Mitutoyo

Mitutoyo Quality

Contour and Surface Roughness Measuring Systems

FORMTRACER Avant Series

Form Measurement

Catalog No.E15030(2)

Advance even higher.

The New Hybrid

FORMTRACER Avant SERIES

Contour and Surface Roughness Measuring Systems

Speed and operability like never before.
A revolutionary measuring system that defies conventional thinking.

The FORMTRACER Avant SERIES, which provides contour and surface roughness measurement in a single unit, now includes the addition of the H-3000 Detector, a hybrid detector that can measure both roughness and contour simultaneously within a single trace. Endowed with “Speed” enabling higher measurement efficiency, “Operability” with automation and a wide variety of features, and “Expandability” allowing upgrade to a complex system by integrating a detector, this revolutionary measuring system defies conventional thinking.

Mitutoyo

FORMTRACER

Contour X Surface Roughness

Equipped with a newly developed high resolution arc scale.
Capable of simultaneously measuring contour and surface roughness with a single trace, with high accuracy and across a wide range.
Can be added to FTA series equipment that you already have, allowing you to perform flexible and highly efficient measurements.

Contour & Roughness Detector
H-3000

Mitutoyo

CONTRACER

Contour

Our lineup presents two types of contour detectors to choose from.

C-3200: general purpose detector
C-4500: high-performance, high-accuracy detector

- Upper/lower surface continuous measurement function that enables measurement of effective diameter of screw threads
- Measuring force can be adjusted with software

VARIATION

Contour Detector
C-4500
(High accuracy)

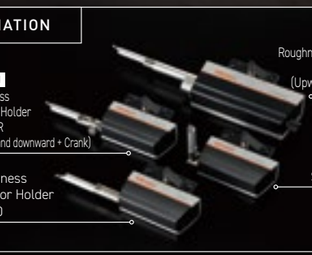
Contour Detector
C-3200
(General-purpose)

SURFTEST

Surface Roughness

Compliant with JIS, ISO, ANSI, VDA, and other industrial surface roughness standards. An optional detector holder that allows you to approach the workpiece from various directions helps shorten measurement time and reduces the burden placed on the operator.

VARIATION



OPTION
Roughness
Detector Holder
S-3000CR
(Upward and downward + Crank)

Roughness
Detector Holder
S-3000

OPTION
Roughness Detector Holder
S-3000MR
(Upward and downward)

OPTION
Roughness
Detector Holder
S-3000C (Crank)

With the machine being able to measure both contours and surface roughness, a feature-rich lineup covers every purpose.

Choose a main unit in a size to match your measurement needs.
Then add a detector later, and expand your measurement possibilities.
Our drive units come in a standard lineup of 100-mm / 200-mm models.

100 mm Drive Unit, Standard Base Model
Contour Instruments
FTA-S4C3000

100 mm Drive Unit, Standard Base Model
Surface Roughness Tester
FTA-S4S3000

Standard Base Model

Base size (W × D): 600×450 mm
Z2-axis (column) range: 300 mm

200 mm Drive Unit, High-column Model
Contour & Surface Roughness
Measuring Instrument
FTA-H8H3000

High-column Model

The base instrument is the same size as the Standard Model, except the column is higher.
Base size (W × D): 600×450 mm
Z2-axis (column) range: 500 mm
The extra depth allows a wider range of measurements in the vertical direction.

200 mm Drive Unit, Large-sized Base Instrument
with Long Column Model
Surface Roughness Tester
FTA-L8S3000

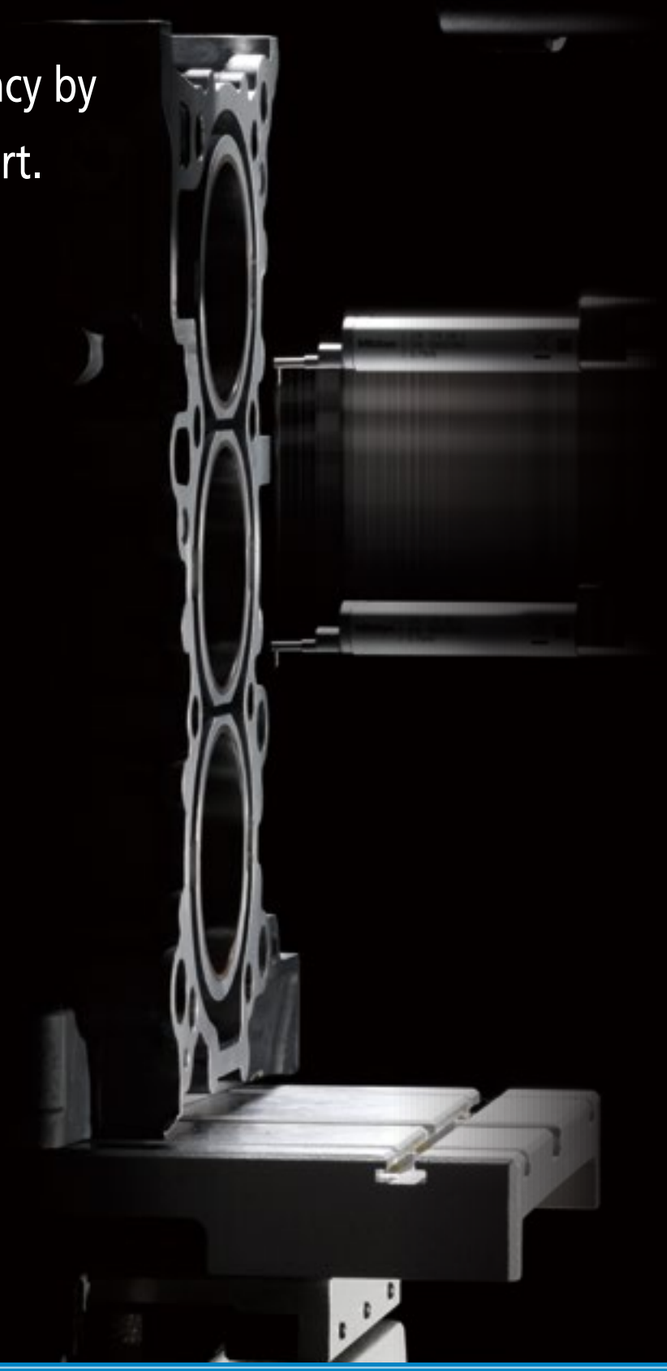
Large Base Model

This is the Large-sized Model with the maximum-size base and column.
Base size (W × D): 1000×450 mm
Z2-axis (column) range: 700 mm
It can efficiently measure heavy and/or long workpieces.

