Bulletin
190-B

Tinius Olsen

Solutions for Construction Testing

Machines • Software • Calibration • Service

Contents Page

Introduction

Concrete is a highly versatile material and is used primarily by the construction industry. In its freshly mixed (un-set) state it can be pumped, poured and moulded into a variety of forms and shapes. In its cured and hardened (set) state, it is hard, strong and durable, making it extremely desirable for structural applications and ideally suited for construction purposes.

Due to its significance and high usage within the construction industry, the quality of concrete is paramount. Tests must be conducted to ensure the concrete used is in accordance with design, structural, and environmental specifications; the most common and dramatic of these is the compressive strength test.

In addition to strength tests, Tinius Olsen provides concrete testing equipment for:

- Consistency
- Workability
- Mixing
- Molding
- Curing
- Capping
- Compaction
- Sampling
- Drying Shrinkage and Moisture Movement

Strength Tests are generally recognized as being either compression tests or flexural tests on standard sized concrete cylinders, cubes or beams, in accordance with ASTM C39, C469, C78, C89;

AASHTO T22; BS 1881-116:1983; EN12390-3:2002.

Consistency is a general term that relates to the relative fluidity of concrete and is used as an indication of the amount of mixed water. Tests are typically performed in accordance with ASTM C143, C1170; AASHTO T119, T126; EN 12350; BS 1881 (Part 104); AS 1012 Part 3 standards.

Workability is another general term that relates to the ability of concrete to be made into a shape or put into a location. Tests are typically performed in accordance with ASTM C403, C231, C213, C138; AASHTO T126, T197.

Mixing technology is self evident and isn't governed by international standards, but efficient mixing is essential for quality specimen manufacturing. Tests

are typically performed in accordance with BS1881 Part 125:1986.

Compaction Factor is the ratio of the weight of partially compacted concrete to the weight of the concrete when fully compacted in the same mould and this gives a reasonably good indication of the workability of concrete, especially those with aggregate size not exceeding 38mm. Tests are typically performed in accordance with EN 12350-4:2000 and BS EN12350-4:2000.

Setting Time By Penetration Resistance The hardening of concrete is a gradual process and any definition of setting time is arbitrary and the method is suitable only for mortar mixtures with a value greater than zero. The initial and final setting times are the periods starting from the time cement and water are mixed together until the penetration resistance is 35 cm^2 and 280 kg/cm^2 respectively.

Drying, Shrinkage and Moisture Movement test method determines the change in size of a concrete or cement sample, brought about by a change in moisture content. Tests can be performed on freshly made specimens or specimens taken from existing structures.

- **Initial drying shrinkage**
  Difference between length of cured specimen and length when it is dried.
- **Drying shrinkage**
  Difference between length of specimen from existing structure and its length when completely dried.
- **Moisture movement**
  Difference between length of dried specimen and its length when again saturated with water.

CONCRETE COMPRESSION TESTERS

We offer a wide range of hydraulic compression testing machine technologies with capacities from 0-3000 kN (0 to 600,000 lbf), including:

- Manual Systems (DG Series)
- Semi-Automatic Systems (MU Series)
- Fully Automatic Systems (FA Series with Horizon software)

To complement this range. we also offer a low cost, portable compression testing machine designed for use on and off of the construction site. These compression testers feature highly robust frames for exceptional stability when testing concrete cylinders or cubes.

Manual Compression Machines DG Series

Key Features

- Meets the key specifications of ASTM C39, AASHTO T22, EN 12390-3, -4, -5 and other ASTM, EN and BS standards depending on platens and accessories chosen.
- Pace deviation bar graph.
- Automatic stress determination and display.
- Interlocked safety door.
- Overload and over travel safety protection.
- Self aligning platen with fast accessory change capability.

System Description

The loading frame has a fully welded construction with a top crosshead, base and solid side walls. The precision ground hydraulic piston is fixed to the base and the machine's platens are hardened, ground, and polished. The upper platen comes with a self-aligning action and suitably sized spacers are also provided as standard to accommodate a variety of different sizes of specimen – the specification table shows which platen set comes with the machine.

The two-speed pump allows the fast approach of the platens for daylight closure, and also allows precise control over the load application using a control lever and valve. A pace rate bar on the display gives operator feedback on the loading rate.

The controller incorporates a digital display, with values of force and stress in English/Imperial, metric, or SI units. and features the integral load pacing bar display in kN/sec or lbf/sec. Maximum load is held and retained for approximately 15 minutes, unless cancelled, using the panel mounted reset switch. Results from approx. 2000 complete runs/tests can be stored in the memory and logged data can be printed

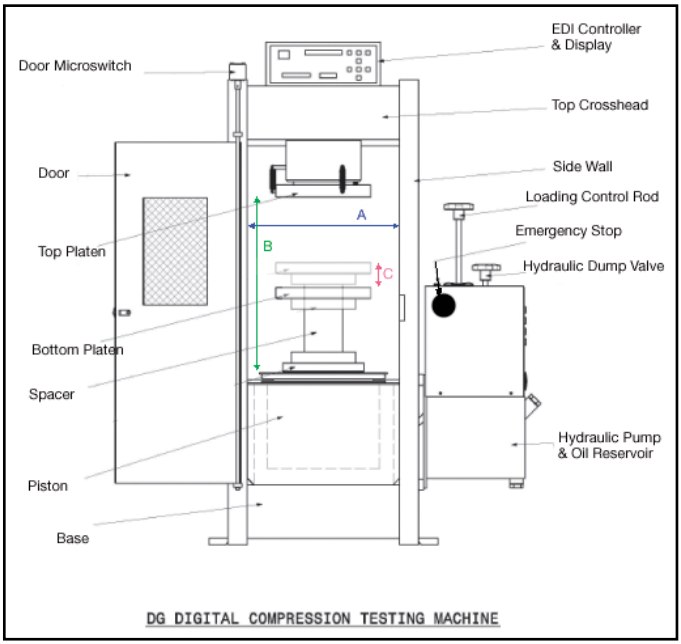
directly via the built-in parallel port. The calibrated operating range of the machines is between 1% and 100% of the machine capacity.

Ordering Information

Model No + Electric Requirements Suffix
Example: TO-308E-DG-02
Where Suffix:
-01 - 110 VAC, 60 Hz, 1ph
-02 - 220 VAC, 60 Hz, 1ph
-03 - 220 VAC, 50 Hz, 1ph

Accessories

TO-320-5500 Platen set for 6 x 12 inch cylinders
TO-320-5502 Platen set for 4 x 8 inch cylinders
TO-320-5504 Platen set for 3 x 6 inch cylinders
TO-320-5510 Platen set for 2 inch cube
TO-320-5512 Platen set for 6 inch cube
TO-320-5518 Platen set for blocks up to 12inches
TO-320-5519 Cylindrical specimen caps
TO-320-5520 Cylindrical specimen cap rubber inserts 60 Shore A, bag of ten (10)
TO-320-5521 Compression Frame Jig Assembly (without platens)
TO-320-5521/01 50 mm square platen set for TO-320-5521
TO-320-5521/02 2 inch square platen set for TO-320-5521
TO-320-5523 BS EN 12390 Part 4 stability compliant - includes oil filled ball seating, certificate and platen certificates



DG DIGITAL COMPRESSION TESTING MACHINE

Specifications of DG Series

Model	Capacity			Maximum Distance Between Walls (A)	Maximum Clearance Between Platens (B)	Piston Stroke (C)	Piston Diameter	Supplied With Platens To Test
TO-302E-DG	kN	50	mm	260	390	50	50	50 & 70.6 mm Cubes
	lbf	11,000	in	10.24	15.35	2	2	
TO-305E-DG	kN	100	mm	260	390	50	78.65	50 & 70.6 mm Cubes
	lbf	22,000	in	10.24	15.35	2	3.02	
TO-308E-DG	kN	250	mm	260	390	50	78.65	50, 70.6 & 100 mm Cubes
	lbf	55,000	in	10.24	15.35	2	3.02	
TO-311E-DG	kN	500	mm	260	390	50	111	50, 70.6 & 100 mm Cubes
	lbf	110,000	in	10.24	15.35	2	4.37	
TO-314E-DG	kN	1,000	mm	260	390	50	157	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	225,000	in	10.24	15.35	2	6.18	
TO-315E-DG	kN	1,500	mm	305	390	50	196.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	338,000	in	12	15.35	2	7.72	
TO-317E-DG	kN	2,000	mm	340	370	50	222.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	450,000	in	13.39	14.57	2	8.74	
TO-320E-DG	kN	3,000	mm	400	400	50	272.15	150 to 300 mm Cubes & 300 mm tall x 300 mm diameter cylinders
	lbf	675,000	in	15.75	15.75	2	10.7	

Automatic Compression Machines MU Series

Key Features

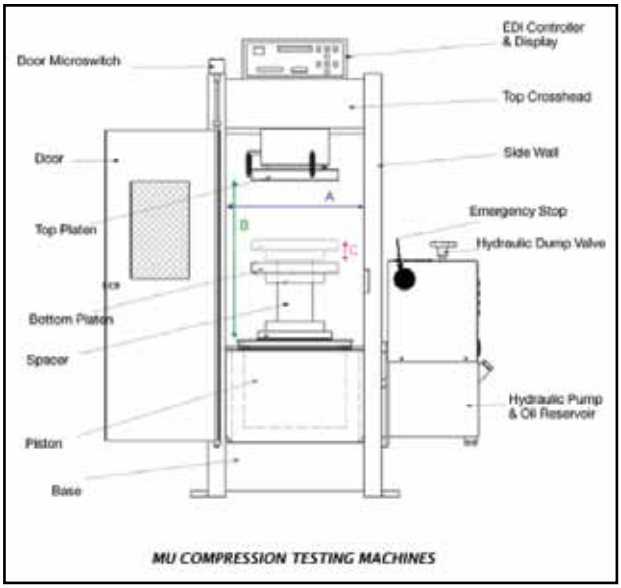
- Exceeds specifications of ASTM C39, AASHTO T22, BS, EN, and other ASTM standards depending on platens and accessories chosen.
- Automatic Pace Rate Control at a preset value.
- Automatic Data Logging.
- Logged Data Printing Facility.
- Data Storage for up to 150 runs.
- Multi-functional LCD interface.
- Menu Driven interface.
- Auto Shut down facility.
- Load hold facility.
- Manual emergency stop button.
- Peak load record
- Bar Graph Display for on-line monitoring of quality control.
- Automatic control of the pump motor.
- Automatic display of breaking load at the end of the test.
- Real Time Clock to keep automatic track of the date, time and runs.
- Calibration checking facility.
- Support for additional compression or flexure units (optional).

System Desription

The loading frame has a fully welded construction with a top crosshead, base, and solid side walls with the precision-ground hydraulic piston fixed to the base. The machine's platens are hardened, ground, and polished; the upper platen comes with a self-aligning action and suitably sized spacers to accommodate a variety of different sizes of specimen – the specification table shows which platen set comes with the machine.

