Surftest SJ-400

Bulletin No. 2013

Portable Surface Roughness Tester

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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: 800µm
Resolution: 0.000125µm (on 8µm range)

Drive unit

Straightness/traverse length
SJ-401: 0.3µm/.98"(25mm)
SJ-402: 0.5µm/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.

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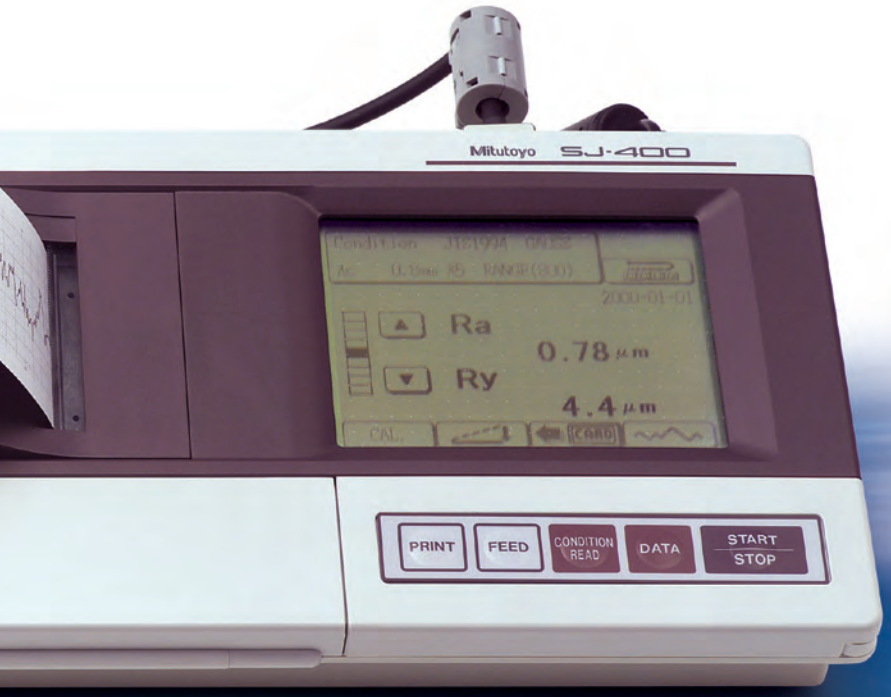
Requirement

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.

