Surface Roughness Measuring System

SURFTEST SJ-500/SV-2100

Bulletin No. 1959

Surface roughness testers offer benchtop or portable operation and the choice of data analysis by PC or an easy-to-use dedicated processor

Mitutoyo

Dedicated data processor type

Surftest SJ-500/SV-2100

Improved operability

7.5 Color TFT LCD
The dedicated data processor has a high-visibility 7.5" color TFT LCD. Icon display and touch panel operation provide user-friendly display and easy operation.

Positioning by joystick and manual control knobs on the processor
Easy-to-operate joystick. Fine positioning of stylus required for small-hole measurements can be easily performed using the manual fine-adjustment knobs.

Multiple trace function
A machine can be programmed to take up to three traces, one after the other.

Auto leveling table (optional)
Automatically levels the surface to be tested for easy, strain-free setup.

Various types of analysis

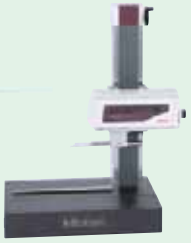
Capable of fine-contour analysis
Supports 43 types of analysis parameters, complying with surface roughness standards such as ISO 1997 and JIS 2001. Also capable of various fine-contour analysis.
* Contour analyses: Area, circle, angle, coordinate difference, step, inclination

High-durability

Ceramic guideway
A ceramic guideway, inherently free from wear and deterioration with age, is employed to maintain the traversing straightness of the drive unit (X-axis) indefinitely. Maintenance-free design, since anti-corrosion treatment is not required for ceramic.

SJ-500
Traverse: 1.97" (50mm)
Compact, high-performance type

SV-2100M4
Traverse: 3.94" (100mm)
Manual column type



SV-2100S4/H4/W4
Traverse: 3.94" (100mm)
Power column type

Dedicated data processor
Advanced processing and easy operation

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Easy operation, high-accuracy analysis of surface roughness and fine contours!

High-visibility color display panel

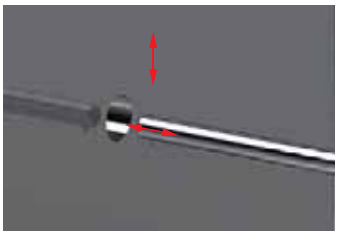
A high-visibility 7.5" color TFT LCD, color icon display and touch-operated panel provide user-friendly, easy operation.
Built-in thermal printer. Fine contour analysis provided as standard.

Supports 16 languages
Japanese, English, German, French, Italian, Spanish, Portuguese, Korean, Simplified Chinese, Traditional Chinese, Czech, Polish, Hungarian, Turkish, Swedish, Dutch

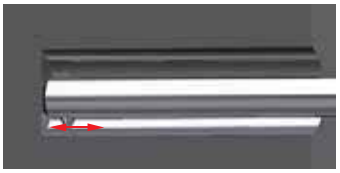
Efficient positioning by joystick and adjustment knobs

Both a fast-traverse joystick (X-axis: .78"/s (20mm/s) for **SJ-500**, 1.98"/s (40mm/s) for **SV-2100**, Z2-axis: .78"/s (20mm/s) for **SV-2100S4/H4/W4**) and manual fine-adjustment knobs, essential for positioning in small hole measurement, are standard features.

Positioning in small hole measurement



Positioning in Y/Z-directions with column fine-adjustment knob (or detector elevation knob) and optional cross-travel table.

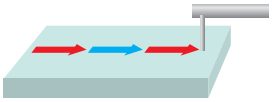


Positioning at the trace start point with X-axis fine-adjustment knob.

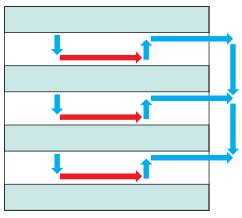
Multiple trace programming function

A machine can be programmed to take up to three consecutive traces by one-key operation, as shown in the figure below.

•SJ-500/SV-2100M4
Consecutive tracing in X-axis direction only

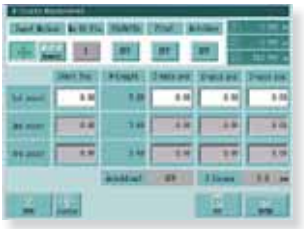


•SV-2100S4/H4/W4
X-axis tracing with programmed Z-axis shifts possible



Measurement
Traverse

Example: **SV-2100S4** input screen

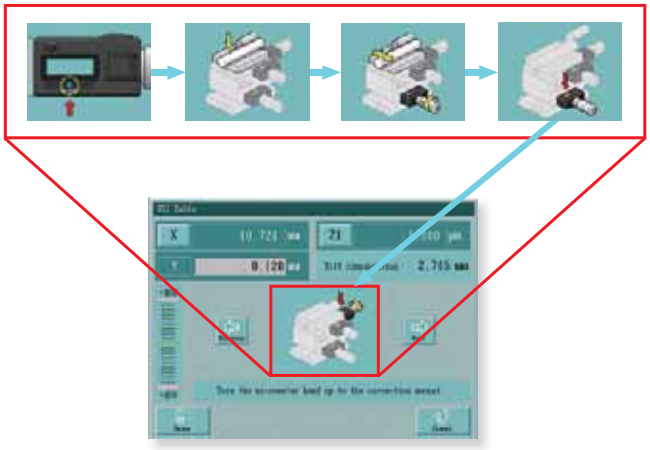


Navigation function aids leveling

Powerful support for leveling adjustments

When using an optional 3-axis adjustment table or leveling table, a navigation screen is available to help the operator level the surface to be tested.

Example of 3-axis adjustable table



The user is guided through the leveling procedure to determine the amount of adjustment needed.

A portable tester also boasting high performance in desktop applications

Surftest SJ-500

High accuracy, high performance, user-friendly display and easy operation

Class-leading traverse straightness: 8µin/2" (0.2µm/50mm)
High-speed traverse at up to 0.78"/s (20mm/s) under joystick control
Smooth positioning using the vertical adjustment knob

Vertical adjustment knob

Essential for positioning the stylus close to the workpiece!

Support for testing problematic features

Supports measurement in the axial direction for shrouded features, such as found on crankshafts, by simply swiveling the detector through 90 degrees.

