C227-E030

SHIMADZU
Excellence in Science

Micro Compression Testing Machine

MCT Series

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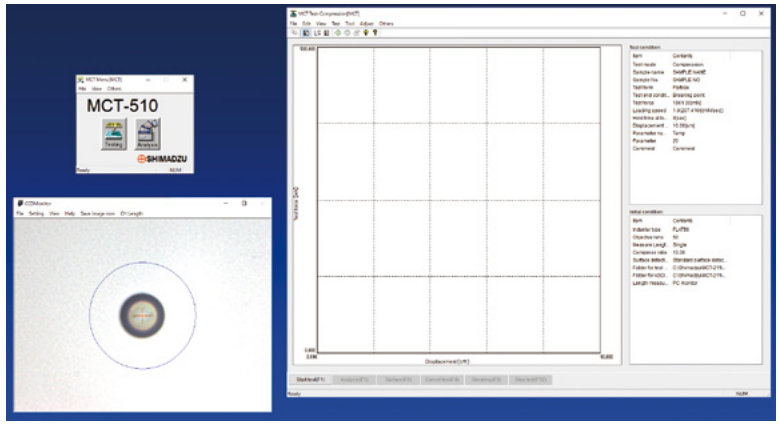


The photograph shows the configuration with the side observation kit and length measurement kit installed.

Evaluating Compression Strength of Various Micro Samples

The MCT series micro compression testing machine evaluates the strength of various types of micro components, micro particles generated in powder processing, and fine fibers used in new materials.
With the development of manufacturing technology for metal and ceramic powders, spherical fine powders with particle sizes ranging from a few μm to a few hundred μm are being produced, which has given rise to the need for evaluation of their properties. Also, the necessity to evaluate the properties of fine fibers, which are the raw material for composite materials, has arisen.
Of course, there is also an increasing need to evaluate the compressive properties of all other types of fine materials.
The Shimadzu MCT series is just the right micro compression testing machine to meet strength-evaluation needs in the fields of micro particles and fine fibers.

Evaluating the Compression Strength of Micro Substances

- Variety of micro components
- Ceramic particles
- Fine metallic powder
- Resin particles
- Pigments
- Powdered food ingredients
- Pharmaceuticals (micro capsules)
- Fine fibers

For example, powders are extremely difficult materials to handle because the momentum of each particle is small, so they can have poor fluidity due to condensation and they are easily scattered, etc. As a countermeasure to this, granulation is performed to enlarge the apparent motion units. When granulating, the material must not break down during transportation or supply, and must be easily dispersed as primary particles during kneading with polymeric materials, for example. In other words, the granulation needs to be such that the material breaks under a suitable load.

This instrument is capable of evaluating the compressive properties of each particle, making it ideal for characterizing such particles.

Contents

MCT Series

A New-Concept Compression Testing Machine for Evaluating the Strength of Micro Materials

Flow of Measurement in the Manual Mode

Setting test conditions → Microscopic observation and size measurement of the sample → Compression test → Indenter cleaning → Analysis

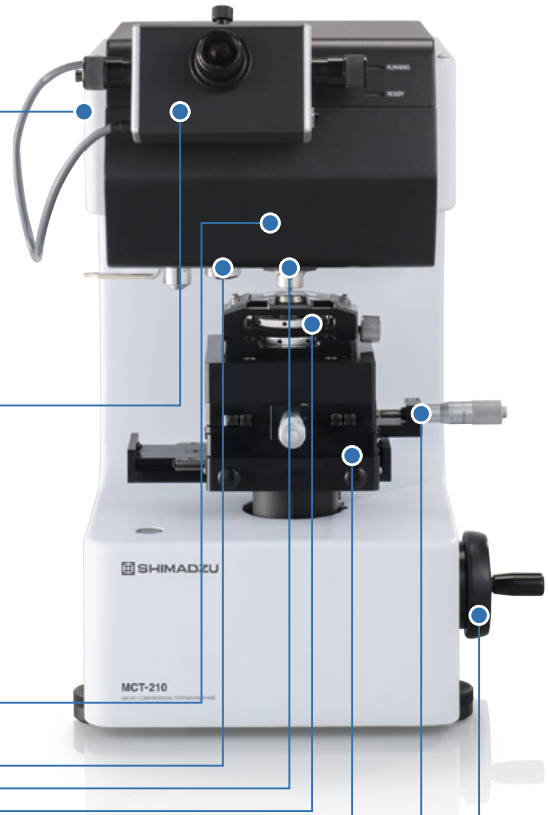
Loading Unit

Wide Loading Range

Two types are available for compressing small materials, with maximum test forces of 4903 mN and 1961 mN.

High Accuracy Measurement

Test force is applied at an accuracy of ±1 % of the set or displayed test force, whichever is greater.



Optical Head (Micrometer)

Sample Size Measurement Function Provided as Standard

By sandwiching the sample image viewed from above between two indicators, the geometric mean diameter and length can be measured. The measured size is displayed on a PC, and the strength can be calculated from this length and displayed.

Compression Displacement Measurement Unit

Measuring Micro Compressive Displacements

To evaluate the compressive properties of micro materials, we provide a model with a measurement range of up to 100 µm with a resolution of 0.001 µm, and a model with a measurement range of up to 10 µm with a resolution of 0.0001 µm.

Objective Lens

For length measurement, we provide objective lenses with 50×magnification (standard) and 100× magnification (optional), and for observation lenses with 10× magnification (standard)and 20× magnification (optional).

Indenter

We provide flat indenters with a diameter of 50 µm, 500 µm (optional), and triangular pyramid indenters with an angle of 115° (optional). A triangular pyramidal indenter is used for samples larger than 500 µm made from a material that does not break at a test force of 4903 mN.

Lower Compression Plate Holder

This is a holder for securely holding the lower compression plate. The unit uses steel band tension to secure the plate.

Slide Stage

The sample is moved under the indenter after determining the sample size using a micrometer. It has a click stop, enabling it to be loaded accurately at the position determined by the micrometer.