The two speed pump allows the fast approach of the platens, for daylight closure, and also allows the automatic, precise control over the load application; a pace rate bar on the display gives operator feedback on the loading rate. The interlocked safety doors on the front and back of the machine prevent the possibility of injury during the test, and a chute is secured to the back of the machine so that once the test is complete, specimen debris can be simply pushed or brushed out. An optional stand is available so these operations can be performed at a safe and comfortable work height.

The controller incorporates a four line digital display and features the integral load pacing bar display, maximum load and stress result display, parallel port output, and an RS232 output. Results from approximately 2000 completed tests can be stored in the memory and these results can be in Imperial/English, Metric, or SI units. The calibrated operating range of the machines is from 1% to 100% of the machine capacity, over which range the accuracy is



+/- 1% of the applied load.

Ordering Information

Model No + Electric Requirements Suffix
Example: TO-308E-MU-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Accessories

TO-320-5500 Platen set for 6 x 12 inch concrete cylinders
TO-320-5502 Platen set for 4 x 8 inch concrete cylinders
TO-320-5504 Platen set for 3 x 6 inch concrete cylinders
TO-320-5510 Platen set for 2 inch cube
TO-320-5512 Platen set for 6 inch cube
TO-320-5518 Platen set for blocks up to 12 inches
TO-320-5519 Cylindrical specimen caps
TO-320-5520 Cylindrical specimen cap rubber inserts 60 Shore A, bag of ten (10)
TO-320-5521 Compression Frame Jig Assembly (without platens)
TO-320-5521/01 50 mm square platen set for TO-320-5521
TO-320-5521/02 2 inch square platen set for TO320-5521
TO-331-01 Flexural attachment with flexural loading unit to use with TO Compression Testers
TO-314-LU-SPL 1000 kN loading unit for testing of hollow prisms – 3 stacks max
TO-320-LU-SPL 3000 kN loading unit for testing of hollow and solid prisms – 2 stacks maximum
TO 320-5523 BS EN 12390 Part 4 stability compliant - includes oil filled ball seating, certificate and platen certificates

* Note: TO-331-01, TO-314-LU-SPL, TO-320-LU-SPL will be attached to Tinius Olsen Compression Tester with 2-way or 3-way valve as per customers need.

NOTES :

1. Brick Platens :Appropriate brick platens can be provided as an option.
2. Spacers : Set of spacers to suit specimen sizes mentioned against each model is supplied with the machine
3. Machines of higher capacities can be manufactured to customer requirements.
4. TO-33101 Flexure Test Attachment — for use with compression testing machine for testing Beams of size 100 x100 x 500 mm and 150 x 150 x 700 mm.
5. TO-314-LU-SPL prism compression unit for use with compression testers for hollow prisms — 3 stacks maximum.
6. TO-320-LU-SPL prism compression unit for use with compression testers for hollow prisms — 2 stacks maximum and solid prisms — 2 stacks maximum.

Specifications of MU Series

Model	Capacity			Maximum Distance Between Walls (A)	Maximum Clearance Between Platens (B)	Piston Stroke (C)	Piston Diameter	Supplied With Platens To Test
TO-302E-MU	kN	50	mm	260	390	50	50	50 & 70.6 mm Cubes
	lbf	11,000	in	10.24	15.35	2	2	
TO-305E-MU	kN	100	mm	260	390	50	78.65	50 & 70.6 mm Cubes
	lbf	22,000	in	10.24	15.35	2	3.02	
TO-308E-MU	kN	250	mm	260	390	50	78.65	50, 70.6 & 100 mm Cubes
	lbf	55,000	in	10.24	15.35	2	3.02	
TO-311E-MU	kN	500	mm	260	390	50	111	50, 70.6 & 100 mm Cubes
	lbf	110,000	in	10.24	15.35	2	4.37	
TO-314E-MU	kN	1,000	mm	260	390	50	157	100 & 150mm Cubes & 100, 150 mm diameter cylinders
	lbf	225,000	in	10.24	15.35	2	6.18	
TO-315E-MU	kN	1,500	mm	305	390	50	196.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	338,000	in	12	15.35	2	7.72	
TO-317E-MU	kN	2,000	mm	340	370	50	222.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	450,000	in	13.39	14.57	2	8.74	
TO-320E-MU	kN	3,000	mm	400	400	50	272.15	150 to 300 mm Cubes & 300 mm tall x 300 mm diameter cylinders
	lbf	675,000	in	15.75	15.75	2	10.7	

Automatic Compression Machines
FA Series

Key Features

- Exceeds specifications of ASTM C39, AASHTO T22, BS, EN, and other ASTM standards depending on platens and accessories chosen.
- Automatic Pace Rate Control at a preset value.
- Automatic Data Logging and printing capable.
- Data Storage for up to 2000 runs.
- Menu Driven interface.
- Auto shut down facility.
- Peak load record
- Automatic control of the pump motor.
- Automatic display of breaking load at the end of the test.
- Real Time Clock to keep automatic track of the date, time, and runs.
- Support for an additional compression or flexure units (optional).
- An automatic load release facility.
- Measurement of Strain with a resolution of up to 0.001 mm (optional feature).
- Measurement of Flexural strength (optional feature).

System Description

The loading frame has a fully welded construction with a top crosshead, base, and solid side walls with the precision ground hydraulic piston fixed to the base. The machine's platens are hardened, ground, and polished; the upper platen comes with a self-aligning action and suitably sized spacers to accommodate a variety of different sizes of specimen – the specification table shows which platen set comes with the machine.

The two speed pump allows the fast approach of the platens, for daylight closure, and also allows the automatic, precise control over the load application; a pace rate bar on the display gives operator feedback on the loading rate. The interlocked safety doors on the front and back of the machine prevent the possibility of injury during the test, and a chute is secured to the back of the machine so that once the test is complete, specimen debris can be simply pushed or brushed out. An optional stand is also available so these operations can be performed at a safe and comfortable work height.

The controller incorporates a four-line digital display and features the integral

load pacing bar display, maximum load, and stress result display, parallel port output, and an RS232 output. Results from approximately 2000 completed tests can be stored in the memory and these results can be in Imperial/English, Metric, or SI units. The calibrated operating range of the machines is from 1% to 100% of the machine capacity, over which range the accuracy is +/- 1% of the applied load.

Horizon Software:

The FA series of machines can be connected to a PC running Tinius Olsen's Horizon software via a bi-directional RS232. This software gives users far more control and reporting capabilities and features:

- An intuitive, simple graphical user interface .
- A database of tests and results along with other information about the sample such as age, sample number, and batch name.
- Real-time graph of Load Vs Time.
- Automatic display of a breaking load at the end of the test.

A sophisticated reporting tool is included that can be used to generate reports for individual samples with data in graphical or tabular form.

- Load Vs Time Plot.
- Stress Vs Time Plot.
- Batch Summary Report.

Strain Measurement with the Automatic Testing Machine

The FA series can also accept data on strain measurements. Installation of an LVDT compressometer to measure the compressive strain on the sample expands the software capabilities to include:

- Compression Vs Time Plot.
- Strain Vs Time Plot.
- Stress Vs Strain Plot.
- Calculation of Young's Modulus.

Also, a second extensometer that is either strain gauge or LVDT based can be placed around the specimen to measure diametral strain

Ordering Information

Model No + Electric Requirements Suffix
Example: TO-320E-FA-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

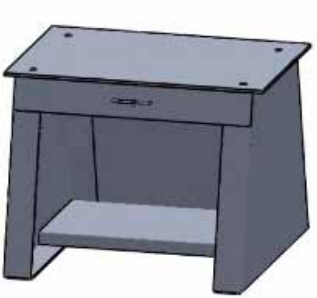
Accessories

TO-320-5500 Platen set for 6 x 12 inch concrete cylinders
TO-320-5502 Platen set for 4 x 8 inch concrete cylinders
TO-320-5504 Platen set for 3 x 6 inch concrete cylinders
TO-320-5510 Platen set for 2 inch cube
TO-320-5512 Platen set for 6 inch cube
TO-320-5518 Platen set for blocks up to 12 inches
TO-320-5519 Cylindrical specimen caps
TO-320-5520 Cylindrical specimen cap rubber inserts 60 Shore A, bag of ten (10)
TO-320-5521 Compression Frame Jig Assembly (without platens)
TO-320-5521/01 50 mm square platen set for TO320-5521
TO-320-5521/02 2 inch square platen set for TO320-5521
TO-331-01 Flexural attachment with flexural loading unit to use with TO Compression Testers
TO-314-LU-SPL 1000 kN loading unit for testing of hollow prisms – 3 stacks maximum
TO-320-LU-SPL 3000 kN loading unit for testing of hollow & solid prisms – 2 stacks maximum
TO-31727 Strain measurement attachment
TO-31728 Split Tensile Test attachment to use with TO ACTM
TO-320-5523 BS EN 12390 Part 4

stability compliant — includes oil filled ball seating, certificate, and platen certificates

* Note: TO-331-01, TO-314-LU-SPL, TO-320-LU-SPL will be attached to Tinius Olsen Compression Tester with 2-way or 3-way valve as per customer's need.

NOTES :
1. Brick Platens: Appropriate brick platens can be provided as an option.
2. Spacers: Set of spacers to suit specimen sizes mentioned against each model is supplied with the machine.
3. Machines of higher capacities can be manufactured to customer requirements.
4. TO-33101 Flexure Test Attachment — for use with compression testing machine for testing Beams of size 100 x 100 x 500 mm and 150 x 150 x 700 mm.
5. TO-314-LU-SPL prism compression unit for use with compression testers for hollow prisms — 3 stacks maximum.
6. TO-320-LU-SPL prism compression unit for use with compression testers for hollow prisms — 2 stacks maximum and solid prisms — 2 stacks maximum.