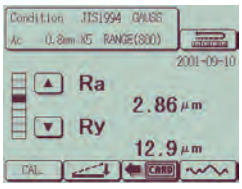


Requirement

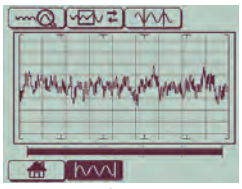
6

Confirmation of measurement results and assessed profiles without a printout

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

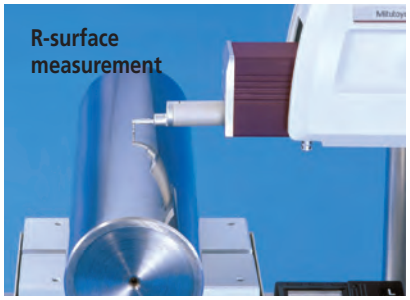


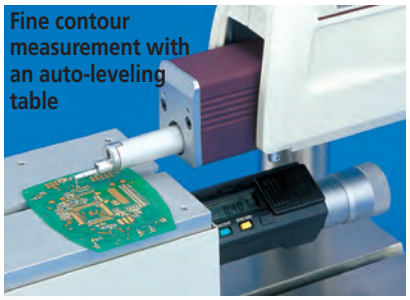
Calculation Result Screen

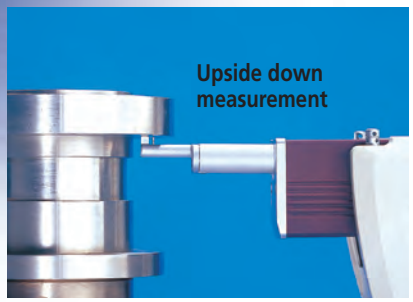


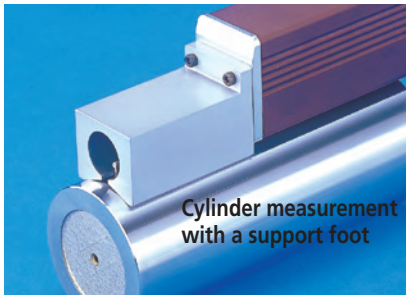
Measured Profile Screen

Measurement Applications





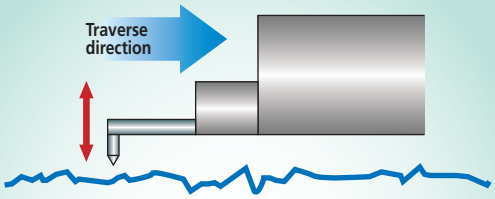




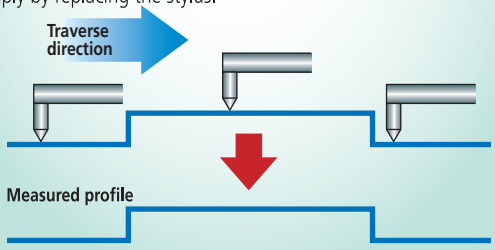
The SJ-400 Series Performs Skidless Measurements

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

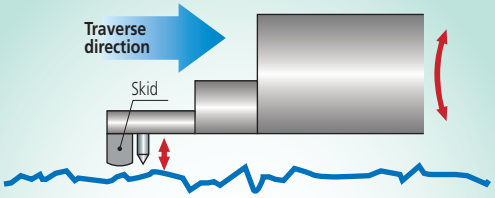
Skidless measurement



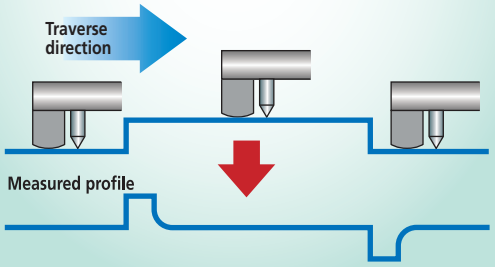
- Skidless measurement is where surface features are measured relative to the drive unit reference surface. This measures waviness and finely stepped features accurately, in addition to surface roughness, but range is limited to the stylus travel available.
- The SJ-400 series supports a variety of surface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



Skidded measurement

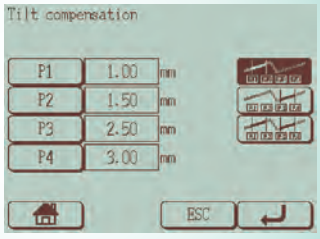


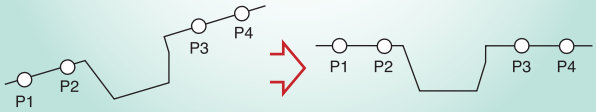
- In skidded measurements, surface features are measured with reference to a skid following close behind the stylus. This cannot measure waviness and stepped features exactly but measuring range is greater because the skid tracks the workpiece surface contour.



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.



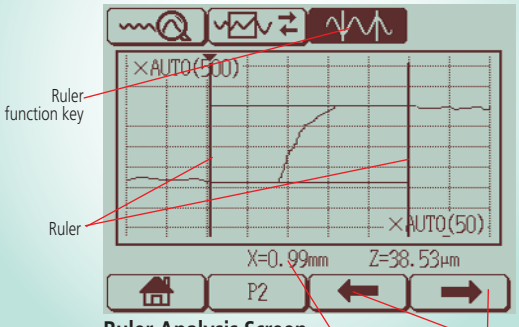


Measured profile before tilt compensation

Measured profile after tilt compensation

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.



