Mitutoyo

FORM MEASUREMENT

Portable Surface Roughness Tester

SURFTEST SJ-410 Series

Rich choice of options provide easier, smoother and more accurate measurements

Portable surface roughness tester evolves!

The large touch-screen, color-graphic LCD ensures both intuitive control and advanced operability

Enhanced power for making measurements on site

Color-graphic LCD

The color-graphic LCD with excellent visibility displays calculated results and assessed profiles even clearer. This is really useful for checking results without printing them out.

Backlight provided

A backlight improves usability in dim testing environments.

Touch screen for easier operations

The screen display can be switched between icon display and text display. Successfully realizes operability with utility and usability.

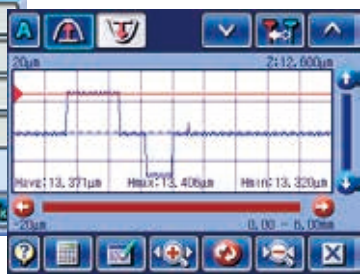
Icon display

Text display

Easy to use and highly functional

This portable surface roughness tester is equipped with analysis functionality rivaling that of benchtop surface roughness testers.

Data compensation



Simple contour analysis function

Applicable standards

Complies with many industry standards

The Surftest SJ-410 complies with the following standards: JIS (JIS-B0601-2001, JIS-B0601-1994, JIS B0601-1982), VDA, ISO-1997, and ANSI.

Multilingual support

The display interface supports 16 languages.

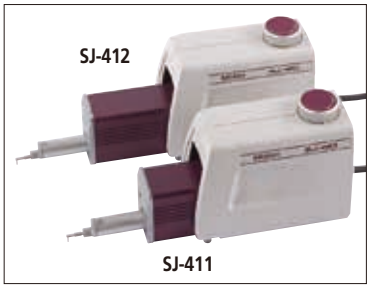
High accuracy measuring

A wide range, high-resolution detector

Measuring range/ resolution
800µm/0.01µm
80µm/0.001µm
8µm/0.0001µm

High straightness drive unit

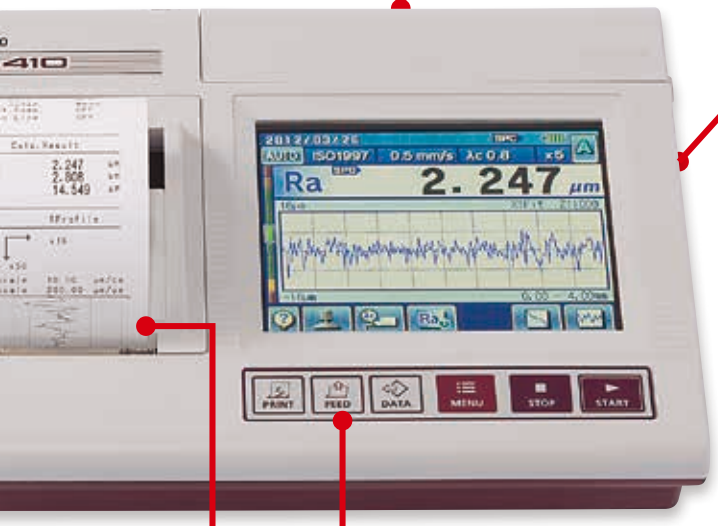
Straightness/ traverse length
0.3µm/25mm (**SJ-411**)
0.5µm/50mm (**SJ-412**)



Interfaces

A variety of interfaces supplied as standard

The external device interfaces that come as standard include USB, RS-232C, SPC output and footswitch I/F.



Data storage

Memory card (optional) is supported

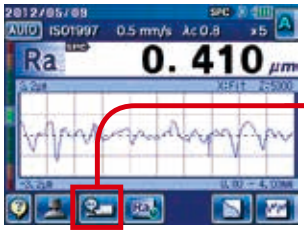
The measurement conditions and data can be stored in a memory card (optional) and recalled as required. This enables batch analysis and printout of data after on-site measurement.

