

Surftest SJ-400

Bulletin No. 2013



Portable Surface Roughness Tester

Mitutoyo

Surftest SJ-400 Series

Revolutionary New Portable Surface Roughness Testers Make Their Debut

Long-awaited performance and functionality are here: compact design, skidless and high-accuracy roughness measurements, multi-functionality and ease of operation.

Requirement

1

High-accuracy measurements with a hand-held tester

A wide range, high-resolution detector and an ultra-straight drive unit provide class-leading accuracy.

Detector

Measuring range: 800 μ m
Resolution: 0.000125 μ m (on 8 μ m range)

Drive unit

Straightness/traverse length
SJ-401: 0.3 μ m/.98" (25mm)
SJ-402: 0.5 μ m/1.96" (50mm)



Requirement

3

Cylinder surface roughness measurements with a hand-held tester

The skidless measurement and R-surface compensation functions make it possible to evaluate cylinder surface roughness.



Requirement

2

Roughness parameters that conform to international standards

The SJ-400 Series can evaluate 36 kinds of roughness parameters conforming to the latest ISO, DIN, and ANSI standards, as well as to JIS standards (1994/1982).

Requirement

4

Measurement/evaluation of stepped features and straightness

Ultra-fine steps, straightness and waviness are easily measured by switching to skidless measurement mode. The ruler function enables simpler surface feature evaluation on the LCD monitor.

Mitutoyo

Requirement

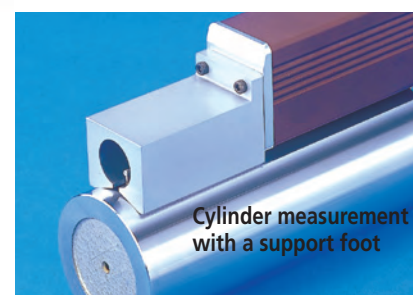
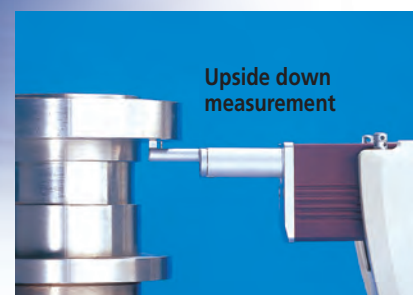
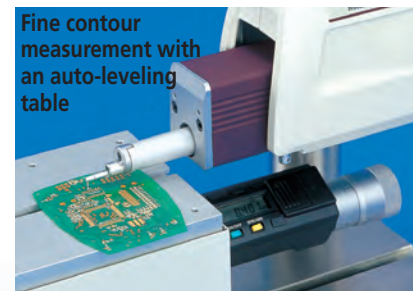
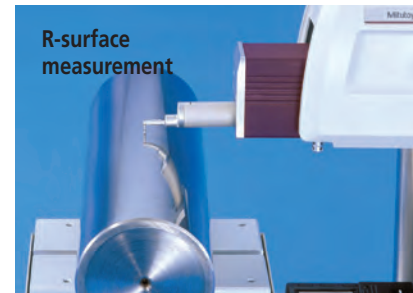
5

Advanced data processing with extended analysis

The SJ-400 Series allows data processing identical to that in the high-end class. These data analysis and report creation capabilities are achieved using the surface roughness analysis program FORMTRACEPAK V5 or SJ-Tools.



Measurement Applications

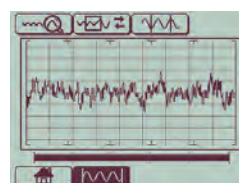
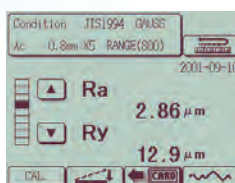


Requirement

6

Confirmation of measurement results and assessed profiles without a printout

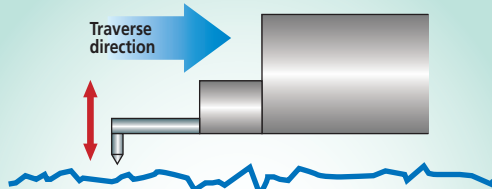
The large, integrated, touch-panel LCD monitor clearly displays evaluation results and measured profiles.



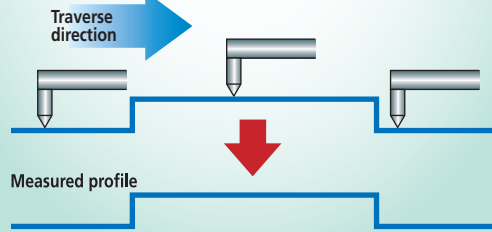
The SJ-400 Series Performs Skidless Measurements

The SJ-400 Series detector uses interchangeable nosepieces that allow skid or skidless measurements to suit the type of measurement required.

