Mitutoyo

# FORMTRACER CS-3300 SERIES

## Contour and Surface Roughness Measuring System

FORM MEASUREMENT


PRE1529

# A Extensive Choice of Functions to Enhance Your Measurement Efficiency

Featuring a wide measuring range and high-resolution detector, many kinds of measurements from contours to surface roughness are covered. Single-unit measurement reduces setup labor and measurement time.

## Wide measuring range and high-resolution detector

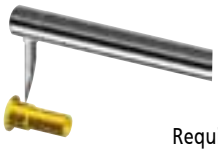
**Measuring range** (Z-axis): 5 mm (80 nm resolution) to 0,05 mm (0,8 nm resolution)

**Accuracy** (Z-axis): ± (1,5+l2HI/100) µm, H = Height from horizontal plane (mm)

# Functionality

## Measurement

**STEP 1** Contour measurement **STEP 2** Surface roughness measurement



Requires that you set up the machine every time you swap detectors.

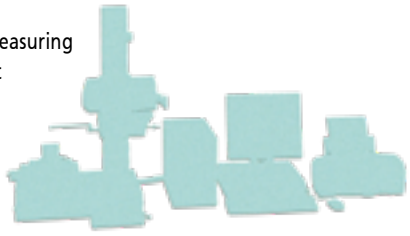
**with CS-3300**

**Enhanced Measurement Efficiency**

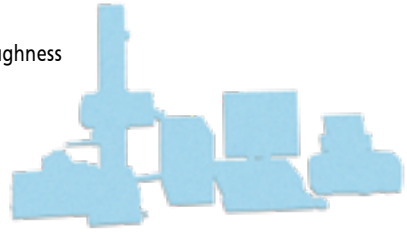
Single setup and single tracing - no change needed

## Space Required

Contour measuring instrument



Surface roughness measuring instrument



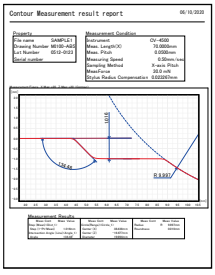
Requiring space for two measuring instruments, PCs, and printers.

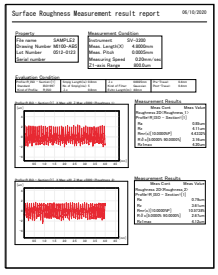
**with CS-3300**

**Space-Saving**

Simplified workstation

## Printed Results

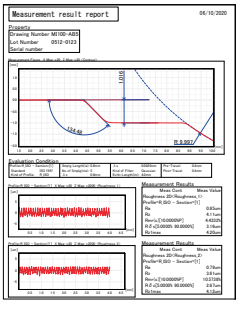




With two separate machines, data is printed on individual reports

**with CS-3300**

**Resource-Saving**

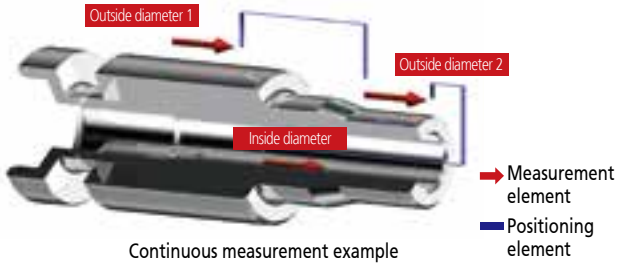


Combining both measurements, the CS-3300 creates detailed inspection certificates on a single sheet of paper

# Functionality

## Highly accurate linear encoders on X / Z2-axis

The drive unit (X-axis) and column (Z2-axis) are equipped with high-accuracy linear scales (ABS type), enabling fully automatic measurement combining vertical and horizontal movement.
This improves the reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurement of parts that are difficult to position.

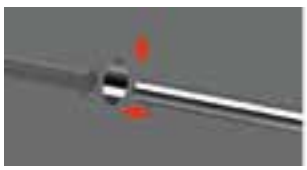



Continuous measurement example
(Outside diameter 1 → Outside diameter 2 → Inside diameter)

## Improved measurement efficiency

Dramatically increased drive speed (X-axis: 80 mm/s, Z2-axis: 30 mm/s) further reduces total measurement time. Small holes can be efficiently measured using the fine-feed knobs on the X and Z2-axes.


