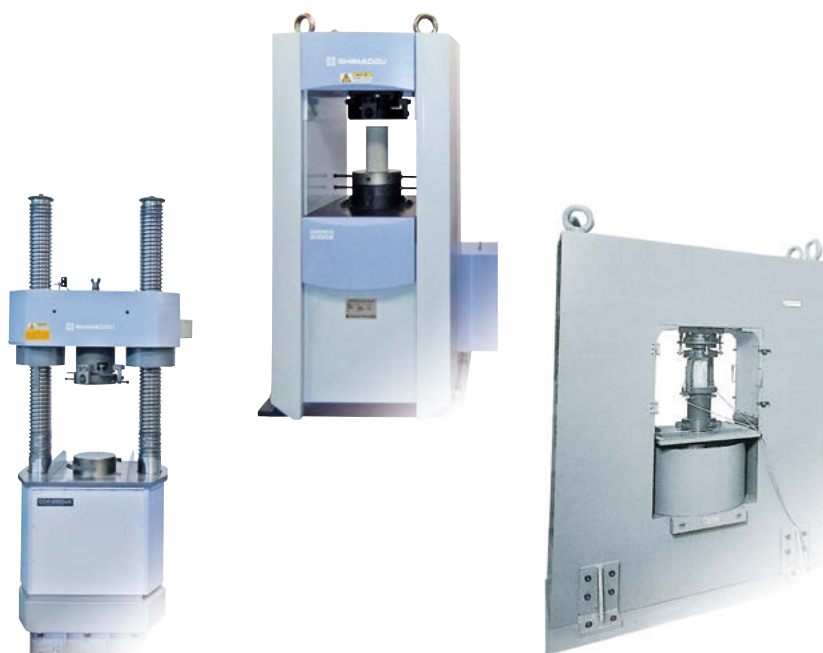# SHIMADZU
Excellence in Science

Hydraulic Universal Testing Machines

Fully Automatic Concrete Compression Testing Machine

Fully Automatic
Concrete Compression Testing Machine

Increasingly stronger concrete is necessary in order to expand the residential space of architectural structures, extend the life of buildings, and to reduce CO_2 emissions as a function of strength.
Shimadzu testing machines allow users to perform accurate compression tests of concrete materials in accordance with the material strength standards.
Conventional test efficiency can now be significantly increased by combining a variety of testing machines suited to the test objective with measurement controllers capable of high-accuracy measurements, and testing programs for quickly creating test reports.

CCH series testing machine
loading unit

CONCERTO series testing machine
loading unit

High-rigidity compression testing machine
loading unit

Fully Automatic Concrete Compression Testing Machine Comparison Table

(A) Sample: Ø100 mm × H 200 mm
(B) Sample: Ø125 mm × H 250 mm
(C) Sample: Ø150 mm × H 300 mm

Concrete Strength

		CCH		CONCRETO		High-rigidity compression testing machine
(Strength guidelines)		2000 kN	3000 kN	2000 kN	3000 kN	5000 kN
Normal strength	(up to 40 N/mm²)	(A)(B)(C)	(A)(B)(C)	(A)(B)(C)	(A)(B)(C)	(A)(B)(C)
High strength	(up to 60 N/mm²)	(A)(B)	(A)(B)(C)	(A)(B)(C)	(A)(B)(C)	(A)(B)(C)
	(up to 80 N/mm²)			(A)(B)(C)	(A)(B)(C)	(A)(B)(C)
Ultra high strength	(up to 90 N/mm²)			(A)(B)(C)	(A)(B)(C)	(A)(B)(C)
	(up to 150 N/mm²)			(A)	(A)(B)	(A)(B)(C)
Super ultra high strength	(up to 250 N/mm²)					(A)

<Supporting Various Sample Heights>

CCH: Vertical motion of the upper crosshead supports a variety of samples heights.

CONCRETO/high-rigidity compression testing machine: Use of the auxiliary compression plates supports a variety of samples heights.

