diameter specimens, 415V, 60Hz
- **TO-202-03** Core Cutting and Grinding for up to 55mm diameter specimens, 415V, 50Hz
- **TO-202-100-02** Core Cutting and Grinding for up to 100mm diameter specimens, 415V, 60Hz
- **TO-202-100-03** Core Cutting and Grinding for up to 100mm diameter specimens, 415V, 50Hz
- **TO-202-150-02** Core Cutting and Grinding for up to 150mm diameter specimens, 415V, 60Hz
- **TO-202-150-03** Core Cutting and Grinding for up to 150mm diameter specimens, 415V, 50Hz

MODEL TO-274

Integral Proving Rings

Tinius Olsen Clamped Boss Load Rings are available in the range 1-50kN. The Proving Rings are made up of special steel, carefully forged to give maximum strength and machined to give high sensitivity commensurate with stability, ensuring long life and accuracy.

All proving rings are of the integral type: the loading (outside) bosses are forged integral with the ring body. This ensures that there is no possibility of abutment shift and consequent loss of accuracy in readings that occurs with bolted abutments.

The rings are supplied complete with dial gage and Works Calibration Chart, individually packed in polished wooden boxes. The repeatability and accuracy of all clamped boss rings comply with the requirements of NIS 0415 Accreditation for the Calibration of Force Measuring Rings and Load Cells used in Soil Testing. Proving rings to meet special requirements are also available on request.

A separate polished and ground pair of loading pads for compression proving rings and a pair of shackles for tension proving rings are provided to suit each proving ring.

Note: All clamped boss load rings are calibrated in kN and supplied with a calibration chart.

Key features

- Repeatability within 0.2% of indicated load.
- Accuracy within ±1% of indicated load.
- Works calibrated.

ORDERING INFORMATION

- **TO-274** Proving ring, 50kN capacity
- **TO-271** Compression proving rings, 25kN capacity
- **TO-264** High sensitive proving ring, 2kN capacity
- **TO-284** Tension compression proving rings, 2kN capacity

SPECIFICATION

- The repeatability of all load rings is within 0.2% of indicated load and accuracy is ±1% of indicated load over the upper 80% of the working range, at the calibration loads.

MODEL TO-900

Mobile Laboratory

At Tinius Olsen we can also offer a complete mobile lab solution to the construction and civil engineering industry. Conceived with rigorous QC/QA requirements in mind and the need to have these on project locations, the mobile laboratory concept is quick and easy to install. The labs are not only configured with Tinius Olsen equipment but they can also accommodate equipment supplied by the end user on site. The novel use of retired shipping containers, rebranded by Tinius Olsen, is cost effective for our customers, supports efficient logistics and is environmentally friendly.

ORDERING INFORMATION

- **TO-900-1** Mobile lab unit (single block unit) fitted as per TO mobile lab specification
- **TO-900-2** Mobile lab unit (double integral block unit) fitted as per TO mobile lab specification
- **TO-900-3** Mobile lab unit on site, start up and training 10 working days
- **TO-900-4** Mobile lab unit on site, equipment calibration and issue of certificates

Key features

- Custom designed in 6m (20ft) or 12m (40ft) containers.
- Thermal insulation for all four sides and roof.
- Internal walls and roof covered with laminated pylon wooden frame with split air conditioning system.
- Working space equipped with lab work table, wooden shelving, steel sinks and drain points.
- Standard door frame with aluminium door and fire exit.
- Concealed electrical wiring and outlets with single and three-phase power.
- Optional facility to provide generator, based on load requirements.

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

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
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