Ruler Analysis Screen

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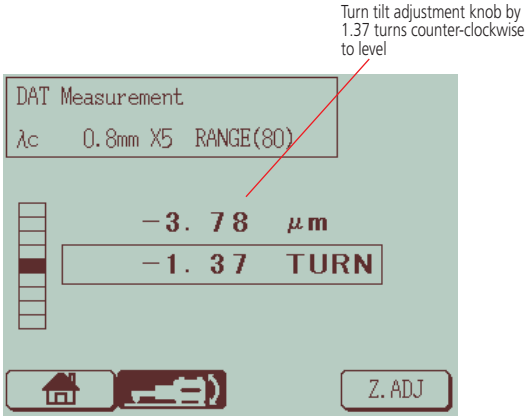
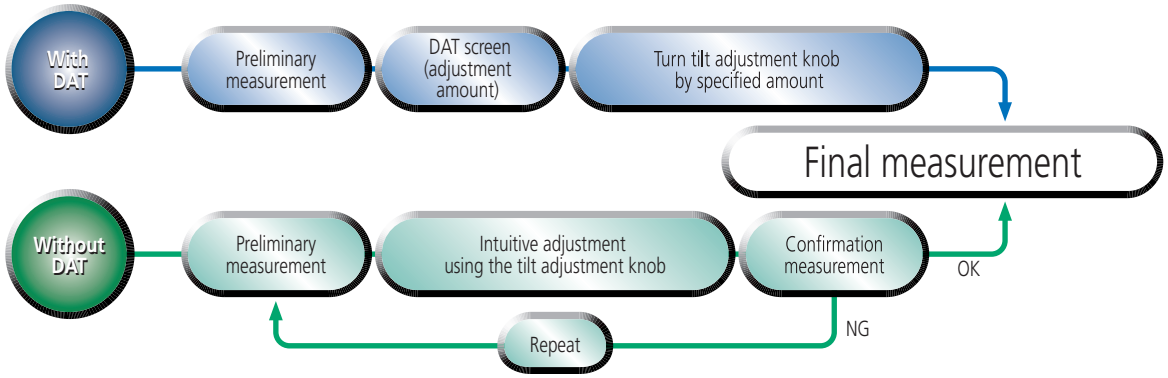
Powerful Support for Leveling

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

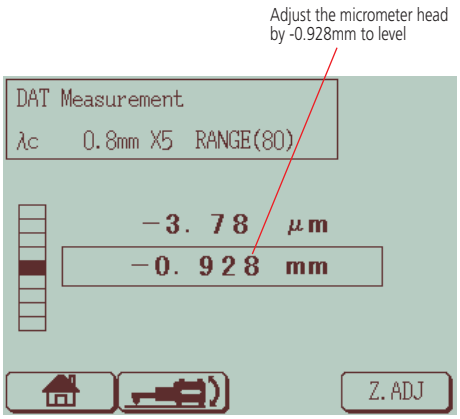


DAT screen guides the user when leveling



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.



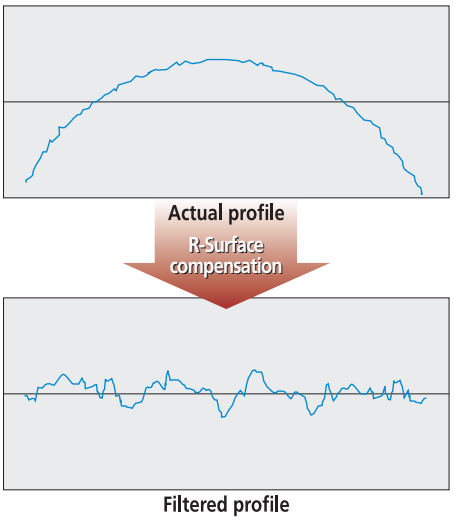
DAT screen guides the user when leveling

More Measuring Functions Than Expected From a Compact Tester

Measuring curved-surface roughness

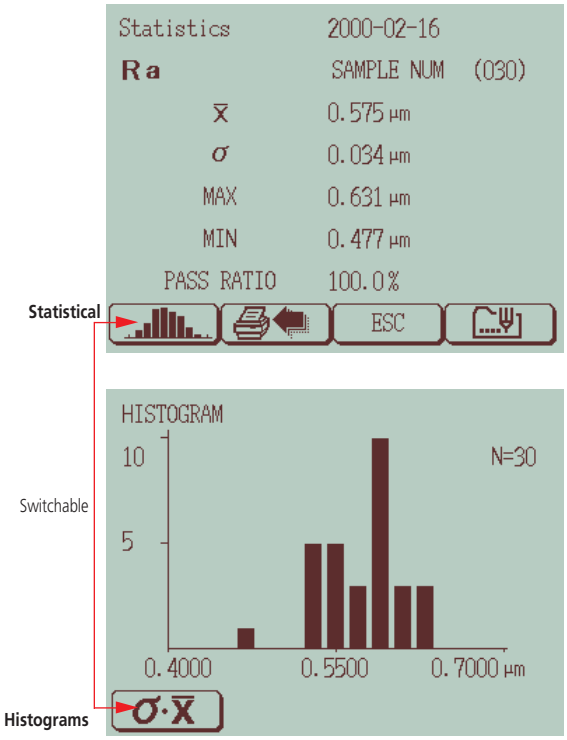
(skidless measurement)

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.