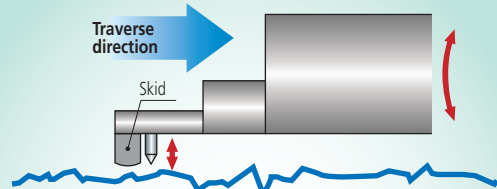
Skidless measurement



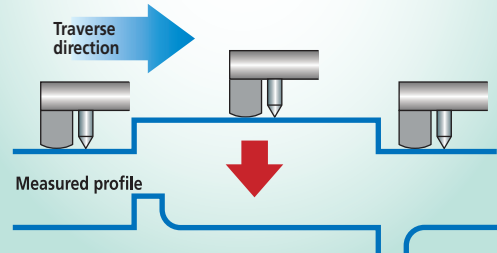
- Skidless measurement is where surface features are measured relative to the drive unit reference surface. This measures waviness and finely stepped features accurately, in addition to surface roughness, but range is limited to the stylus travel available.
- The SJ-400 series supports a variety of surface feature measurements simply by replacing the stylus.



Skidded measurement

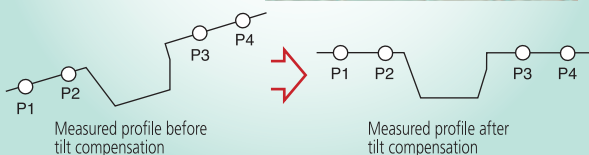


- In skidded measurements, surface features are measured with reference to a skid following close behind the stylus. This cannot measure waviness and stepped features exactly but measuring range is greater because the skid tracks the workpiece surface contour.



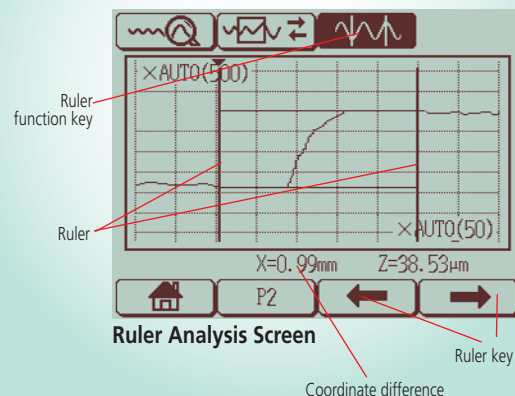
Tilt compensation function

- The Tilt Compensation Datum Points are selectable from all of the profile (choose P1 and P2) or any arbitrary two sections on the profile (choose P1, P2, P3 and P4), as required. If you choose adjacent sections for tilt compensation then the characteristics of features of interest between these sections, such as scratch depth, etc, can be measured directly.



Simplified surface feature evaluation with the ruler function

- This function determines the coordinate difference between two arbitrary points so feature characteristics, such as step height and width, etc, can be measured.

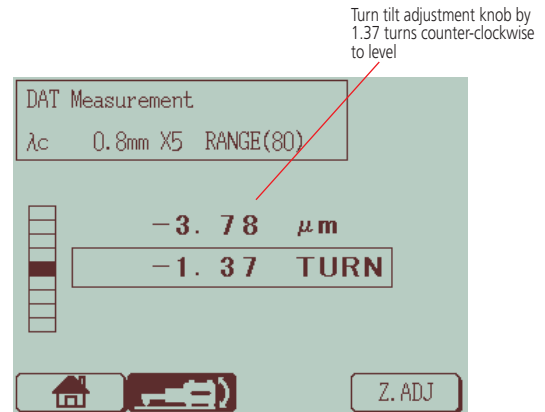


Mitutoyo

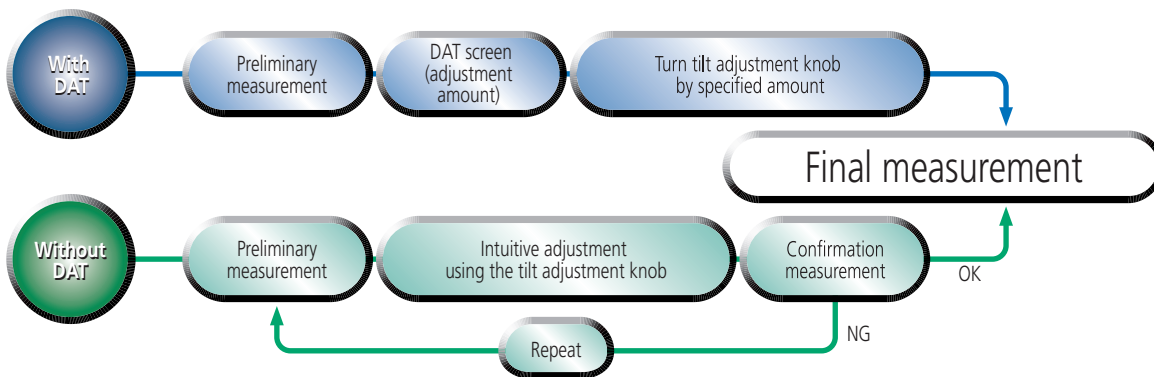
Powerful Support for Leveling

The height/tilt adjustment unit comes as standard for leveling the drive unit prior to making skidless measurements and, supported by guidance from the unique DAT function, makes it easy to achieve highly accurate alignment.