X-Y Stage

A stage that can move 25 mm in the X-Y direction is provided as standard. A standard micrometer can be adjusted in increments of 0.01 mm. Also, a digital display option is available.

Vertical Stage Shift Handle

This enables the stage to be smoothly raised and lowered. Coarse and fine adjustments can be made with this one knob.

MCT-AD Model

Automating Particle Detection, Length Measurement, Continuous Testing, and Indenter Cleaning Using an Electric XY Slide Stage and Dedicated Software

Flow of Measurement in the Automatic Model (Refer to pp. 10–12 for Details)

Setting test conditions → Wide-area scan particle detection and length → Preparation of test list → Continuous test Indenter cleaning → Analysis

Length Measurement Kit (Color)

Measuring Lengths and Saving Images on the PC Window

An image of the particles viewed from above can be displayed on a PC, particles can be detected within an area of up to 10 mm × 10 mm via a wide-area scan, and the diameter and length of the detected particles can be measured. Digital data of particle images can be saved during measurement and after testing is completed.

Objective Lens

An ultra-long working distance 40× lens for length measurement and a 10× lens for observation are included.

Lower Compression Plate Holder (Including a cleaner)

The compression plate has a structure that facilitates image capture. It can be easily installed and removed using screws from the side.

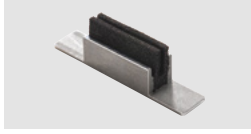
Electric XY Slide Stage

Improving Work Efficiency by Automatic Stage Control

The lower compression plate can be advanced in 0.001 mm increments by PC operation. While automatically controlling the X-Y stage, images of particles on the lower compression plate are continuously acquired, and up to 100 automatically detected particles can be tested continuously.

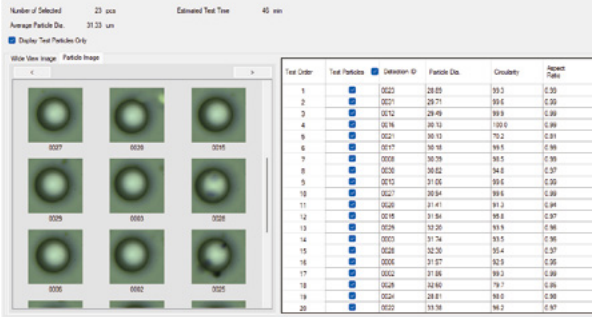
Cleaner

The indenter is automatically cleaned after each compression test.

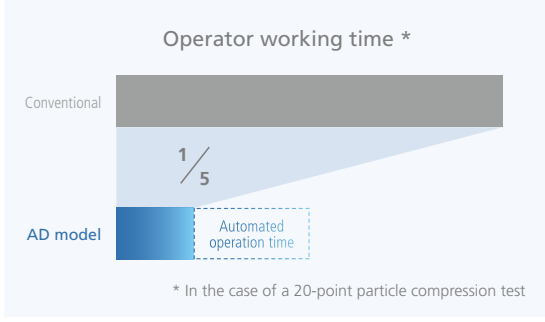


Features of the MCT-AD Model

The system performs wide-area scanning for automatic particle detection, then carries out automatic dimensional measurement using high-magnification images, allowing continuous testing of up to 100 particles.



By enabling automated operation, the system reduces operator workload to about 20%. Greater efficiency gains can be achieved as the number of measurement points increases.

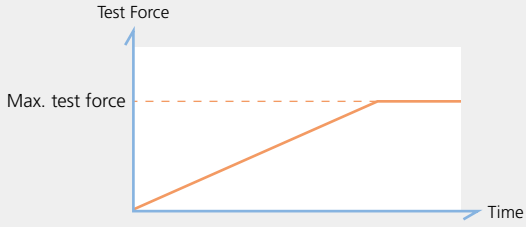


Performing a Variety of Physical Property Tests

(Test items can be selected according to the application.)

Compression Test

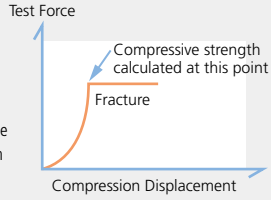
In this test, when the sample shape is set to particle or fiber, a load is applied up to the set test force. If the sample breaks (fractures), the crushing strength is determined, and if the sample does not break, the strength at the specified deformation is obtained. If other sample shapes are selected, the test ends once the load reaches the set test force.



Loading Pattern

●Compressive Strength

The compressive strength is calculated from the compressive test force and particle size, and displayed.Alternatively, the X % strength (reference strength) is calculated from the test force and particle diameter at the time of X % deformation of the sample diameter, and displayed.



For particles: $Cs\ (Cx)$, σ_F or $St\ (Sx) = \alpha \times P / (\pi \times d \times d)$

$\sigma_{10\%} = P_{10\%} / A$

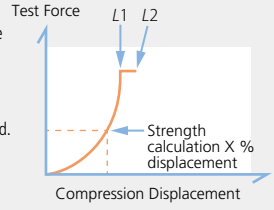
Cs	:	Strength (MPa) α = 2.48 (JIS R 1639-5:2007)
Cx	:	Reference strength (MPa) α = 2.48
σ_F	:	Fracture strength (MPa) α = 2.8 (JIS Z 8844:2019)
$\sigma_{10\%}$	:	Deformation strength (MPa) (JIS Z 8844:2019)
St	:	Strength (MPa) α = 2.8 (Equation of Hiramatsu et al.)
Sx	:	Reference strength (MPa) α = 2.8
P	:	Test force (N)
d	:	Diameter of particle (mm)
$P_{10\%}$	:	Test force at 10 % deformation of sample diameter (N)
A	:	Representative area (mm)

For fibers: x$St\ (Sx) = 2P / (\pi \times L \times d)$

St	:	Strength (MPa)
Sx	:	Reference strength (MPa)
P	:	Test force (N)
d	:	Fiber diameter (mm)
L	:	Fiber length (mm)

●Rate of Change

The rate of change or amount of change is calculated from the displacement at the start of holding the test force ($L1$) and the displacement at the end of holding the test force ($L2$), and displayed.