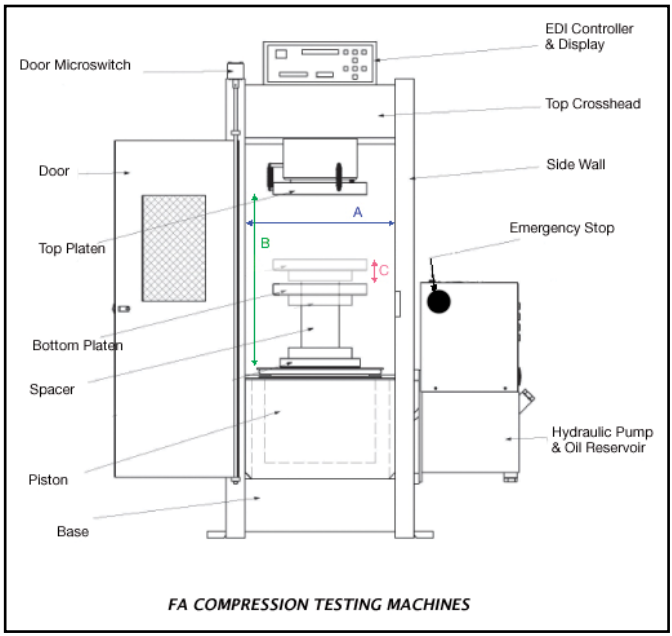


Options For DG, MU and FA Series

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

Ordering Information

TO-STAN01 Machine stand for machine capacities up to 1000 kN
TO-STAN02 Machine stand for machine capacities up to 2000 kN
TO-STAN03 Machine stand for machine capacities up to 3000 kN



Specifications of FA Series

Model	Capacity			Maximum Distance Between Walls (A)	Maximum Clearance Between Platens (B)	Piston Stroke (C)	Piston Diameter	Supplied With Platens To Test
T0-302E-FA	kN	50	mm	260	390	50	50	50 & 70.6 mm Cubes
	lbf	11,000	in	10.24	15.35	2	2	
T0-305E-FA	kN	100	mm	260	390	50	78.65	50 & 70.6 mm Cubes
	lbf	22,000	in	10.24	15.35	2	3.02	
T0-308E-FA	kN	250	mm	260	390	50	78.65	50, 70.6 & 100 mm Cubes
	lbf	55,000	in	10.24	15.35	2	3.02	
T0-311E-FA	kN	500	mm	260	390	50	111	50, 70.6 & 100 mm Cubes
	lbf	110,000	in	10.24	15.35	2	4.37	
T0-314E-FA	kN	1,000	mm	260	390	50	157	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	225,000	in	10.24	15.35	2	6.18	
T0-315E-FA	kN	1,500	mm	305	390	50	196.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	338,000	in	12	15.35	2	7.72	
T0-317E-FA	kN	2,000	mm	340	370	50	222.2	100 & 150 mm Cubes & 100, 150 mm diameter cylinders
	lbf	450,000	in	13.39	14.57	2	8.74	
T0-320E-FA	kN	3,000	mm	400	400	50	272.15	150 to 300 mm Cubes & 300 mm tall x 300 mm diameter cylinders
	lbf	675,000	in	15.75	15.75	2	10.7	

Super L Testing Machines

The Tinius Olsen “Super L” has long been recognized as the standard for accuracy, dependability and versatility in hydraulic universal testing machines; the many thousands of Super Ls currently in use throughout the world attest to this fact. Now more than ever before, the Super L represents the highest standard in hydraulically powered universal testing machines with its patented dual-pressure hydraulic loading system, rigid four-column construction, and new space-saving console with a smaller footprint design. Super L systems are guaranteed to meet ASTM, ISO, and other national and international specifications for accuracy. Accuracy is within +/- 0.5% of the indicated load from 0.2% to 100% of capacity. All equipment used to calibrate the weighing and indicating systems of the Super L is traceable to the National Institute of Standards and Technology (NIST) in the US. For consistent accuracy and rugged reliability in testing at capacities from 30,000 to 600,000 lbf (150 to 3,000 kN) or more, the Tinius Olsen Super L is still the standard of excellence.

Key Features.

- Four-column construction provides exceptional load frame rigidity.
- Modular design - all Super Ls have a handheld terminal for manual control and result display, or have closed loop servo control via a variety of software/hardware options.
- Suitable for tension, compression, transverse, and other tests on materials and assemblies.
- Extra-length screws and columns options, with or without an adjustable upper crosshead, to increase the available test space for longer test samples.
- Semi-open front crossheads options for easier loading of samples.
- Hydraulically actuated lever grips options to allow rapid loading and unloading of samples.
- Accordion-type, non-metallic screw covers options to protect the screws and increase the life of your system.
- Broad range of instrumentation available.
- Low capacity load cells available.
- Tee-slotted table options for locating and securing customized tooling.
- Controlled temperature cabinet options for temperatures from –300° to 1000°F (-185° to 535°C).
- Furnaces available for testing temperatures to 2200°F (1200°C).

Easy-to-use testing software.

Tinius Olsen has software that can be added to the Super L for data acquisition and for computer-assisted control of the testing machine (for machines equipped with the optional servo control).

Testing and crosshead remote control with handheld controller.
For manual control and convenient operation, each Super L includes as standard a remote handheld controller with an LCD and an extended cord. It allows positioning of the adjustable crosshead, prior to the test, and opening and closing of the optional hydraulically actuated grips. A portion of the 3-line LCD reads force in either lbf, N, or kgf in 10 mm high numbers. In addition to displaying load, it can be optionally equipped with appropriate instrumentation and signal conditioners to display position and strain values. If the position instrumentation (high resolution encoder) and signal conditioning module are ordered, the speed will be displayed.

Optional servo control.
As dependable as the basic manually controlled Super L is, the rate at which load is applied is determined by the operator. Therefore, as an option, the Super L can be supplied with closed-loop servo control capability. This closed-loop control system constantly monitors the test in progress and regulates the testing rate to maintain the preset conditions. This option enables you to conduct tensile, compression, flexure, and other tests automatically and ensures consistent testing control free from operator variability. Proof tests can also be performed automatically as can tests requiring different control modes (e.g. crosshead speed to start, strain rate through yield, and back to crosshead speed to failure). Also, this valuable closed-loop servo control upgrade can be added easily to the machine at a later date. This servo capability can be accomplished by adding hardware and software options.

For most users, the standard Super L line includes:
30,000 to 400,000 lbf (150 to 2,000 kN)

For rapid sequence production testing, Super L Models A and AF:
30,000 to 200,000 lbf (150 to 1,000 kN); open-front crossheads

For extraordinary testing, high capacity and special purpose Super Ls:
600,000 lbf (3,000 kN) and beyond

Portable Compression Testing Machine

System Description

This system consists of a four column loading frame, a pumping unit, and a calibrated ECO Digital Readout mounted on the top of the test frame. The detachable hydraulic piston assembly is mounted on the loading frame base.

Specifications:

Capacity: 1500 kN
Platen Size: 220 mm diameter
Piston Diameter: 196.2 mm

Optional Extras:

Brick Platens

Ordering Information

TO-315E-ECO
Machines with other specifications are also available on request.

Model No + Electric Requirements Suffix
Example: TO-315E-ECO-01

Where Suffix:
-01 - 110 VAC, 60Hz, 1ph
-02 - 220 VAC, 60Hz, 1ph
-03 - 220 VAC, 50Hz, 1ph

Flexure Testing Machines

Key Features

- Lightweight, rugged high strength frame
- Two types of system available, one with a manual pump, the other with a motorised pump.
- Double action hydraulic pump used on manuual system.
- Self-aligning four point loading roller assembly.
- Maximum capacity of either frame is 100 kN (22,000 lbf).
- For testing beams of 100 x 100 x 500 mm and 150 x150 x 700 mm.

System Description

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

of the piston. A spacer is provided for testing different size of beams and load is indicated on a digital indicator. For the 150 x150 x 700 beams, the support span is 600 mm and the loading span is 200 mm, whereas for the 100 x 100 x 500 beams, the support span is 400 mm and the loading span is 133 mm.

Applicable Standards

BS 1881, ASTM C 78-02, BS EN 12390-5:2000

Ordering Information

TO-331 Manual pump Flexure Test Frame
TO-332 Motorised Pump Flexure Test Frame

Model No + Electric Requirements Suffix
Example: TO-332-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

CONCRETE REPAIR AND REBUILD SERVICES

We have the technology and ability to upgrade, digitize, service, and calibrate most common makes of Compression Testing Machines.

Tinius Olsen's premier retrofit service delivers the best value, highest performance, and the most dependable customer service in the industry. Tinius Olsen offers the most extensive retrofit service, servicing any international brand (ELE, Forney, Testmark and more) — any model and any capacity.

With these services, you get the benefit of working with the leading manufacturer recognised for the most reliable compression testing machines to take your manufacturing performance to a higher level.

Our service packages are the best in the industry and can increase productivity, improve reliability, and bring better accuracy to your machines which could include:

- Conversion from analogue to digital model.
- Conversion from digital to microprocessor model.
- Conversion of microprocessor machine to fully automatic model and even from analogue to fully automatic or any order of your choice/need.

We can help you :

- Ensure conformance to standards.
- Enhance your hardware and software capabilities.
- Stream line operations.
- Failure analysis, component inspection, repair and reconditioning, and reassembly.
- And above all save costs.

We have a staff of experienced engineers to help you select the retrofit solution. For special machine applications, our in-house engineering and manufacturing capabilities allow us to re-engineer and make new parts, as well as retrofit newer

technologies into older designs for even greater performance. Call us to see if your machine can be upgraded.

Hand Pump

Specification

Construction – differential piston with single hand lever
Hydraulic medium – mineral oil, (ISO VG 68 grade recommended)
Maximum working pressure – HP 5012 700 bar
Flow capacity – model flow per stroke cm^3
Up to 30 bar HP 5012
Above 30 bar 49 2.8
Force required at the end of the hand lever at maximum pressure 400 N approximately
Mass Pump cartridge only — 9.86 kg
Pump with oil tank (without oil) — 21.6 kg

Ordering Information

TO-5012 Hand Pump

Economic Digital Readout

Key Features

- Calibration in lbf.
- Multipoint calibration with dynamic point calibration.
- Battery as well as electrically operated.

Ordering Information

TO-30235-ECO Economic Digital Readout unit with Pressure Sensor for Tinius Olsen Compression Testing Machine

Enhanced Digital Indicator (EDI)

Ordering Information

TO-30235-DG Electronic Digital Readout unit with Pressure Sensor for Digital Compression Testing Machine
TO-30235-MU Electronic Digital Readout unit with Pressure Sensor for MU Compression Testing Machine
TO-30235-FA Electronic Digital Readout unit with Pressure Sensor for Fully Automatic Compression Testing Machine

Electrical Pumping Unit (only for Digital Version)

Ordering Information

TO-32701-01 110 VAC, 60 Hz, 1 ph
TO-32701-02 220 VAC, 60 Hz, 1 ph
TO-32701-03 220 VAC, 50 Hz, 1 ph

STRAIN MEASUREMENT

Strain Measurement Using Demountable Mechanical Strain Gauges

Key Features

- Suitable for use on a loading member under adverse conditions.
- Demountable measuring head.
- Portable.
- High accuracy reference test bar incorporated.

System Description

Designed for gauge lengths of 100, 150, or 200 mm of the reference pins. Supplied with two standard bars and a dial gauge 0.002 mm x 5 mm, which is fixed on the meter. Complete in a wooden case. Can be supplied with a digital gauge, 0.001 x 25 on request.

Ordering Information

TO-369 Demountable Mechanical Strain Gauge, 100 mm
TO-370 Demountable Mechanical Strain Gauge, 150 mm
TO-371 Demountable Mechanical Strain Gauge, 200 mm

Accessories

TO-36901 Reference Pins, pack of 100, for use with any of the above.

Modulus of Elasticity

Longitudinal Compressometer

System Description

This apparatus is used for determining strain and deformation characteristics of standard concrete cylinders of 150 mm diameter x 300 mm 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 gauge, fixed to a bracket, fitted to the top frame, is used for taking deformation measurement. Supplied complete with TO 070 dial gauge 0.002 × 5 mm or TO 072-DG digital gauge 0.001 x 25 cm.