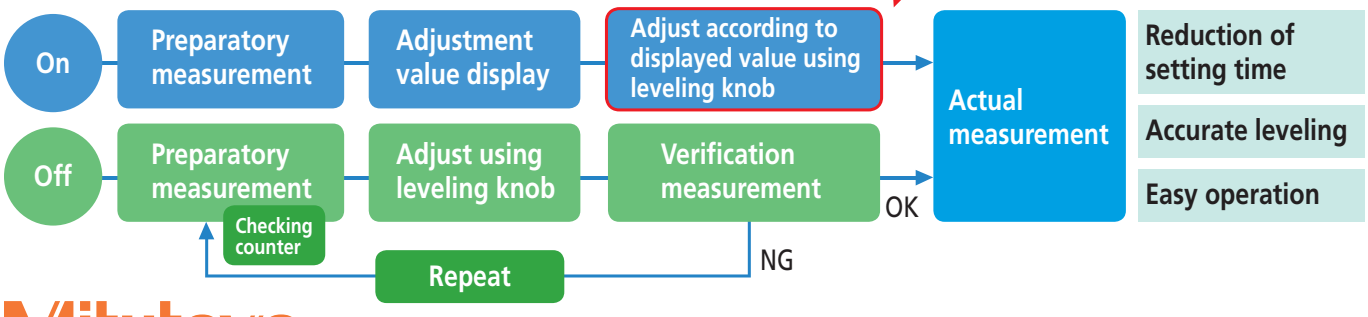
Normal tracing

Tracing a shrouded feature

Drive unit inclination adjustment mechanism

Digital Adjustment Tilting (DAT) function is supplied as standard for efficient leveling of workpieces: ±1.5°
DAT function: Patent pending (Japan, U.S., Germany)

DAT function **Powerful support for manual leveling!!**



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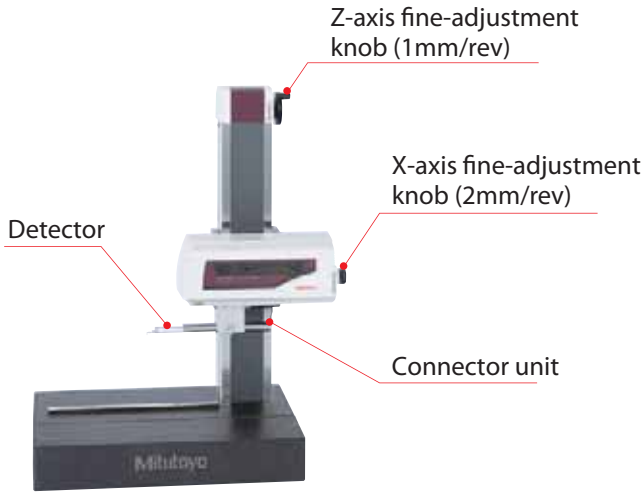
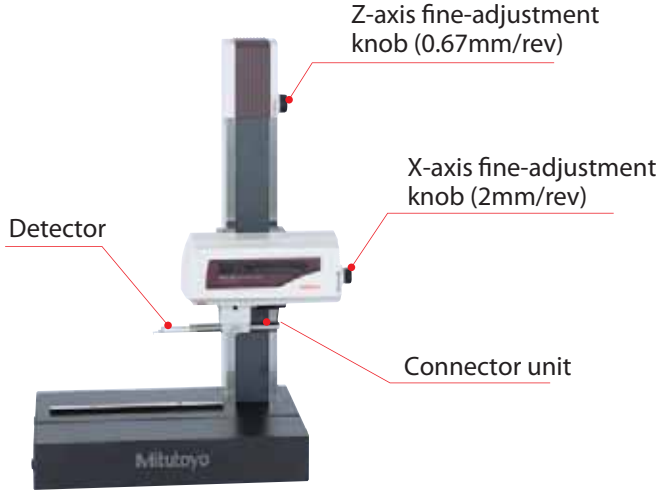
A desktop tester that's easy to use for portable applications

Surftest SV-2100

By setting the origin point at start-up, the Absolute scale system allows accurate positioning for repeated or multiple measurements.



SV-2100M4



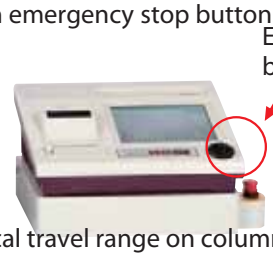
SV-2100S4

High-speed traverse at up to1.57"/s (40mm/s) (X-axis) under joystick control
Smooth positioning, using the Z-axis fine-adjustment knobs
Stable, high-accuracy measurement with a traverse straightness of 6µin/4" (0.15µm/100mm)

1. Capable of a series of automatic measurements, plus auto leveling (optional) and stylus retraction. Accurate positioning for repeated or multiple measurements possible.

Measurement setup screen

2. SV-2100S4/H4/W4 models are equipped with an emergency stop button.



3. Base sizes and vertical travel range on column

Model No.	Vertical travel range	Vertical traverse method	Base size
SV-2100S4	13.8" (350mm)	Power and manual	23.6" x 17.72" (600×450mm)
SV-2100H4	21.6" (550mm)		
SV-2100W4			39.4" x17.72 (1000×450mm)
SV-2100M4	13.8" (350mm)	Manual only	23.6" x 17.72" (600×450mm)

Dedicated data processor

MiCAT
Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
FORM

Data processing unit

- Data saving (internal memory)
- High-speed printing
- Expansion slot for external memory (CF card)
- Display supports 16 languages
- Key panel

- High-visibility 7.5" color LCD
- Touch panel with color icon display
- Joystick

Customizable menu screen

The menu customization function allows display of frequently used menu icons

One-touch display of various screens

Home screen

Evaluation setup screen

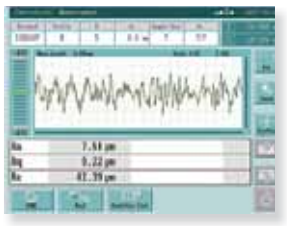
Measurement setup screen

Calibration screen

Contour analysis screen

Statistical processing

Statistical data processing possible (up to 300 data samples)
Statistical processing items: MAX, MIN, average, standard deviation, histogram, probability of acceptance.