The DAT Function



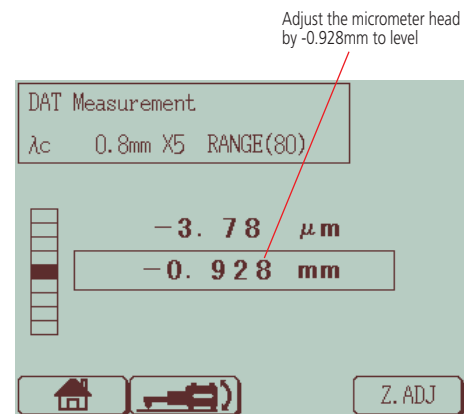
DAT screen guides the user when leveling



DAT Function for the optional leveling table



With the SJ-400 mounted on a stand, the DAT function also works with the optional leveling table.



DAT screen guides the user when leveling

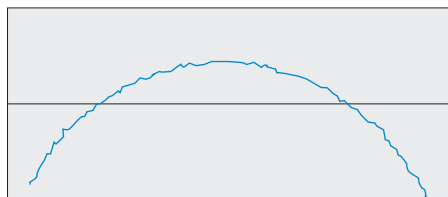
More Measuring Functions Than Expected From a Compact Tester

Measuring curved-surface roughness (skidless measurement)

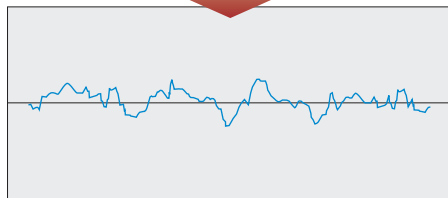
Usually, a spherical or cylindrical surface (R-surface) cannot be evaluated, but, by removing the radius with a filter, R-surface data is processed as if taken from a flat surface.



Measurement of a cylindrical surface



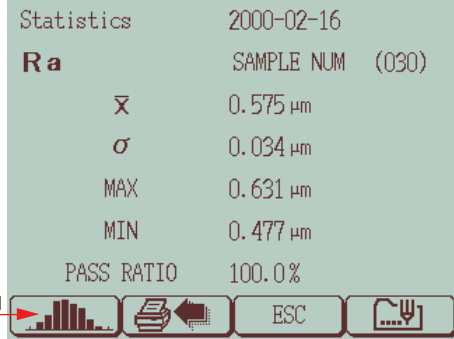
Actual profile
R-Surface compensation



Filtered profile

Statistics

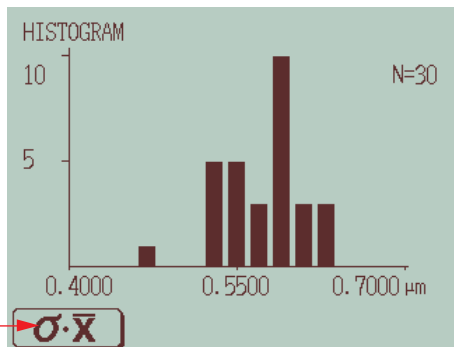
Statistical processing can be performed on multiple measurements for one roughness parameter. Histograms can be displayed and printed in addition to statistical results (mean, standard deviation, maximum/minimum value and acceptance ratio).



Statistical

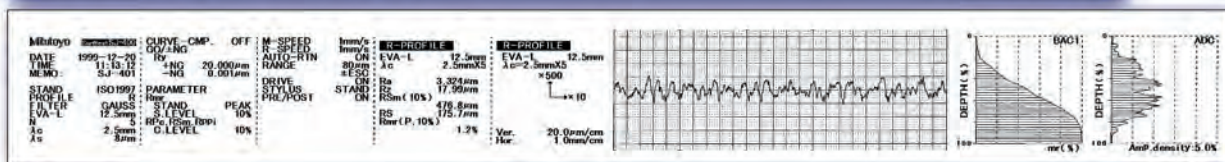
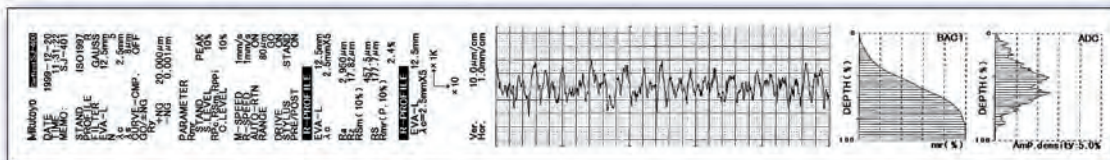
Switchable

Histograms



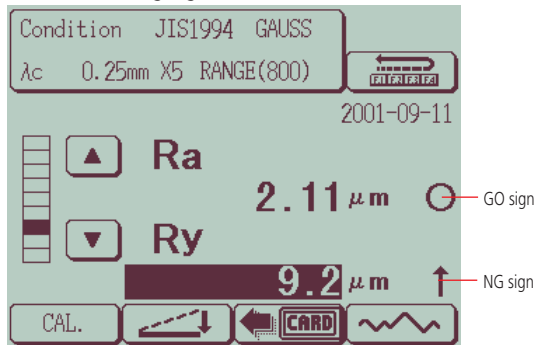
Built-in thermal printer

A high quality, high-speed thermal printer prints out measured results. It can also print a BAC curve or an ADC curve as well as calculated results and assessed profiles. These results and profiles are printed out in landscape format, just as they appear on the LCD, in easy-to-understand form.