Small hole measurement example



Y- and Z-axis positioning using the column (Z2-axis) fine-feed knob or cross-travel table (optional)

Measurement start positioning with the (X-axis) fine-feed knob

## Sophisticated design

The detector unit can be extended to avoid interference between the drive unit and the workpiece.
All detector and drive unit cables are housed inside the main unit to eliminate any risk of abrasion and guarantee trouble-free, high-speed operation.

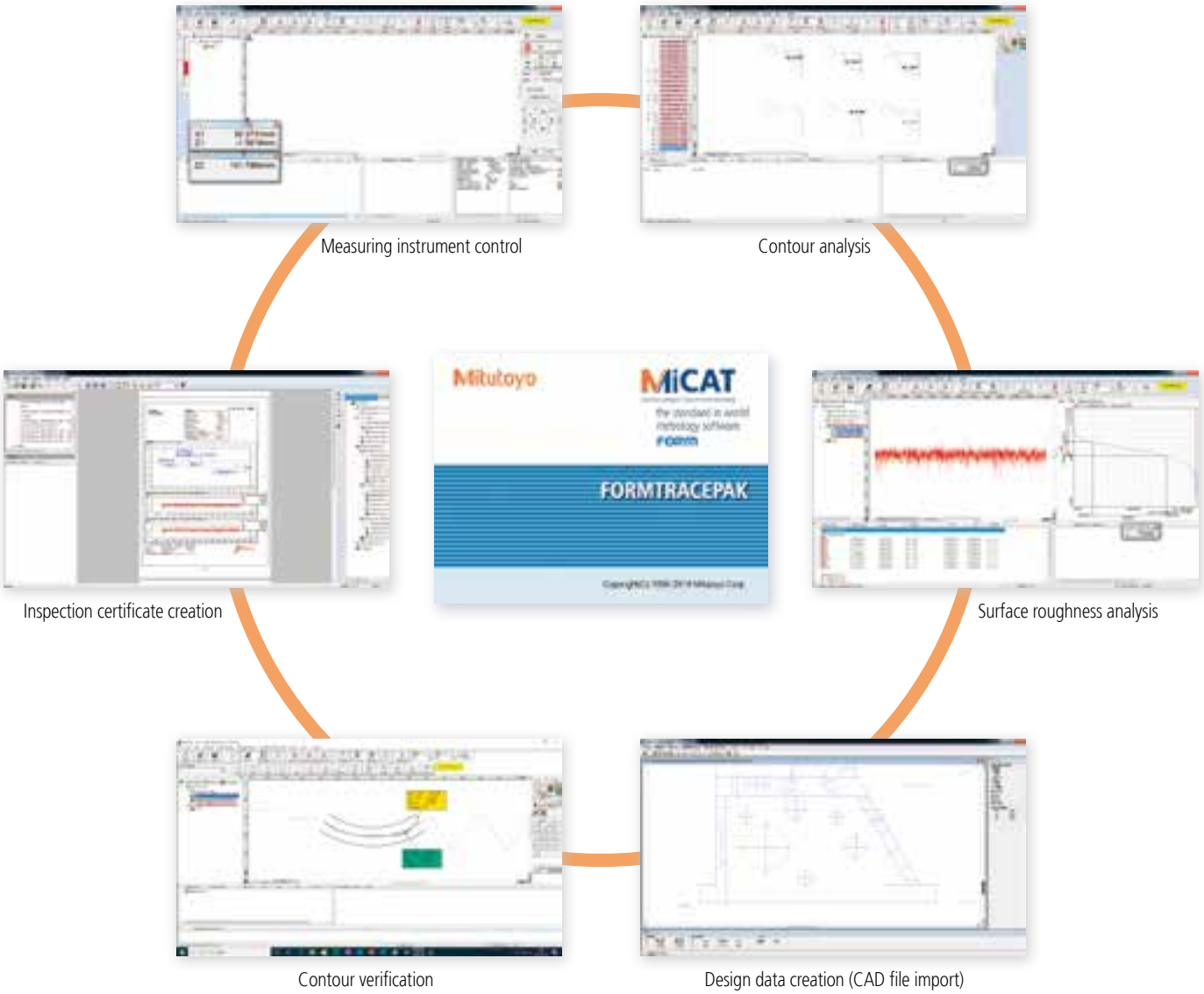
Cable-free design

## Drive unit tilting function and air vibration-damping stand

Drive unit (X-axis) tilting function powerfully supports measurements on inclined planes and heavy workpieces that are not easily moved.