Applicable Standards

ASTM C 469

Ordering Information

TO-372 Longitudinal Compressometer

Essential Extras
TO-072 Dial Gauge, 0.002 x 5 mm
TO-072-DG Digital Gauge, 0.001 x 25 cm

Lateral Extensometer
System Description

This is used for the determining the lateral extension of 150 mm diameter x 300 mm high cement concrete cylinders while running a compression test. The extensometer consists of two movable frames pivoted at one end. A dial gauge measures the lateral extension, and a removable spacer strip is for the initial setting of the dial gauge. The extensometer is attached to the specimen by screws. Supplied complete with TO-070 dial gauge 0.002×5 mm or TO-072¬DG digital gauge 0.001 x 25 cm.

Applicable Standards
ASTM C 469

Ordering Information
TO-373 Lateral Extensometer

Essential Extras
TO-072 Dial Gauge, 0.002 x 5 mm
TO-072-DG Digital Gauge, 0.001 x 25 cm

Strain Measurement Using Electronic Strain Gauge

Extensometers
Averaging Axial Extensometer
System Description
Designed for compressive strength tests on rock, concrete, and other large compression speciemns. Axial strain is measured on opposite sides of the test specimen and the output is the average of these two readings. This model may be used simultaneously with the Model TOE 3544 circumferential extensometer or the Model TOE3975 diametral extensometer.

Ordering Information
TOE-3542RA Averaging Axial Extensometer

Miniature Averaging Axial Extensometer

System Description
Designed for compressive strength tests on rock, concrete and other small diameter compression specimens. Axial strain is measured on opposite sides of the test specimens and the output is the average of these two readings.

Ordering Information
TOE-3442RA Miniature Averaging Axial Extensometer

Circumferential Extensometer

System Description
Designed for rock or concrete compression testing or for compression tests on other large samples. This model may be used simultaneously with the Model TOE-3542RA extensometer.

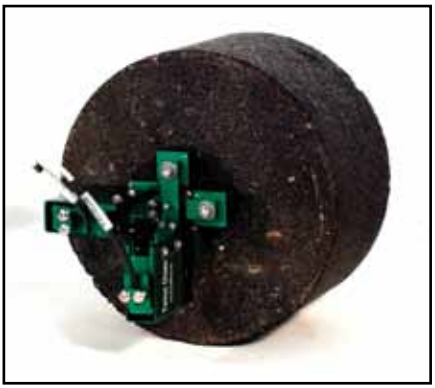
Ordering Information
TOE-3544 Circumferential Extensometer

Extensometer For Asphalt Testing

System Description
The Model 3909 was designed for measuring the axial displacements in the simple performance tests prescribed by NCHRP Report 465

Ordering Information
TOE-3909 Axial Extensometer

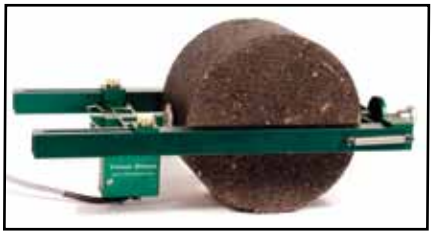
Creep Extensometer For Asphalt Testing



System Description
This model 3910 extensometer is designed for creep compliance and tensile strength per AASHTO TP9 (from SHRP M-007) . This model meets the needs for testing asphalt core samples that are 4 or 6 inch diameter; they also meet the requirements developed under the US Federal Highways SHRP program.

Ordering Information
TOE-3910 Creep and tensile Extensometer

Indirect Tensile Extensometer



System Description
The Model 3911 indirect tensile extensometer for asphalt was designed in accordance AASHTO TP31 and ASTM 4123. This model meets many of the needs for testing asphalt core samples that are 4 or 6 inch diameter, and meet the requirements developed under the US Federal Highway's SHRP program.

Ordering Information
TOE-3911 Indirect tensile extensometer for asphalt

CONSISTENCY AND WORKABILITY

Slump Test

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 foot rule and a datum bar, a thing of the past.

System Description:
The sheet steel slump cone is filled with freshly mixed concrete and is tamped with a tamping bar in four layers. The top of the concrete is leveled 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 50 mm. Supplied complete with base plate, having cleats and swivel handle and Tamping Rod of 16 mm diameter x 600 mm long (part no TO 345).

Applicable Standards
EN 12350-2, ASTM C143
Ordering Information
TO-334 Slump Test Apparatus with Tamping Rod

Accessories
TO-33401 Slump Cone

Consistometer

System Description
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, and 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 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 C 1170, AS 1012 (Part 3)
Ordering Information
TO-335 Consistometer

Motorised Flow Table

System Description
The Flow Table is designed for determining the workability of Portland cement concrete. The 76.2 cm diameter table top is finely machined from a solid brass casting; the stand is made from cast iron. Operation is simple, where the ground and hardened steel cam is designed to drop the table by 12.5 mm.

Applicable Standards
AASHTO T126

Ordering Information
TO-336 Motorised Flow Table

Model No + Electric Requirements Suffix
Example: TO-336-01
Where Suffix:
-01 - 110 VAC, 60Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 H z, 1 ph

Compaction Factor Apparatus

System Description
The Compaction Factor apparatus consists of a hoppers and receiver assembly, TO-345 Tamping Rod of 16 mm diameter x 60 cm long having a Hooper and two trowels.

Applicable Standards
ASTM C 403, AASHTO T197

Ordering Information
TO-337 Compaction Factor Apparatus

Optional Extra
TO-345 Tamping Rod

Spring Type Concrete Penetrometer

System Description:
It consists of; a cylindrical spring housing with a plunger attached to the top of the spring. Penetration needle is attached to the other end of the spring housing. The plunger is graduated in 1 kg divisions, to a maximum capacity of 60 kg, 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 are provided. Supplied complete in a carrying case.

Applicable Standards
ASTM C 403, ASSHTO T197

Ordering Information
TO-338 Concrete Penetrometer, Spring Type

Bulk Density

System Description
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, conforming to ASTM/BS Standards. The set comprises one each of 20 and 10 litres Bulk Density Measure.

Applicable Standards
BS 812, EN 1097-3, EN 12350-6, ASTM C 138

Ordering Information
TO-339 Bulk Density (Set of 20 L and 10 L)

Optional Extra
TO-33901 Bulk Density Measure, 20L
TO-33902 Bulk Density Measure, 10L

Air Entrainment Meter – Type A

System Description
Entrainment of a small amount of air in the cement concrete has been found to improve considerably 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, a check of the air content is required to ensure that the percentage of air remains between 1 to 2 % to get the optimum performance of the concrete structure. For determining these percentages, Air Entrainment Meter, as specified in ASTM standards.

It consists of a pressure-tight flanged cylindrical measuring bowl, fitted with a removeable flanged and a 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 air content, is fixed on the conical cover assembly.

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 gauge, funnel, trowel and tamping bar.

Applicable Standards
EN 12350-7; ASTM C 231, ASTM C 213

Ordering Information
TO-340 Type A Air Entrainment Meter

Air Entrainment Meter – Type B

Key Features:

- 7L capacity
- Shock-proof pressure gauge mounting
- Lightweight aluminum construction
- Heavy-duty plastic carrying case for easy transport to site

System Description

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 nomograph, the air meter provides quick and easy particle density and percent of free moisture in aggregate determinations.

The meter has a multi-range feature to accurately measure entrained air up to 22%. Air Entrainment Meter is supplied complete with straight edge, syringe and carrying case.

Applicable Standards:

EN 12350-7; ASTM C 231, ASTM C 213, AASHTO T-152

Specifications:

Dimensions	248 x 337 mm (diameter x height)
Capacity	7 litres
Readings	Up to 22 % entrained air
Accuracy	± 0.25 % full scale
Aggregate size	50 mm maximum
Container	With tare weight stamped on bottom; 2-piece clamping device for positive seal
Pressure gauge	In shock-proof mounting
Weight	6.8 kg

Ordering Information

Type A

TO-340 Air Entrainment Meter Capacity 0.0005m³ (5L), suitable for aggregate size up to 38 mm

TO-341 Air Entrainment Meter Capacity 0.01 m³ (10L), suitable for aggregate size up to 76 mm

TO-342 Air Entrainment Meter Capacity 0.1 m³ (100 L), suitable for aggregate size up to 150 mm. Supplied with foot pump in place of pressure bulb as supplied with other models.

Type B

TO-340-B Air Entrainment Meter Capacity 0.007 m³ (7 L), suitable for aggregate size up to 50 mm

MIXING EQUIPMENT

For quality specimens to be manufactured, efficient mixing of concrete prior to moulding is essential. Efficient mixing helps by coating the surface of all aggregate particles with cement paste and also creates uniformity in the mixture. We offer both pan and drum models which are suitable for mixing small quantities of concrete, any typically used in laboratories.

Concrete Mixer, Pan Type, Capacity 40 L

Key Features

- Portable and compact
- Adjustable bades
- Simple to clean and maintain
- Easy to operate

System Description

The design of the paddles in this mixer ensures uniform and efficient mixing of cement and 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.

Applicable Standards:

BS 1881 Part 125:1986

Specifications

Mixing Capacity	40 Litres
Overall Dimension	910 mm x 875 mm x 1250 mm
Motor	2 HP, 3 Ph AC, 960 rpm

Ordering Information

TO-9891 Concrete Mixer, Pam Type, Capacity 40L

Concrete Mixer, Drum Type, Capacity 1 Cubic Feet

Key Features
- Adjustable Blades
- Simple to clean and maintain
- Easy to operate

System Description
The mixer consists of a 100 liter capacity steel vessel, which is mounted on a frame. This motorized vessel can be rotated at 20-24 RPM and tilted to any angle by a handle making mixing and discharging simple and swift. The mixer also features paddle blades for efficient mixing and large wheels for system mobility.

Applicable Standards:
BS 1881 Part 125:1986

Ordering Information
TO-9701 Concrete mixer, drum type, capacity 1cu. ft
Model No + Electric Requirements Suffix
Example: TO-9701-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

MOULDING

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

Cube Moulds

System Description
Tinius Olsen's quality grade metal moulds are strong enough to resist distortion and retain their shape and size under rugged conditions. These moulds have the required quality surface finish and are designed so that they maintain superior alignment despite constant dismantling and reassembly.
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Applicable Standards
BS 1881, ASTM C 31, ASTM C 192, EN 12390-1,-2, DIN 51229

Ordering Information
TO-343 Mould, Cast Iron, for 100 mm cube
TO-344 Mould, Cast Iron, for 150 mm cube

Optional Extras (for all moulds)
TO-345 Tamping Rod, Steel, 16 mm diameter x 600 mm length rounded at the lower end. For use with Cube and Cylindrical Moulds
TO-348 Tamping Bar, Steel, 25 mm x 25 mm square ramming face, 400 mm long, 2 kg in weight. For use with Beam Moulds

Beam Moulds

System Description
We have two standard sizes of beam moulds for casting flexural strength testing specimens. These steel moulds are supplied complete with a base plate.