HIGH EFFICIENCY

Helps improve work efficiency by reducing measurement effort.

As a new addition to our series of contour detectors and roughness detectors, we have introduced a hybrid detector capable of simultaneously measuring both contour and roughness in one trace. Both roughness and contour can be measured with a single machine, reducing setup work-hours, measurement time, and space needed for installation. The best-in-class measurement range can be further extended by using an optional stylus. The stylus can be easily attached and detached without the use of tools. The unit is equipped with a newly developed arc scale to achieve unprecedented measurement accuracy. This new model supports efficient measurement work.



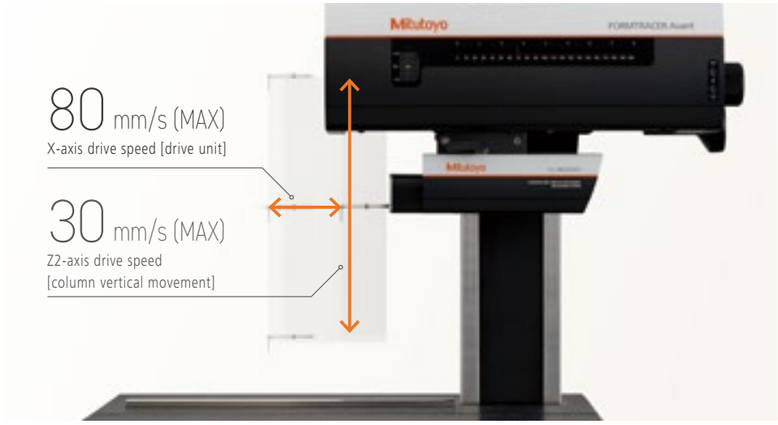
Contour & roughness detector

Contour detector

Roughness detector

New functions enable highly efficient measurement

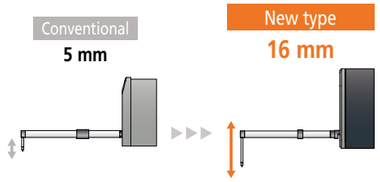
High-speed driving drastically reduces the measurement time



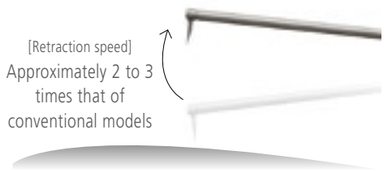
Measurement of contour and surface roughness in one trace

Equipped with a newly developed arc scale, this is a wide-range, high-resolution detector.
Both contour and surface roughness can be evaluated simultaneously with just one trace, without the need to change the detector, thereby helping to reduce measurement time.

Z-axis measurement range: 16 mm
(3.2 times wider than conventional models)



Reduction of the total measurement time



The stylus-up (retraction) speed has been improved compared to conventional models, while the speed at which the stylus comes down to touch the workpiece has been made slower in consideration of measurement safety.
Contact with the workpiece is automatically detected, allowing quick start of measurement. By shortening the total measurement time, measurement efficiency is increased.

*Approximately 3 times faster when measuring contour
Approximately double when measuring contour and roughness simultaneously

WORKABILITY

Remarkably improved workability with outstanding features

This system uses a cable-less design allowing measurements without having to worry about snagging unprotected detector cables, while the drive section is an X-axis inclinable drive unit. The inclination range is a wide ±45°, allowing inclined surfaces on of workpieces to be simply measured without using an inclination jig. In addition, the detector can be replaced without turning power off, the guide pin reproduces positioning with high accuracy, and the software supporting the mounted detector starts up automatically. Such outstanding features drastically improve work efficiency.

X-axis Inclinable Drive Unit

To measure inclined surfaces efficiently, an X-axis inclinable drive unit which can measure surfaces within a range of ±45° is mounted. When mounting the contour detector C-4500, the measuring force can be varied in 5 steps by using the software provided (FORMTRACEPAK), eliminating the need to adjust the measuring force by switching weights or through positional adjustment. This system can also maintain the specified measuring force even when inclined.

[X-axis drive unit inclination range]

±45°

Arc Scale

The system features a built-in precision arc scale that allows the circular trajectory of the stylus tip to be read directly, eliminating the need for an arc direct conversion mechanism, which often causes measurement error on the detector. It allows precision measurement over a wide range even if the arm is not in the horizontal attitude. You can perform precision measurement without worrying about the measurement range.

Cable-less

All detector and drive unit cables are housed inside the main unit to eliminate any risk of abrasion or snagging and guarantee precision measurement and rapid movement.

Hot Swapping

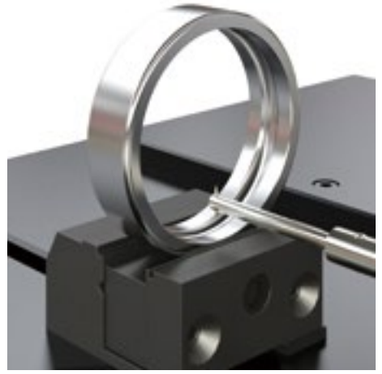
There is no requirement to turn the controller power off when replacing the detector with another detector, off when replacing the detector with another detector; moreover, the tool-less replacement mechanism (thumb-turn clamp lever) greatly helps to reduce the replacement time to approx. 1/4 (approx. 30 seconds) compared to a conventional model. Furthermore, positioning using the guide pin improves reproductivity when replacing detectors and allows efficient operation of the automatic measuring program.

WORKABILITY

Optimized measurement features depending on characteristics of workpieces

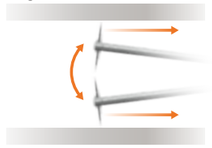
The upper/lower surface continuous measurement feature, performing control of measurement direction and measuring force by double-sided stylus and software, remarkably improves the measurement range. The stylus-drop detection feature immediately stops operation if the stylus suddenly drops, thus preventing damage to the stylus during continuous cut-out measurement without having to rely on a conventional mechanical stop. Other features enable accurate and safe measurements in accordance with the characteristics of a workpiece.

Upper/lower Surface Continuous Measurement



Upper/lower surfaces can be measured continuously by using Mitutoyo's double-sided conical stylus. This continuous measurement data can be used to facilitate analysis of features that were difficult to measure before, such as the effective diameter of an internal screw-thread. The collision monitoring feature for the magnet arm and the detector cover ensures safe measurement even during high-speed movement, in addition, optional accessories for automatic measurement automate processes from the setup to the measurement.