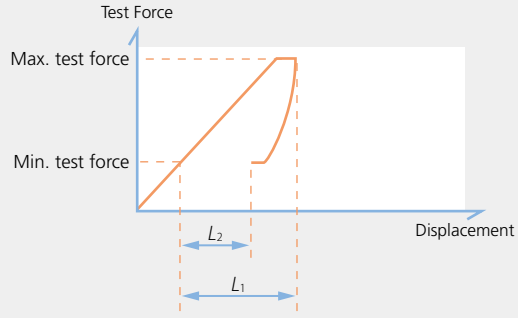
For particles and fibers: Rate of change $Cp = (L2 - L1) / d \times 100$

For other samples: Amount of change $Dp = L2 - L1$

Cp	:	Rate of change (%)
Dp	:	Amount of change (μm)
d	:	Diameter of particle or fiber (μm)
$L1$	:	Displacement at the start of load-hold time (μm)
$L2$	:	Displacement at the end of load-hold time (μm)

Load-Unload Test

In this test, a load is applied up to the maximum test force and then unloaded to the minimum test force.



Loading Pattern

For particles and fibers

Compression rate $Cr = L_1 / d \times 100$

Recovery rate $Rr = (L_1 - L_2) / d \times 100$

Cr	:	Compression rate (%)
Rr	:	Recovery rate (%)
d	:	Diameter of particle or fiber (μm)
L_1	:	Displacement 1 (μm)
L_2	:	Displacement 2 (μm)

For other samples

Compression amount $Cv = L_1$

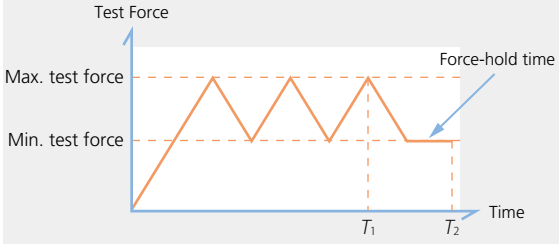
Recovery amount $Rv = L_1 - L_2$

Cv	:	Compression amount (μm)
Rv	:	Recovery amount (μm)

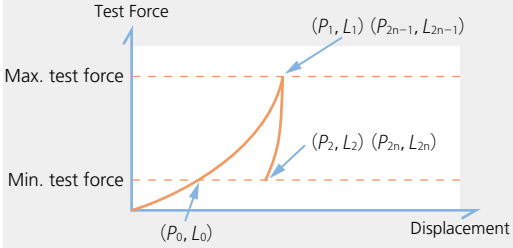
Cycle Test

In this test, the load-unload test is repeated up to 250 times. This test is used to evaluate the properties of a sample under cyclic loading.

*AD models are not supported by this system



Loading Pattern (Test Force-Time)



Loading Pattern (Test Force-Displacement)

The compression rate, recovery rate, or amount of compression and recovery is determined for each cycle.

For particles and fibers:

At the *n*-th cycle Compression rate $Cr = (L_{2n-1} - L_0) / d \times 100$

Recovery rate $Rr = (L_{2n-1} - L_{2n}) / d \times 100$

Cr : Compression rate (%)

Rr : Recovery rate (%)

d : Diameter of particle or fiber (μm)

L_0 : Displacement at the minimum test force during the first loading cycle

L_{2n-1} : Displacement at the maximum test force in the n-th cycle

L_{2n} : Displacement at the end of unloading in the n-th cycle

For other samples:

At the *n*-th cycle Compression amount $Cv = L_{2n-1} - L_0$

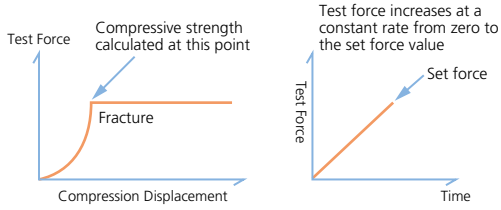
Recovery amount $Rv = L_{2n-1} - L_{2n}$

Cv : Compression amount (μm)

Rv : Recovery amount (μm)

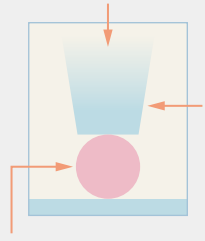
Measurement Principles of the MCT Series

A test force is applied by electromagnetic force at a fixed rate of increase to the sample that is fixed between an upper pressure indenter (standard is a 50 μm flat indenter) and a lower compression plate. The amount of sample deformation is automatically measured during this process.
The test force can be set from 9.8 mN up to 4903 mN or 1961 mN, and deformation can be measured up to 100 μm or 10 μm with a resolution of 0.001 μm or 0.0001 μm. The compression force and the amount of deformation are measured and recorded throughout the deformation process.
This allows for the dynamic measurement of deformation characteristics in fine powders, providing a wide range of analytical data. Also, the size of the sample can be measured using a microscope, so it is possible to evaluate samples of various sizes.



- A sudden increase in displacement indicates that the sample has fractured.
- The mechanical strength (tensile strength) of the sample is determined from this fracture load.

Force: 9.8 to 4903 mN or 1961 mN load using electromagnetic force



Indenter:
Flat indenter
50 μm diameter
500 μm diameter (optional)
triangular pyramid indenter 115° (optional)

Compression displacement measurement:
0 to 100μm or 10 μm

Sample:
Individual compression of particles with diameters from 1 to 500 μm is possible.
Compression of fibers with diameters from 1 to 500 μm is possible.
A diluting agent (alcohol, etc.) is required to dilute the sample for separation.

Sample sizing:
sample size can be measured at an increment of 0.1 μm using an optical microscope.