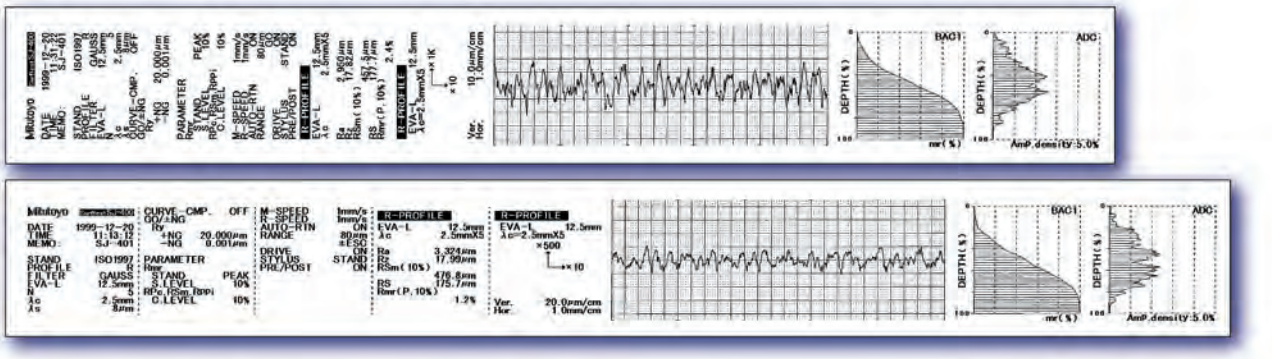
Statistics

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).



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.



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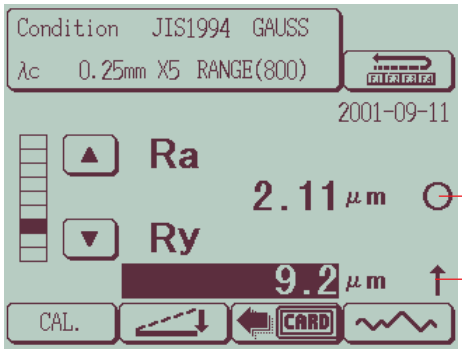
GO/NG indication

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

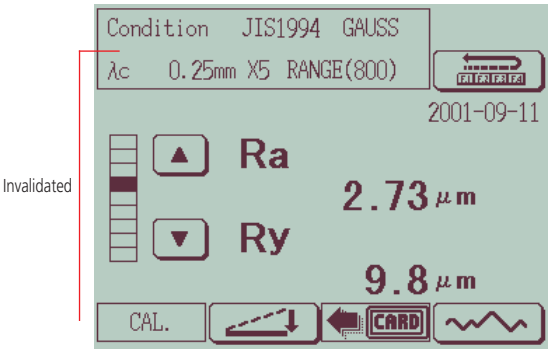
Previously measured data can be recalculated for use in other evaluations by changing the current standard, assessed profile and roughness parameters.

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.

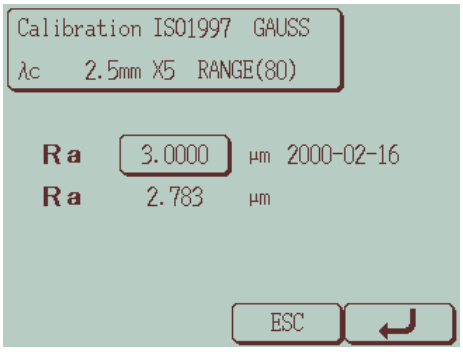
Key masking

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

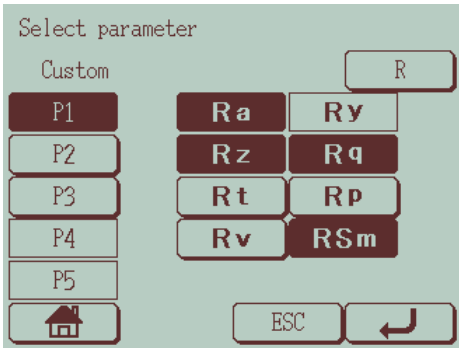
The measurement conditions and data can be stored in the control unit or memory card (optional) and recalled as required. Batch printout of data after on-site measurement improves measuring efficiency.