Applicable Standards
BS 1881, ASTM C 31, ASTM C 192, EN 12390-1,-2, DIN 51229

Ordering Information
TO-346 Beam Mould 100 mm x 100 mm x 500 mm
TO-347 Beam Mould 150 mm x 150 mm x 700 mm

Cylindrical Moulds

System Description
These cast iron, longitudinally split moulds are offered in two different sizes and are supplied complete with a base plate and top plate.

Ordering Information
TO-349 Mould, Cast Iron, Split lengthways 150 mm diameter x 300 mm high
TO-350 Mould, Cast Iron, Split lengthways 100 mm diameter x 200 mm high
TO-351 Mould, Cast Iron, Split lengthways 100 mm diameter x 100 mm high
TO-352 Mould, Cast Iron, Split lengthways 150 mm diameter x 150 mm high
TO-354 Mould, Cast Iron, Split lengthways 300 mm diameter x 300 mm high

CURING

Curing Tank

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

System Description
The fully insulated water tank holds standard up to 36 150 mm cast cubes or 72 of the 70.6 mm cast cubes. 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 tank's one end.

Applicable Standards
EN 12390-2, ASTM C31, C192, AASHTO T23

Ordering Information
TO-355-1 Curing Tank for 6 x 150 mm cubes or 12 x 70.6 mm cubes
TO-355-2 Curing Tank for 12 x 150 mm cubes or 24 x 70.6 mm cubes
TO-355-3 Curing Tank for 24 x 150 mm cubes or 48 x 70.6 mm cubes
TO-355-4 Curing Tank for 36 x 150 mm cubes or 72 x 70.6 mm cubes

Accelerated Curing Tank

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.

Ordering Information
TO-355-1 ACW Accelerated curing Tank for 6 moulds of 150 mm cubes.
TO-355-2 ACW Accelerated curing Tank for 12 moulds of 150 mm cubes.
Boiling Water Method Accelerated Curing Tank
TO-355-1 ACB Accelerated curing Tank for 6 moulds of 150 mm cubes.
TO-355-2 ACB Accelerated curing Tank for 12 moulds of 150 mm cubes.

Model No + Electric Requirements Suffix
Example: TO-355-1 ACW-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

CAPPING

Cylindrical Specimen Capping Equipment

System Description
It is essential that the ends of the 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 obtain these conditions. 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 C 617, AASHTO T-231

Ordering Information
TO-357 Capping Set, Vertical, for Capping 150 mm diameter Cylinders and Cores
TO-358 Capping Set, Vertical, for Capping 100 mm diameter Cylinders and Cores

Optional Extras
TO-359 Mould for capping 150 mm diameter concrete cylinders as per USBR recommendations
TO-35701 Capping compound, pack of 5 kg, for capping ends of concrete test cylinders
TO-35702 Warmer for melting capping compound. Consists of an electrically heated bath with a temperature regulator, complete with a cover and carrying handle. (220 V, 50 Hz, 1 ph AC supply)
TO-35703 Bowl — metallic bowl for holding the molten capping compound

TO-35704 Ladle — metallic ladle for pouring molten capping compound into grooves between cylinder and capping plate

Cylindrical Specimen Caps And Rubber Pads

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

Ordering Information
TO-320-5519 Cylindrical specimen 6 inch cap
TO-320-5520 Rubber insert for 6 inch cap
TO-320-5524 Cylindrical specimen 4 inch cap
TO-320-5525 Rubber insert for 4 inch cap

VIBRATORY COMPACTION

Proper compaction of cement concrete while casting specimens for compression testing is essential to achieve higher compressive strength.

Vibrating Table

System Description

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

Ordering Information

TO-365 Vibrating Table

Model No + Electric Requirements Suffix
Example: TO-365-01
Where Suffix:
-01 - 110 VAC, 60Hz, 1ph
-02 - 220 VAC, 60Hz, 1ph
-03 - 220 VAC, 50Hz, 1ph

SAMPLE COLLECTION

Core Case

System Description

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 100 mm in diameter without use of a frame and feed.

Water is fed into the jacket and flows through a manifold, into drill spindle

and continues to the inside of diamond core bit. The water jacket surrounding the core barrel is flanged, so it can be clamped to the surface to be drilled with the supplied clamping pliers and anchors. A rubber O-ring is fitted on this flange, which 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 brief case.

Ordering Information

TO-368 Core Case (without cut core bits and water jacket)
Core Case is not supplied with any core drilling bit or water jacket – these must be ordered separately.

Accessories

Core bits with the Water Jacket are offered in the following sizes (selection based on the requirement);
TO-36801 Core bit and water jacket 25 mm diameter x 75 mm long
TO-36802 Core bit and water jacket 38 mm diameter x 100 mm long
TO-36803 Core bit and water jacket 50 mm dia x 100 mm long
TO-36804 Core bit and water jacket 75 mm diameter x 100 mm long
TO-36805 Core bit and water jacket 100

mm diameter x 100 mm long
TO-36810 Core bit and water jacket 50mm diameter x 200 mm long
TO-36811 Core bit and water jacket 75 mm diameter x 200 mm long
Notes:
To obtain 200 mm long Core Samples, Core Bits of 100 mm length of the corresponding diameter should be used first and replaced with 200 mm long Core Bit in the Same Water Jacket to advance the core length.

Caution :
1. Coring is not possible on concrete with reinforced with steel.
2. Not to be used on concrete witstrengths of M60 since this may overload motor and damage drill bit.

TESTS ON HARDENED CONCRETE: DRYING, SHRINKAGE AND MOISTURE MOVEMENT

Length Comparator

System Description
Apparatus consists of frame with adjustable cross head. Base is stainless steel circular platen with recessed seating and 300 mm + 0.5 mm long steel reference bar with coefficient of thermal expansion less than 2 x 10–6 mm/°C with 6 mm diameter steel balls mounted at ends. Frame supplied with TO 070 dial gauge 0.002 × 25 mm or TO 072-DG digital gauge 0.001 x 25 cm.

Applicable Standards
BS 6073-1, 812-120, EN 1367-4, ASTM C 490, C 151, C 157, C 531, AASHTO T107, T160

Ordering Information
TO-374 Length Comparator
Essential Extras
TO-072 Dial Gauge, 0.002 x 5 mm
TO-072-DG Digital Gauge, 0.001 x 25 cm

Volume Change Apparatus

System Description
Apparatus consists of mould 100 x 100 x 250 mm 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.

Ordering Information
TO-375 Prism Mould – Volume Change Apparatus, 75 mm x 75 mm x 285 mm

Essential Extra
TO-374 Length Comparator

Cement, Lime, Plaster and Mortar Testing Equipment

Introduction and Terminology

Fineness

To determine the fineness of cements, pozzolanas and other powdery materials, international specifications typically recommend the use of "specific area" method. The air permeability method is good example of this kind of measurement where the specific surface as a fraction of the total surface area in cm^2/g of material is determined

Consistency and Setting-time

Apparatus for determining the normal consistency, standard consistency and time of setting of cement and lime in accordance with ASTM, BS and AASHTO specifications.

Soundness

The soundness of cement, rapid hardening portland cement, low heat portland cement and class-A lime is very important; once hardened it is vital that the paste is not subjected to large changes in volume. Using Le Chatelier Moulds, its is possible to perform an expansion test to determine the soundness of cements and limes.

Flow of Mortar and Hydraulic Cement

The Flow Test is carried out as recommended on cement mortars, pozzolanas and limes. The specimen is placed on a flow table top which is then raised and dropped through a known height.

Sample Preparation

Specimens of cement, limes and related materials are required to be cast in certain standard shapes and sizes prior to the quality control tests to determine

the mechanical properties of the materials. Mortar is prepared using a mortar mixer and compacted using a vibration machine.

FINENESS, CONSISTENCY AND SETTING TIME

Air Permeability Apparatus (Blaine Type)

System Description
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, Dibutylphthalate Liquid and Punch.

Applicable Standards
ASTM C 204, BS:4359 Part 2, Appendix A, AASHTO T153, EN196-6, 459-2, 13286-44

Ordering Information
TO-390 Air Permeability Apparatus (Blaine Type)

Accessories
TO-390-01 Permeability Cell
TO-390-02 'U' Tube Manometer, mounted on stand
TO-390-03 Perforated Metal Disc
TO-390-04 Plunger
TO-390-05 Rubber Stopper
TO-390-06 Rubber Tube, 20 cm long
TO-390-07 Filter Paper Discs (set of 12)
TO-390-08 Dibutylphthalate liquid, 100 ml bottle
TO-390-09 Punch
TO-390-10 Non perforated Disc

Vicat Apparatus

System Description
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 10 mm plunger of the Vicat apparatus penetrates the cement paste to a pre-determined 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 mould.

Applicable Standards

BS 12, 146, 915, 1370, 4027, 4246, 4248, ASTM C 191, C 141, C 187, C 308, C 359, C 472 & AASHTO T¬ 129, E 131, EN 196-3, 13454-2

Ordering Information

TO-3934 Vicat Apparatus

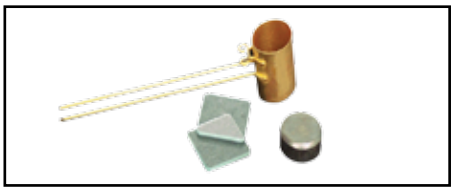
Accessories

TO-39301 Vicat Mould
TO-39302 Glass Base Plate
TO-39303 Initial Needle (in Plastic Case)
TO-39304 Final Needle (in Plastic Case)
TO-39305 Consistency Plunger (in Plastic Case)
TO-39306 Mild Steel Base Plate
TO-39307 Vicat Mould Split Type, with Clamping Ring

SOUNDNESS OF CEMENT AND HYDRATED LIME

The cement is gauged and filled into a mold on a plate of glass, the edges of the mold being held together. When the mould has been filled it is covered with a plate of glass held down by a small weight and the whole is immersed in water at 15° C. for twenty-four hours. Any tie or band which has been used to keep the edges of the mold together during setting is then removed. The distance between the indicator needles is measured and the mold is placed in cold water which is raised to a temperature of 100° C. in the course of half an hour and is kept boiling for six hours. The mold is removed from the water and after it has cooled the distance between the indicator needles is again measured. The difference between the two measurements represents the expansion of the cement. This must not exceed 10 mm when the cement has been aerated for twenty-four hours and 5 mm when the cement has been aerated for seven days.

Le-Chatelier Mould



System Description

The Le-Chatelier Mould consists of a small split cylinder, which, when assembled, forms a mould with an internal diameter of 30 mm and a height of 30 mm. On either side of the split cylinder, two parallel indicating arms with pointed ends are fixed. The mould construction is such that when a mass of 300 g is applied, this will increase the

distance between these indicator arms by 17.5 mm ± 2.5 mm without permanent deformation of the mould.

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

The mould is supplied complete with two glass plates and weight 100 g ± 10 g.