With the CCH series, the crosshead moves vertically to support measurements of various sample heights. In addition, by the operation of the compression plate height sensor, the upper crosshead stops just before touching the sample.

CCH		CONCRETO		High-rigidity compression testing machine
2000 kN	3000 kN	2000 kN	3000 kN	5000 kN
Normal-strength coreless material*1		Coreless materials can be tested by using auxiliary compression plates.		Same as left
Supports bending tests for concrete beams.		Supports concrete bending tests compliant with JIS standards.		

*1 Coreless materials shall be no higher than standard size samples.

Measurement controller

TRAPEZIUM X

TRAPEZIUM X Material Testing Software
(The PC and table are optional.)

Fully Automatic Concrete Compression Testing Machine Standard Specifications

CCH series

Loading Unit		
Max. capacity	2000 kN	3000 kN
P/N	346-45850-10	Special-order product
Upper and lower compression plate size	Ø220 mm	Ø220 mm
Distance between compression plates	Max. 800 mm	Max. 900 mm
Effective distance between columns	440 mm	540 mm
Test stroke	150 mm	150 mm
Max. loading speed*	Max. 30 mm/min (60 Hz) Max. 25 mm/min (50 Hz)	Max. 30 mm/min (60 Hz) Max. 25 mm/min (50 Hz)
Size	(W) 860 × (D) 620 × (H) 2250 mm	(W) 1070 × (D) 710 × (H) 2600 mm
Power supply capacity 3-phase, 200//220 V, 50/60 Hz	Approx. 5 kVA	Approx. 7 kVA

*When unloaded and at a minimum oil temperature of 20 °C.

CONCRETO series

Loading Unit		
Max. capacity	2000 kN	3000 kN
P/N	346-45473-10	Special-order product
Upper and lower compression plate size	Ø220 mm	Ø220 mm
Distance between compression plates	Max. 320 mm	Max. 320 mm
Effective distance between columns	400 mm	500 mm
Test stroke	100 mm	100 mm
Max. loading speed*	Max. 20 mm/min (60 Hz) Max. 16 mm/min (50 Hz)	Max. 20 mm/min (60 Hz) Max. 16 mm/min (50 Hz)
Size	(W) 860 × (D) 700 × (H) 1530 mm	(W) 960 × (D) 730 × (H) 1890 mm
Power supply capacity 3-phase, 200//220 V, 50/60 Hz	Approx. 4 kVA	Approx. 7 kVA

*When unloaded and at a minimum oil temperature of 20 °C.

High-rigidity compression testing machine

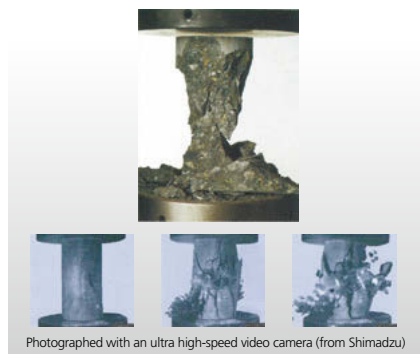| Specifications	
Capacity	5000 kN
Distance between compression plates	Max. 430 mm
Compression diameter	Ø220 mm
Loading speed	0 to 25 mm/min

*When unloaded and at a minimum oil temperature of 20 °C.

Testing Ultra High-Strength Concrete (130 N/mm^2)