Storage capacity

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

Customizing

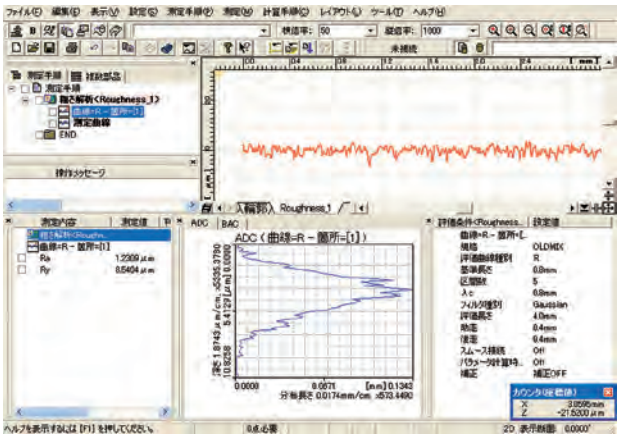
The SJ-400 Series can be set up to calculate and display only a subset of the roughness parameters available. Parameters can be added later for recalculation, if required.

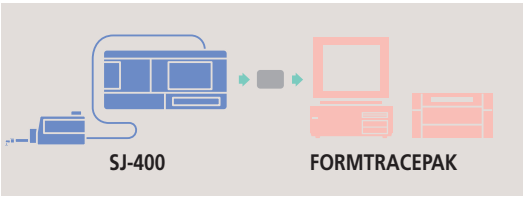


Customized Screen

Wide Choice of Evaluation Possibilities with Analyzing Program FORMTRACEPAK V5

SJ-400 Series measurement data can be transferred into FORMTRACEPAK V5 by using a memory card (Optional) for detailed analysis.



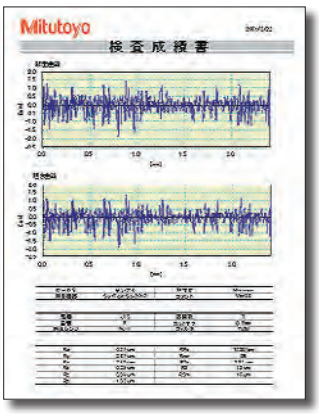


See the FORMTRACEPAK brochure (Bulletin No. 2010) for more details.

Simplified Communication Program (SJ Tools)

One of the various functions of the Surftest SJ-400 Series is the ability to use RS-232 with a simplified communication program that allows the transfer of measurement data into a calculation software. The program must be used with Microsoft Excel to generate the inspection report and/or certificate.

This program can be downloaded for free from the Mitutoyo website. http://www.mitutoyo.co.jp



Required environment:

* OS:	* Spreadsheet software:
Windows 2000-SP4	Microsoft Excel 2000
Windows XP	Microsoft Excel 2002
Windows Vista	Microsoft Excel 2003
Windows 7	Microsoft Excel 2007

*Windows OS & Microsoft Excel are products of Microsoft Corporation.

Requires RS-232C cable (Optional)

SJ-400 Series RS-232C cable Order No. **12AAA882**

*RS-232C cable D-sub9pin x 2 (store purchase) is a straight cable.
*RS-232C ⇨cannot be used in a USB connector.

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Carrying case is a standard accessory

Specification

Inch/(Metric)

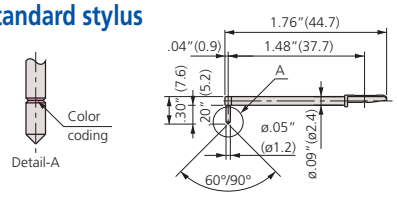
Order No.		**SJ-401**	**178-947-4A** (inch/mm)	**178-957-4A** (inch/mm)
		SJ-402	**178-945-4A** (inch/mm)	**178-959-4A** (inch/mm)
Measuring method			Skidless/Skidded measurement	
Measuring range	Z-axis		32000µin, 3200µin, 320µin (800µm, 80µm, 8µm) (Up to 2,400µm with an option stylus)	
	X-axis		SJ-401: 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

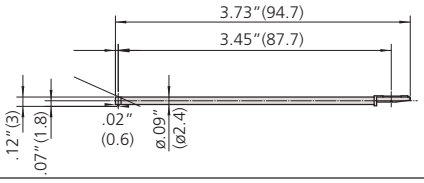
Unit: Inch(mm)

Standard stylus



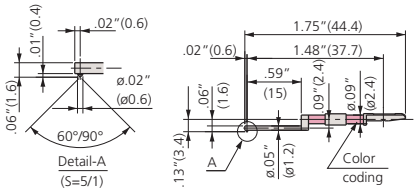
12AAE882 [1µm]*
12AAE924 [1µm]**
12AAC731 [2µm]*
12AAB403 [5µm]**
12AAB415 [10µm]**
12AAE883 [250µm]
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

