Bulletin
190-B

Tinius Olsen

# Solutions for Construction Testing

## Machines • Software • Calibration • Service


## 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

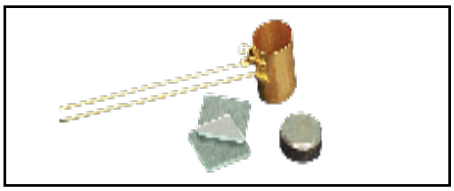
***Ordering Information***
**TO-3934** Vicat Apparatus

***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

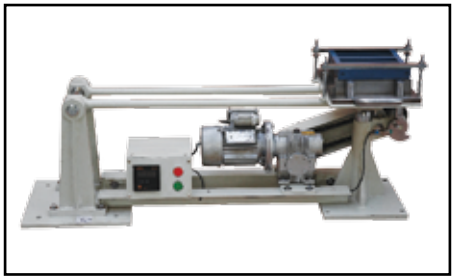
## Cube Moulds

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

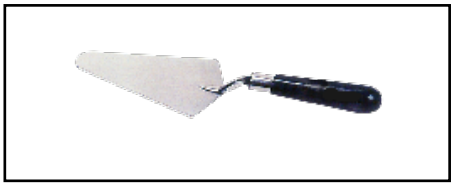
Three-gang Mould
Three-gang Mould for 40.1 x 40 x 160 mm mortar prisms and is supplied with a glass plate. Weight 12.2 kg.

***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.

# 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.

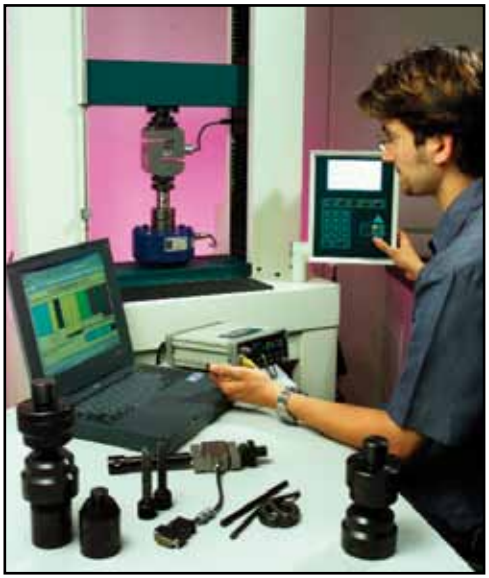
Tinius Olsen's calibration service is accredited in accordance with the International Standard ISO/IEC 17025:2005 by A2LA (American Association for Laboratory Accreditation) for our United States location and UKAS (United Kingdom Accreditation Service) for our Surrey, UK location for a variety of calibration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

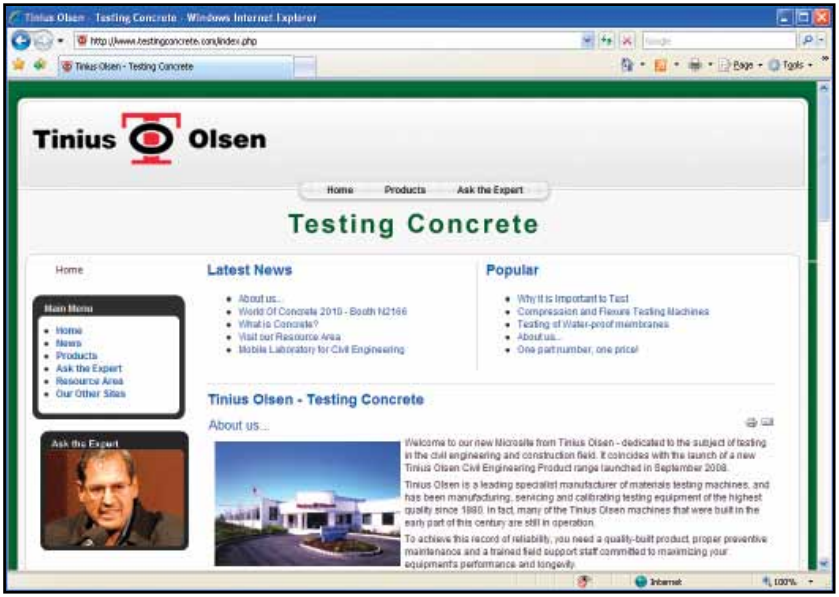
A2LA and UKAS are signatories to the ILAC (International Laboratory

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.

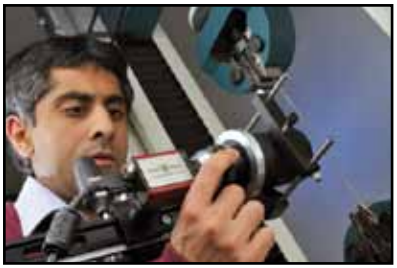

These machines are ideally suited for the testing of geotextiles, waterproof membranes, sealants, tiles, insulation material and other kinds of plastic materials.

## *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.

Contact your local representative

Tinius Olsen

Corporate Headquaters
1065 Easton Road,
Horsham,
PA 19044 USA
Tel +1 (215) 675-7100
Fax +1 (215) 441-0899

www.TiniusOlsen.com
www.TestingConcrete.com

info@TiniusOlsen.com

Tinius Olsen Ltd.
6 Perrywood Business Park,
Honeycrock Lane,
Salfords, Redhill,
Surrey, RH1 5DZ, England
Tel +44 1737 765001
Fax +44 1737 764768

Tinius Olsen India Private Ltd
J3 SDF, NSEZ,
Noida Phase 2,
U.P. 201305, India