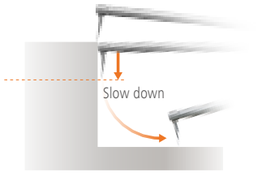
Note: When mounting contour detector C-4500



Stylus Drop Detection Feature

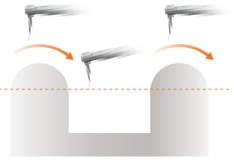
Detects sudden drop of the stylus from a measurement surface and stops the measurement operation; also, it controls the dropping rate to avoid breakage of stylus.

Note: When mounting contour detector C-4500



Continuous Cut-out Measurement Feature

The detector hold position can be registered, allowing measurement to be performed without dropping below the preset position. This feature allows continuous measurement of interrupted surface features on workpieces without needing to use mechanical stoppers.



Real One POINT

Reduces positioning distance for surface roughness measurement

Industry's No.1

The positioning distance from the start of measurement to the start of measurement data acquisition is reduced to the absolute minimum of 0.05 mm. The system vigorously supports the measurement of edges and narrow parts where it is difficult to secure sufficient measurement distance.

DESIGN

Coexistence of form and functional beauty with no compromise on detail

Visual beauty, functional rationality, and reliable measurement accuracy. We seek product design endowed with all of these properties. Coexistence of beauty and form in pursuit of design with no compromise on detail, and functional beauty providing both operability and innovation.
In addition to coloring, the new design adds improvements and ingenious features that considers the whole product structure and enables ease of use.

1

2

3

4

1 In addition to coloring, the new design considers both usability and innovation. While inheriting the contracer and surftest tradition, one also senses a leading innovative spirit.

2 Applying an angle to the front surface of the vibration isolator and side table helps reduce stress on users who work while standing and provides excellent usability.

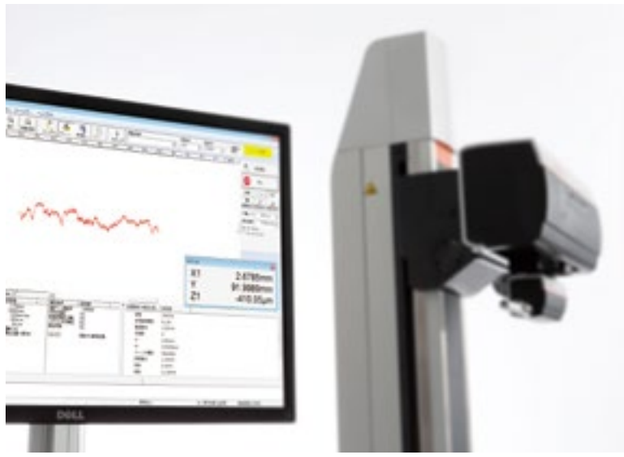
3 Improved operability thanks to added new features, such as the override control for adjusting the driving speed in real-time, and part program key that assists creation of part programs.

4 All detector and drive unit cables are housed inside the main unit to eliminate any risk of abrasion and guarantee precision measurement and rapid movement.

SOFTWARE

Backup for the unified management and sharing of measurement data, and visualization of quality

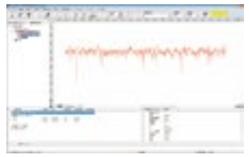
FORMTRACEPAK is equipped with a wide variety of features, such as control of the contour and surface roughness measuring systems, data analysis and comparison, and report creation. etc. MCubeMap visualizes the analysis data in detail by using various graphical technologies.
MeasurLink integrates measured data to a server via a networking system. Mitutoyo supports the realization of quality improvement by preventing defective products being produced, utilizing unified management and sharing of information.



Surface Texture Analysis Program

FORMTRACEPAK

This is a data processing unit that offers total support with such standard functions as from measuring instrument control to surface roughness analysis, contour analysis, contour matching, and inspection report creation. It also supports a status monitor to allow you to monitor the operating status of the measuring instrument.



Surface roughness analysis

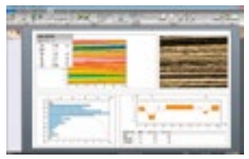
Contour analysis

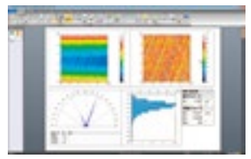
3D Surface Property Analyzing Software

MCubeMap

Parameter analysis is available for not only the vertical directions of Sa and Sq, but also spaces, compounds, and features. A wide variety of graphical technologies help visualize the analyzed data in detail.

Note: The Y-axis table for 3D measurement is required separately.



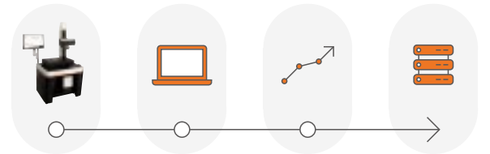


An example of 3D analysis

Measurement Data Network System

MeasurLink

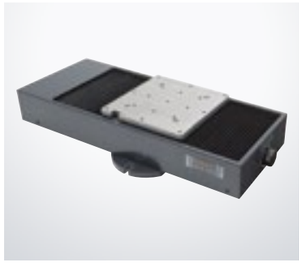
MeasurLink networks each measuring system and aggregates the measurement data in a server. The real-time aggregation enables "Visible quality" meaning the unified management and sharing of information relevant to quality.



ACCESSORIES

Optional accessories for automatic measurement

Mitutoyo offers a wide variety of optional accessories supporting the major reduction of total measurement time, from setup and measurement to evaluation, by enabling quicker implementation of operations, such as measurement of multiple points, alignment of cylindrical workpieces and leveling for surface roughness measurement.



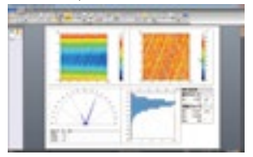
Y-axis Table | No.178-097

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: 0 - 80 mm/s
Maximum load: 50 kg
Mass: 28 kg

Y-axis Table for 3D Measurement | No.178-096

3D roughness measurement is possible by combining it with 3D-ALT. Additionally, 3D surface texture analysis is possible using MCubeMap.

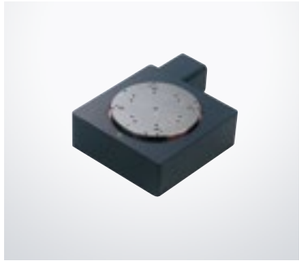


3D surface texture analysis software: MCubeMap

Travel range: 100 mm
Resolution: 0.05 µm
Straightness accuracy (static): 0.3 µm/100 mm
Drive speed: 0 - 20 mm/s
Maximum load: 15 kg
Mass: 31 kg

Inclination adjustment angle: ±2° in all directions
Maximum load (on Y axis): 10 kg
Stage surface dimensions: 139x139 mm
Mass: 4.5 kg

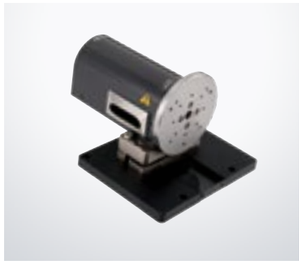
3D-ALT 178-077



Rotary Table | θ1-axis Table | No.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 FORMTRACER Avant.)