2X long for deep hole



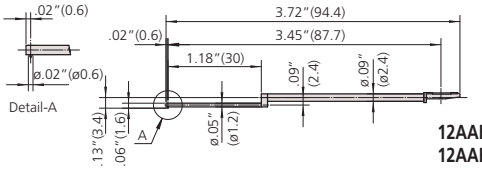
12AAE898 [2µm]*
12AAE914 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole



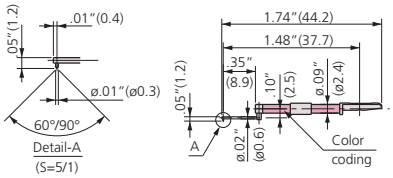
12AAC732 [2µm]*
12AAB404 [5µm]**
12AAB416 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole/2X long for deep hole



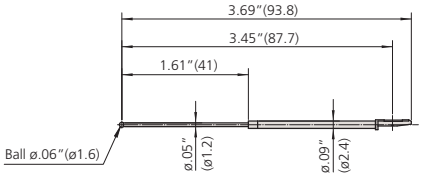
12AAE892 [2µm]*
12AAE908 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For extra small hole



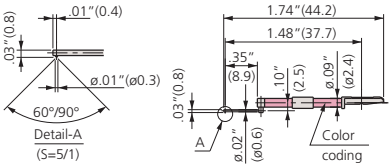
12AAC733 [2µm]*
12AAB405 [5µm]**
12AAB417 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For small hole



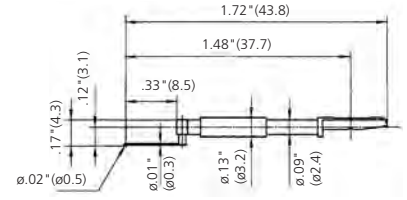
12AAE884
[.03"(0.8mm)]
[ ]: Tip radius

For extra minute hole



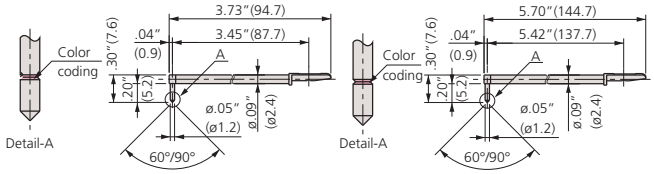
12AAC734 [2µm]*
12AAB406 [5µm]**
12AAB418 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For ultra small hole



12AAJ662
[.01"(0.25mm)]
[ ]: Tip radius

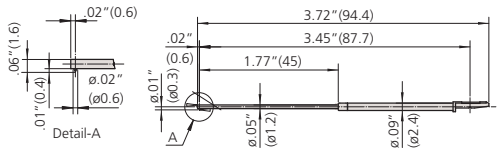
For deep hole (2X long and 3X long)



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



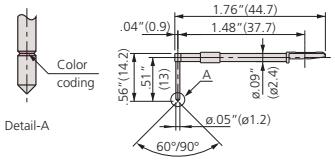
12AAE938 [2µm]*
12AAE940 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

Mitutoyo

Styli

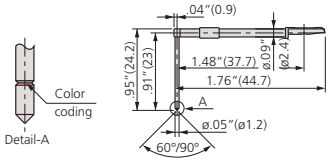
Unit: Inch(mm)

For deep groove .39"(10mm)



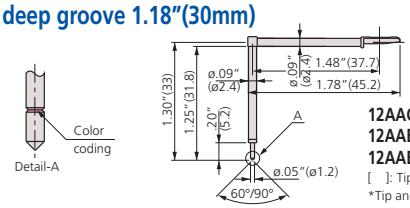
12AAC735 [2µm]*
12AAB409 [5µm]**
12AAB421 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For deep groove .78"(20mm)



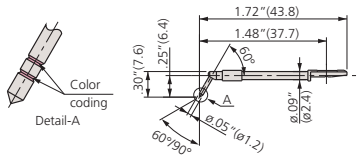
12AAC736 [2µm]*
12AAB408 [5µm]**
12AAB420 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For deep groove 1.18"(30mm)



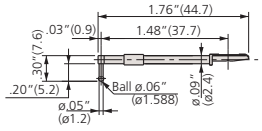
12AAC737 [2µm]*
12AAB407 [5µm]**
12AAB419 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For gear tooth



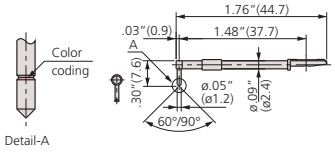
12AAB339 [2µm]*
12AAB410 [5µm]**
12AAB422 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For rolling circle waviness surface