Applicable Standards
BS 6463; EN 196-3, 459-2

Extensibility of Mould Apparatus
(Resistance of Mould Test Apparatus)

System Description
Le -Chatelier moulds need to be checked and calibrated periodically with this unit to check the state of the split cylinder. This unit comprises a metal sleeve with a hook and set screw to fit over one of the mould pointers, and a clamp to fit on to the other pointer of the mould. This equipment is supplied complete with one weight 300 g + 1 g.

Applicable Standards
EN 196

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

Shrinkage Bar Mould
System Description
The use of shrinkage bar moulds are also recommended to determine cement soundness; any shrinkage of the specimen is determined by Length Comparator (listed in the concrete section of this catalogue)
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 mould and multiple mould compartments. Each mould is supplied complete with base plate and two reference points per compartment of mould. Each mould size is 25 x 25 mm section and 250 mm effective length (distance between two innermost reference points)

Applicable Standards
ASTM C 151

Ordering Information
TO-400 Le-Chatelier Mould
TO-400-S Extensibility of Mould Apparatus
TO-401 Le-Chatelier Flask
TO-402 Mould, one compartment with smooth reference points
TO-403 Mould, two compartments with smooth reference points
TO-404 Mould, four compartments with smooth reference points
TO-405 Mould, one compartment with knurled and threaded reference points
TO-406 Mould, two compartment with knurled and treaded reference points
TO-407 Mould, four compartment with knurled and treaded reference points

Accessories (Optional Extras)
TO-40201 Set of 20, Smooth Reference Points
TO-40501 Set of 20, Knurled and Threaded Reference Points

Cement Autoclave

Key Features:
- Improved aesthetics
- Rustproof stainless steel pressure vessel and enclosure
- Microprocessor based PID controller for accurate control of temperature and pressure
- Three fold safety mechanism to protect the operator and equipment
- Simple to use

System Description
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 pressure inside the vessel is controlled by a microprocessor based PID controller, but the system has a spring loaded pressure safety valve release, as well as heater PID control with RTD measurement.

Applicable Standards
ASTM C 188, C 141, C 151, C 155 , AASHTO T107

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

Ordering Information
TO-408-1 Cement Autoclave

Model No + Electric Requirements Suffix
Example: TO-408-1-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Accessories (Optional extras)
TO-40801 Heating elements
TO-40802 Silicon rubber lid gasket
TO-40803 Spring loaded Safety loaded Safety valve

WORKABILITY & SAMPLE PREPARATION

Flow Table

System Description
The Flow Table consists of a brass table top 250 ± 2.5 mm dia., 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 100 rpm. Suitable for operation

on 220 V, 50 Hz/110 V, 60 Hz, single phase AC supply.
Complete with Flow mould 100 mm base diameter, 70 mm top diameter and 50 mm high.

Applicable Standards
BS 4551-1, 3892-1, ASTM C 87, C 109, C 185, C 230, C 243, C 348, AASHTO T71, T106, T137

Ordering Information
TO-411-1 Flow Table

Model No + Electric Requirements Suffix
Example: TO-411-1-03
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Mortar Mixer

System Description
This mixer is designed to mix mortars and cement paste to standard requirements and can be operated in either manual or automatic modes. The mixer features microprocessor control of the speed and mixing program and employs an elliptical mixing motion for thorough and efficient mixing.

Specification:

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

Rated power 180 W
Bowl capacity – 5 Litres
Weight – 54 kg
Dimensions (l x w x h) 530 x 350 x 580 mm

Applicable Standards
BS 3892-1, 3892-3, 6463-103, 4551-1, ISO 679, EN 196-1, 196-3, 413-3, 459-2, 1744-1, 13279-2, 1015-2, 13395-1, 13454-2

Ordering Information
TO-412-2 Mortar Mixture

Model No + Electric Requirements Suffix
Example: TO-412-2-02
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50Hz, 1ph

Vibration Machine

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

Applicable Standards
BS 4550

Ordering Information
TO-418-1 Vibration Machine

Model No + Electric Requirements Suffix
Example: TO-365-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

MOULDING

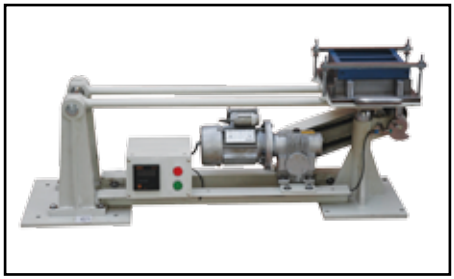
Cube Moulds

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

Applicable Standards
BS 1881-131; ASTM C109

Ordering Information
TO-414 Steel Mould for 70.6 mm cube
TO-417 Cast Iron Mould for 50 mm cube
TO-417-3-CI Three Gang, Cast Iron Mould for 50 mm cube
TO-417-3-NB Three Gang, Naval Brass Mould for 2 inch cube

Preparation of Flexural Prisms Jolting Apparatus



This machine consists of a mould table which is seated on a rotating cam driven at 60 rpm and features push button start/stop control, and automatic stop control at the end of test.

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

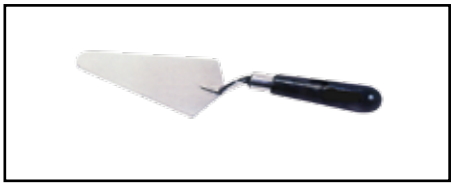
Three-gang Mould
Three-gang Mould for 40.1 x 40 x 160 mm mortar prisms and is supplied with a glass plate. Weight 12.2 kg.

Ordering Information
TO-421 Jolting Apparatus
TO-422 Three Gang Mould

Model No + Electric Requirements Suffix
Example: TO-421 -01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Gauging Trowels

100 to 150 mm/200 mm long blade with straight edge. Weight 210 + 10 g



Ordering Information
TO-428 Gauging Trowel, 100 to 150 mm long blade
TO-429 Gauging Trowel, 200 mm long blade

Flexural & Compression Attachments

The following two attachments are for use with all the Tinius Olsen Compression Testers

Flexural/ Bend Attachment

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

Applicable Standards
BS 4551-1, EN 196-1, 1015-11, 13454-2

Ordering Information
TO-320-5522 Flexural attachment

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. This attachment must be used with the appropriate compression platens.

Applicable Standards

BS 3892-1, EN 196-1, 459-2, 1015-11, EN 13454-2; ASTM C 109

Ordering Information

TO-320-5521 Compression Frame attachment
TO-350-5521/03 40mm square platen set for TO-320-5521

Compression equipment for Brazilian Test

This 200 kN load frame with manual hydraulic pump for loading, it has a self retracting piston, with compression platens selected according to the specimen size. It enables the testing of cube and circular specimens from 50 mm to 100 mm diameter, with a thickness equaling half of the diameter.

Ordering Information

TO-207 Load Frame

Accessories

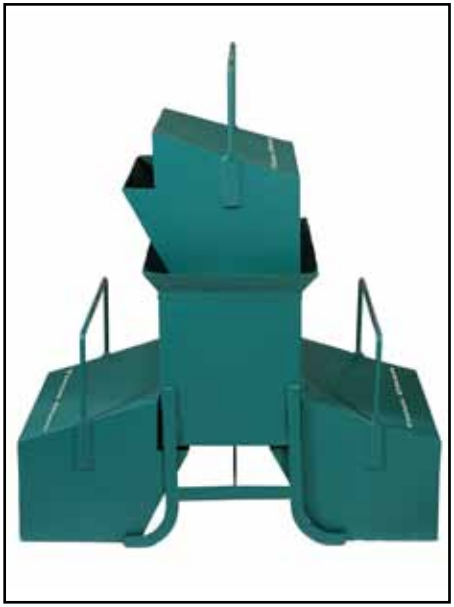
TO-20702 Pair of Semi-circular Jaws, for 50 mm diameter samples.
TO-20704 Pair of Jaws for 60 mm diameter samples.
TO-20705 Pair of Jaws for 70 mm diameter samples.
TO-20706 Pair of Jaws for 80 mm diameter samples.
TO-20707 Pair of Jaws for 90 mm diameter samples.
TO-20708 Pair of Jaws for 100 mm diameter samples.

Sand, Aggregate & Fillers

SAMPLING, PHYSICAL PROPERTIES

For rapid collection of samples from aggregates, sand and fillers, a sample divider is required.

Riffle Sample Divider



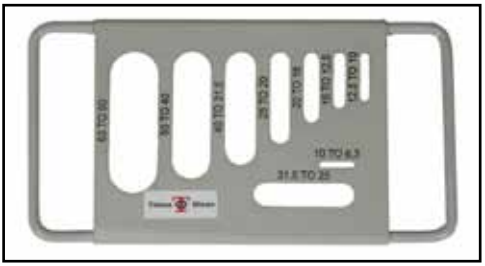
System Description
Consists of a metal box, fitted with a series of chutes of equal width, which discharge the material alternatively in opposite directions into separate pans. The chutes of the riffle are steep enough to allow rapid flowing of the material.

Supplied complete with three containers.

Applicable Standards
BS 1377, 1924, 812, EN 932-1

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

Determination of Flakiness & Elongation



System Description
Aggregates that are flaky and/or elongated will often lower the work ability of a concrete mix, and may also affect long term durability. In bituminious 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 flakiness index and elongation index of the aggregate respectively.

Applicable Standards
BS 812

Ordering Information
TO-450 Thickness Gauge Constructed from heavy gauge sheet steel
TO-446 Length Gauge Constructed from steel, mounted on a hardwood base.

CRUSHING & GRINDING

Laboratory Ball Mill

System Description
This is primarily designed for grinding pigments and cement. Material is ground at a set speed using steel grinding balls for a predetermined length of time. The system is configured for 415V 3 ph 50 Hz AC power but can be reconfigured to your requirements.

Ordering Information
TO-441 Laboratory Ball Mill, 5 kg capacity

Accessories
Recommended balls for ball mill
Samples Number of Steel Balls
TO-44101 40 mm dia - 43 req'd
TO-44102 30 mm dia - 67 req'd
TO-44103 25 mm dia - 10 req'd
TO-44104 19 mm dia - 71 req'd
TO-44105 12.5 mm dia - 94 req'd

Note - above no of balls required for 5kg charge. Multiply number by 2 or 4 for 10kg or 20kg charges respectively.

Jaw Crusher

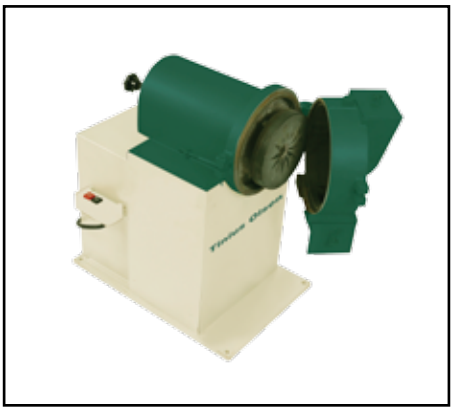
Key Features
- Designed to speed-up crushing of aggregates, ore, mineral, coal, and similar materials.
- Compact and rugged for laboratory and small production units.