- **Measurement condition**
  Internal memory: 10 sets
  Memory card: 500 sets
- **Measurement result**
  Memory card: 1000 sets

Password protection

Access to functions can be restricted by a password

A pre-registered password can limit use of measurement conditions and other settings to the tester's administrator.



Sheet buttons

Single button measurements

A sturdy sheet-button panel with superior durability in any environment is provided. For repeat measurement of the same work, simply pressing the start switch can complete measurement, analysis and printout.

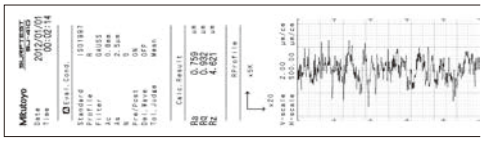
Carrying case

The unit is easily transported in a dedicated carrying case which includes holders for the accessories as well as the tester itself. (Standard accessory.)

Printer

High-speed printer prints out measurement results on site

A high-quality, high-speed thermal printer prints out measurement 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 color-graphic LCD.



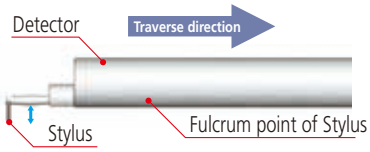
Enhanced measuring functions

Your choice of skidless or skidded measurement

Patent registered in Japan, U.S.A.. Patent pending in Germany

•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 roughnness, 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.

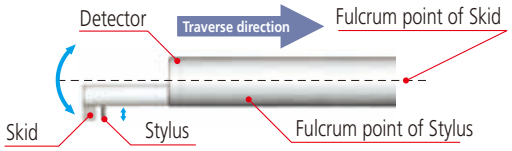


Measuring example of stepped features: Skidless

Measured profile

•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 the range of movement within which measurement can be made is greater because the skid tracks the workpiece surface contour.



Measuring example of stepped features: Skidded

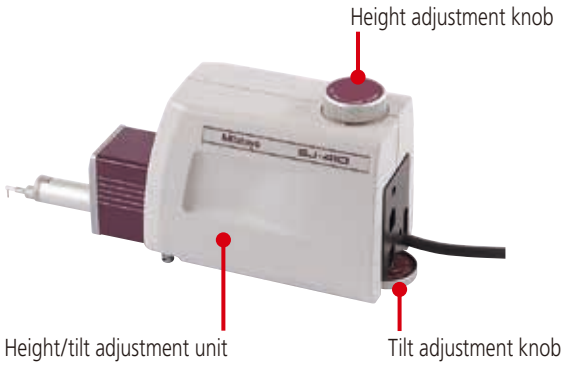
Measured profile

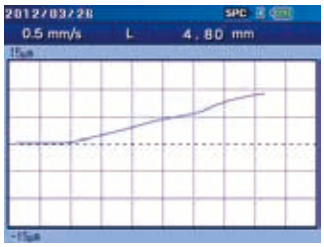
Powerful support for leveling

Patent registered in Japan, U.S.A.. Patent pending in Germany

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 D.A.T. function, makes it easy to achieve highly accurate alignment.

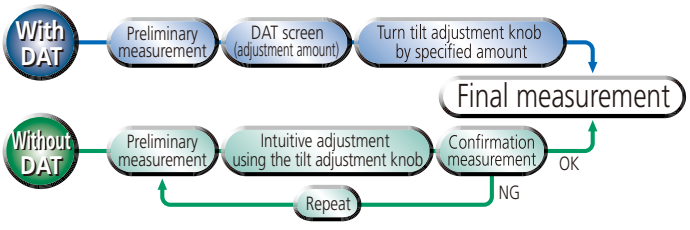
• Height/tilt adjustment unit (Standard accessory)