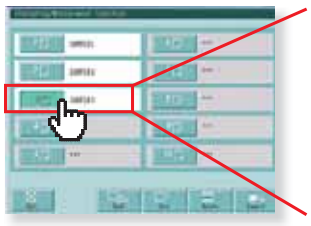
Statistical data input

Statistical results

Saving and recalling measurement setups

Up to 10 measurement setups can be saved to and recalled from internal memory.

One-touch recall of stored setups



Click the desired measurement setup file

Measurement screen opens

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Analysis to international standards

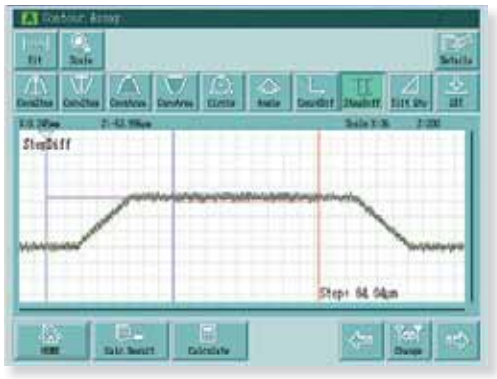
Evaluates surface roughness using up to 43 parameters complying with international standards such as ISO 1997 and JIS 2001.
Bearing Area Curve (BAC), Amplitude Distribution Curve (ADC), and power spectrum (wavelength display) are readily available in graph form.

A large variety of optional accessories

Options supporting measurement including an auto leveling table, a 3-axis adjustment table, and a leveling table. Furthermore, these can be easily operated via a navigation function. (Supported accessories differ depending on the model.)

Fine-contour analysis

Various contour analyses (area, circle, angle, coordinate difference, step, inclination) are supplied as standard.



Select desired analysis icon and then specify the range.

Easy, icon-based input of setup conditions
*** Patent pending**

Setups are aided by icons representing ISO/JIS roughness standard parameters with appropriate values selected from recommended lists.

Typical surface roughness symbol on drawing

Grinding

Ra 1.5

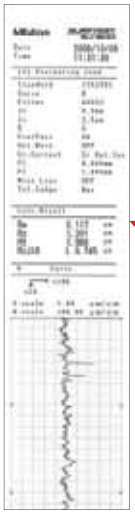
⊥ 0.08-0.8/Rz8max 3.3

Typical result of icon-based setup

U"X"0.08—0.8/Rz8max 3.3

Clicking a parameter icon displays the recommended cut-off value, etc.

Built-in thermal printer



Measurement data is printed by the high-definition, high-speed thermal printer.
In addition to calculation results and evaluation results, BAC, ADC and other curves can also be printed.

PC data processing type
Surftest SJ-500P

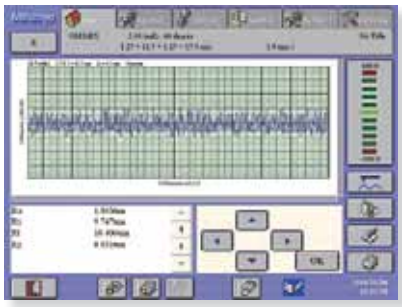
A superior data processing tester with PC data analysis for higher efficiency.

* If a power column type with PC data-processing is desired, consider the SV-3100 series

SJ-500P

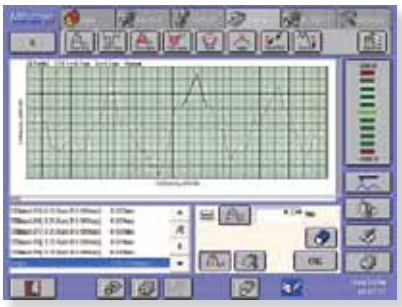
SURFPAK-EZ: Easy-to-use task-focused software

User-friendly graphical display and button layout allows intuitive operation. Simplified fine-contour analysis provided as standard, including step, area, angle, and circle calculation.



Measurement and results display screen

Calibration and control screen (SJ-500P)