# Software Capabilities

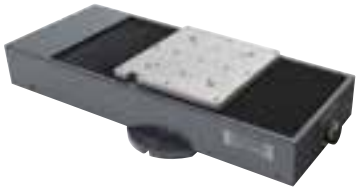
**FORMTRACEPAK** provides a wide range of support, including measuring instrument control, contour analysis, surface roughness analysis, design data creation, contour verification, and inspection certificate creation functions!
Various functions are available to meet the needs of every department, including simplified repetitive measurements conducted by inspection departments and thorough pursuit of surface texture enhancement by R&D departments.



# Optional Accessories for Automatic Measurement

## Y-axis table 178-097

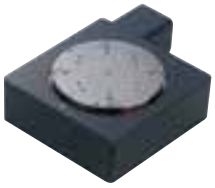
Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single surface.



| | |
|---|---|
| Travel range | 200 mm |
| Resolution | 0,05 µm |
| Positioning accuracy | ±3 µm |
| Drive speed | MAX 80 mm/s |
| Maximum load | 50 kg |
| Mass | 28 kg |

## Rotary table θ1-axis table 12AAD975

For efficient measurement in the axial/transverse directions. When measuring a cylindrical workpiece, automatic alignment can be performed in combination with the Y-axis table. (θ1-axis mounting plate <Option: **12AAE630**> is required when directly installing on the base of the **CS-3300**.)



| | |
|---|---|
| Rotation | 360° |
| Resolution | 0,004° |
| Maximum load | 12 kg |
| Rotational speed | MAX 10°/s |
| Mass | 7 kg |

## Rotary table θ2-axis unit 178-078

You can measure multiple points on a cylindrical workpiece and automate front/rear-side measurement. (θ2-axis mounting plate <Option: **12AAE718**> is required when directly installing on the base of the **CS-3300**.) In order to install on a **3D-ALT**, a separate special plate for mounting the θ2-axis unit (**12AAE707**) is required.

| | |
|---|---|
| Rotation | 360° |
| Resolution | 0,0072° |
| Maximum load (loading moment) | 4 kg (moment 343 N·cm or less) |
| Rotational speed | MAX 18°/s |
| Mass | 5 kg |

## Centering chuck (ring operated) 211-032

This chuck is useful when measuring small workpieces as they can be easily clamped with its knurled ring.

| | |
|---|---|
| Holding range | Inner jaws OD: Ø1 to Ø36 mm<br>Inner jaws ID: Ø16 to Ø69 mm<br>Outer jaws OD: Ø25 to Ø79 mm |
| Dimensions (D×H) | Ø118×41 mm |
| Mass | 1,2 kg |

## Micro-chuck 211-031

This chuck is suitable for clamping extra-small diameter workpieces (Ø1 mm or less), which cannot be retained with the centering chuck.

| | |
|---|---|
| Holding range | OD: Ø0,2 to Ø1,5 mm |
| Dimensions (D×H) | Ø107×48,5 mm |
| Mass | 0,6 kg |

## Auto leveling table 178-087

This table performs fully automatic leveling adjustment at the start of a measurement, ensuring rapid measurement regardless of the operator's skill level.

| | |
|---|---|
| Inclination adjustment angle | ±2° |
| Maximum load | 7 kg |
| Table dimensions | 130×100 mm |
| Mass | 3,5 kg |

# Optional Accessories for 3D Surface Roughness Measurement

## Y-axis table for 3D measurement 178-096

The Y-axis table enables precise workpiece positioning during 3D surface roughness measurement. It delivers high-level 3D surface roughness analysis when used with **MCubeMap**, the 3D surface property analysis software.

| | |
|---|---|
| Travel range | 100 mm |
| Resolution | 0,05 µm |
| Straightness (static) | 0,3 µm/100 mm |
| Drive speed | 0 to 20 mm/s |
| Maximum load | 15 kg |
| Mass | 31 kg |