- Manganese steel jaws adjustable up to 6 mm opening.
- Supported with strong steel frame.
- Suitable for operation with 440 V, 3 ph, AC power (other voltages available)

Ordering Information

TO-442	415 VAC, 50Hz, 3ph
TO-442-SP	220 VAC, 50Hz, 1ph

Pulveriser



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 having planetary movement in vertical plane.
- Suitable for operation with 440 V, 3 ph, AC power (other voltages available).

Ordering Information

TO-443	415 VAC, 50Hz, 3ph
TO-442-SP	220 VAC, 50Hz, 1ph

GRAVITY AND WATER ABSORPTION

Density Basket

System Description

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

Applicable Standards

ASTM C 127 & AASHTO T85

Ordering Information

TO-453 Density Basket

Bulk Density, Voids and Bulking

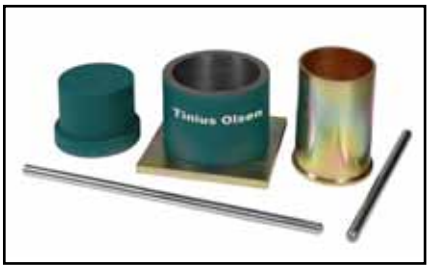
System Description

The shape of the particles of aggregate is very important. This is because it effects the ease of handling the mixture of aggregate and binder, for example, the work ability 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

MECHANICAL PROPERTIES OF AGGREGATES

The selection of proper aggregate for a given application is essential to attain material Performance. The following mechanical tests are designed to meet this requirement.

Crushing Value Equipment



Applicable Standards
BS 312, ASTM C 29, C 138

Ordering Information
TO-454 Measures (set of 3, 15, 30 litres) with TO 345 Tamping Rod
TO-454-01 Measures, 3 Litres
TO-454-02 Measure, 15 Litres
TO-454-03 Measure, 30 Litres

Bulk Density Measures

These are used to determine the unit weight of aggregates. The Bulk Density measures indicated in TO 339 can be utilized to do the test.

Ordering Information
TO-33901 Bulk Density Measure, 20 Litres
TO-33902 Bulk Density Measure, 10 Litres

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

Applicable Standards
BS 812-110, 111

Ordering Information
TO-455 Crushing Value Equipment

Accessories
TO-455-01 Cylindrical Cell, 150 ± 0.5 mm ID x 130 to 140 mm height
TO-455-02 Plunger, 148 ± 0.5 mm diameter x 100 to 115 mm height
TO-455-03 Base Plate, 200 to 230 mm square x 6 mm thickness
TO-455-04 Tamping Rod, 16 mm diameter X 450 to 600 mm length
TO-455-05 Metal Measure, 110 ± 0.5 mm ID x 180 ± 0.5 mm height

Aggregate Impact Tester with Blow Counter

System Description
This is used to determine the aggregate impact value and has been designed in accordance with ASTM and BS Standards. The sturdy construction consists of a base and support columns. These form a rigid frame work 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 + 5 mm. The hammer is provided with a locking arrangement.

Applicable Standards
BS 812-112

Ordering Information
TO-456 Aggregate Impact Tester with Blow Counter

Accessories
TO-456-01 Cylindrical Cup
TO-456-02 Metal Measure 75 mm ID x 50 mm deep
TO-456-03 Tamping Rod
TO-456-04 Automatic Blow Counter

Abrasion Testing

Los Angeles Abrasion Machine

Key Features
- European and ASTM methods
- Revolution counter
- Full width cover

System Description
The Los Angeles Abrasion Machine comprises a heavy steel cylinder, rotated about its 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 Tinius Olsen Los Angeles Abrasion Machine's 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. Its is also Supplied with one set of abrasive charges as standard.
It is suitable for operation on 200 V, 50 Hz/110 V, 60 Hz, Single Phase AC supply.

Applicable Standards
ASTM C 131, C 535, EN 1097-2, AASHTO T96

Ordering Information
TO-458-1 Los Angeles Abrasion Machine

Model No + Electric Requirements Suffix
Example: TO-458-1-02
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Particle Size Analysis
Sieve Analysis
ASTM D 422, AASHTO T88

The analysis of soil by particle size provides a useful engineering classification system from which a considerable amount of empirical data can be obtained. This helps in ascertaining possible frost action, determining graded filters, selection of grouting materials, designing of cement and asphaltic concrete mixes etc.
Two different procedures are used for coarse and fine soils.

- Sieving is used for gravel as well as sand size particles.
- Sedimentation procedures are used for finer soils. For soils containing coarse and fine soil particles.

It is usual to employ both sieving and sedimentation procedures.
We provide the following range of equipment for performing particle size analysis:

- Sieves, GI Frame of 45 cm diameter
- Sieves, GI Frame of 30 cm diameter

Aperture Size (mm)	TO-051 (45 cm dia)	TO-052 (30 cm 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

Asphalt Quality Control

PENETRATION EQUIPMENT

Universal Penetrometer

System Description

Our 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 millimeter 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 sample. Adjustable feet are provided in the base for leveling. 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 duration of penetration preset in factory to 5 seconds. The instrument is provided leveling screws.

Each penetrometer is supplied with a plunger weighing 47.5 g for testing bituminous product, one 50g weight, and one 100g weight. It also includes the cone and Penetration Unit.

Applicable Standards

ASTM D 5, ASTM D 1321, ASTM D 2884, ASTM D 1403, BS 1377, BS 2000- (Part 49), BS 4691, BS 4698, ASTM D 937, ASTM D 217, EN 1426, 13179-2, AASHTO T49, IP49

Ordering Information

TO-512 Universal Penertrometer

Model No + Electric Requirements Suffix
Example: TO-512-1-02
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Penetration Cone

System Description

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.

Weight : 102.5 + 0.05 g

Applicable Standards

BS 1377, 1924.3, EN DDENV 1997-2

Ordering Information

TO-515 Penetration Cone

Bitumen Penetration Kit

Our Bitumen Penetration Kit consists of a Penetration Needle, transfer Dish and Aluminium Sample Containers.

Applicable Standards

ASTM D 5, BS 2000 (D-49), EN 1426, 13179-2, AASHTO T49, IP49

Ordering Information

TO-518 Bitumen Penetration Kit

Optional Accessories

TO-51801 Penetration Needle
TO-51802 Transfer Dish made of copper
TO-51803 Aluminium Sample Containers

STABILITY TESTING

Marshall Stability Test Machine

Key Features

- Single Speed, Bench top load frame
- Max. loading capacity of 50 KN
- Geared Screw jack and Motor Drive,
- Precise speed
- Limit Switch Protection for both upward and downward movement

System Description

Marshall Stability Test Equipment is used to test the stability of bituminous samples, by highway departments, contractors, engineers, testing laboratories, and other governmental agencies. It is used for 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 25.4 mm maximum size.

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.

Specifications

Maxi Vertical Clearance	470 mm
Mini Vertical Clearance	250 mm
Horizontal Clearance	265 mm
Platen Diameter	133 mm
Platen Travel	25 mm
Platen Speed	50.8 mm/min
Rated Power	375 W
Dimension (l x w x h)	550 x 400x 870 mm
Weight	60kg

Applicable Standards

ASTM D1559 BS 598-107, EN 12697-34, AASHTO T-245

Ordering Information

TO-550 Marshall Stability Apparatus, two speed machine including machine mounted 25kN proving ring and micrometer.
TO-550-2 Digital Marshall Apparatus, including 25kN loadcell and LVDT displacement transducer.

Model No + Electric Requirements Suffix
Example: TO-518-2-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Optional Accessories

TO-55001 Breaking Head Stability Mould
TO-55002 Compaction Mould
TO-55003 Base Plate
TO-55004 Extension Collar
TO-55020 Electric Conversion Kit for Marshall Test Equipment

CORE DRILLING

Pavement Core Drilling Machine

System Description

This petrol 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 comprises of two vertical support columns which carry the drill head/engine assembly accurately with the help of a screwed spindle.

The 6 HP petrol 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.

Specifications

Bit Diameter	150 mm
Length	350 mm
Maximum depth of core	450 mm
Drill Speed	Variable speed from 900 to 200 rpm
Drive Motor	6 HP Petrol Engine
Guide Shafts	40 mm diameter
Screwed Spindle	20 mm diameter
Water Tap	12 mm
Drill Wrenches	Included

Applicable Standards

EN 12504-1

Ordering Information

TO-551-1 Pavement Core Drilling Machine

Accessories

Diamond Core Bits

TO-55101 50 mm diam. x 200 mm long
TO-55102 50 mm diam. x 450 mm long
TO-55103 75 mm diam. x 200 mm long
TO-55104 75 mm diam. x 450 mm long
TO-55105 100 mm diam. x 200 mm long
TO-55106 100 mm diam. x 450 mm long
TO-55107 150 mm diam. x 200 mm long
TO-55108 150 mm dia. x 450 mm long

Hilti bits are also available on request.

COMPACTION

Automatic Compactor for Bituminous Mixes - Light Compaction

Key Features

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

System Description

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

This equipment consist's of a drive mechanism that lifts the weight of 4.5 kg and drops it through a height of 457 mm. It has a rammer foot that is removable, which 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.

Applicable Standards
BS 598-107, EN 12697-10, -30, AASHTO T245

Ordering Information
TO-553 - 1 Automatic Compactor with light compaction
Model No + Electric Requirements Suffix
Example: TO-553-1-02
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Each machine is supplied with a TO 55002 Compactor Mould, a TO 55003 Base Plate and TO 55004 Extension Collar.

Bitumen Compactor for Modified Marshall Moulds - Heavy Compaction

Key Features
- Rugged construction to withstand hard work.
- Fully automatic and easy to operate.
- Uniform compaction.
- Automatic Blow Counter.

System Description
The mechanical compactor design is similar to TO 533-1, with two exceptions
- Weight of rammer - 10.2 kg
- Provision for accommodating - 6 inch mould specimen

Other features are same as TO 553-1. It is supplied complete with 6 inch mould assembly.

Applicable Standards
ASTM D 5581:1996, D 6926

Ordering Information
TO-553 - 2 Automatic Compactor with heavy compaction

Model No + Electric Requirements Suffix
Example: TO-553-2-03
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Softening Point - Ring & Ball Equipment

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

The Ring and Ball Apparatus has a magnetic stirrer with heating facility and digital display of temperature, the heating can be adjusted.
Suitable for operation on 220 V, 50 Hz/110 V, 60 Hz, single phase, AC supply. Each unit comes with a bath of heat resistant glass, Tapered Rings, Ball Centering Guide, Steel Balls, Ring Holder, a hot plates, and Thermometers.

Applicable Standards
ASTM D 36, E 28, STPTC PT 3, AASHTO T53, BS:2000, EN 1427

Ordering Information
TO-561-1-01 110 VAC, 60 Hz, 1 ph
TO-561-1-03 220 VAC, 60 Hz, 1 ph

Essential Accessories
TO-56101 Tapered Rings (set of 2)
TO-56102 Ball Centering Guide (set of 2)
TO-56103 Steel Balls of 9.5 mm diameter (set of 2)
TO-56104 Ring holder (1)
TO-56105 Electric Heater (Hot Plate) (1)
TO-56110 Thermometer IP 60C, Range: –2°C to 80°C
TO-56111 Thermometer IP 61C, Range: 30°C to 200°C

EXTRACTION

Centrifuge Extractor

System Description
This equipment is used to determine the bitumen percentage in Bituminous paving mixtures. It has a removable, precision machined, aluminium 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 0 rpm to 3600 rpm. Each unit is supplied with a set of 25 filter paper discs.