Displacement: 360°
Resolution: 0.004°
Maximum load: 12 kg
Rotational speed: Max 10°/s
Mass: 7 kg



Rotary Table | θ2-axis Unit | No.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 FORMTRACER Avant.)

Displacement: 360°
Resolution: 0.0072°
Maximum load (loading moment): 4 kg (moment 343 N·cm or less)
Rotational speed: Max 18°/s
Mass: 5 kg

Auto Leveling Table | No.178-087

This table performs fully automatic leveling adjustment roughness measurement surfaces at the start of measurement. Full automation ensures rapid measurement regardless of the skill level of the operator.

Inclination adjustment angle: ±2°
Maximum load: 7 kg
Table dimensions: 130×100 mm
Mass: 3.5 kg

Drive Unit DAT Unit | **No.178-050**

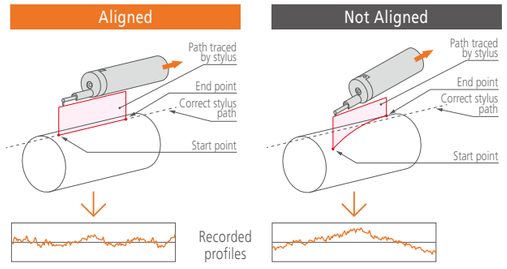
This optional unit supports leveling of measurement surfaces by inclining the drive unit. This makes leveling easy when working with large workpieces that are hard to place on the auto leveling table.

*Cannot be used in combination with FTA-H3000.

Inclination range: ±1.5°
Mass: 6.7 kg

3-axis Adjustment Table | **No.178-182**

This table helps make the adjustments required when measuring cylindrical surfaces. 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.



Centering Chuck (Ring Operated) | **No.211-032**

This chuck is useful when measuring small workpieces.
You can easily clamp them with its knurled ring.

Holding range: Inner jaws OD: ϕ1 - ϕ36 mm
Inner jaws ID: ϕ16 - ϕ69 mm
Outer jaws OD: ϕ25 - ϕ79 mm
Dimensions (D × H): ϕ118×41 mm
Mass: 1.2 kg

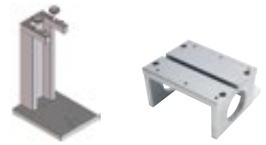
Micro-chuck | **No.211-031**

This chuck is suitable for clamping extra-small diameter workpieces (ϕ1 mm or less), which cannot be retained with the centering chuck.

Holding range: OD: ϕ0.2 - ϕ1.5 mm
Dimensions (D × H): ϕ107×48.5 mm
Mass: 0.6 kg

Table and Fixture Systems

Leveling Table (Vernier Type) **No.178-183**
Digital Leveling Table (Digimatic Type) **No.178-185**
Leveling Table **No.178-195**
Leveling Table (for D.A.T.) **No.178-196**



Calibration Stand*1 **No.12AAM100**
Calibration Stand*2 **No.12AAG175**

V-block **No.998291**
Precision Vise **No.178-019**

Cross-travel Table **No.218-171**

Rotary Vise **No.218-173**
Center Supports **No.172-600**
Center Support Risers **No.172-601**
Swivel Center Support **No.172-604**
Holder with Clamp **No.176-107**
V-block with Clamp **No.172-603**
V-block with Clamp **No.172-378**

Desktop Type Vibration Isolators

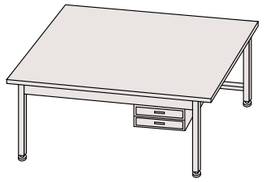
Manually Charged Pneumatic Type*3
No.178-023

Automatically Charged Pneumatic Type*3
No.178-025

Automatically Charged Pneumatic Type*4
No.178-115

Measurement Workbench (for Standard Base)
No.12AAQ587
External size (W × D × H) : 900×750×740 mm
Maximum loading : 300 kg

Measurement Workbench (for Wide Base)
No.12AAQ583
● Stand for Desktop type for **178-115**.
External size (W × D × H) : 1500×900×740 mm
Maximum loading : 800 kg



Desk Type Vibration Isolators

Desk Type*3 (Stand Integrated Type, Air System)
No.178-188

Side Table*5
No.178-181

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

Desk Type*4 (Stand Integrated Type, Air System)
No.178-189

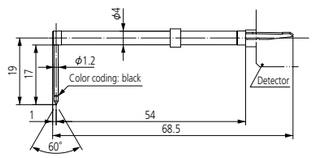
Monitor Arm*5
No.12AAK120

Example combination:
with monitor arm but no side table*6
(tester and PC not included)

*1 Required for calibrating upward measurement of FTA-**C3000/**D3000 series. (Contour measurement)
*2 Required for calibrating in bulk by mounting straight arm / small-hole stylus arm without using cross-travel table and Y-axis table. (Contour measurement)
*3 For models with a product code that ends in S4, S8, H4, or H8.
*4 For models with a product code that ends in W4, W8, L4 or L8 (wide base models).
*5 Used together with desk types (**178-188** or **178-189**).
*6 User to provide a printer rack.