Simplified contour analysis screen

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Specifications

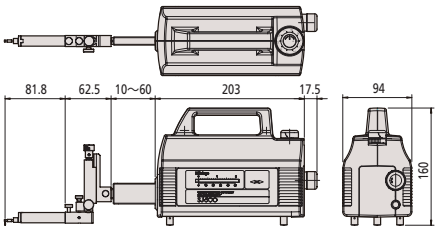
Specifications

Type of data processing		Dedicated data processor					PC system
Model No.		**SJ-500**	**SV-2100M4**	**SV-2100S4**	**SV-2100H4**	**SV-2100W4**	**SJ-500P**
Order No.*	**with 0.75 mN detector**	**178-533-01A**	**178-637-01A**	**178-681-01A**	**178-683-01A**	**178-685-01A**	**178-531-01A**
	with 4 mN detector	**178-533-02A**	**—**	**—**	**—**	**—**	**—**
Travel range (operation)	X axis	2" (50mm) (power drive/manual)	3.94" (100mm) (power drive / manual)				2" (50mm) (power drive / manual)
	Z2 axis (column)	———	350mm (manual)	13.8" (350mm) (power drive / manual)			———
Measuring range	X axis	2" (50mm)	3.94" (100mm)				2" (50mm)
	Z1 axis (detector unit)	3200µin / 3200µin / 320µin (800µm / 80µm / 8µm)					
Resolution	X axis	1.97µin (0.05µm)					
	Z1 axis (detector unit)	0.4µin / 3200µin range, 0.4µin / 3200µin range, 0.004µin /320µin range (0.01µm / 800µm range, 0.001µm / 80µm range, 0.0001µm / 8µm range)					
	Z2 axis (column)	———	———	(1µm)			———
Power drive speed	X axis	0 - 0.78"/s 0 - 20mm/s (via joystick)	0 - 1.98"/s (0 - 40mm/s) (via joystick)				0 - 20mm/s (via PC)
	Z2 axis (column)	———	———	0 - 0.78"/s (0 - 20mm/s) (via joystick)			———
Measuring speed		0.00078" - 0.2"/s (0.02 - 5mm/s)					
Traverse guideway straightness		8 µin / 2"(0.2µm / 50mm)	6µin / 4" (0.15µm / 100mm)				8µin / 2"(0.2µm / 50mm)
Stylus up/down operation		Arc movement					
Point of stylus		Downward					
Detector	Measuring force	0.75 mN or 4 mN					
	Stylus tip	0.75mN detector: 60°, R2 µm or 4mN detector: 90°, R5µm					
Applicable standards		JIS'82 / JIS'94 / JIS'01 / ISO'97 / ANSI / VDA					
Assessed profiles		Dedicated data processor type: P (primary profile), R (roughness profile), WC, envelope residual profile, roughness motif, waviness motif PC system type: P (primary profile), R (roughness profile), WC, WCA, WE, WEA, DIN4776 profile, E (envelope residual profile), roughness motif, waviness motif					
Evaluation parameters		Dedicated data processor type: Ra, Rc, Ry, Rz, Rq, Rt, Rmax, Rp, Rv, R3z, Sm, S, Pc, mr (c),δc, mr, tp, Htp, Lo, lr, Ppi, HSC, Δa, Δq, Ku, Sk, Rpk, Rvk, Rk, Mr1, Mr2, A1, A2, Vo, λa, λq, R, AR, Rx, W, AW, Wx, Wte, (43 parameters), Customization PC system type: Pa, Pq, Psk, Pku, Pp, Pv, Pz, Pt, Pc, PSm, PΔq, Pmr (c), Pmr, Pδc, Ra, Rq, Rsk, Rku, Rp, Rv, Rz, Rt, Rc, RSm, RΔq, Rmr (c), Rmr, Rδc, Wa, Wq, Wsk, Wku, Wp, Wv, Wz, Wt, Wc, WSm, WΔq, Wmr (c), Wmr, Wδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Rx, AR, R, Wx, AW, W, Wte, Ry, RyDIN, RzDIN, R3y, R3z, S, HSC, Lo, lr, Δa, λa, λq, Vo, Htp, NR, NCRX, CPM, SR, SAR, NW, SW, SAW					
Analysis graphs		Dedicated data processor type: ADC, BAC, power spectrum graph PC system type: ADC, BAC Graph, power spectrum graph, auto-correlation graph, Walsh power spectrum graph, Walsh auto-correlation graph, slope distribution graph, local peak distribution graph, parameter distribution graph					
Curved surface compensation		Dedicated data processor type: Parabolic compensation, Hyperbolic compensation, Elliptical compensation, Circular compensation Conic compensation, Inclination (Entire, Arbitrary) PC system type: Parabolic compensation, Hyperbolic compensation, Elliptical compensation, Circular compensation, Conic compensation, Inclination (Entire, Arbitrary), Polynomial compensation					
Contour analysis		Dedicated data processor type: Area, Circle, Angle, Coordinate difference, Step, Inclination PC system type (SURFPAK-EZ): Area, Circle, Angle, Coordinate difference, Step, Inclination					
Filters		Dedicated data processor type: 2CR-75%, 2CRPC-75%, Gaussian, Robust-spline PC system type: 2CR-75%, 2CR-50%, 2CRPC-75%, 2CRPC-50%, Gaussian, Rubust-spline					
Base size (width x depth)		———	23.6" x 17.7"(600x450mm)			39.4"x17.7"(1000x450mm)	———
Base material		———	Granite				———
External dimensions (W x D x H)	Main unit	16.7"x3.7"x6.3" (425x94x160mm)	28.2"x17.7"x34" (716x450x863mm)	30.16"x17.7"x38" (766x450x966mm)	30.16"x17.7"x45.9" (766x450x1166mm)	45.9"x17.7"x46.3" (1166x450x1176mm)	16.7"x3.7x63" (425x94x160mm)
	Display unit	12.9" x 10.63" x 4.38 (330x270x124mm)					———
	Electronic unit	———	———	14.6" x 9.65" x 2.83" (372x245x71.8mm)			———
———	PC I/F unit	———	———	———	———	———	13.7" x 10.4" x 3.4" 350x263x86mm
Mass	Main unit	5.9 lbs (2.7kg)	308.6 lbs (140kg)	308.6 lbs (140kg)	330.7 lbs (150kg)	485 lbs (220kg)	5.91 lbs (2.7kg)
	Display unit	8.8 lbs (4.0kg)					———
	Electronic unit	———	———	6.6 lbs (3.0kg)			———