- For particles
  Mechanical strength acquired using JIS R 1639-5:2007[*1]

$$Cs = 2.48 \times \frac{P}{\pi d^2}$$

  Using JIS Z 8844:2019[*2] or the equation of Hiramatsu et al.[*3]

$$St = 2.8 \times \frac{P}{\pi d^2}$$

- For fibers

$$St = \frac{2P}{\pi dL}$$

Cs or St : Strength (MPa)
P : Test force (N)
d : Particle diameter or fiber diameter (mm)
L : Fiber length (mm)

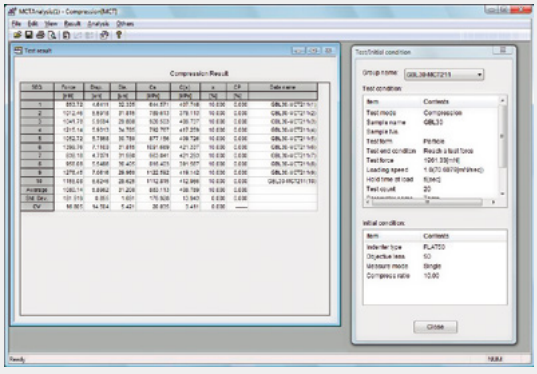
Bibliography:
*1 Test methods of properties of fine ceramic granules Part 5: Compressive strength of a single granule
*2 Test method of fracture and deformation strength of a fine particle
*3 Hiramatsu, Oka, Kiyama: *MMIJ Journal* Vol. 81 (1965)

Comprehensive Analysis Functions Facilitate Compressive Property Evaluation

(Data Examples)

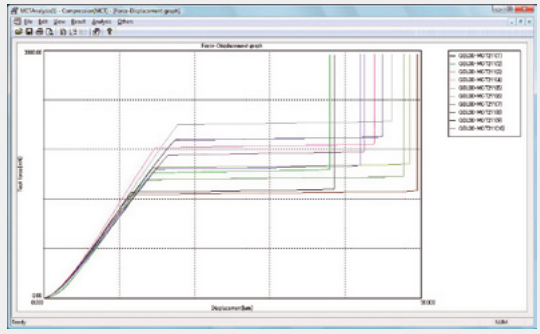
Display of Test Force, Displacement, and Strength

Individual test results (test force, displacement, strength, etc.), their average values, and the associated test conditions can be displayed.



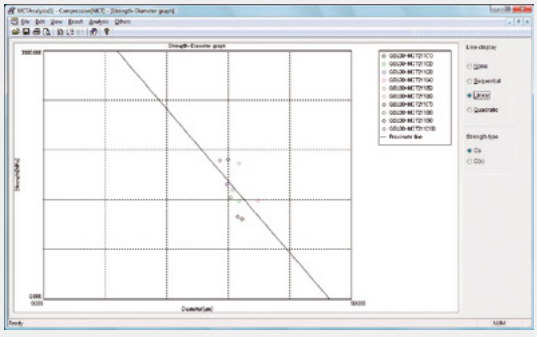
Superimposed Test Force-Displacement Curves

Plotting multiple test force–displacement curves simultaneously allows differences in deformation properties to be identified at a glance.
The curves can also be superimposed starting from the same origin.



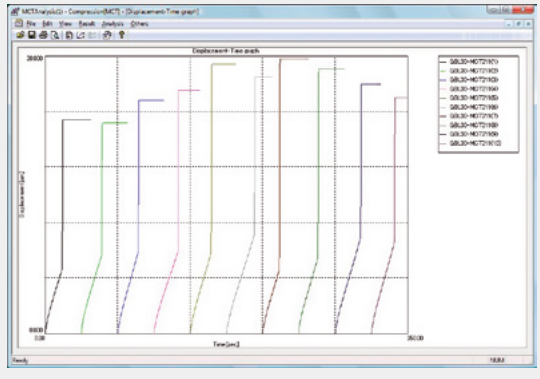
Strength-Particle Diameter Curve

The relationship between particle size and strength can be displayed on a graph.



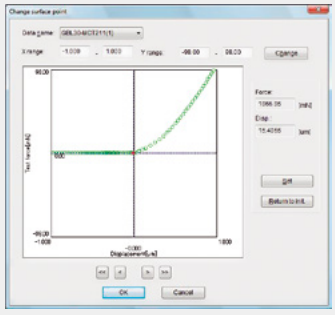
Displacement-Time Curves

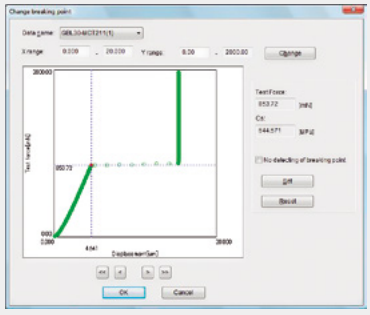
After the indenter has reached the sample surface, information can be obtained regarding the sample deformation resistance as it deforms.



Checks and Changes for Surface Detection Point and Fracture Points

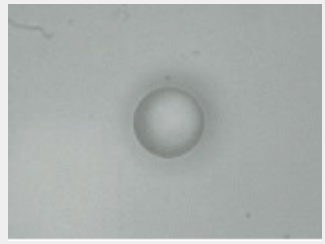
Surface detection and fracture points, which significantly impact test results, can be checked and changed not only during testing but also during analysis.





Overhead Image Display on PC Window

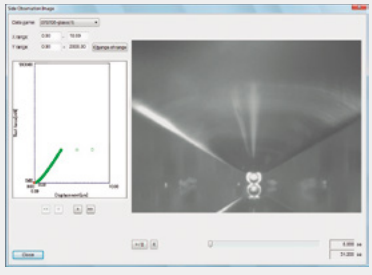
Images of the samples viewed from above can be viewed on a PC.
(When the optional length measurement kit is attached)



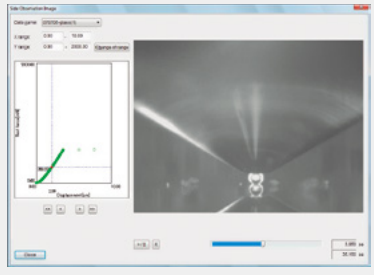
This is an example of an approx. 80 µm particle observed with a 50× objective lens.