GO/NG indication

Upper and lower tolerance limits can be set for up to 3 roughness parameters. A GO/NG indication is displayed after a measurement. The calculation result is highlighted if NG.



Calculation Result Screen with GO / NG judgment result

Real sampling

This function samples stylus displacement for a specified time without engaging detector traverse. This function has a wide range of uses, such as a simplified vibration meter or a displacement gage incorporated in another system.

Recalculating

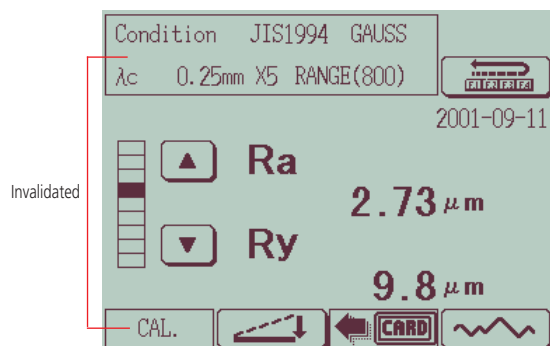
Previously measured data can be recalculated for use in other evaluations by changing the current standard, assessed profile and roughness parameters.

Arbitrary length measurement

This function allows a sampling length to be arbitrarily set in .004" (0.1mm) increments SJ-401: .004" to .98" (0.1mm to 25mm), SJ-402: .004" to 1.96" (0.1mm to 50mm). It also allows the SJ-400 Series to make both narrow and wide range measurements.

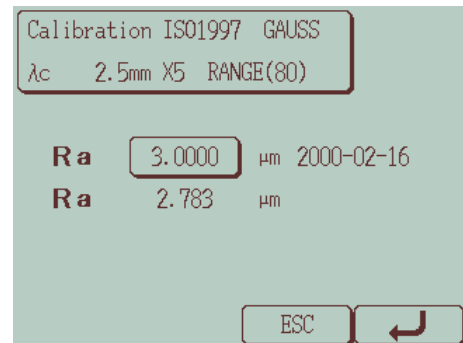
Key masking

Locks out input from the touch panel keys. This eliminates the possibility of the operator accidentally changing the calibration or measurement conditions.



Auto-Calibration

The SJ-400 Series is equipped with Ra calibration and step calibration methods for detector calibration (gain adjustment). In both calibration methods only the calibrated value of the precision specimen needs to be entered. No other operations are required to calibrate the tester.



Calibration Screen

Storing/recalling measured data and conditions

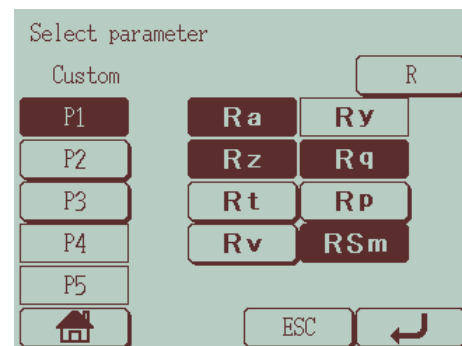
The measurement conditions and data can be stored in the control unit or memory card (optional) and recalled as required. Batch printout of data after on-site measurement improves measuring efficiency.

Storage capacity

Measurement conditions	Control unit: 5 conditions Memory card: 20 conditions
Measurement data	Memory card: 50 or more pieces of data

Customizing

The SJ-400 Series can be set up to calculate and display only a subset of the roughness parameters available. Parameters can be added later for recalculation, if required.



Customized Screen

Wi

ホーム 編集 表示 設定 測定条件 測定 測定モード レポート ヘルプ

測定条件: 100 測定時間: 1000

測定モード: 粗さ 測定項目: Ra 測定速度: 100 測定時間: 1000

測定結果

項目	値
Ra	1.2300 μm
Ry	8.5404 μm

測定条件

項目	値
測定モード	粗さ
測定項目	Ra
測定速度	100
測定時間	1000





Carrying case
is a standard accessory

Specification

Inch/(Metric)