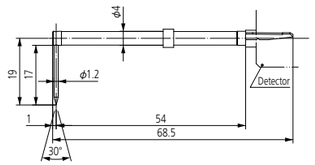
For Contour & Roughness Measurement | Styli for H-3000 Detector

Standard Stylus — 12AAY442



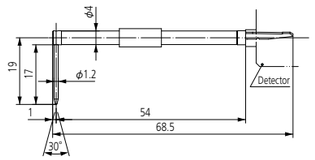
Measurement	☑ Roughness ☑ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle*2	50°
Calibration tool	Calibration kit 16 mm gage block
Note	Standard accessories for FTA-H3000

Cone Stylus — 12AAY443



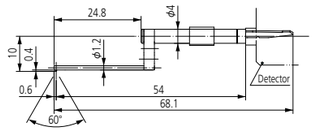
Measurement	☐ Roughness ☑ Contour
Tip radius	25 µm
Tip angle	30°
Tip material	Sapphire
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle*2	65°
Calibration tool	Calibration kit 16 mm gage block
Note	Standard accessories for FTA-H3000

ϕ0.5 Ball Stylus — 12AAY444



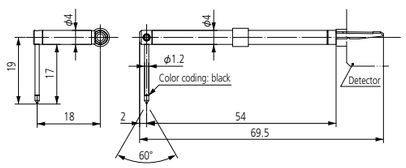
Measurement	☐ Roughness ☑ Contour
Tip radius	250 µm (ball)
Tip angle	30°
Tip material	Sapphire
Stroke	±8 mm
Measuring force*1	Approx. 4 mN
Tracing angle*2	60°
Calibration tool	Calibration kit 16 mm gage block
Note	Measuring force above is only when the X-axis angle is 0°

Stylus for Small Hole — 12AAY445



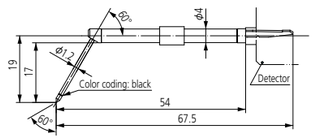
Measurement	☑ Roughness ☐ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle	—
Calibration tool	Roughness specimen (optional) or Step gage (optional)
Note	Measuring force above is only when the X-axis angle is 0°

Eccentric Stylus — 12AAY446



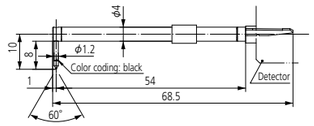
Measurement	☑ Roughness ☑ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle*2	50°
Calibration tool	Calibration kit 16 mm gage block
Note	

Stylus for Gear Tooth — 12AAY447



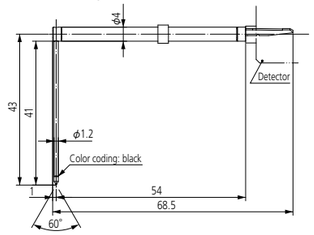
Measurement	☑ Roughness ☐ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle	—
Calibration tool	Roughness specimen (optional) or Step gage (optional) or 2 mm gage block (optional)
Note	

Stylus for Groove (7 mm) — 12AAY448



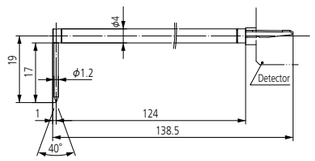
Measurement	☑ Roughness ☑ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle*2	50°
Calibration tool	Calibration kit 16 mm gage block
Note	

Stylus for Deep Groove (40 mm) Stylus — 12AAY449



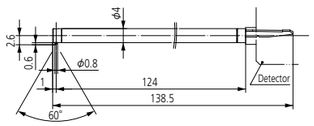
Measurement	☑ Roughness ☐ Contour
Tip radius	2 µm
Tip angle	60°
Tip material	Diamond
Stroke	±8 mm
Measuring force*1	0.75 mN
Tracing angle	—
Calibration tool	Roughness specimen (optional) or Step gage (optional)
Note	Measuring force above is only when the X-axis angle is 0°

Double-length Stylus — 12AAY450



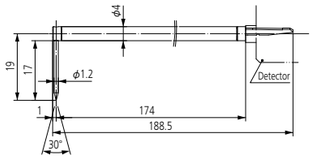
Measurement	☑ Roughness ☑ Contour
Tip radius	5 µm
Tip angle	40°
Tip material	Diamond
Stroke	±16 mm
Measuring force*1	Approx. 4 mN
Tracing angle*2	35°
Calibration tool	Calibration kit 30 mm gage block (optional gage block)
Note	

Double-length Stylus for Deep Hole — 12AAY451



Measurement	☑ Roughness ☐ Contour
Tip radius	5 µm
Tip angle	60°
Tip material	Diamond
Stroke	±16 mm
Measuring force*1	Approx. 4 mN
Tracing angle	—
Calibration tool	Roughness specimen (optional) or Step gage (optional)
Note	

2.7x-length Stylus — 12AAY452



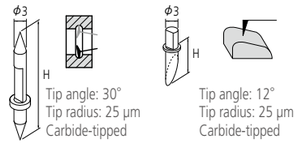
Measurement	☐ Roughness ☑ Contour
Tip radius	25 µm
Tip angle	30°
Tip material	Sapphire
Stroke	±21.5 mm
Measuring force*1	Approx. 7 mN
Tracing angle*2	35°
Calibration tool	Calibration kit 40 mm gage block (optional gage block)
Note	

*1: The measuring force is the nominal value at the mid-stroke position.
*2: Indicates the tracing angle in the stroke ±5mm range. It is also subject to changes depending on the surface texture.

For Contour Measurement | Styli

Stylus name	Stylus No.	Order No.	Application arm No.	H (mm)
Double-sided Conical Stylus*1	**SPHW-56**	**12AAM095*2**	**AB-31, AB-37**	20
	SPHW-66	**12AAM096**	**AB-31, AB-37**	32
	SPHW-76	**12AAM097**	**AB-31, AB-37**	48
One-sided Cut Stylus	**SPH-51**	**354882**	**AB-31, AB-37**	6
	SPH-61	**354883**	**AB-31, AB-37**	12
	SPH-71	**354884*2*3**	**AB-31, AB-37**	20
	SPH-81	**354885**	**AB-31, AB-37**	30
	SPH-91	**354886**	**AB-31, AB-37**	42
Intersecting Cut Stylus	**SPH-52**	**354887**	**AB-31, AB-37**	6
	SPH-62	**354888**	**AB-31, AB-37**	12
	SPH-72	**354889**	**AB-31, AB-37**	20
	SPH-82	**354890**	**AB-31, AB-37**	30
	SPH-92	**354891**	**AB-31, AB-37**	42
Cone Stylus Tip Angle 30° Sapphire Tipped	**SPH-53**	**354892**	**AB-31, AB-37**	6
	SPH-63	**354893**	**AB-31, AB-37**	12
	SPH-73	**354894**	**AB-31, AB-37**	20
	SPH-83	**354895**	**AB-31, AB-37**	30
	SPH-93	**354896**	**AB-31, AB-37**	42
Cone Stylus Tip Angle 30° Carbide-tipped	**SPH-56**	**12AAA566**	**AB-31, AB-37**	6
	SPH-66	**12AAA567**	**AB-31, AB-37**	12
	SPH-76	**12AAA568**	**AB-31, AB-37**	20
	SPH-86	**12AAA569**	**AB-31, AB-37**	30
	SPH-96	**12AAA570**	**AB-31, AB-37**	42
Cone Stylus Tip Angle 20° Carbide-tipped	**SPH-57**	**12AAE865**	**AB-31, AB-37**	6
	SPH-67	**12AAE866**	**AB-31, AB-37**	12
	SPH-77	**12AAE867**	**AB-31, AB-37**	20
	SPH-87	**12AAE868**	**AB-31, AB-37**	30
	SPH-97	**12AAE869**	**AB-31, AB-37**	42
Cone Stylus Tip Angle 50° Diamond Tipped	**SPH-79**	**355129**	**AB-31, AB-37**	20
Knife Edge Stylus	**SPH-54**	**354897**	**AB-31, AB-37**	6
	SPH-64	**354898**	**AB-31, AB-37**	12
	SPH-74	**354899**	**AB-31, AB-37**	20
	SPH-84	**354900**	**AB-31, AB-37**	30
	SPH-94	**354901**	**AB-31, AB-37**	42
Ball Stylus	**SPH-55**	**354902**	**AB-31, AB-37**	6
	SPH-65	**354903**	**AB-31, AB-37**	12
	SPH-75	**354904**	**AB-31, AB-37**	20
	SPH-85	**354905**	**AB-31, AB-37**	30
	SPH-95	**354906**	**AB-31, AB-37**	42
Small Hole Stylus	**SPH-41**	**12AAM104**	**AB-33**	2
	SPH-42	**12AAM105**	**AB-33**	4
	SPH-43	**12AAM106**	**AB-33**	6.5