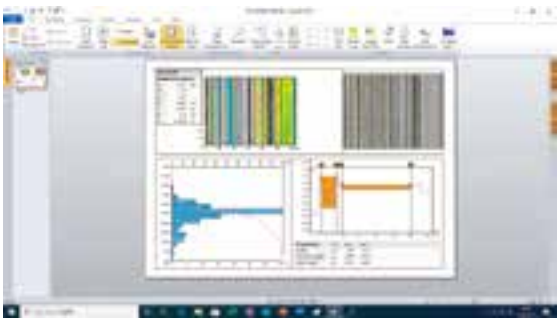
## 3D auto leveling table 3D-ALT 178-077

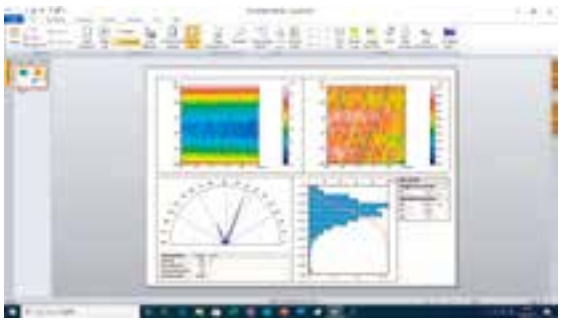
Installed on the Y-axis table for 3D measurement, this table performs fully automatic adjustment for precise leveling of measurement surfaces prior to the start of measurement. Operation is easy and reliable, allowing fully automatic leveling to be performed by anyone.

| | |
|---|---|
| Inclination adjustment angle | ±2° in XZ and YZ planes |
| Maximum load | 10 kg |
| Stage surface size | 139×139 mm |
| Mass | 4,5 kg |

## 3D surface property analyzing software MCubeMap

**MCubeMap** is 3D surface property analyzing software that visualizes the analyzed data clearly with a wide variety of graphic technologies. Being compliant with ISO 25178-2, the standard of 3D surface roughness parameters, it enables you to create impressive reports with graphics and flexible layout of analysis results.

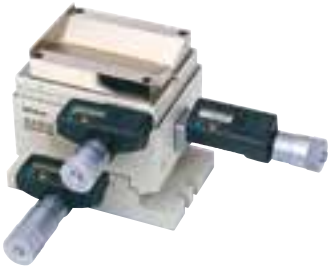




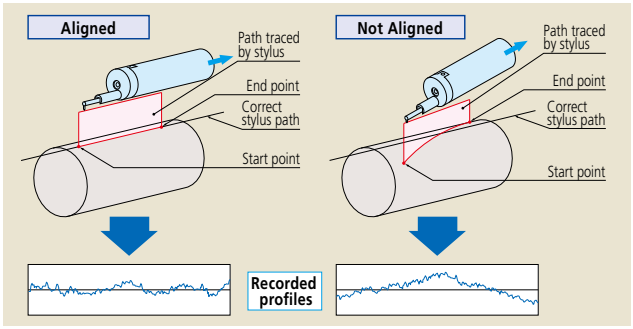
# Optional Accessories

## 3-axis adjustment table 178-047

This table helps make the adjustments required when measuring the surface of cylindrical workpieces. The corrections for the pitch angle and the swivel angle are determined from a preliminary measurement and the Digimatic micrometers are adjusted accordingly. A flat-surfaced workpiece can also be leveled with this table. By using Mitutoyo's 3-axis adjustment table, the workpiece can be aligned and leveled easily, simply by following the **FORMTRACEPAK** guidance. No experience or special expertise is required.



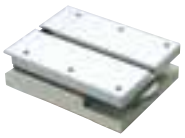
| | |
|---|---|
| Inclination adjustment angle | ±1,5° |
| Swiveling angle | ±2° |
| Y-axis travel range | ±12,5 mm |
| Resolution | 0,001 mm |
| Table dimensions | 130×100 mm |
| Maximum load | 15 kg |




## Table and fixture systems

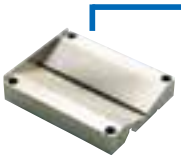
**Leveling table**
(Analog type)
**178-043-1 (mm), 178-053-1 (inch)**