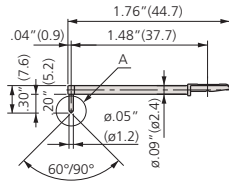
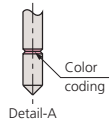
Order No.		SJ-401	178-947-4A (inch/mm)	178-957-4A (inch/mm)
		SJ-402	178-945-4A (inch/mm)	178-959-4A (inch/mm)
Measuring method		Skidless/Skidded measurement		
Measuring range	Z-axis	32000µin, 3200µin, 320µin (800µm, 80µm, 8µm) (Up to 2,400µm with an option stylus)		
	X-axis	SJ-401: 1" (25mm) SJ-402: 2" (50mm)		
Drive method	Straightness	SJ-401: 12µin/1" (0.3µm/25mm) SJ-402: 20µin/2" (0.5µm/50mm)		
	Measuring speed	.002", .004", .02", .04"/s (0.05, 0.1, 0.5, 1.0mm/s)		
	Return speed	.02", .04", .08"/s (0.5, 1.0, 2.0 mm/s)		
Height-Tilt adjustment unit	Tilt adjustment range	±1.5°		
	Height adjustment amount	.39"(10mm)		
Assessed profile		Primary profile (P), Roughness profile (R), Filtered waviness profile (W), DIN4776, MOTIF (R, W)		
Evaluation parameters		Ra, Ry, Rz, Rq, Pc, R3z, mr, Rt, Rp, Rv, Sm, S, δc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Lo, Ppi, R, AR, Rx, Δa, Δq, Ku, HSC, mrd, Sk, W, AW, Wte, Wx, Vo		
Analysis graphs		Bearing Area Curve (BAC), Amplitude Distribution Curve (ADC)		
Number of sampling length		X1, X3, X5, XL* (*=arbitrary length)		
Arbitrary length		SJ-401: .01" to 1" (.01" increments) [0.1 to 25mm (0.1mm increments)] SJ-402: .04" to 2" (.01" increments) [0.1 to 50mm (0.1mm increments)]		
Sampling length (L)		.003", .01", .03", .1", .3" (0.08, 0.25, 0.8, 2.5, 8mm)		
Printing width		1.89" (48mm)/paper width: 2.28" (58mm)		
Recording magnification	Vertical magnification	10 to 100K magnification, Auto		
	Horizontal magnification	1 to 1K magnification, Auto		
Detector	Detection method	Differential inductance method		
	Minimum resolution	.005µin (320µin range)/0.000125µm (8µm range)		
	Stylus tip	Cone 90°, Radius 5µm, Diamond	Cone 60°, Radius 2µm, Diamond	
	Measuring force	4mN	0.75mN	
	Radius of skid	1.57"(40mm)		
	Skid force	Less than 400mN		
Function	Customize	Display/Roughness parameter selectable		
	Data compensation	R-surface, Tilt compensation		
	Ruler function	Displays the coordinate difference of any two points		
	D.A.T. function	Helps to adjust leveling during skidless measurement		
	Displacement detection mode	Enables the stylus displacement to be input while the drive unit is stopped		
	Statistical processing	Maximum value, Minimum value, Mean value, Standard deviation (s), Pass ratio, Histogram		
	Tolerance judgment	Upper and lower limit values for three parameters can be specified		
	Measuring Condition storage	Five sets of measuring conditions (control unit)		
Printer		Thermal printer		
Cut-off length		.003", .01", .03", .1", .3" (0.08, 0.25, 0.8, 2.5, 8mm)		
Digital filter		2CR, PC75 (phase corrected), Gaussian		
Calibration		Ra, Step (Automatic calibration entering the value of roughness specimen)		
Power supply		Via AC adapter, built-in rechargeable battery (Ni-H)		
Battery	Charging time	15 hours		
	Number of measurements	600 maximum without printing		
Power consumption		43W (max.)		
Dimension	Control unit	12.09"x6.50"x3.7" (307x165x94mm)		
	Height-Tilt adjustment unit	5.16"x2.48"x3.90" (131x63x99mm)		
	Drive unit	SJ-401: 5.04"x1.42"x1.85" (128x36x47mm) SJ-402: 6.08"x1.41"x1.84" (155x36x47mm)		
Roughness standard		JIS (JIS B0601-2001/1994/1982), DIN, ISO, ANSI		
LCD size		Touch panel		
Data output		RS-232C input/output, SPC output		
External control		Connection to data processing system (option)		
Mass	Control unit	2.64lbs. (1.2kg)		
	Height-Tilt adjustment unit	1.88lbs. (0.4kg)		
	Drive unit	SJ-401: 1.32lbs. (0.6kg) SJ-402: 1.41lbs. (0.64kg)		
Standard accessories		AC adapter, Carrying case, Printing paper, Touch pen, Protect sheet, Skidless nosepiece, User's manual, one-sheet manual, tools		

Optional Accessories

Styli

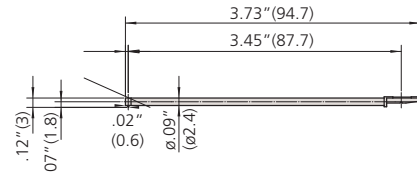
Unit: Inch(mm)

Standard stylus



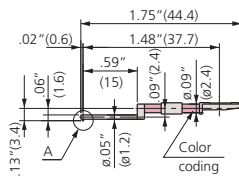
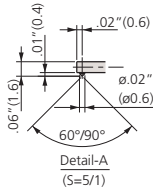
12AAE882 [1μm]*
12AAE924 [1μm]**
12AAC731 [2μm]*
12AAB403 [5μm]**
12AAB415 [10μm]**
12AAE883 [250μm]
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

2X long for deep hole



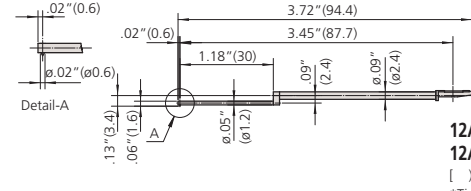
12AAE898 [2μm]*
12AAE914 [5μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole