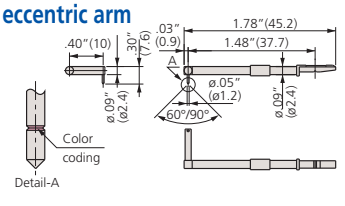
12AAB338 [.03"(0.8mm)]
[ ]: Tip radius

For knife-edge detector



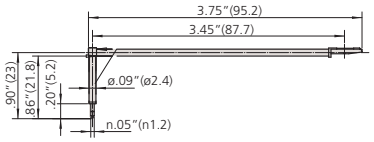
12AAC738 [2µm]*
12AAB411 [5µm]**
12AAB423 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For eccentric arm



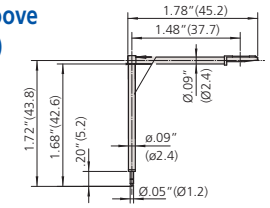
12AAC739 [2µm]*
12AAB412 [5µm]**
12AAB424 [10µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

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



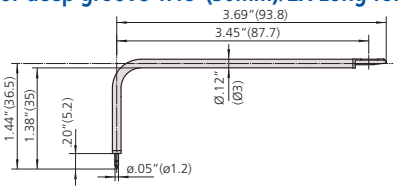
12AAE893 [2µm]*
12AAE909 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For deep groove 1.57"(40mm)



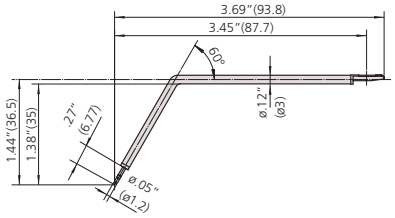
12AAE895 [2µm]*
12AAE911 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

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



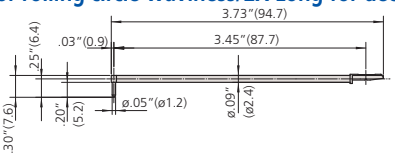
12AAE894 [2µm]*
12AAE910 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For gear tooth/2X Long for deep hole



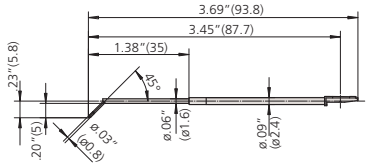
12AAE896 [2µm]*
12AAE912 [5µm]**
[ ]: Tip radius

For rolling circle waviness/2X Long for deep hole



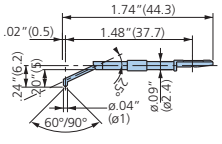
12AAE886
[.01"(0.25mm)]
[ ]: Tip radius

For corner hole/2X Long for deep hole



12AAE897 [2µm]*
12AAE913 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

For bottom surface

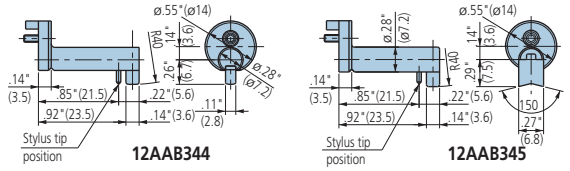


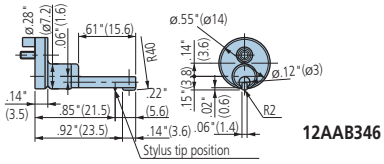
12AAE899 [2µm]*
12AAE915 [5µm]**
[ ]: Tip radius
*Tip angle: 60° **Tip angle: 90°

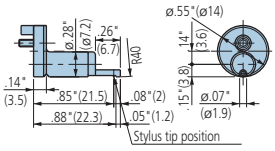
Optional Accessories

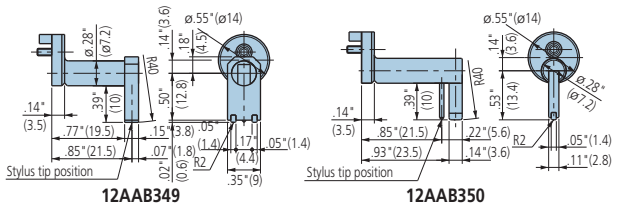
Applicable skid nosepiece

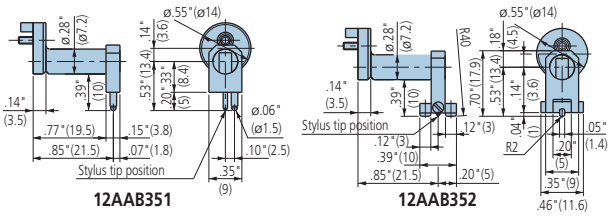
Inch(mm)