**Digital leveling table**
(Digital type)
**178-042-1 (mm), 178-052-1 (inch)**



**Leveling table**
**178-016**

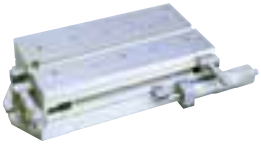
**Calibration stand**
**12AAG175**



**V-block**
**998291**

**Precision vise**
**178-019**

**Cross-travel table**
**218-001 (mm), 218-011 (inch)**



**Cross-travel table**
**218-041 (inch)**

**Rotary vise**
**218-003**

**Center supports**
**172-142**

**Center support risers**
**172-143**

**Swivel center support**
**172-197**

**Holder with clamp**
**176-107**

**V-block with clamp**
**172-234**

**V-block with clamp**
**172-378**

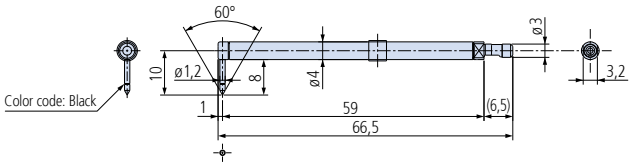
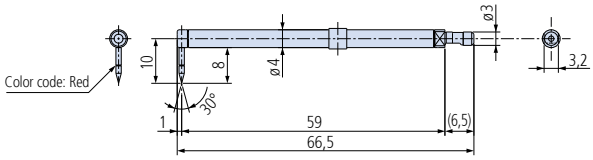
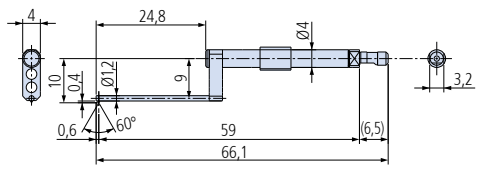
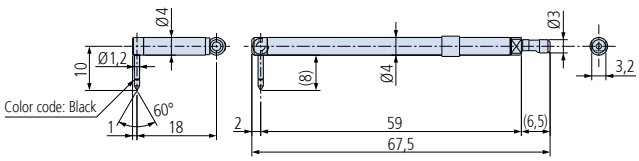
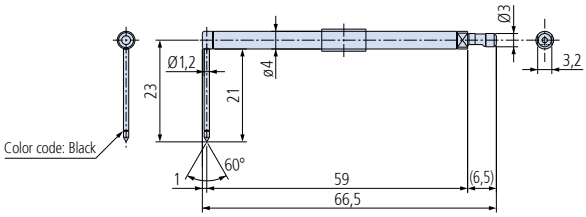
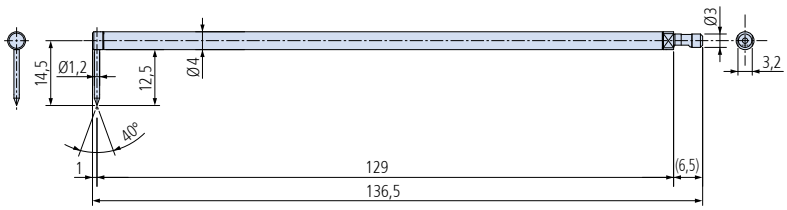
**Side table**
**178-181**

**Monitor arm**
**12AAK120**


Example combination: with side table but no monitor arm
(Measuring unit and PC not included)


Example combination: with monitor arm but no side table
(Measuring unit and PC not included)

# Styli

| Type | Dimensions Unit: mm | Specifications |
|---|---|---|
| Standard stylus **(12AAD554)** Standard accessory |   | Tip radius: 2 µm<br>Tip form: 60° cone<br>Tip material: Diamond<br>For contour/surface roughness measurement<br>Measurable depth: 7 mm MAX |
| Cone stylus **(12AAD552)** Standard accessory |   | Tip radius: 25 µm<br>Tip form: 30° cone<br>Tip material: Sapphire<br>For contour measurement<br>Measurable depth: 7 mm MAX |
| Small hole stylus **(12AAD556)** |   | Tip radius: 2 µm<br>Tip form: 60° cone<br>Tip material: Diamond<br>For contour/surface roughness measurement<br>Applicable hole: Ø2 mm MIN<br>Measurable depth: 15 mm MAX |
| Eccentric type stylus **(12AAD558)** |   | Tip radius: 2 µm<br>Tip form: 60° cone<br>Tip material: Diamond<br>For contour/surface roughness measurement<br>Offset from centerline: 15 mm MAX |
| Deep groove stylus **(12AAD560)** |   | Tip radius: 2 µm<br>Tip form: 60° cone<br>Tip material: Diamond<br>For contour/surface roughness measurement<br>Measurable depth: 20 mm MAX |
| 2x-long stylus*1 **(12AAD562)** |   | Tip radius: 5 µm<br>Tip form: 40° cone<br>Tip material: Diamond<br>For contour/surface roughness measurement<br>MAX measuring range of Z-axis is double (10 mm) that of the standard stylus. |

*1: Measuring force is 4 mN and the Z-axis resolution is double that of the standard stylus.