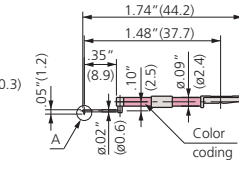
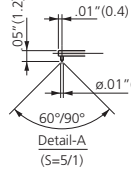
12AAC732 [2μm]*
12AAB404 [5μm]**
12AAB416 [10μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole/2X long for deep hole



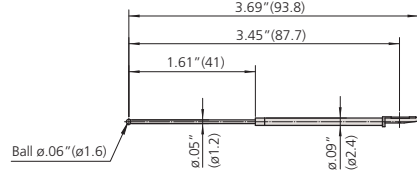
12AAE892 [2μm]*
12AAE908 [5μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For extra small hole



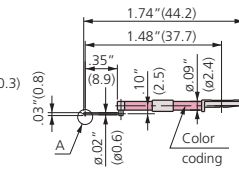
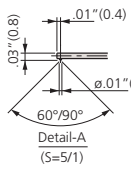
12AAC733 [2μm]*
12AAB405 [5μm]**
12AAB417 [10μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole



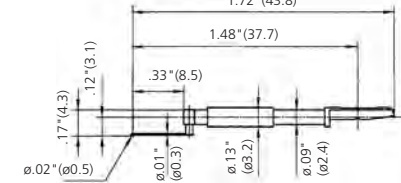
12AAE884
[0.03" (0.8mm)]
[]: Tip radius

For extra minute hole



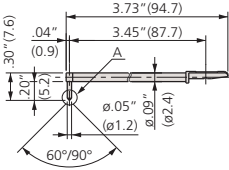
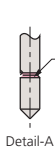
12AAC734 [2μm]*
12AAB406 [5μm]**
12AAB418 [10μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For ultra small hole

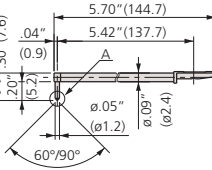
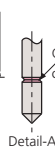


12AAJ662
[0.01" (0.25mm)]
[]: Tip radius

For deep hole (2X long and 3X long)

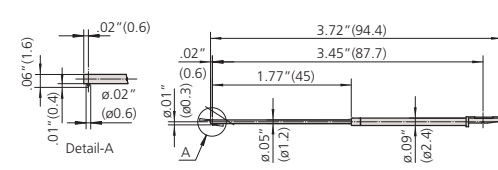


2X stylus
12AAC740 [2μm]*
12AAB413 [5μm]**
12AAB425 [10μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°



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

For small slotted hole

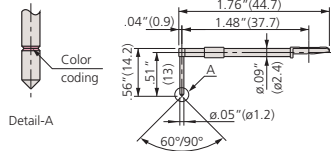


12AAE938 [2μm]*
12AAE940 [5μm]**
[]: Tip radius
*Tip angle: 60° **Tip angle: 90°

Styli

Unit: Inch(mm)

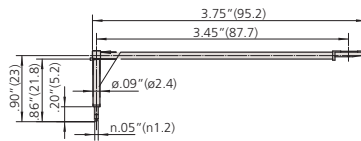
For deep groove .39"(10mm)



12AAC735 [2µm]*
12AAB409 [5µm]**
12AAB421 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

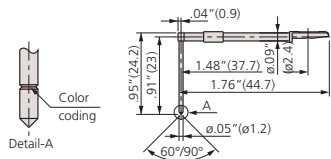
For deep groove .78"(20mm)/2X Long for deep hole



12AAE893 [2µm]*
12AAE909 [5µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

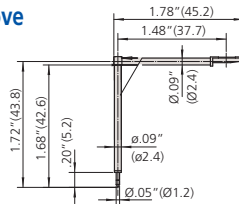
For deep groove .78"(20mm)



12AAC736 [2µm]*
12AAB408 [5µm]**
12AAB420 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

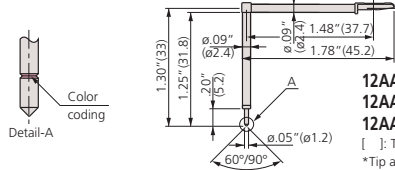
For deep groove 1.57"(40mm)



12AAE895 [2µm]*
12AAE911 [5µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

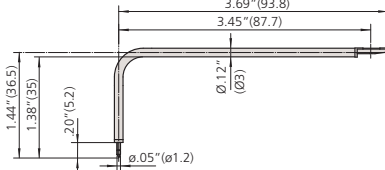
For deep groove 1.18"(30mm)



12AAC737 [2µm]*
12AAB407 [5µm]**
12AAB419 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

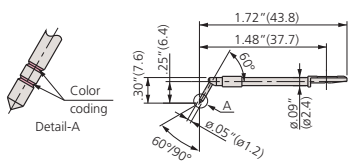
For deep groove 1.18"(30mm)/2X Long for deep hole