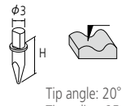
Double-sided conical stylus | One-sided cut stylus



Tip angle: 30°
Tip radius: 25 µm
Carbide-tipped

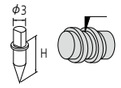
Tip angle: 12°
Tip radius: 25 µm
Carbide-tipped

Intersecting cut stylus

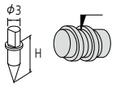


Tip angle: 20°
Tip radius: 25 µm
Carbide-tipped

Cone stylus

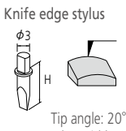


Tip angle: 30° (SPH-79: 50°)
Tip radius: 25 µm
Sapphire, Carbide-tipped
(SPH-79:Diamond tipped)

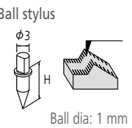


Tip angle: 20°
Tip radius: 25 µm
Carbide-tipped

Knife edge stylus | Ball stylus

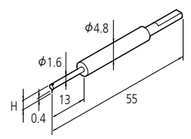


Tip angle: 20°
Edge width: 3 mm
Tip radius: 25 µm
Carbide-tipped



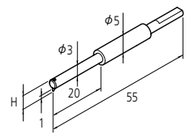
Ball dia: 1 mm
Carbide-tipped

Small hole stylus SPH-41



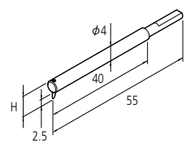
Tip shape:
One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Carbide-tipped

Small hole stylus SPH-42



Tip shape:
One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Carbide-tipped

Small hole stylus SPH-43

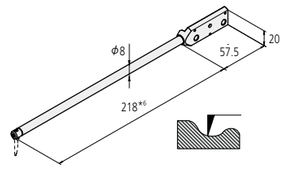


Tip shape:
One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Carbide-tipped

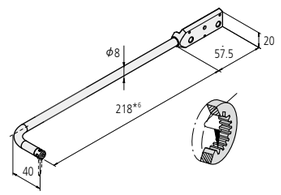
For Contour Measurement | Arms

Arm name	Arm No.	Parts No.	Applicable stylus No.
Straight Arm	**AB-31*4**	**12AAM101**	**SPH-5＊, 6＊, 7＊, 8＊, 9＊、SPHW*5 - 56, 66, 76**
Eccentric Arm	**AB-37**	**12AAQ762**	**SPH-5＊, 6＊, 7＊, 8＊, 9＊、SPHW*5 - 56, 66, 76**
Small-hole Arm	**AB-33**	**12AAM103**	**SPH-41, 42, 43**

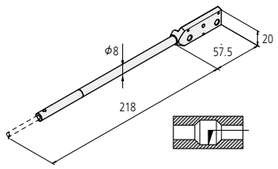
Straight Arm AB-31



Eccentric Arm AB-37



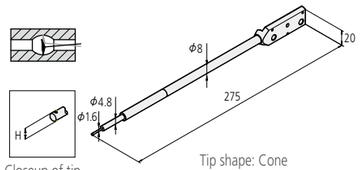
Small-hole Arm AB-33



For Contour Measurement | Arm Styli (Comprising an Arm and Stylus)

Arm stylus name	Stylus No.	Parts No.	H (mm)
Double-sided Small Hole Arm Stylus*7	**SPHW-21**	**12AAT469**	2.4
	SPHW-22	**12AAT470**	5
	SPHW-31	**12AAM108**	2.4
	SPHW-32	**12AAM109**	5
	SPHW-33	**12AAM110**	9

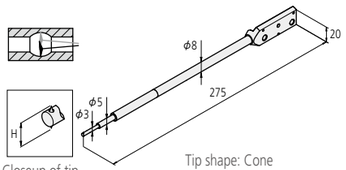
Double-sided Small Hole Arm Stylus SPHW-21/31



Closeup of tip

Tip shape: Cone
Tip angle: 20° (SPHW-21)
30° (SPHW-31)
Tip radius: 25 µm
Carbide-tipped

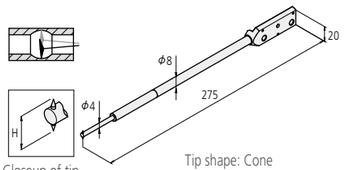
Double-sided Small Hole Arm Stylus SPHW-22/32



Closeup of tip

Tip shape: Cone
Tip angle: 20° (SPHW-22)
30° (SPHW-32)
Tip radius: 25 µm
Carbide-tipped

Double-sided Small Hole Arm Stylus SPHW-33

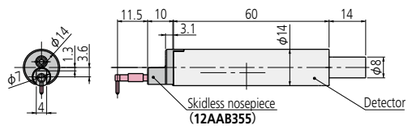


Closeup of tip

Tip shape: Cone
Tip angle: 30°
Tip radius: 25 µm
Carbide-tipped

*1 Stylus for contour detector C-4500. *2 Standard accessory of FTA-**C4000/D4000 series. *3 Standard accessory of FTA-**C3000/D3000 series.
*4 Standard accessory of FTA-**C3000/C4000/D3000/D4000 series. *5 Stylus for FTA-**C4000/D4000 series. *6 One-sided cut stylus SPH-71 (standard accessory) mounting.
*7 Arm Stylus for FTA-**C4000/D4000 series.