Image Observation during Compression

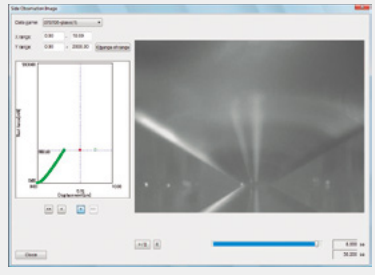
The following shows a glass bead of approximately 30 µm being compressed with a 50µm diameter of flat indenter.



Start of Test



During compression



At Fracture

Left window: Test force and displacement measurement data
Right window: Side observation data
A side observation image is displayed for any point in the measurement data.

MCT-AD Model

Labor Requirements and Downtime for Each Test are Reduced through the Automation of Particle Detection, Length Measurement, Continuous Testing, and Indenter Cleaning

Measurement Workflow for the Automatic Model

Preparation

Dispersion of Sample

The sample is dispersed onto the lower compression plate.
A dispersion tool (optional) is available.
Refer to P. 15 detailed description.

Setting Test Conditions

Select single test or continuous test, and set the following as the test conditions:

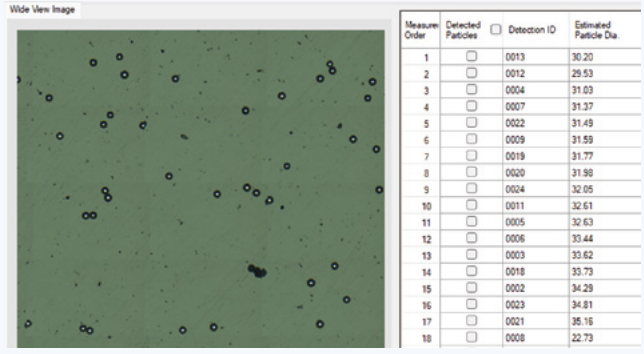
- **Test mode**
- **Test force**
- **Loading speed**
- **Test end conditions**

Test Condition	Test Mode		
	Compression Test	Load–Unload Test	Cycle Test
Single Test A single test performed on a particle selected by the user	✓	✓	✓
Continuous Test Automated sequential testing of particles detected via image analysis	✓	✓	✗

Particle Detection

Wide-Area Scan

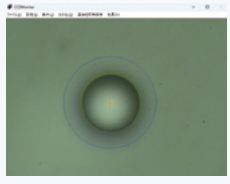
Images of the compression plate captured from above using a low-magnification lens are stitched together to create a wide-area image of up to 10 × 10 mm, from which the particles are detected.

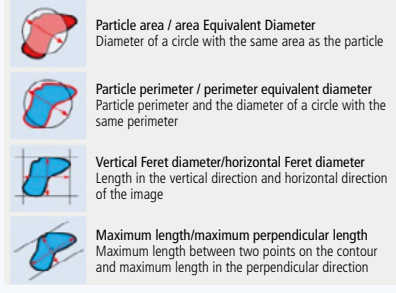


Length Measurement

Automatic Length Measurement

The detected particles are imaged with a high-magnification lens, and their diameters are measured.

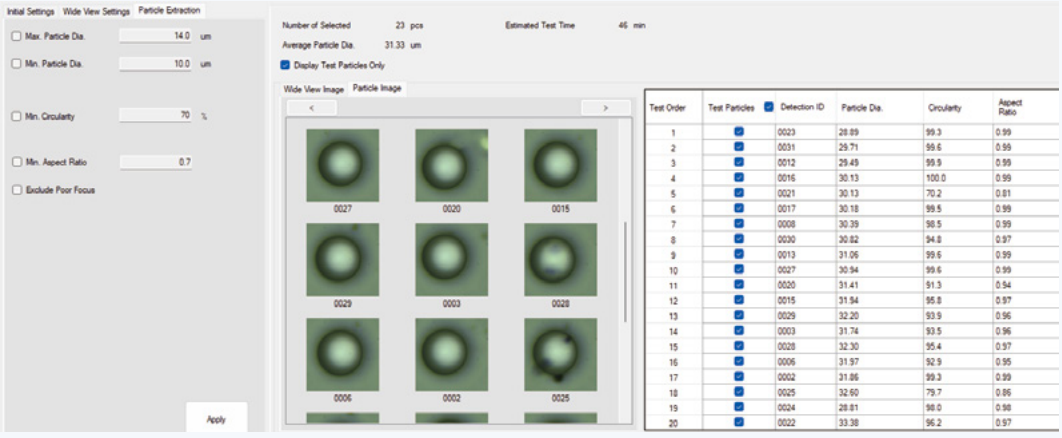




Preparation of Test List

Determining the Test Particles

A test list is prepared by extracting up to 100 particles that are close to the ideal test target determined from the particle size, circularity, and particle images.



Test

Performing the Test

When the Test Start button is pressed, the electric XY slide stage moves, and the test is performed in accordance with the test list.

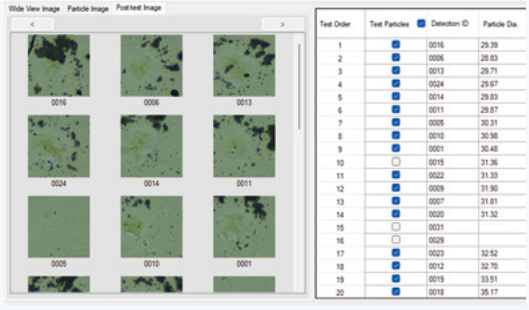
Cleaning the Indenter

The indenter is automatically cleaned when each test is completed.

Image Capture

Capturing Images before and after the Test

Images are saved during length measurement and after the test. With the side observation kit (optional), a video recording of the test can be saved.