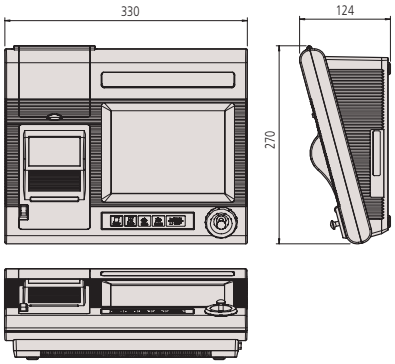
Dimensions

Unit: mm

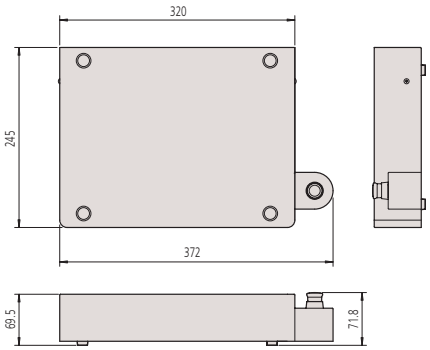
SJ-500



Dedicated data processor

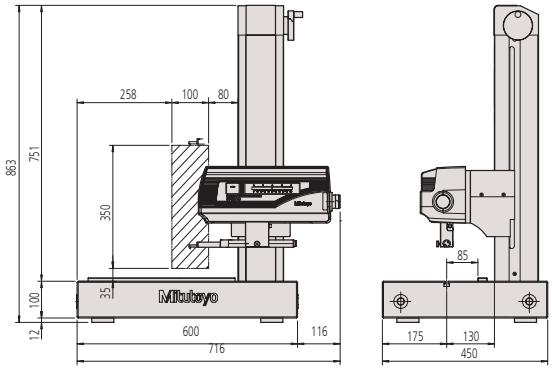


Electronic unit

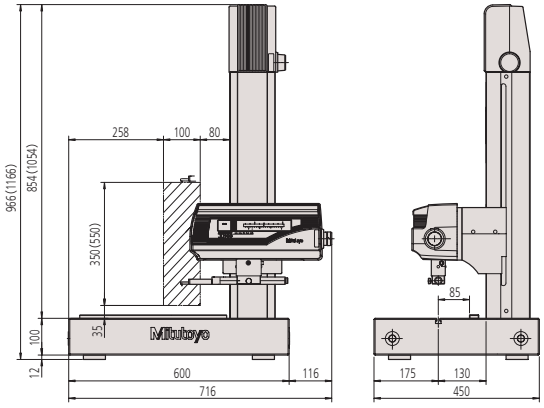


Only for SV-2100S4 / H4 / W4

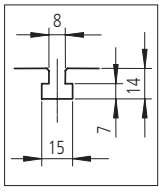
SV-2100M4



SV-2100S4 / SV-2100H4



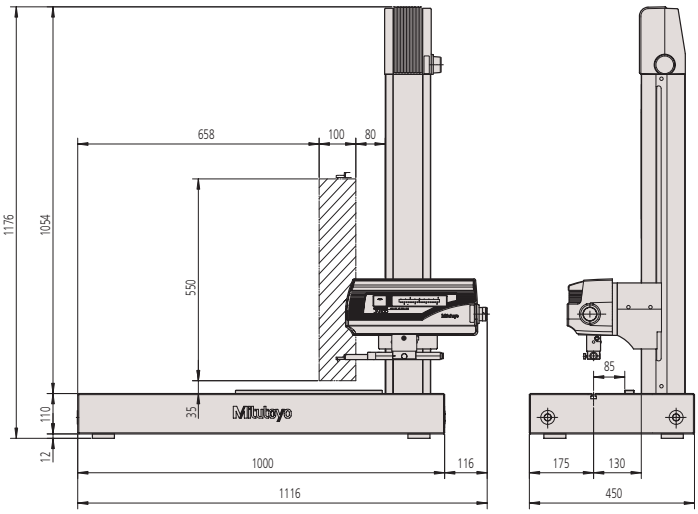
( ): SV-2100H4



T-groove dimensions
(common to all types)

Measuring range

SV-2100W4



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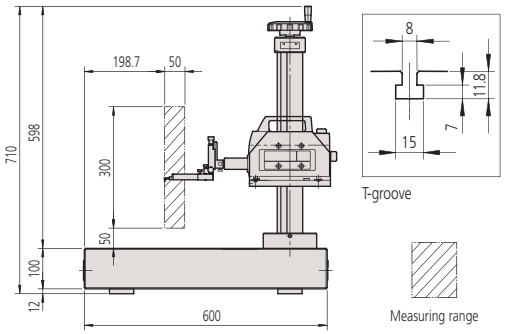
Optional Accessories

Manual column stand: 178-085 (for SJ-500)

Suitable for desktop use in inspection rooms and such.

No.178-085 * Except measuring unit
Vertical adjustment range: 11.8" (300mm)
Dimension (W × D × H): 23.6" x 17.7" x 28"
(600 × 450 × 710mm)
Weight: 242 lbs (110kg)

Dimensions of SJ-500 with manual column stand Unit: mm



Auto-leveling table: 178-081 (for SJ-500 / SV-2100M4), 178-083 (for SV-2100S4 / H4 / W4)

This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this tedious operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.

Inclination adjustment angle	±2°
Maximum load	15.4 lbs (7kg)
Table dimensions	5.12" x 3.94"(130x100mm)
Mass	7.7lbs (3.5kg)

DAT leveling table: 178-048

Inclination adjustment angle	±1.5°
Maximum load	15.4 lbs (7kg)
Table dimensions	5.12" x 3.94" (130x100mm)

This table can be used by itself or in conjunction with other leveling tables.

Leveling table: 178-043-1 (with analog heads) 178-042-1 (with digital heads)

No.178-043-1

No.178-042-1

Order No.	178-043-1	178-042-1
Table dimensions	5.12" x 3.94" (130x100mm)	
Maximum load	33 lbs (15kg)	
Inclination adjustmnt. angle	±1.5°	
Swiveling angle	±3°	
X/Y-axis travel range	±0.49" (±12.5mm)	
Resolution	0.01mm	0.001mm
Dimensions	8.66" x 7.4" x 3.27" (220×189×83mm)	10.3" x 9.17 x 3.27" (262×233×83mm)
Mass	13.2 lbs (6Kg)	13.9 lbs (6.3Kg)

Quick chuck: 211-032

This chuck is useful when measuring small workpieces. The knurled ring makes clamping very easy.

Retention range	Inner latch	OD: ø 0.039" - 1.42"(1 - 36mm)
	Inner latch	ID: ø 0.55" - 2.76" (14 - ø70m)
	Outer latch	OD: ø 0.039 - 2.95" (1 - ø75mm)
Dimensions		ø 4.64 x 1.61" (118x41mm)
Mass		2.65 lbs (1.2kg)

Micro-chuck: 211-031

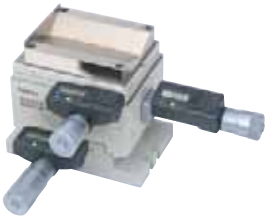
This chuck is suitable for clamping extra-small diameter workpieces (ø1mm or less), which cannot be clamped with the centering chuck.

Clamping range	OD: ø 0 - 0.06" (0 - 1.5mm)
Dimensions	ø 4.64" – 1.91" (118x48.5mm)
Mass	1.32 lbs (0.6kg)