# Specifications

| Model No. | | CS-3300S4 | CS-3300H4 | CS-3300W4 | CS-3300L4 | CS-3300S8 | CS-3300H8 | CS-3300W8 | CS-3300L8 |
|---|---|---|---|---|---|---|---|---|---|
| Measuring range | X-axis | 100 mm | | | | 200 mm | | | |
| | Z1-axis (detector) | 5 mm (±2,5 mm from the horizontal) | | | | | | | |
| Scale unit | X-axis | Ultra-high precision linear encoder | | | | | | | |
| | Z1-axis (detector) | Differential inductance | | | | | | | |
| | Z2-axis (column) | ABS linear encoder | | | | | | | |
| Resolution | X-axis | 0,05 µm | | | | | | | |
| | Z1-axis (detector) | 0,08 µm/5 mm<br>0,008 µm/0,5 mm<br>0,0008 µm/0,05 mm | | | | | | | |
| | Z2-axis (column) | 1 µm | | | | | | | |
| X-axis Tilting angle | | ±45° | | | | | | | |
| Z2-axis (column) travel range | | 300 mm | 500 mm | | 700 mm | 300 mm | 500 mm | | 700 mm |
| Drive speed | X-axis | Software: 0 to 80 mm/s<br>Remote box operation: 0 to 40 mm/s | | | | | | | |
| | Z2-axis (column) | Software: 0 to 30 mm/s<br>Remote box operation: 0 to 30 mm/s | | | | | | | |
| Measuring speed | Surface roughness measurement | 0.02, 0.05, 0.1, 0.2 mm/s | | | | | | | |
| | Contour measurement | 0,02, 0,05, 0,1, 0,2, 0,5, 1,0, 2,0, 5,0, 10, 20, 30 mm/s<br>* Recommended that measurements be conducted at measurement speeds no faster than 5 mm/s.<br>(If the measurement speed is too fast, coupled with high surface roughness, this may cause the stylus to chip or compromise measurement accuracy.) | | | | | | | |
| Straightness (when the X-axis is horizontal) | | In the ordinary state: 0,2 µm/100 mm<br>Detector unit in its maximum state of protrusion: 0,4 µm/100 mm | | | | In the ordinary state: 0,6 µm/200 mm<br>Detector unit in its maximum state of protrusion: 1,2 µm/200 mm | | | |
| Accuracy (20 °C) | X-axis | ± (0,8+0,01L) µm L: Measurement length (mm)<br>Wide range: 1,8 µm/100 mm<br>Narrow range: 1,05 µm/25 mm | | | | ± (0,8+0,015L) µm L: Measurement length (mm)<br>Wide range: 3,8 µm/200 mm<br>Narrow range: 1,2 µm/25 mm | | | |
| | Z1-axis (detector) | ± (1,5+\|2H\|/100) µm H: Height measured from the horizontal (mm) | | | | | | | |
| Stylus vertical motion | | Circular motion | | | | | | | |
| Measuring direction | | Both pulling and pushing directions | | | | | | | |
| Measuring face direction | | Downward | | | | | | | |
| Measuring force | | 0,75 mN | | | | | | | |
| Tracing angle (Standard accessory cone stylus) | | Ascent 65°, descent 65° (depending on the surface roughness) | | | | | | | |
| Stylus tip | Standard stylus | Stylus Tip radius: 2 µm, angle: 60° Material: Diamond (for surface roughness/contour) | | | | | | | |
| | Cone stylus | Stylus Tip radius: 25 µm, angle: 30° Material: Sapphire (for contour) | | | | | | | |
| Base size (W×D) | | 600×450 mm | | 1000×450 mm | | 600×450 mm | | 1000×450 mm | |
| Base material | | Gabbro | | | | | | | |
| External dimensions | Measuring Unit W | 759 mm | 759 mm | 1159 mm | 1159 mm | 769 mm | 769 mm | 1169 mm | 1169 mm |
| | Measuring Unit D | 482 mm | 482 mm | 482 mm | 492 mm | 482 mm | 482 mm | 482 mm | 492 mm |
| | Measuring Unit H | 966 mm | 1166 mm | 1176 mm | 1430 mm | 966 mm | 1166 mm | 1176 mm | 1430 mm |
| | Controller (W×D×H) | 221×346×472 mm | | | | | | | |
| | Remote box (W×D×H) | 248×102×62 mm | | | | | | | |
| Mass | Measuring unit | 140 kg | 150 kg | 220 kg | 270 kg | 140 kg | 150 kg | 220 kg | 270 kg |
| | Controller | 14 kg | | | | | | | |
| | Remote box | 0,9 kg | | | | | | | |
| Vibration isolating stand | Anti-vibration mechanism | Diaphragm air suspension | | | | | | | |
| | Supply air pressure | 0,4 to 0,7 MPa | | | | | | | |
| | Allowable load | 250 kg | | 350 kg | | 250 kg | | 350 kg | |
| | External dimensions (W×D×H) | 830×800×700 mm | | 1280×940×700 mm | | 830×800×700 mm | | 1280×940×700 mm | |
| | Mass | 155 kg | | 240 kg | | 155 kg | | 240 kg | |
| Accuracy guaranteed temperature range | | 20 °C±1 °C | | | | | | | |
| Accuracy guaranteed temperature change over time (MAX) | | 2,0 °C/8 h | | | | | | | |
| Operating temperature range | | 5 to 40 °C (within ±1 °C temperature fluctuation on calibration and measurement) | | | | | | | |
| Operating humidity range | | RH 20 to 80 % (non-condensing) | | | | | | | |
| Storage temperature range | | -10 to 50 °C | | | | | | | |
| Storage humidity range | | RH 5 to 90 % (non-condensing) | | | | | | | |
| Communication interface | | USB | | | | | | | |
| Power supply rating | | 100 to 120 V, 200 to 240 V ±10 %, AC50/60 Hz | | | | | | | |
| Consumption | | 400 W | | | | | | | |