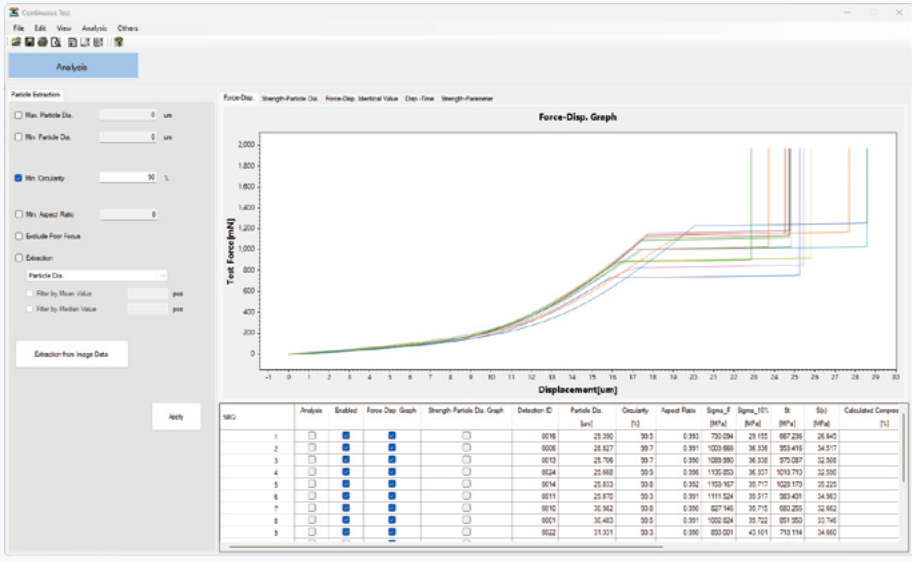
Analysis

Review of Test Results

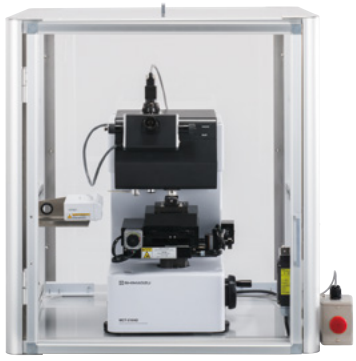
Test results are reviewed based on graph profiles and post-test particle images, and the data to be used for analysis are selected. Results close to the average or median values of particle size and strength can be extracted.

Report Output

A report can be generated that includes graphs as well as the average values and standard deviations of the selected test results (test force, displacement, and strength).



Accessories for the **MCT-AD** Series

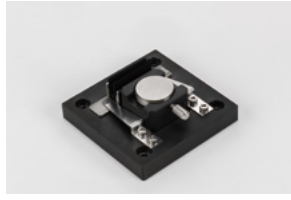


Electromagnetic Lock Windbreak Case (Optional)

The door of the windbreak case is equipped with an electromagnetic lock. The XY stage will not move unless the door is closed, so the risk of injury due to human error is reduced.

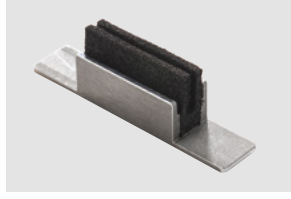
Lower Compression Plate Holder

This is a side-fixing type that is easy to attach and remove.



Cleaner

This automatically removes sample residue adhering to the indenter. It is replaced for use on each continuous test.



Ionizer STABLO-AP IEN (Optional)

This enables testing while removing static electricity on charged samples. It can be operated intermittently for up to 7 hours.

Specifications

	MCT Series Manual Model			
	510	511	210	211
Loading Unit				
Loading Method	Electromagnetic force			
Loading Range (mN)	9.8～4903		9.8～1961	
Load Accuracy	Within ±1 % of displayed test force or 0.1 mN (whichever is greater)			
Resolution	5 μN (when testing at 49 mN or less)		2 μN (when testing at 19 mN or less)	
Displacement Measurement Unit				
Measurement Method	Differential transformer			
Measurement Range (μm)	0 to 100	0 to 10	0 to 100	0 to 10
Min. Increment (μm)	0.001	0.0001	0.001	0.0001
Linearity	Within ±2 % of full scale			
Optical Monitor				
Total Magnification	Approx. 100×, 500× (200×, 400×, 1000× with option)			
Objective Lens	10×, 50× (20×, 40×, 100× with option)			
Eyepiece	10×			
Illumination Method	Epi-illumination			
Light Source Lamp	LED 3W / 3V			
Light Path	Switching between observation and photography is possible			
Optical Head				
Collimation method	Direct connection between encoder and control handle: Synchronized movement of two indexes			
Detector	Optical encoder			
Effective Measurement Range	Approx. 200 μm (with 50× objective lens)			
Min. Increment	0.01 μm/pulse			
Indenter				
Upper Pressure Indenter	Type: Flat indenter (50 μm dia.) (500 μm flat indenter as option) Material: Diamond			
Lower Compression Plate	SKS flat plate (Diamond pressure plate available as option)			
Sample Stage				
Vertical Positioning Range	Approx. 60 mm			
Area	Approx. W25 × D125 mm			
Horizontal Positioning Range	25 mm for both X and Y directions Min. increment: 0.01 mm (0.001 mm with option)			
Available Test Parameters				
Test Mode	Compression test, load-unload test, cycle test			
Shape of Sample	Particle, fiber, or other shapes			
Data Processing Items	Calculation of compressive strength, display of test parameters and results			
	Display of test force and displacement data			
	Display of test force/displacement curve			
	Display of test force/displacement identification value			
	Display of strength/particle diameter curve			
	Display of displacement/time curve			
	Display of strength/parameter curve			
Power Supply	Single phase 100-115 V AC ±10%, 230 V AC ±10%, 50/60 Hz			
Utility				
Power Consumption	Approx. 100 W (excluding power consumption of PC)			
Installation(*1)	The grounding pin of the 3-pin connector must be connected to a ground resistance of 100 Ω or less.			
Temperature Conditions	Standard temperature: 23 ± 1 °C; Allowable range: 10 to 35 °C			
Vibration Conditions	Horizontal vibration: 0.017 Gal max. (at 10 Hz or more) 0.01 μm max. (at less than 10 Hz)			
	Vertical vibration: 0.010 Gal max. (at 10 Hz or more) 0.005 μm max. (at less than 10 Hz)			
Humidity	20 to 60% (no condensation)			
Dimensions and Weight				
External Dimensions	Main unit: Approx. W355 × D405 × H530 (mm) Control unit: Approx. W315 × D375 × H110 (mm)			
Weight	Main unit: Approx. 60 kg; Control unit: Approx. 5 kg			

(*1) Since this is a precision measuring device, special care must be taken regarding installation conditions.