12AAE894 [2µm]*
12AAE910 [5µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

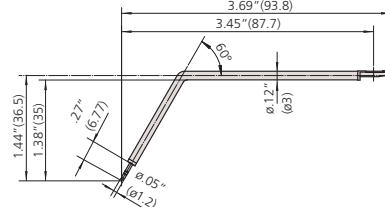
For gear tooth



12AAB339 [2µm]*
12AAB410 [5µm]**
12AAB422 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

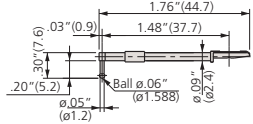
For gear tooth/2X Long for deep hole



12AAE896 [2µm]*
12AAE912 [5µm]**

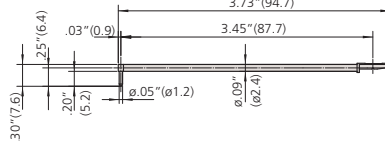
[] : Tip radius

For rolling circle waviness surface



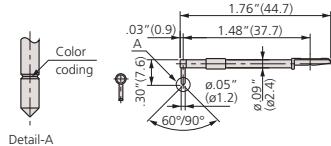
12AAB338 [.03"(0.8mm)]
[] : Tip radius

For rolling circle waviness/2X Long for deep hole



12AAE886 [.01"(0.25mm)]
[] : Tip radius

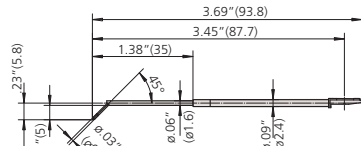
For knife-edge detector



12AAC738 [2µm]*
12AAB411 [5µm]**
12AAB423 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

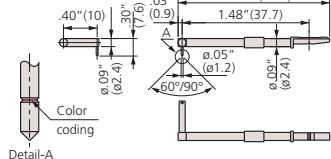
For corner hole/2X Long for deep hole



12AAE897 [2µm]*
12AAE913 [5µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

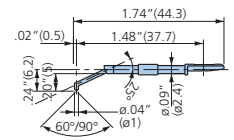
For eccentric arm



12AAC739 [2µm]*
12AAB412 [5µm]**
12AAB424 [10µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

For bottom surface



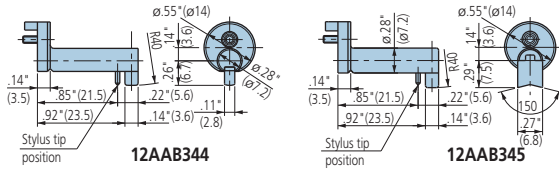
12AAE899 [2µm]*
12AAE915 [5µm]**

[] : Tip radius
*Tip angle: 60° **Tip angle: 90°

Optional Accessories

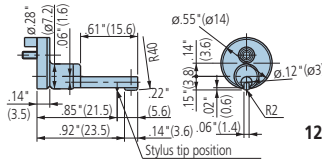
Applicable skid nosepiece

Inch(mm)

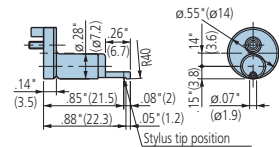


12AAB344

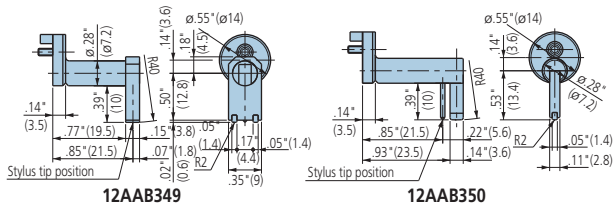
12AAB345



12AAB346

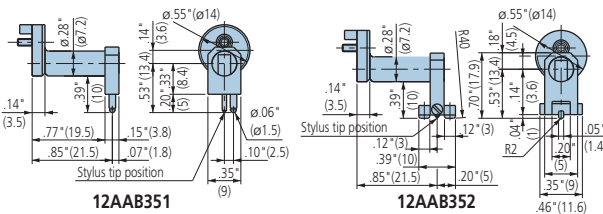


12AAB347



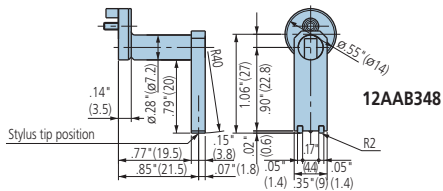
12AAB349

12AAB350

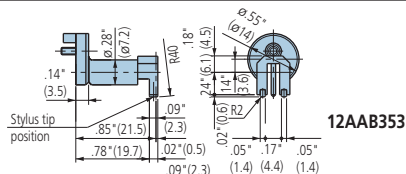


12AAB351

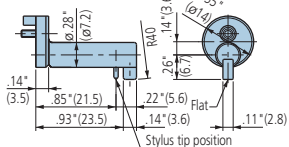
12AAB352



12AAB348



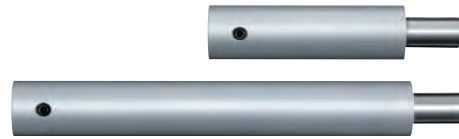
12AAB353



12AAB354

Extension Rods

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

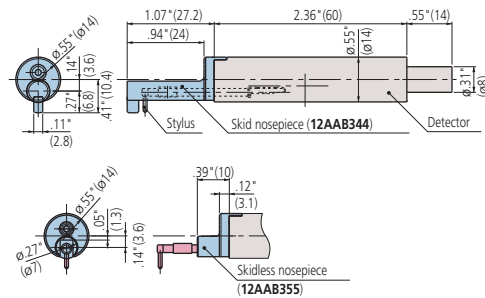


Detector

178-396-2: 0.75mN measuring force, with 12AAC731 standard type stylus (2μm tip radius)