Preliminary measurement

Amount of tilt adjustment

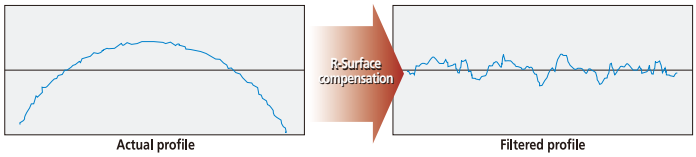


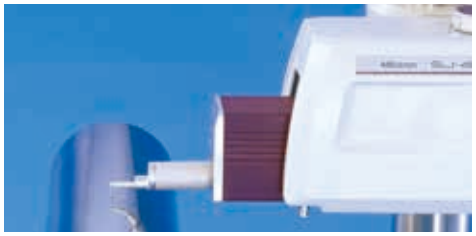
When the SJ-410 Series detector is mounted on the manual column stand*[1] for measurement, it can be combined with any of the optional products for easier leveling: leveling table*[1], 3-axis alignment table*[1] or tilt adjustment unit*[1].

*1: For details about optional products, see P6-7.

More measuring functions than expected from a compact tester

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.



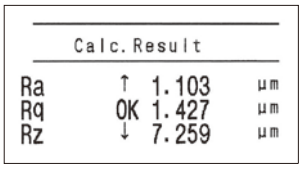


Recalculating

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

GO/NG judgement function

An "OK/NG" judgment symbol is displayed when limits are set for the roughness parameter. In case of "NG," the calculated result is highlighted. The calculated result can also be printed out.

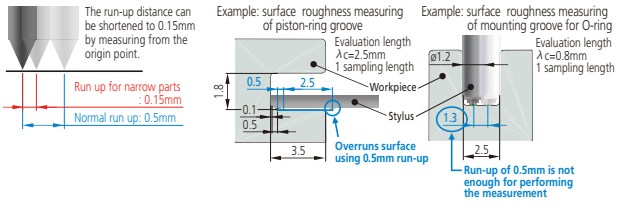


The "OK" symbol means the measurement is within the limits set; "NG" means it is not, in which case an arrow points to either the upper or lower limit in the printout.

Narrow space measuring function Patent pending in Japan

Surface roughness measurement requires a run-up distance before starting the measurement (or retrieving data). When the SJ-410 Series measures, its run-up distance is normally set to 0.5mm. This distance, however, can be shortened to 0.15mm using the narrow part measurement function (starting from the origin point of the drive unit). The function extends the possibility of measurement of narrow locations such as grooves in piston ring / O-ring mounts.

•Narrow space measuring **Typical applications**



Real sampling

This function samples stylus displacement for a specified time without engaging detector traverse, which enables use as a simplified vibration meter or displacement gage incorporated in another system.

Assessing a single measurement result under two different evaluation conditions

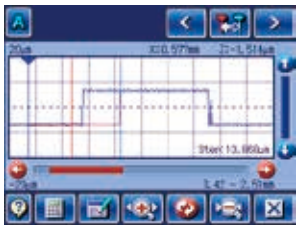
A single measurement enables simultaneous analysis under two different evaluation conditions. A single measurement allows calculation of parameters and analysis of assessed profiles without the need for recalculation after saving data, contributing to higher work efficiency.

Arbitrary sampling length setting

This function allows a sampling length to be arbitrarily set in 0.01mm increments (**SJ-411**: 0.1mm to 25mm, **SJ-412**: 0.1mm to 50mm). It also allows the **SJ-410** series to make both narrow and wide range measurements.

Simple contour analysis function

Point group data collected for surface roughness evaluation is used to perform simplified contour analysis (step, step height, area and coordinate variation). It assesses minute forms that cannot be assessed by a contour measurer.