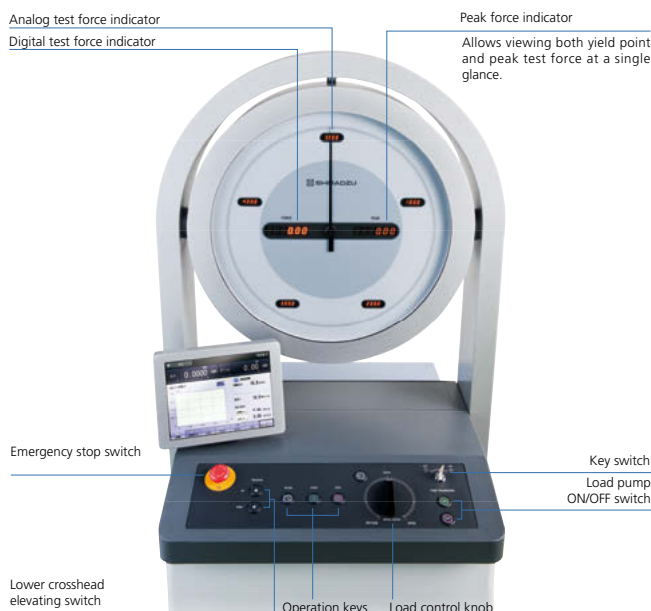(Ø100×200-mm high-sample)

Explosion-proofed

Photographed with an ultra high-speed video camera (from Shimadzu)

Not explosion-proofed

Note: This test uses the CONCRETO2000, which can support compression tests of ultra high-strength concrete.

Measurement Controller (Operation Unit)

Easy-to-See Display for Both Digital and Analog Measurements

The analog indicator is large, with a 450-mm diameter. The digital display is located within the same field of view to ensure even small changes in test force are not overlooked, such as at the yield point.

Analog test force indicator
Digital test force indicator

Peak force indicator
Allows viewing both yield point and peak test force at a single glance.

Emergency stop switch

Key switch
Load pump ON/OFF switch

Lower crosshead elevating switch

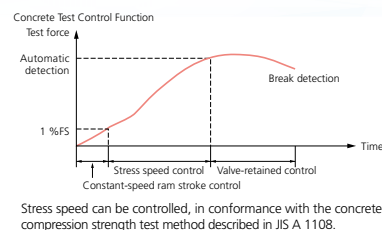Operation keys   Load control knob

Semi-Auto-Tuning Function Enables High-Precision Stress Control
(compliant with JIS A1106 and A1108 concrete testing standards)

Control parameters are semi-auto-tuned in real time, based on test force values measured during testing. This eliminates the need for preliminary testing and makes it easy to perform highly precise stress-controlled testing. The semi-auto-tuning function also allows the user to perform stress-controlled testing of concrete as described in JIS A 1106 and A 1108.
Note: Requires TRAPEZIUM X.

Concrete Test Control Function
Test force
Automatic detection
Break detection
1 %FS
Time
Stress speed control   Valve-retained control
Constant-speed ram stroke control

Stress speed can be controlled, in conformance with the concrete compression strength test method described in JIS A 1108.

USB Memory Enables Performing Tests Without Connecting to a Computer *

Inserting a USB memory stick into the measurement controller with test parameters stored in the USB allows users to perform tests without a computer. Furthermore, measurement data is automatically saved in the USB memory after tests, which enables the user to analyze the data with TRAPEZIUM X or to use it to create reports.
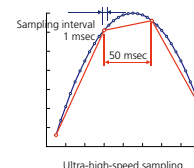* Requires TRAPEZIUM X.

Rangeless Data Measurement

Measure test force and strain without having to specify an amplifier range. This means data can be acquired using optimal measurement parameters, even for samples with unknown strength. In addition, since the analog indicator and output to the data recorder have a virtual range, evaluation is possible in the same manner as before.

Ultra-High-Speed Sampling Function Ensures No Sudden Variations in Strength Are Missed

By connecting to a computer installed with TRAPEZIUM X data processing software, data can be acquired at ultra-high sampling rates of up to 1 msec (1 kHz). This makes it possible to capture any sudden changes in test force, such as at the break point of brittle materials, with high precision. Sampling parameters can be changed during tests, so that critical areas can be analyzed in more detail.