For Surface Roughness Measurement | Detectors



Order No.	Measuring force	
178-396-2	0.75 mN	Detectors that comply with ISO 4278
178-397-2	4 mN	Detectors that comply with previous standards, for general use.

For Surface Roughness Measurement | Extension Rods

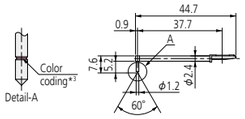
Extension Rod 50 12AAG202 Extension length 50 mm

Extension Rod 100 12AAG203 Extension length 100 mm

Note: No more than one extension rod can be connected.

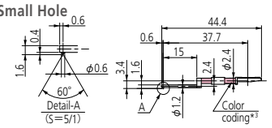
For Surface Roughness Measurement | Styli

Standard Stylus



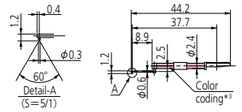
12AAE882 (1 µm)
12AAE924 (1 µm) *1
12AAC731 (2 µm)
12AAB403 (5 µm) *1
12AAB415 (10 µm) *1
12AAE883 (250 µm) *4
( ): Tip radius

For Small Hole



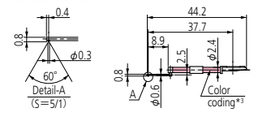
12AAC732 (2 µm)
12AAB404 (5 µm) *1
12AAB416 (10 µm) *1
( ): Tip radius

For Extra-small Hole



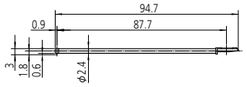
12AAC733 (2 µm)
12AAB405 (5 µm) *1
12AAB417 (10 µm) *1
( ): Tip radius

For Extra-minute Hole



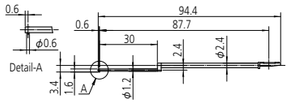
12AAC734 (2 µm)
12AAB406 (5 µm) *1
12AAB418 (10 µm) *1
( ): Tip radius

Double-length for Deep Hole*2



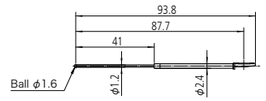
12AAE898 (2 µm)
12AAE914 (5 µm) *1
( ): Tip radius

For Small Hole/Double-length for Deep Hole*2



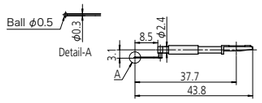
12AAE892 (2 µm)
12AAE908 (5 µm) *1
( ): Tip radius

For Small Hole*2 *4



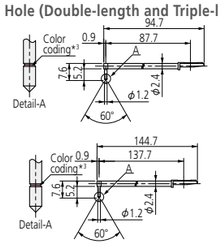
12AAE884 (φ1.6 mm)

For Ultra-small Hole*4



12AAJ662 (φ0.5 mm)

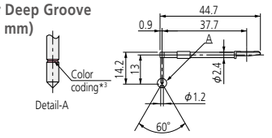
For Deep Hole (Double-length and Triple-length)*2



2倍
12AAC740 (2 µm)
12AAB413 (5 µm) *1
12AAB425 (10 µm) *1
( ): Tip radius

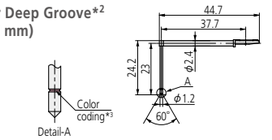
3倍
12AAC741 (2 µm)
12AAB414 (5 µm) *1
12AAB426 (10 µm) *1
( ): Tip radius

For Deep Groove (10 mm)



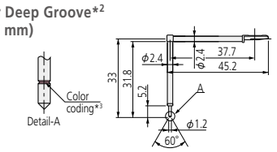
12AAC735 (2 µm)
12AAB409 (5 µm) *1
12AAB421 (10 µm) *1
( ): Tip radius

For Deep Groove*2 (20 mm)



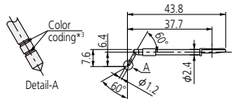
12AAC736 (2 µm)
12AAB408 (5 µm) *1
12AAB420 (10 µm) *1
( ): Tip radius

For Deep Groove*2 (30 mm)



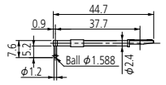
12AAC737 (2 µm)
12AAB407 (5 µm) *1
12AAB419 (10 µm) *1
( ): Tip radius

For Gear Tooth



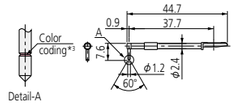
12AAB339 (2 µm)
12AAB410 (5 µm)
12AAB422 (10 µm)
( ): Tip radius

For Rolling Circle Waviness Surface*4



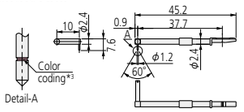
12AAB338 (φ1.588)

For Knife-edge



12AAC738 (2 µm)
12AAB411 (5 µm) *1
12AAB423 (10 µm) *1
( ): Tip radius

For Eccentric Arm*2



12AAC739 (2 µm)
12AAB412 (5 µm) *1
12AAB424 (10 µm) *1
( ): Tip radius

*1 Tip angle 90°

*2 For downward-facing measurement only.

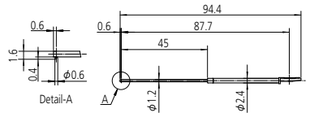
*3

Tip radius	1 µm	2 µm	5 µm	10 µm	250 µm
Color coding	White	Black	No color	Yellow	No notch or color

*4 Used for calibration, a standard step gauge (178-611, option) is also required

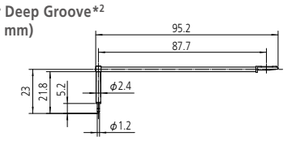
*Customized special interchangeable styli are available on request, Please contact any Mitutoyo office for more information.