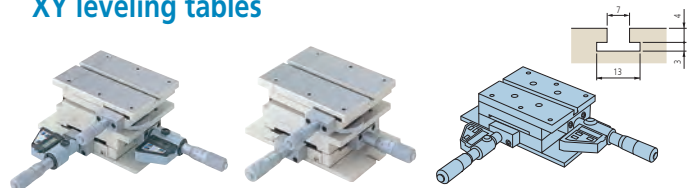
178-397-2: 4mN measuring force, with 12AAB403 standard type stylus (5μm tip radius)

Set configuration/Dimensions



Stand, Tables

XY leveling tables



178-042-1 (mm)

178-052-1 (inch/mm)

178-043-1 (mm)

178-053-1 (inch/mm)

178-049 (mm)

178-059 (inch/mm)

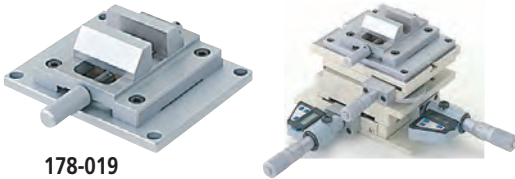
Inch(mm)

Order No.	178-042-1, 178-052-1	178-043-1, 178-053-1	178-049, 178-059
Table size	5.12" x 3.94" (130 x 100mm)		
Maximum loading	15kgf		
Inclination angle	±1.5°		
Horizontal rotating angle	±3°		
X, Y axis displacement	±.49" (12.5mm)	±.49" (12.5mm)	±.49" (12.5mm)
Min. reading of the micrometer head	.00005" (0.001mm)*	.001" (0.001mm)*	.00005" (0.001mm)*
Dimension	10.31"x9.17"x3.27" (262x233x83mm)	8.66"x7.44"x3.27" (220x189x83mm)	10.31"x9.17"x2.16" (262x233x55mm)
Mass	13.89 lbs. (6.3kg)	13.22 lbs. (6kg)	11.02 lbs. (5kg)

* Digital display

Precision vise

- Can be used with the XY leveling table.

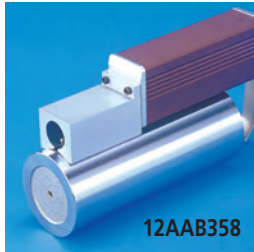


178-019

Order No	178-019
Clamping method	Sliding jaws
Jaw opening	1.42" (36mm)
Jaw width	1.73" (44mm)
Jaw depth	.63" (16mm)
Height	1.50" (38mm)

Cylinder attachment

Used to attach on a cylinder
Diameter: ϕ .59" up to 2.36" (ϕ 15mm up to 60mm)



12AAB358

Leveling table (for D.A.T. function)

- Can be used with the XY leveling tables.
Table swivels: $\pm 1.5^\circ$
Table size: 5.12" x 3.94"
(130x100mm)
Max. Loading: 15kgf



178-048 (mm)

178-058 (inch/mm)

Manual column stand

Column travel: 7.87" (200mm)
Dimensions: 14.57" x 7.87" x 29.13"
(370x200x740mm)
Mass: 28.66 lbs. (13kg)



178-009



Measuring data output

Input tool

Data input device for spreadsheet software.

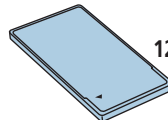


264-005

Others

Memory card

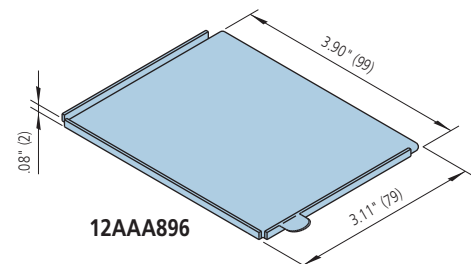
Stores/recalls the measuring conditions (up to 20), measured data, and statistical data.
Memory: 8MB



12AAA841

LCD protective sheet

For touch panel protection
(10 sheet set)



12AAA896

SPC connecting cables

Connects a control unit with DP-1VR.

3'(1m): 936937

6'(2m): 965014

DP-1VR

Performs various statistical processing



264-503A (120V)

Reference step specimen

Used to calibrate detector sensitivity.
Step nominal value: 2 μ m/10 μ m



178-611 (mm)

178-612 (inch/mm)

Printer paper

Five rolls 984'(25m)

Standard paper:

270732

Durable paper:

12AAA879