Configuration

●Main Testing Unit

	Name	Qty.
1)	Main testing unit	1
2)	Optical head	1
3)	Objective lens (10×)	1
4)	Objective lens (50×)	1
5)	Flat indenter (50 μm dia.)	1
6)	Sample stage (X-Y stage)	1
7)	Micrometer head	2
8)	Thin sample attachment, type 3	1
9)	Lower compression plate	1

●Required PC Specifications

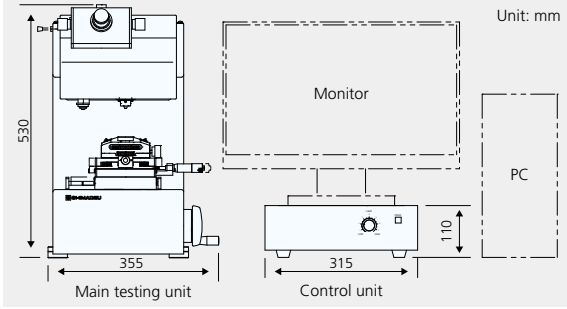
OS	Windows® 11 Pro (64-bit)
CPU	Intel® Core™ i5-13500 or higher
Disk Drive	CD-ROM drive
Expansion Bus	PCIe bus with at least 2 slots (capable of accommodating 175 mm and 120 mm cards)

Installation Precautions

Read the following precautions when selecting an installation site.

1. Minimizing Vibration
   (1) Install the testing machine in an area with minimal floor vibration. In principle, the machine should be installed on a shock-absorbing bench.
   (2) Avoid locations with frequent foot traffic.
   (3) Do not place the testing machine near equipment that generates vibration.
   (4) If possible, avoid installing the testing machine on the second floor or higher, as buildings may sway.
   (5) Install the testing machine away as far as possible from roads and railway tracks.
   (6) Do not perform testing when cranes or other equipment are in operation nearby.
2. Minimizing Airflow and Noise
   (1) Keep the testing machine away from devices that generate airflow, such as air-conditioning units, and ensure that airflow does not reach the machine directly or indirectly.
   (2) Use a windbreak case during testing.
   (3) Do not open or close doors during testing.
   (4) Do not place the testing machine near devices that generate noise, such as telephones.

External Dimensions



Prepare a printer separately.

AD Model

	MCT Series Automatic Model	
	MCT-210AD	MCT-211AD
Loading Unit		
Loading Method	Electromagnetic force	
Loading Range (mN)	9.8 to 1961	
Load Accuracy	Within ±1 % of displayed test force or 0.1 mN (whichever is greater)	
Resolution	2 μN (when testing at 19 mN or less)	
Displacement Measurement Unit		
Measurement Method	Differential transformer	
Measurement Range (μm)	0 to 100	0 to 10
Min. Increment (μm)	0.001	0.0001
Linearity	Within ±2 % of full scale	
Optical Monitor (with Length Measurement Kit)		
Total Magnification	Approx. 1300× (with a 40× objective lens and a 21.5-inch display)	
Objective Lens	10×, 40×	
Eyepiece	10×	
Illumination Method	Epi-illumination	
Light Source Lamp	LED 3W / 3V	
Field of View	Vertical: Approx. 90 μm; Horizontal: Approx. 120 μm	
Min. Increment	Approx. 0.2 μm (with a 40× objective lens)	
Digital Camera	1/2.9-inch color camera	
Indenter		
Upper Pressure Indenter	Type: Flat indenter (50 μm dia.)	
	Material: Diamond	
Lower Compression Plate	SKS flat plate, 25 mm dia.	
Sample Stage		
Vertical Positioning Range	Approx. 20 mm	
Area	Approx. W125 × D125 mm	
Horizontal Positioning Motor	Stepping motor	
Horizontal Positioning Range	50 mm for both X and Y directions	
Horizontal Step Size	1 mm, 100 μm, 10 μm, 1 μm (four steps)	
Horizontal Speed	Max. 4 mm/sec	
Available Test Parameters		
Single Test	Refer to the test condition settings of the MCT manual model.	
Continuous Test		
Test Mode	Compression test, load-unload test	
Shape of Sample	Particles	
Wide-Area Scan Range	Selectable from 10 × 10 mm, 5 × 5 mm, 2 × 2 mm, or 1 × 1 mm	
Applicable Particle Size	5 to 35 μm or the indenter diameter, whichever is smaller	
Measurement Method	Particle area / area Equivalent Diameter Particle perimeter / perimeter equivalent diameter Vertical Feret diameter/horizontal Feret diameter Maximum length/maximum perpendicular length	
Number of Continuous Tests	Max. 100 points	
Indenter Cleaning	Indenter is automatically cleaned after each compression test.	
Image Saving	Particle image captured during measurement Particle image captured after testing Video during testing (when using the side-view observation option)	
Data Processing Items	Refer to the test condition settings of the MCT manual model.	
Power Supply		
Main Unit	Single phase 100-115 V AC ±10%, 230 V AC ±10%, 50/60 Hz	
Electric XY Stage		
Utility		
Power Consumption	Approx. 100 W (excluding power consumption of PC)	
Installation(*1)	The grounding pin of the 3-pin connector must be connected to a ground resistance of 100 Ω or less.	
Temperature Conditions	Standard temperature: 23 ± 1 °C; Allowable range: 10 to 35 °C	
Vibration Conditions	Horizontal vibration: 0.017 Gal max. (at 10 Hz or more) 0.01 μm max. (at less than 10 Hz)	
	Vertical vibration: 0.010 Gal max. (at 10 Hz or more) 0.005 μm max. (at less than 10 Hz)	
Humidity	20 to 60 % (no condensation)	

Dimensions and Weight	
External Dimensions	Main unit: Approx. W385 × D405 × H630 mm or less Main control unit: Approx. W315 × D375 × H110 mm or less Electric XY-stage control unit: Approx. W315 × D300 × H100 mm or less
Weight	Main unit: Approx. 70 kg Main control unit: Approx. 5 kg Electric XY stage control unit: Approx. 5 kg

(*1) Since this is a precision measuring device, special care must be taken regarding installation conditions.