Sampling interval
1 msec
50 msec

Ultra-high-speed sampling

Measurement Controller Standard Specifications		
1. Force measurement method		Cylinder internal pressure measurement with high-precision pressure cell
	Precision: Standard type	Within ±1.0 % of indicated value (when the force is 1/1 to 1/250 of rated value) (Conforming to JIS B 7721 Class 1, ISO 7500/1 Class 1, and ASTM E4)*1
	High-precision type (option)	Within ±0.5 % of indicated value (when the force is 1/1 to 1/250 of rated value) (Conforming to JIS B 7721 Class 0.5, ISO 7500/1 Class 0.5, and ASTM E4)*1
	Magnification	Rangeless
2. Force display	Operation unit	Digital display; Min. display resolution: 1/200,000 (for 300-kN type;1/240,000 for 3000-kN type)
	Analog force indicator*2	Analog display; Scale plate diameter: 450 mm; Min. scale: 1/1000 (for 300-kN type;1/600 for 3000-kN type) Digital display; Min. display resolution: 1/200,000 (for 300-kN type;1/240,000 for 3000-kN type)
3. Stroke measurement display		Measurement with optical encoder; digital display (resolution: 0.01 mm)
4. Automatic load control	Method	Fully closed-loop automatic load control
	Test control functions	Single test control, Strain test control, Stroke speed 3-step switching control, Concrete test control (compression, bending, splitting tensile tests)
	Range	Ram stroke control Ram stroke control Speed range : 0.1 mm/min to max. loading speed*3 / Control range : Ram return point to max. ram stroke
		Test force control Speed range : 0.2 % to 500 % full-scale/min / Control range : 0.4 % to 100 % of full-scale force
5. Input/output interface		External analog input: 2 CH; External analog output: 2 CH External digital input: 2 CH (optional); Internal amplifiers possible: 2 ports Analog recorder (optional) output, USB function (for computer) / Host (for USB memory) interface, and Dataletty (optional) output
6. Standard functions		Auto-test force-strain control (with semi-auto-tuning), Test force auto-zero, Test force auto-calibration, Break detecting (break sensitivity, break level, break peak level, and high sensitivity), Auto-return, Arbitrary stroke speed setting, Stroke speed preset, Cycle count, Stress value display, Displacement meter display, PEAK/BREAK value display, Test condition files (100 files), Japanese/English display, S-S curve display, Sample protection, Current speed display, and Manual load control
7. Safety devices		Overload automatic stop (When the test force value exceeds 102 % of the full-scale value, the loading pump automatically stops.) Software limit detection (automatically stops test upon reaching limit setting value) Control automatic stop (When an excessive control deviation is reached, the test automatically stops.)

*1 Calibration is required after instrument installation to provide conformance. *2 Models without an analog test force indicator are also available. *3 For the maximum loading speed, refer to the testing machine specifications.

Enables Intuitive Operation

Search files and select parameters quickly by simply touching the screen to perform consecutive tests efficiently.

TRAPEZIUM X Material Testing Software

● By registering frequently used parameters in a Quick Parameter List, tests can be started in one step.

● As more test results and parameter files accumulate over time, a file can be searched by keywords or date. In addition, reports and setting lists can be previewed to recall files easily.

Search conditions
Search results
Summary preview

Concrete Software

The software is used for testing concrete (compression, bending, and splitting tensile testing). It enables the user to perform tests compliant with JIS A 1108, JIS A 1106, and JIS A 1113 standards.

Data Processing Items

TRAPEZIUM X includes the following date processing items.

The circle (●) indicates an available data processing item.

	4-point bending	Concrete
Elastic modulus (4 types)	●	● 1 type: JIS A 1149
Upper yield point (2 types)	●	
Lower yield point	●	
Yield strength point (2 points)	●	
Intermediate force (5 points)	●	●
Intermediate displacement (5 points)	●	●
Max. test force point	●	●
Break point	●	
Joint elongation		
Reduction		
Energy	●	
Poisson's ratio		●
Arbitrary calculation formula (10 formulas)	●	●
Average value	●	●
Standard deviation	●	●
Max. value	●	●
Min. value	●	●
Range	●	●
Median	●	●
JIS median	●	●
Coefficient of variation	●	●
3 Σ	●	●

Note: Optional equipment will be necessary, depending on the test.

