Tinius Olsen

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Testing Solutions for the Civil & Construction Industry

EQUIPMENT, SOFTWARE, CALIBRATION, SERVICE AND AFTER SALES SUPPORT

Tinius Olsen

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Contents

Specifications in this catalogue are subject to change without notice

Tinius Olsen

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

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

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

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

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

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

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

Tinius Olsen

Tinius Olsen

Our Global Presence

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

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

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

PowerCept Middle East LLC
PO BOX 123489
Dubai – UAE

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

Key highlights of PowerCept are:

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

Package Solutions

Turnkey Project Management

All Tinius Olsen Package Solutions include the following:

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

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

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

Horizon Software

Key features

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

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

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

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

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

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

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

MODEL TO-391

Auto Blaine Apparatus

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

BS/EN Standards

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

ASTM Standards:

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

STANDARD features

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

Key features

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

OPTIONAL ACCESSORIES

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

PACKAGING INFORMATION

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

MODEL TO-408

Cement Autoclave

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

OPTIONAL ACCESSORIES

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

MODEL TO-408 SPECIFICATIONS	
Working pressure	21 ± 1kg/cm² at 215°C (300psi at 419°F)
Pressure vessel	150 x 500mm depth
Weight	70kg
Heater	2000W

Key features

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

MODEL TO-411

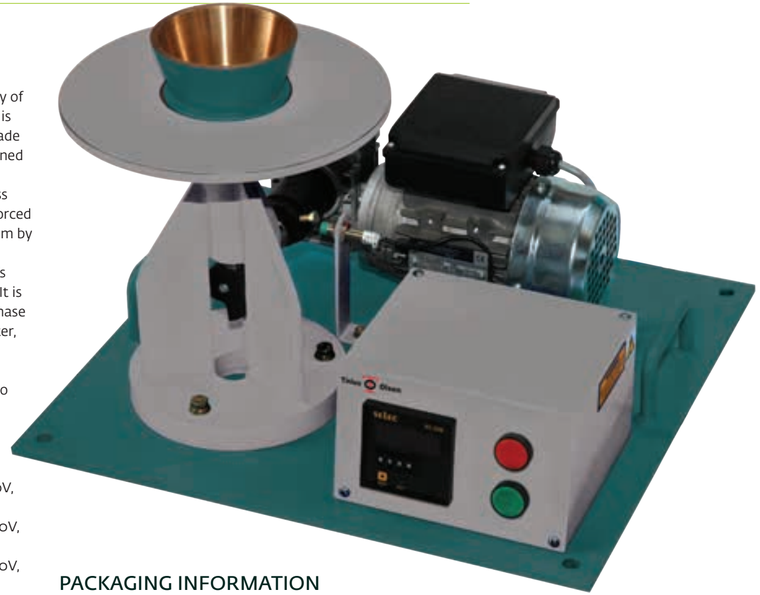
Flow Table

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

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

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

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



ORDERING INFORMATION

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

PACKAGING INFORMATION

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

APPLICABLE STANDARDS

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

MODEL TO-412

Mortar Mixer

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

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

MODEL TO-412 SPECIFICATIONS

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

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

STANDARD FEATURES

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

PACKAGING INFORMATION

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

MODEL TO-418

Vibration Machine

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

APPLICABLE STANDARD

- **BS 4550**

ORDERING INFORMATION

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

STANDARD ACCESSORIES

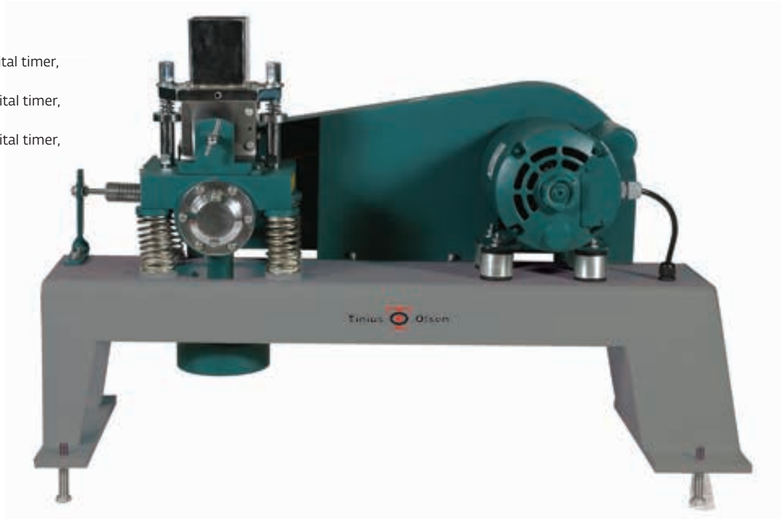
- **TO-414** Cube mold 70.6mm

OPTIONAL ACCESSORIES

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

PACKAGING INFORMATION

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



MODEL TO-421

Jolting Apparatus

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

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

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

The machine is supplied with one mold and hopper.

Key features

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

STANDARD FEATURES

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

PACKAGING INFORMATION

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

MODEL TO-320-5521

Compression Frame Jig Assembly

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

MODEL TO-320-5522

Flex/Bend Attachment

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

MODEL TO-390

Air Permeability Apparatus (Blaine type)

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

APPLICABLE STANDARDS

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

ORDERING INFORMATION

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

SUPPLIED AS STANDARD

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

OPTIONAL ACCESSORIES

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

PACKAGING INFORMATION

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

MODEL TO-394

Vicat Apparatus

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

ORDERING INFORMATION

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

SUPPLIED AS STANDARD

For EN Standards

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

For ASTM Standards

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

OPTIONAL ACCESSORIES

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

APPLICABLE STANDARDS

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

PACKAGING INFORMATION

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

MODEL TO-400
Le-Chatelier Mold & Apparatus

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

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

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

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

APPLICABLE STANDARD
- **EN 196**

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

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

MODEL TO-428
Gauging Trowel

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

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

MODEL TO-402
Shrinkage Bar Mold

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

APPLICABLE STANDARD
- **ASTM C151**

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

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

MODEL TO-414

Cement Molds

Cube Molds

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

APPLICABLE STANDARDS

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

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

Three-gang molds

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

ORDERING INFORMATION

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

Three-gang, naval brass mold for 2in cube

Three-gang, cast iron mold for 50mm cube

Three-gang, steel mold

Standards Reference Listing

AASHTO

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

AASHTO

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

AASHTO

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

AASHTO

Standard	Title	Equipment Reference	Page
T180	This method of test is intended for determining the relationship between the moisture content and density of soils when compacted in a given mold of a given size with a 4.54kg (10lb) rammer dropped from a height of 457mm (18in)	Automatic Soil Compactor	98
		Proctor Compaction Apparatus	119
T193	Standard method of test for the California Bearing Ratio	CBR Test Apparatus – Analog	101
		CBR Test Apparatus – Digital	104
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