Configuration

●Main Testing Unit

	Name	Qty.
1)	Main testing unit	1
2)	Optical head	1
3)	Objective lens (10×)	1
4)	Objective lens (40×)	1
5)	Flat indenter (50 μm dia.)	1
6)	Sample stage (electric X-Y stage)	1
7)	Length measurement kit	1
8)	Lower compression plate holder	1
9)	Lower compression plate	1
10)	Cleaner One piece will be used for the installation check test.	10

●Required PC Specifications

OS	Windows® 11 Pro (64-bit)
CPU	Intel® Core™ i5-13500 or higher
Disk Drive	CD-ROM drive
Expansion Bus	PCIe bus with at least 3 slots (capable of accommodating 175 mm and 120 mm cards)

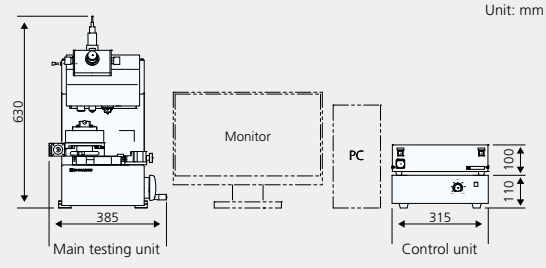
Installation Precautions

Read the following precautions when selecting an installation site.

1. Minimizing Vibration
   (1) Install the testing machine in an area with minimal floor vibration. In principle, the machine should be installed on a shock-absorbing bench.
   (2) Avoid locations with frequent foot traffic.
   (3) Do not place the testing machine near equipment that generates vibration.
   (4) If possible, avoid installing the testing machine on the second floor or higher, as buildings may sway.
   (5) Install the testing machine away as far as possible from roads and railway tracks.
   (6) Do not perform testing when cranes or other equipment are in operation nearby.
2. Minimizing Airflow and Noise
   (1) Keep the testing machine away from devices that generate airflow, such as air-conditioning units, and ensure that airflow does not reach the machine directly or indirectly.
   (2) Use a windbreak case during testing.
   (3) Do not open or close doors during testing.
   (4) Do not place the testing machine near devices that generate noise, such as telephones.

External Dimensions

Unit: mm



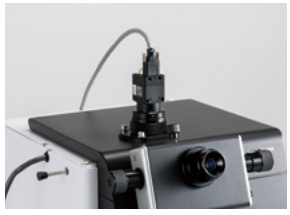
Prepare a printer separately.

Optional Accessories

Length Measurement Kit (Color or Monochrome)

P/N for length measurement kit, color: 347-24778-48
P/N for length measurement kit, monochrome: 347-24778-47

Determining the test position is simplified as the indenter size can be displayed on the PC window alongside the sample image. Also, the length can be measured on the window, and images can be saved. The maximum magnification is about 1300× (21.5-inch wide display, 50× objective lens).



PC requirements: Compatible with PCs recommended by Shimadzu

Side Observation Kit (Color or Monochrome)

P/N for side observation kit, color: 347-24779-16
P/N for side observation kit, monochrome: 347-24779-15

The condition of the sample can be observed during compression. Images can be displayed on the PC window, and the images can be saved linked to the data.
The maximum magnification is approx.260X (When using a 21.5-inch wide display, 10Xobjective lens)

PC requirements: Compatible with PCs recommended by Shimadzu

Desk-Type Vibration Absorbing Bench

P/N: 344-04193-06

This is a desk-type coil spring vibration absorbing bench. Use this when installing in a location subject to significant vibrations.

Active Vibration-Absorbing Bench

P/N 344-04211-11: AC 120 V
P/N 344-04211-12: AC 230 V

This consists of an active vibration-absorbing bench and a dedicated stand. It actively absorbs vibrations over a wide range from 0.7 to 100 Hz.

Micrometer Head (Digital Display)

P/N: 347-25447-12 (2 pcs)

This displays the amount of stage movement in two orthogonal directions (front-back, left-right) in 1 µm increments. The maximum movement is 25 mm. (The photo shows the heads attached to the stage.)

Objective Micrometer

P/N: 046-60201-02

This is used to adjust the magnification of a microscope.
The scale is engraved with a 10 µm pitch.

Objective Lens

100× objective lens (for manual models)	P/N: 344-89977-40
40× objective lens (for manual models)	P/N: 347-25400
20× objective lens (for manual models)	P/N: 344-89924-40
40× extended operation lens	P/N: 344-89300-41

(Improves the contrast in the field of view)

Windbreak Case

Without electromagnetic lock
P/N: 347-27010-01

With electromagnetic lock for AD model
P/N: 347-27010-05

This case reduces the effect of air vibrations such as wind and sound on the MCT main unit.
W700 × D650 × H750 mm

Flat Indenter

This is a cone frustum-shaped indenter. The diameters of the flat parts are as follows.

500µm	P/N: 340-47026-02
200µm	P/N: 340-47026-04
100µm	P/N: 340-47026-05
20µm	P/N: 340-47026-06

For changes to the indenter diameter of the AD model, please contact us.

Diamond Lower Compression Plate

P/N: 340-47050

This is used when testing samples with high hardness.
Size: 1 × 1 mm

Windbreak Case (Large)

Without electromagnetic lock
P/N: 347-27010-02

With electromagnetic lock for AD model
P/N: 347-27010-06

This is used when using an active vibration-absorbing bench.
W700 × D650 × H900 mm

Sample Dispersion Unit

P/N: 347-26014

This is a tool for dispersing the sample on the lower compression plate. It uses negative pressure to suction the sample into the tool before scattering it onto the plate.

Testing Machine Configurator easily configures a materials testing system to meet your specific needs and request a quote.

Testing Machine Configurator
https://www.shimadzu.com/an/test/tmc/

For the method of use

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