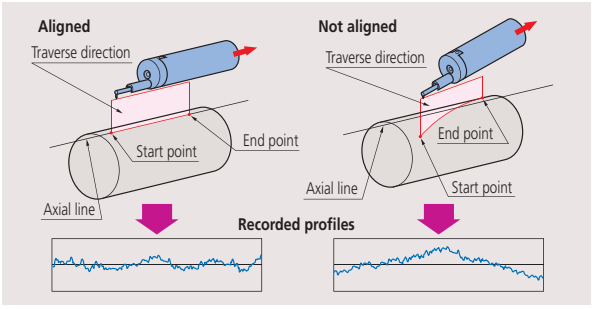
Optional Accessories

3-axis adjustment table: 178-047

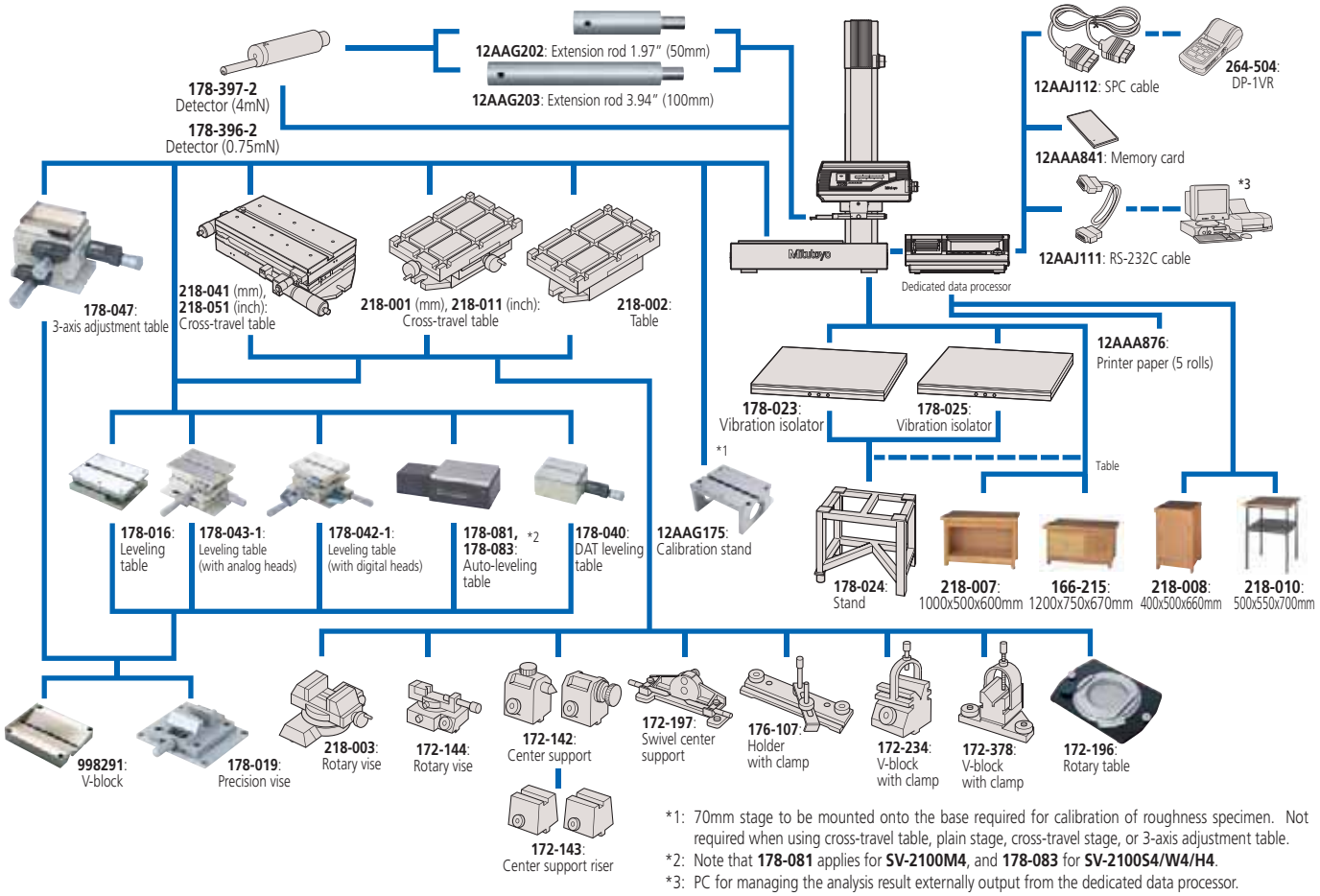
This table helps make the alignment adjustments required when measuring cylindrical surfaces. The corrections for the pitch angle and the swivel angle are determined from a preliminary measurement and the Digimatic micrometers are adjusted accordingly. A flat-surfaced workpiece can also be leveled with this table.



Inclination adjustment angle	±1.5°
Swiveling angle	±2°
Y-axis range	0.49" ±(12.5mm)
Resolution of heads	0.001mm
Table dimensions	5.12" x 3.94"(130x100mm)
Maximum load	33 lbs (15kg)



System configuration including optional accessories (for SV-2100M4 / S4 / H4 / W4)



*1: 70mm stage to be mounted onto the base required for calibration of roughness specimen. Not required when using cross-travel table, plain stage, cross-travel stage, or 3-axis adjustment table.
*2: Note that **178-081** applies for **SV-2100M4**, and **178-083** for **SV-2100S4/W4/H4**.
*3: PC for managing the analysis result externally output from the dedicated data processor.