Applicable Standards
ASTM D 2172, AASHTO T-58, T-164, EN 12697-1

Ordering Information
TO-563-1 Centrifuge Extractor for a load of 1.5kg
TO-563-2 Centrifuge Extractor for a load of 3kg

Model No + Electric Requirements Suffix
Example: TO-563-2-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Optional Extra
TO-56301 Filter Paper Disc (set of 25)

DUCTILITY

ASTM D 113, AASHTO T51

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 to which a standard briquette can be elongated before the thread thus formed breaks under specified conditions.

A molten bitumen sample is poured into a standard mould, 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.

Ductility Testing Machine,

Electrically Operated, Digital

System Description

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 water bath completely encased in metal bound hardwood. It is equipped with an electric pump circulator and heater. The temperature is controlled by digital temperature controller. Two rates of travel i.e. 5 cm/minimum and 1cm/minimum are provided. The machine is supplied complete with 4 Ductility moulds, each with a base plate.

Ordering Information

TO-565 Ductility Testing Machine

Model No + Electric Requirements Suffix
Example: TO-563-2-01
Where Suffix:
-01 - 110 VAC, 60 Hz, 1 ph
-02 - 220 VAC, 60 Hz, 1 ph
-03 - 220 VAC, 50 Hz, 1 ph

Essential Accessories

TO-56501 Ductility Mould, with Base Plate

FLEXURE

Benkelman Beam

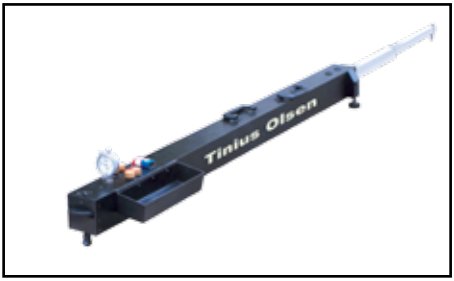
Key Features

- Lightweight aluminium construction.
- Easy to transport.
- Unique Telescopic Design, simplifying field set up.
- Compact, reduced storage space needed.

System Description

The Benkelman Beam uses the technique of using balanced beam in conjunction with a suitable vehicle to measuring 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. This equipment is supplied with a wooden carrying case.



Applicable Standards
AASHTO T-256

Ordering Information
TO-566-1 Benkelman Beam with Dial Gauge (TO 072)
TO-566-1D Digital Benkelman Beam with Digital Dial Gauge (TO 072D)
TO-072 Dial Gauge, 25 mm travel and 0.01 mm least count for TO566-1
TO-072D Digital Dial Gauge, 25 mm travel and 0.001 mm least

PENETRATION

Pavement Dynamic Cone Penetrometer

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

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 800 mm, or when an extension is fitted, to a depth of 1200 mm. 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 which 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 DCPis 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 a 8 kg weight dropping through a height of 575 mm and a 60° cone having a diameter of 20 mm. It is supplied complete with assembly tools and weighs 20 kg approx.

The DCP needs three operators, one to hold the instrument, other 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

Essential Accessories

TO-56701 Top & Bottom Rod
TO-56702 Handle
TO-56703 Hammer
TO-56704 1m Scale
TO-56705 60° Cone
TO-56706 Anvil

MOBILE LABORATORY

At Tinius Olsen we can also offer a complete mobile lab solution to the construction and civil engineering industry. Conceived with the rigorous QC/QA requirements and need to have these on project locations, the mobile laboratory concept is quick and easy to install; these 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.

Key Features

- Custom designed in 6 m (20 ft) or 12 m (40 ft) containers.
- Thermal insulation for all 4 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.

Ordering Information

Consult Tinius Olsen sales team for site specific order information

SOFTWARE

Tinius Olsen is proud to introduce you to 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, EP600 and Impact software, added a host of report writing and data manipulation capabilities and in the process, we've created a new, unparalleled testing platform that will make easy work of your materials testing programs, whether they're designed for the demanding rigours of R&D or the charting and analysis functions of QC testing.

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 wKnowledge Center (requires Internet access)

One the first features you 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.

Horizon software can accept data from all manner of testing equipment, including, but not limited to, compression testers, Marshall tester, Speedy testers, Super L, etc. , and can take manual data entry from equipment such as the slump cone test, Vicat penetration test, Blaine apparatus, sieve grading results, consistometer etc. 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 take all these results and produce a consolidated testing report complete with your, and/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 and has future enhancements readily available as your testing needs change and grow. talk to your sales engineer to see how Horizon software can best suit your needs and wants.

CALIBRATION AND SERVICE SUPPORT

Quality is our business. We understand that the quality of your product depends not only on the testing equipment that you purchase, but also on the quality and commitment of the support that stands behind that equipment.

Tinius Olsen has been manufacturing, calibrating and servicing physical testing equipment of the highest quality for decades. We have established an enviable record of reliability, by building highquality machines, encouraging customer programs of proper preventativemaintenance and a trained field staff that are committed to maximizing equipment performance and longevity.

Our calibration equipment and software has been developed for the exclusive use of our calibration and service personnel, and it demonstrates our continuing commitment to your quality assurance and support needs. The software ensures our customers of our strict compliance with the requirements of the applicable ISO and ASTM standards. Our quality program has also been recognized and approved by companies in the aerospace, nuclear, steel, and other quality critical industries.

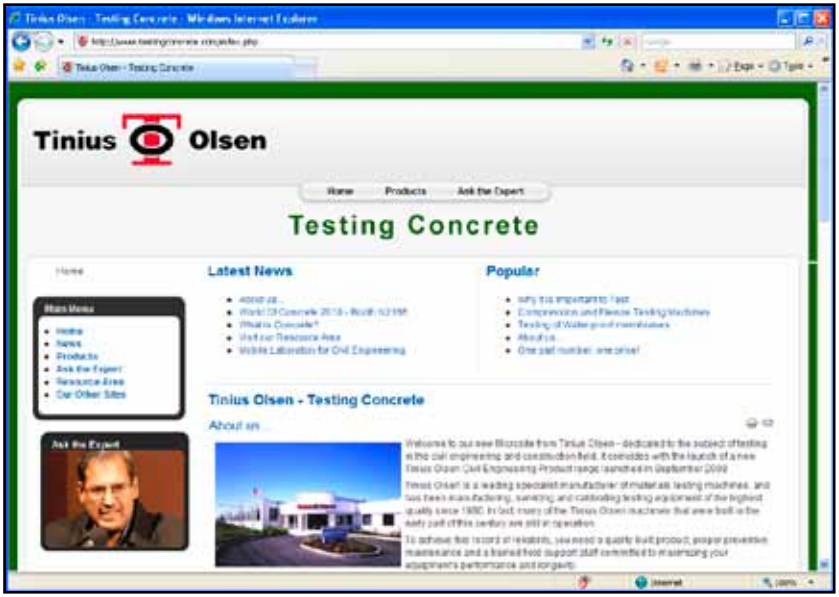
Tinius Olsen's calibration service is accredited in accordance with the International Standard ISO/IEC 17025:2005 by A2LA (American Association for Laboratory Accreditation) for our United States location and UKAS (United Kingdom Accreditation Service) for our Surrey, UK location for a variety of calibration standards.

A2LA and UKAS are signatories to the ILAC (International Laboratory

Accreditation Cooperation) Mutual Recognition Arrangement, whose aim is to develop international cooperation for facilitating trade by promoting the acceptance of accredited tests and calibration results from accredited laboratories by industry, as well as government, including results from laboratories in other countries. For a complete listing of our Accreditation Scopes, please check our website at www.TiniusOlsen.com for more details.

We are also able to calibrate a variety of other manufacturers' tensile and compression equipment, as well as their extensometry and other instrumentation. This truly translates into one source for all your certification needs. Please check with your local representative for calibration and service capabilities.

In addition to equipment calibration and service capabilities, Tinius Olsen can help you with your application questions. As one of the founding companies of the materials testing industry in the 19th century, we have a wealth of application experience and expertise. This knowledge base is available to everyone through our application based websites where users can ask questions of our experts regarding their unique testing issues. Check the address below to see the kinds of questions and answers.



OTHER SYSTEMS FROM TINIUS OLSEN

Tinius Olsen also manufactures other types of physical testing equipment that can be used by governmental or commercial civil engineering test labs an universities. Examples of these lines of equipment include, but are not limited to, benchtop materials testing machines, laser or video extensometers, high force electromechanical testers, impact testers, and drop dart testers,

Benchtop Materials Testing Machines

Tinius Olsen manufactures two key lines of benchtop testers, namely the S series and the T series. These machines are available in a variety of frame capacities, namely 1 kN (200 lbf), 5 kN (1,100 lbf), 10 kN (2,200 lbf), 25 kN (5,500 lbf), 50 kN (11,000 lbf) and 75 kN (16,500 lbf). The primary difference between the S series and T series is the display options; the T series is strictly controlled by a PC and software, whereas the S series has a built in display which allows quick simple tests to be performed, in addition to being able to be controlled from a PC and software.

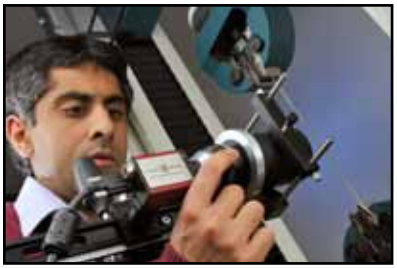
These machines are ideally suited for the testing of geotextiles, waterproof membranes, sealants, tiles, insulation material and other kinds of plastic materials.

High Force Electromechanical Testers

Tinius Olsen has several options available in this category of tester, namely the LoCap series, the U series or the Electomatic series. These machines each their own unique place in the market and are perfectly suited to a wide variety of applications and budgets.

Extensometry

For those demanding applications where long travel or elevated temperature



testing is being being used, Tinius Olsen has a couple of solutions to offer. The first one is a laser extensometer and the other is a video extensometer; both are non-contact methods and suited to a wide range of temperature limits and can still maintain extremely high accuracy.

Impact Testing

Tinius Olsen can offer pendulum impact testers capable of performing eith Charpy or Izod impact tests at a variety of capacities, namely 2J, 25J, 50J, 406J or 542J; ideal for testing plastic or metallic specimens.

The higher capacity pendulum impact testers can be motorized to allow safer and quicker testing.

Drop Dart Testers

Ideally suited for the rapid testing of plastic sheet or geotextile materials. The systems work on a simple concept where a the height at which a defined falling weight penetrates the clamped specimen.

These systems represent just a part of the product offerings from Tinius Olsen. Be sure to check with your local representative about all the appropriate products from Tinius Olsen for your applcations.

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