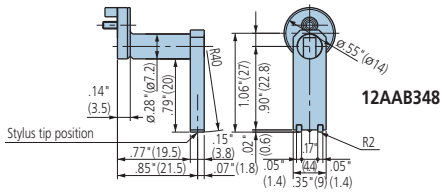


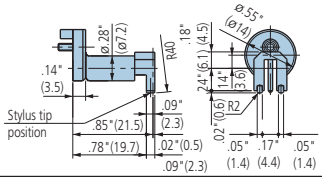


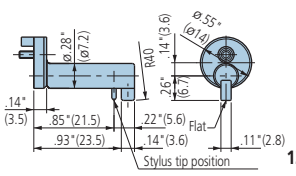












Extension Rods

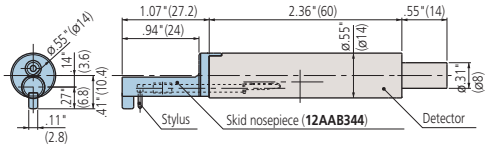
(**12AAG202**: 1.97"(50mm), **12AAG203**: 3.94"(100mm)

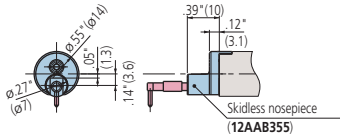
Detector

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)

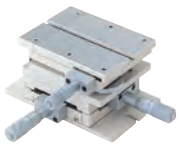
Set configuration/Dimensions

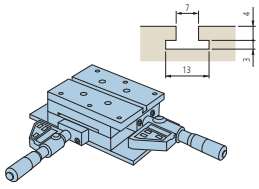




Stand, Tables

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

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> Étalonnage - Logiciel GMM Caligest®
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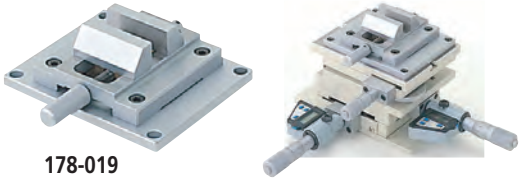
E-mail : info@pms-becus.com
www.pms-becus.com

546 Avenue des Amaranches
ZAC Ecotec - 74460 MARNAZ - FRANCE

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)

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

• Can be used with the XY leveling tables.
Table swivels: ±1.5°
Table size: 5.12"x3.94" (130x100mm)
Max. Loading: 15kgf

Manual column stand

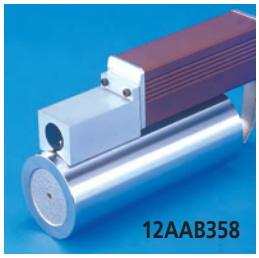
Column travel: 7.87"(200mm)
Dimensions: 14.57"x7.87"x29.13" (370x200x740mm)
Mass: 28.66 lbs. (13kg)

178-048 (mm)
178-058 (inch/mm)

178-009

Cylinder attachment

Used to attach on a cylinder
Diameter: ø.59" up to 2.36" (ø15mm up to 60mm)



12AAB358

Measuring data output

Input tool

Data input device for spreadsheet software.

264-005

SPC connecting cables

Connects a control unit with DP-1VR.
3'(1m): **936937**
6'(2m): **965014**

DP-1VR

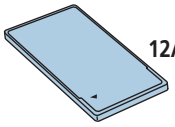
Performs various statistical processing

264-503A (120V)

Others

Memory card

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



12AAA841

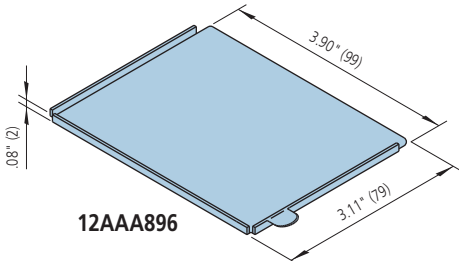
Reference step specimen

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

178-611 (mm)
178-612 (inch/mm)

LCD protective sheet

For touch panel protection
(10 sheet set)



12AAA896

Printer paper

Five rolls 984'(25m)
Standard paper: **270732**
Durable paper: **12AAA879**