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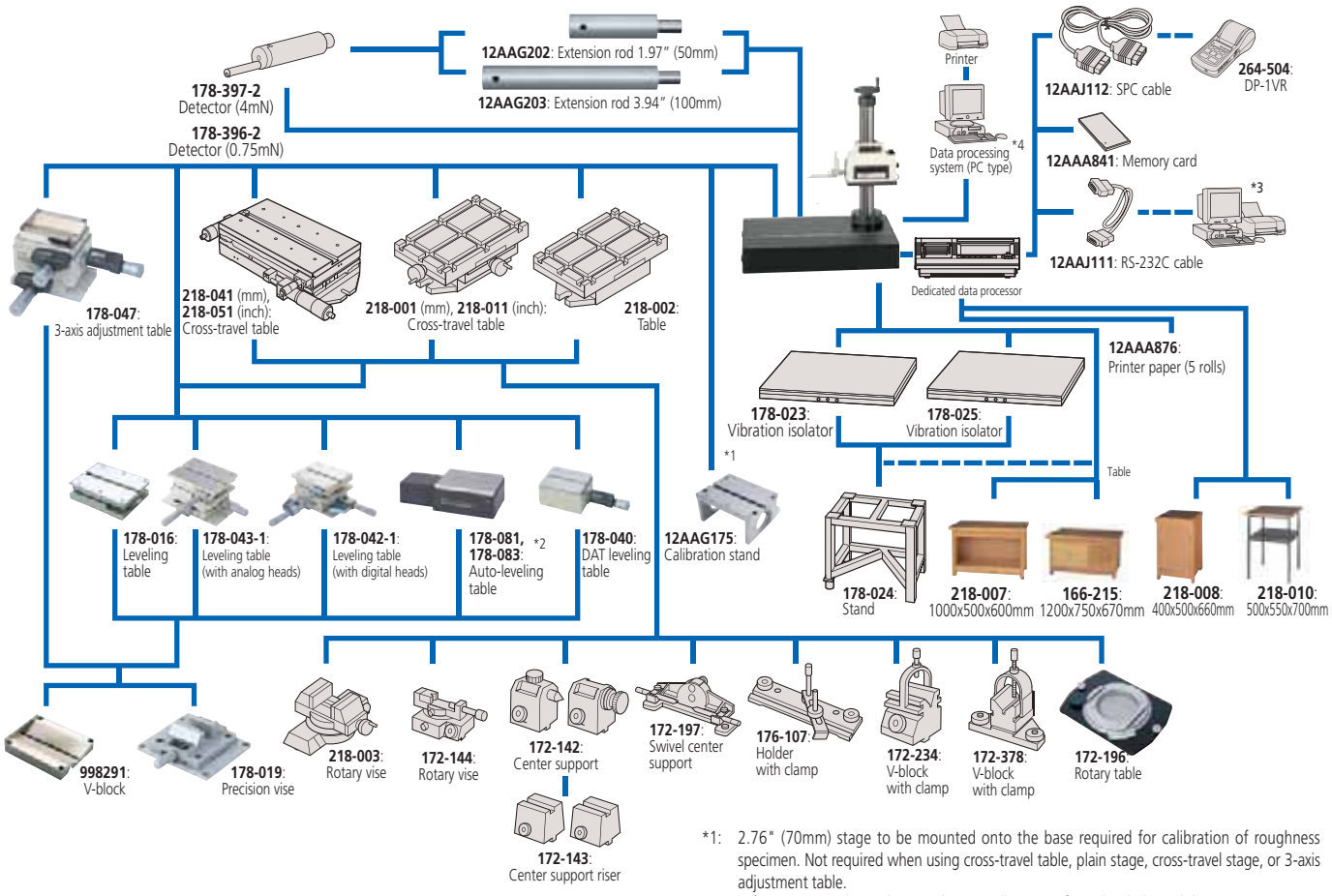
Optional Accessories

System configuration including optional accessories (for SJ-500 with optional manual column stand)



*1: 2.76" (70mm) stage to be mounted onto the base required for calibration of roughness specimen. Not required when using cross-travel table, plain stage, cross-travel stage, or 3-axis adjustment table.

*3: PC for managing the analysis result externally output from the dedicated data processor.

*3: Only SJ-500P can be connected. Use a USB cable when connecting the **SJ-500P** main unit and a PC. A USB cable is a standard accessory of the **SJ-500P**.

Roughness specimen (standard accessory): 178-601

Display	Ra = about 3 µm
Material	Ni (TiN surface coating)

Roughness specimen: 178-604

For checking stylus tip

Display	Ra = about 3 µm, about 0.4 µm

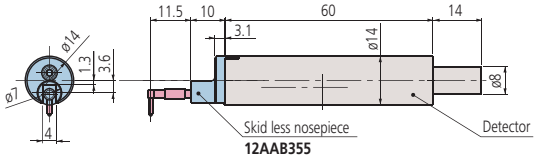
Reference step specimen: 178-611 (mm), 178-612 (inch)

For sensitivity calibration of detector

Nominal value of step	2µm 10µm, 79µin 394µin

Optional Styli

Detectors



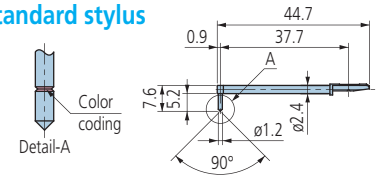
Detector (0.75mN): **178-396-2**
Detector (4mN): **178-397-2**

Extension rods

Extension rods
(**12AAG202**: 1.97" (50mm), **12AAG203**: 3.94" (100mm)

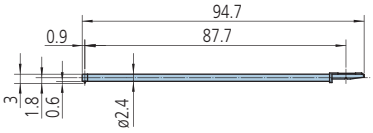
Styli

Standard stylus



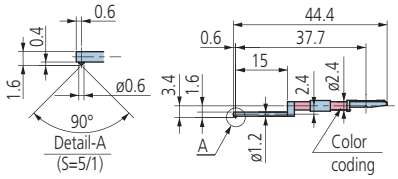
12AAE882 (1µm)*
12AAE924 (1µm)**
12AAC731 (2µm)*
12AAB403 (5µm)**
12AAB415 (10µm)**
12AAE883 (250µm)
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

Double-length for deep hole



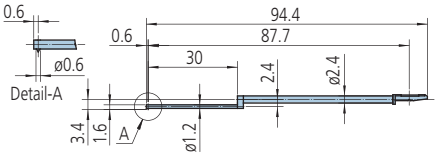
12AAE898 (2µm)*
12AAE914 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For small hole



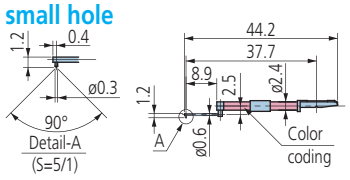
12AAC732 (2µm)*
12AAB404 (5µm)**
12AAB416 (10µm)**
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole/Double-length for deep hole



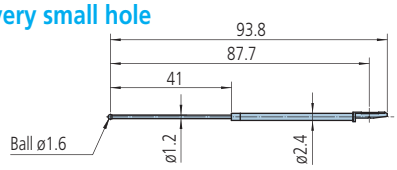
12AAE892 (2µm)*
12AAE908 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For very small hole



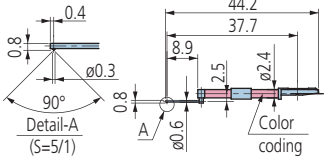
12AAC733 (2µm)*
12AAB405 (5µm)**
12AAB417 (10µm)**
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

For very small hole



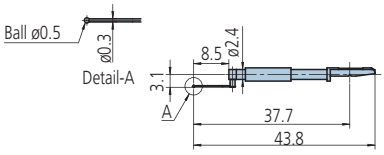
12AAE884 (0.8mm)
( ): Tip radius

For extra small hole



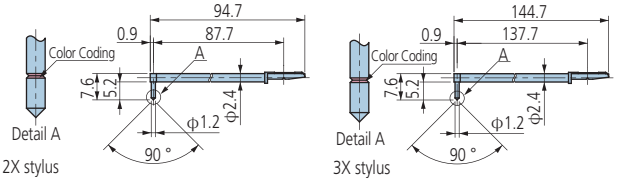
12AAC734 (2µm)*
12AAB406 (5µm)**
12AAB418 (10µm)**
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