Retest, Add test, and File merge functions

● Retest : Portions of batch test results can be retested and replaced with new results.

● Add tests : The total number of tests can be increased by adding batch numbers (or lot numbers). In addition, in multiple batch tests, if the number of tests is increased for just a single batch, that number of tests can be added to just that batch.

● File merging : Test result files can be selected and merged. It also enables statistical processing.

More Attractive Reports Increase Persuasiveness

Create expressive reports with freely configurable layouts and a wide selection of web-compatible output functions.

● **Report Designer enables freely changing layouts**

Creates reports that contain test results, graphs, photographs, logos, or other graphical content. The layout and size of items in reports can be freely changed. Fonts, colors, borders, and other features can be specified in detail for each item.

● **Reports can be output in Adobe Acrobat, Microsoft Word, Excel, or HTML file formats**

Reports created using Report Designer can be output in various file formats. This makes it possible to freely customize reports using software preferred by the user.

● **WebPlus Function (optional)**

By installing the WebPlus function on the server, networked computers without TRAPEZIUM X installed can be used to reanalyze data or print reports via Internet Explorer.

CONCRETO Series with Extended Functionality (Special Model)

Special CONCRETO Series with Larger Stroke and Faster Ram Speeds When Unloaded

With the standard CONCRETO series, auxiliary compression plates need to be incorporated to measure coreless materials with dimensions not matching JIS standard sizes.
With this series, coreless materials can be measured without using auxiliary compression plates.
The following is changed from the standard specifications.

	Standard CONCRETO Series	CONCRETO Series with Extended Functionality
Test stroke	100 mm	300 mm
Loading speed when unloaded	Max.16/20 mm/min (power supply frequency 50/60 Hz)	Max.160/200 mm/min (power supply frequency 50/60 Hz)

(Supplied by YAMANASHI Prefecture Concrete.)

The I type measurement controller prior to the model change is used.
A hydraulic source to extend the speed is incorporated into the back of the measurement controller.

CCH Series for Bending Tests of Concrete Beams

This testing machine supports concrete beam bending tests and compression tests.
A special bending test jig is attached to the load table. In this design, concrete compression tests can also be performed by attaching the lower compression test jig for concrete to the center of this lower bending jig.
For the specifications, refer to the CCH series loading unit. (Make separate inquiries if you wish to extend the test stroke.)

The I type measurement controller prior to the model change is used.

(Supplied by Faculty of Environmental and Urban Engineering, Kansai University)

Universal Testing Machines

Universal Testing Machines

UH-500kNX

UH-F500kNX

Universal Testing Machine
UH-X Series

With a semi-auto tuning function, highly accurate stress control and strain control are now possible.
In addition, use of the hybrid hydraulic source contributes to significant power savings. It is compliant with ISO 6892-2009 and JIS Z 2241.

Capacity	200 kN to 4,000 kN; 7 types
Force range	rangeless
Test control functions	Single, cycle, stress, and strain test control, etc.

High-Efficiency Universal Testing Machine
UH-FX Series

Front-opening grips are provided to enable performing high-efficiency tensile tests. The series can be extended into an automatic tensile test system by adding an automatic extensometer and data processor. It is compliant with ISO 6892-2009 and JIS Z 2241.

Capacity	300 kN to 4,000 kN; 6 types
Force range	rangeless
Test control functions	Single, cycle, stress, and strain test control, etc.

Universal Testing Machine Optional Test Devices

Upper Spherical Compression Plates for Concrete (JIS A 1108)

This upper spherical compression plate is compliant with JIS A1108. A fixed compression plate provided as standard for each model is used for the lower compression plate.