For Small Slotted Hole*2



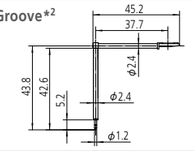
12AAE938 (2 µm)
12AAE940 (5 µm) *1

For Deep Groove*2 (20 mm)



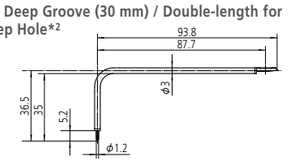
12AAE893 (2 µm)
12AAE909 (5 µm) *1
( ): Tip radius

For Deep Groove*2 (40 mm)



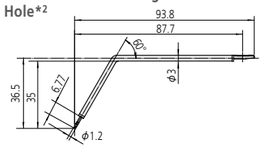
12AAE895 (2 µm)
12AAE911 (5 µm) *1
( ): Tip radius

For Deep Groove (30 mm) / Double-length for Deep Hole*2



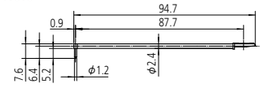
12AAE894 (2 µm)
12AAE910 (5 µm) *1
( ): Tip radius

For Gear Tooth / Double-length for Deep Hole*2



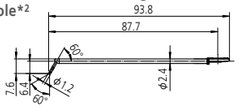
12AAE896 (2 µm)
12AAE912 (5 µm)
( ): Tip radius

For Rolling Circle Waviness / Double-length for Deep Hole*2 *4



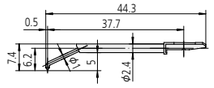
12AAE886 (250 µm)

For Corner Hole / Double-length for Deep Hole*2



12AAM601 (2 µm)
12AAM603 (5 µm)
( ): Tip radius

For Bottom Surface



12AAE899 (2 µm)
12AAE915 (5 µm) *1
( ): Tip radius

APPLICATION

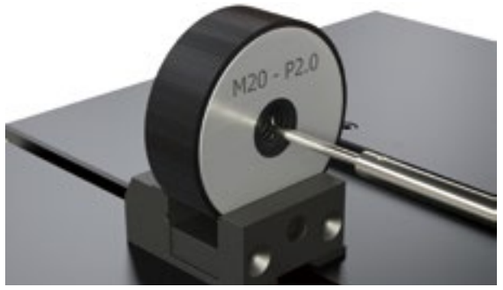
Efficient precision measurement for practically any workpiece

FORMTRACER Avant Series has applications supporting measurements for a wide variety of workpieces. For example, a part-program (automatic measuring program) creation support key equipped with the remote BOX allows rapid creation of programs, and the contour sensor allows immediate measurement by creating a measurement-ready state once the sensor contacts a workpiece. Furthermore, this series features stylus-up significantly faster than conventional models, along with high-speed axis travel. By combining these elements into a single system, efficient and accurate measurements are realized.

PET bottle Preform measurement

The thread of a familiar PET bottle requires precision measurement, since leaks will occur if it is too loose, or the cap cannot be tightened if it is too tight. The "sectional form of thread" of such PET bottles can be measured without cutting the product by using a cone stylus. Angle and pitch can be measured efficiently.

Screw gauge Ring measurement

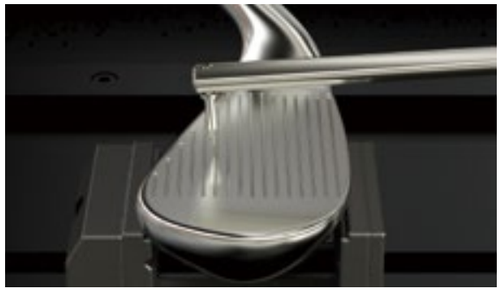


Upper/lower surface continuous measurement and measurement adjustable feature on the C-4500 detector allows simultaneous measurements of the effective diameter of screw or ring gages, together with thread angle and pitch. Since a part-program (automatic measuring program) for measuring and analysis can be created, effective diameter, which requires high accuracy in micrometer threads, can be accurately and efficiently measured.

Bearing measurement

Bearing rings (outer ring/inner ring) are required to have a shape and surface roughness that will allow the lubricating oil to work as an effective preventive measure against seizure and wear. The H-3000 detector has both a wide measurement range and high resolution, allowing contour and surface roughness to be evaluated efficiently and with high accuracy in a single measurement.

Golf club face Groove form measurement

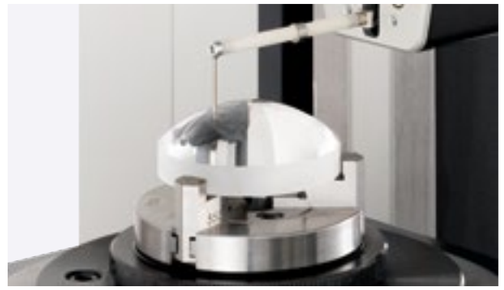


Groove pitches, groove intervals, and edge shapes are strictly determined by golf club standards. By using the part-program (automatic measuring program) as a standard feature and automating analysis, efficient evaluation is possible with precision measurement.

Can Pull-top groove measurement

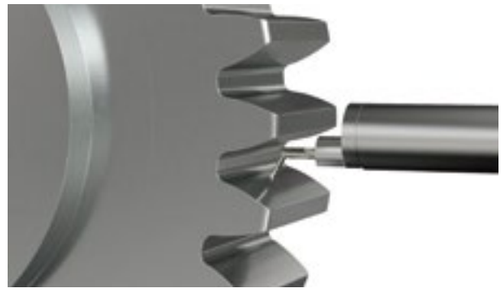
If the pull-top groove is too shallow, the pull-top cannot be opened, and if it is too deep, it will be opened easily, resulting in leakage during transportation due to vibration or shock. The groove dimensions of products can be efficiently controlled for measured where high accuracy is required.

Lens measurement



Lens measurements require a high level of shape accuracy to achieve the necessary optical performance. The H-3000 detector achieves high-accuracy and high-resolution shape measurement, allowing accurate and precise evaluation of PV values by comparison with design values. It also supports analysis of surface roughness and various dimensional analysis functions.

Surface roughness test for tooth faces of gears



The surface roughness of gear teeth may affect strength and torque transfer efficiency. By using a stylus for gear teeth, it is possible to measure over the full face of a tooth, right down to the root. FORMTRACER Avant Series, which can cut off the positioning distance to its limit (0.05 mm) helps evaluate the surface roughness of gear teeth.

Surface roughness test for tablet molds

Durability is required for tablet molds to ensure the detachability of pharmaceutical powder and reduction of production cost. FORMTRACER Avant Series, which can cut off the positioning distance to its limit, helps evaluate the surface roughness of molds with accuracy and precision as it can measure products with high accuracy from edge to edge.

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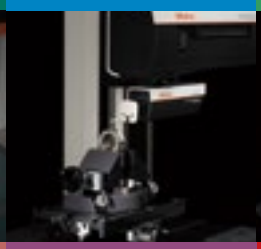
Coordinate Measuring Machines

Vision Measuring Systems

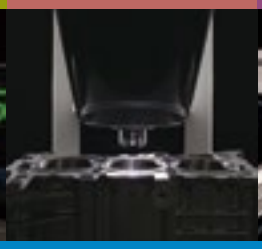
Form Measurement



Optical Measuring

Sensor Systems

Test Equipment



Digital Scale and DRO Systems

Small Tool Instruments and Data Management

Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

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https://www.mitutoyo.co.jp/global.html

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