For ultra small hole



12AAJ662 (0.25mm)
( ): Tip radius

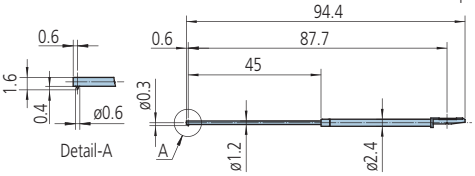
For deep hole (double-length and triple-length)



2X stylus
12AAC740 (2µm)* ( ): Tip radius
12AAB413 (5µm)** *Tip angle: 60°
12AAB425 (10µm)** **Tip angle: 90°

3X stylus
12AAC741 (2µm)* ( ): Tip radius
12AAB414 (5µm)** *Tip angle: 60°
12AAB426 (10µm)** **Tip angle: 90°

For small slotted hole



12AAE938 (2µm)*
12AAE940 (5µm)**
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

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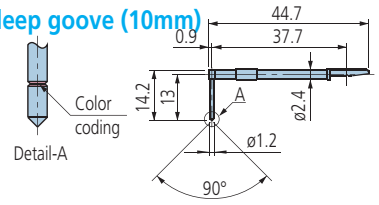
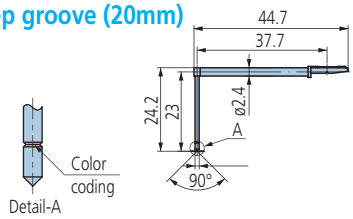
Styli

For deep goove (10mm)



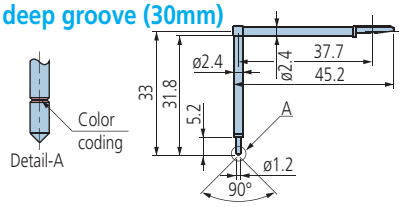
12AAC735 (2µm)*
12AAB409 (5µm)**
12AAB421 (10µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For deep groove (20mm)



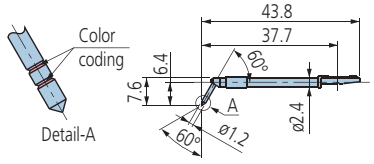
12AAC736 (2µm)*
12AAB408 (5µm)**
12AAB420 (10µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For deep groove (30mm)



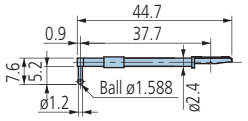
12AAC737 (2µm)*
12AAB407 (5µm)**
12AAB419 (10µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For gear tooth



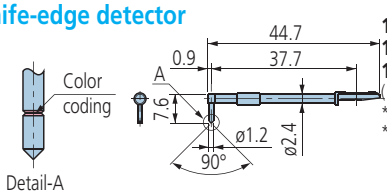
12AAB737 (2µm)*
12AAB410 (5µm)**
12AAB422 (10µm)**
( ): Tip radius
*Tip angle: 60° **Tip angle: 90°

For rolling circle waviness surface



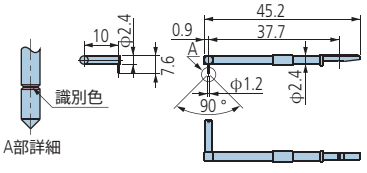
12AAB338 (ø1.588)
( ): Tip radius

For knife-edge detector



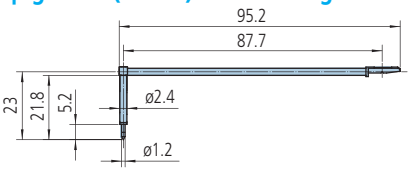
12AAC738 (2µm)*
12AAB411 (5µm)**
12AAB423 (10µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For eccentric arm



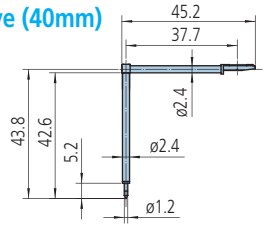
12AAC739 (2µm)*
12AAB412 (5µm)**
12AAB424 (10µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For deep groove (20mm)/Double-length for deep hole



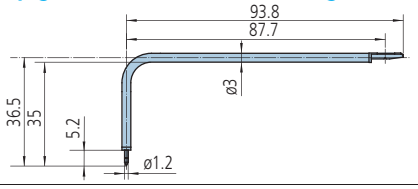
12AAE893 (2µm)*
12AAE909 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For deep groove (40mm)



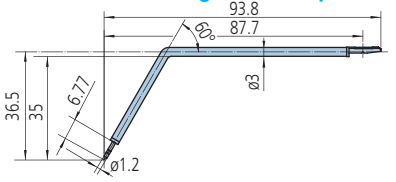
12AAE895 (2µm)*
12AAE911 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For deep groove (30mm)/Double-length for deep hole



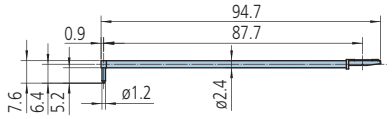
12AAE894 (2µm)*
12AAE910 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For gear tooth/Double-length for deep hole



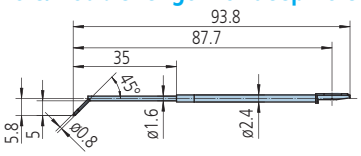
12AAE896 (2µm)*
12AAE912 (5µm)**
( ): Tip radius

For rolling circle waviness/Double-length for deep hole



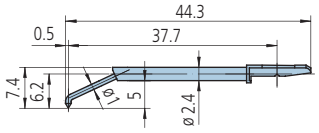
12AAE886 (250µm)
( ): Tip radius

For corner hole/Double-length for deep hole



12AAE897 (2µm)*
12AAE913 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

For bottom surface



12AAE899 (2µm)*
12AAE915 (5µm)**
( ): Tip radius
*Tip angle: 60°
**Tip angle: 90°

- Coordinate Measuring Machines
- Vision Measuring Systems
- Form Measurement
- Optical Measuring
- Sensor Systems
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- Digital Scale and DRO Systems
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0209-06 • Printed in USA • March 2009

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