- Standard setup : Upper spherical compression plate (upper plate only), 1 set
- Flatness : Within 0.01 mm per 100 mm
- Rockwell hardness : HRC55 or higher
 Angle of rotation of compression plate: 3° or higher

Upper Spherical Compression Plate
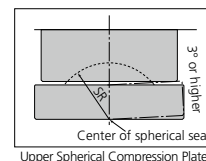
Applicable testing machine		P/N	
Model	Capacity (kN)	Plate dia. (mm)	
		Ø160	Ø220
UH	1000	346-42002-21	346-42002-22
	2000	346-42002-31	346-42002-32
UH-F	1000	346-42003-21	346-42003-22
	2000	346-42003-31	346-42003-32

Notes: 1. The compression plate can be attached by simple one-touch operation with the UH-F model.
2. Please contact Shimadzu for items with different specifications.

Bending Test Jigs for Concrete (JIS A 1106)

These test jigs are compliant with bending strength test methods for concrete using trisected point loading.

- Standard setup: Bending test jigs for concrete, 1 set
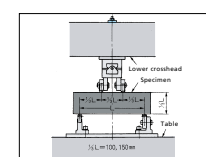
Bending Test Jigs for Concrete (mm)

Applicable testing machine		P/N		Allowable test force for jig (kN)	Load point Tip radius×width (mm)	Support Radius×width (mm)	Span L (mm)	Span of load points 1/3 L (mm)
Model	Capacity (kN)	UH	UH-F					
UH UH-F	*200/300	343-02800-02	343-02813-01	100	15×170	15×170	300 450	100 150
	500	343-02800-03	343-02813-02					
	1000	343-02800-04	343-02813-03					
	2000	343-02800-05	343-02813-04					

*No 200-kN type is available for the UH-F series.

I-Beam Bending Test Jig

An I-beam is placed on the table of a testing machine's loading unit when performing bending tests on large materials.
The I-beam can be removed when not needed.

- Applicable samples : Metal (steel), wood, concrete, structural members consisting of composite materials, laboratory models, etc.
- Standard setup : Bending test jigs, 1 set

I-Beam Bending Test Jig with Rollers

For testing machines of 1000 kN or above, i-beam bending test jigs with rollers are also available. In this case, the loading unit is installed underfloor and the I-beam moves on rails embedded on the floor.

L:Span d:Roller diameter W:Roller width

I-Beam Bending Test Jig with Rollers

Applicable testing machine		P/N		Max. span L (m)	Allowable test force for jig (kN)	Roller (mm)		Sample height (mm)	Column and screw rod extension (mm)	
Model	Capacity (kN)	UH	UH-F			Diameter	Width		UH	UH-F
UH UH-F	*200	343-01913-03	–	1.5	100	30	250	300	200	–
		343-01913-04	–	2						
	300	343-01913-05	343-02815-13	1.5	150	30	250	300	200	200
		343-01913-06	343-02815-14	2						
	500	343-01913-07	343-02815-03	1.5	250	50	400	400	300	300
		343-01913-08	343-02815-04	2						
	1000	343-01913-09	343-02815-05	1.5	500	50	400	500	500	500
		343-01913-10	343-02815-06	2						
		343-01913-11	343-02815-07	3						
	2000	343-01913-12	343-02815-08	1.5	1000	70	500	500	800	800
		343-01913-13	343-02815-09	2						
		343-01913-14	343-02815-10	3						

* No 200-kN type is available for the UH-F series.
Note : The column and screw rod extension amounts in the table above are based on the following specifications.
  For details on part Nos. for extending the column and screw rod, see page 2.
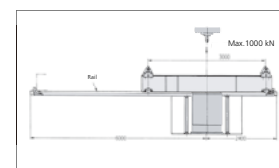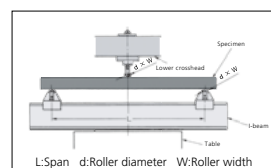 1. Deflection: Within the standard ram stroke
  2. Sample height: Within the dimensions indicated in the table
    Test jigs other than those in the table are also available. Please contact Shimadzu for details.