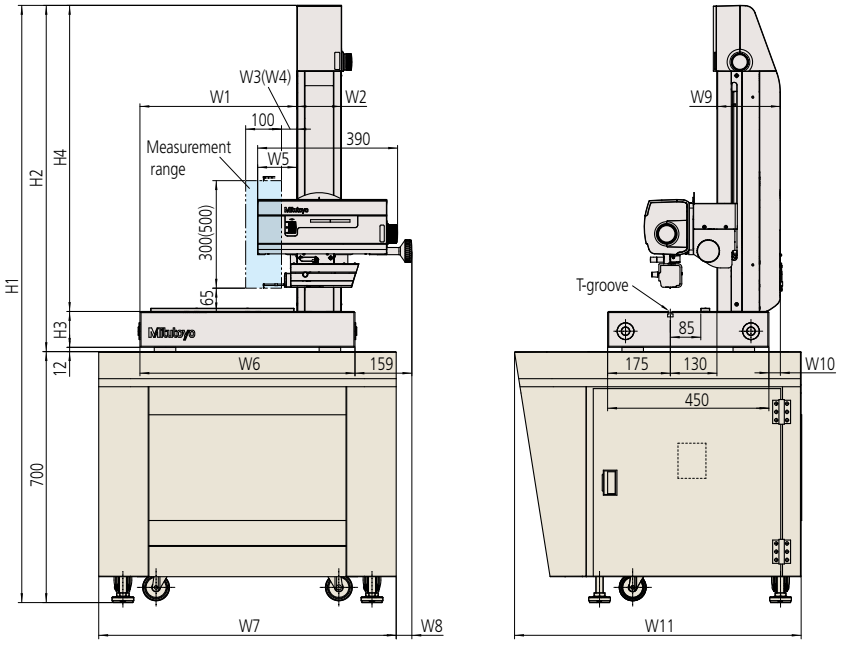
Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Main Unit Startup System: Contour and Surface Roughness Measuring System introduced in this catalog incorporate a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo sales office prior to relocating this machine after the initial installation.

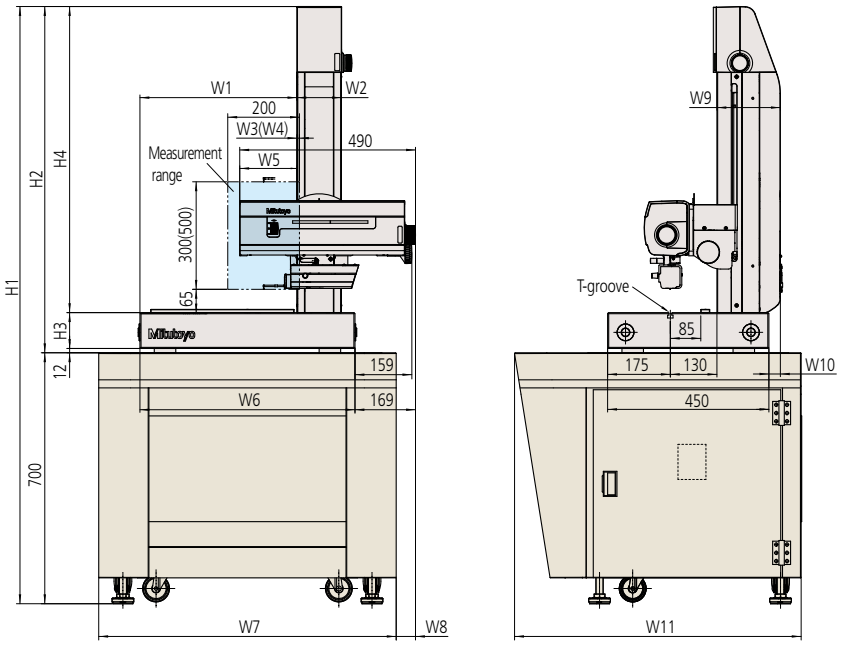
# Dimensions

## CS-3300S4 / H4 / W4 / L4

Unit: mm




## CS-3300S8 / H8 / W8 / L8




Unit: mm

| X-axis (drive unit) | Model No. | W1 | W2 | W3 | W4* | W5 | W6 | W7 | W8 | W9 | W10 | W11 | H1 | H2 | H3 | H4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 mm | **CS-3300S4** | 438 | 124 | 43 | 113 | 110 | 600 | 830 | 44 | 177 | 32 | 800 | 1666 | 966 | 100 | 854 |
| | **CS-3300H4** | 438 | 124 | 43 | 113 | 110 | 600 | 830 | 44 | 177 | 32 | 800 | 1866 | 1166 | 100 | 1054 |
| | **CS-3300W4** | 838 | 124 | 43 | 113 | 110 | 1000 | 1280 | 19 | 177 | 32 | 940 | 1876 | 1176 | 110 | 1054 |
| | **CS-3300L4** | 825 | 150 | 30 | 100 | 97 | 1000 | 1280 | 19 | 187 | 42 | 940 | 2130 | 1430 | 110 | 1308 |
| 200 mm | **CS-3300S8** | 438 | 124 | -7 | 63 | 160 | 600 | 830 | 54 | 177 | 32 | 800 | 1666 | 966 | 100 | 854 |
| | **CS-3300H8** | 438 | 124 | -7 | 63 | 160 | 600 | 830 | 54 | 177 | 32 | 800 | 1866 | 1166 | 100 | 1054 |
| | **CS-3300W8** | 838 | 124 | -7 | 63 | 160 | 1000 | 1280 | 29 | 177 | 32 | 940 | 1876 | 1176 | 110 | 1054 |
| | **CS-3300L8** | 838 | 150 | -20 | 50 | 147 | 1000 | 1280 | 29 | 187 | 42 | 940 | 2130 | 1430 | 110 | 1308 |

* W4: At maximum detector extension

Coordinate Measuring Machines

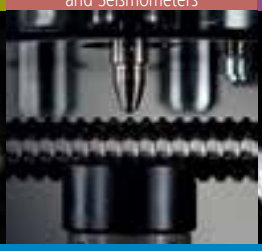
Vision Measuring Systems

Form Measurement

Optical Measuring

Sensor Systems

Test Equipment and Seismometers



Digital Scale and DRO Systems

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