Step

Step volume

Dimensions

Coordinate difference

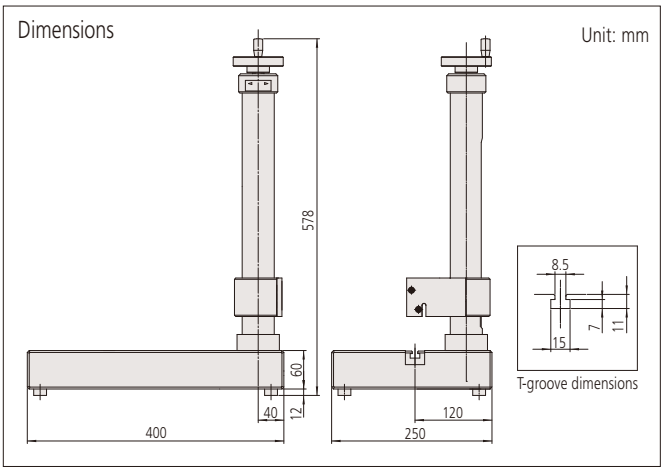
Optional Accessories

Simple column stand

Can be adjusted to match the height of the item to be measured.

No.178-039
Vertical adjustment range: 250mm
Dimensions: 400×250×578mm
Mass: 20kg

Dimensions Unit: mm

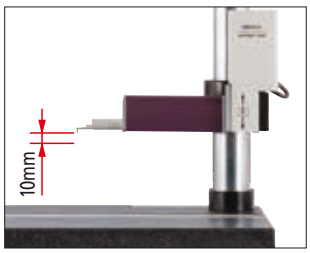


Options for simple column stand

Three new optional products are available to be attached to the manual column stand (**No.178-039**). You can choose the unit that suits your application. Or, you can also use the three products in any combination. Using the optional units makes **SJ-411/412** more convenient and easier to use to ensure accurate measurements.

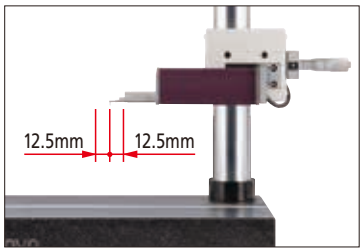
•Auto-set unit*

This unit enables the vertical (Z axis) direction to be positioned automatically (auto-set function).
A single button operation completes a series of operations from measurement, saving and auto-return (saving and auto-return can be switched on and off by operating the drive unit).



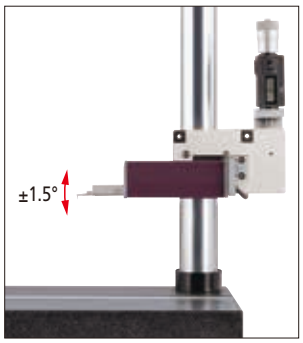
•X-axis adjustment unit*

This unit helps fine-tune the horizontal (X axis) direction.

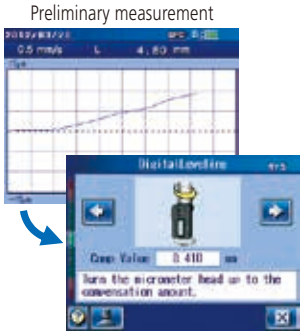


•Tilting adjustment unit*

This unit is used for aligning the workpiece surface with the detector reference plane. It supports the DAT function to make the leveling of workpiece surfaces easier.

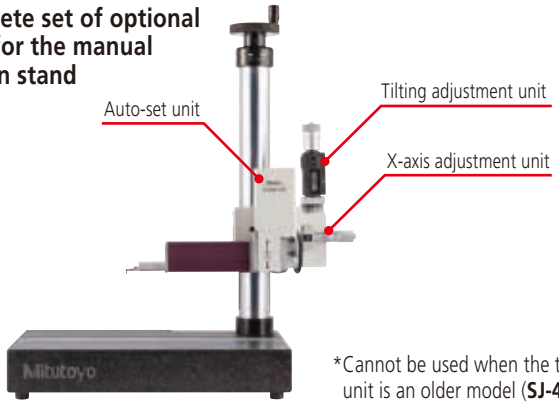


Preliminary measurement



Tilt adjustment

Complete set of optional units for the manual column stand

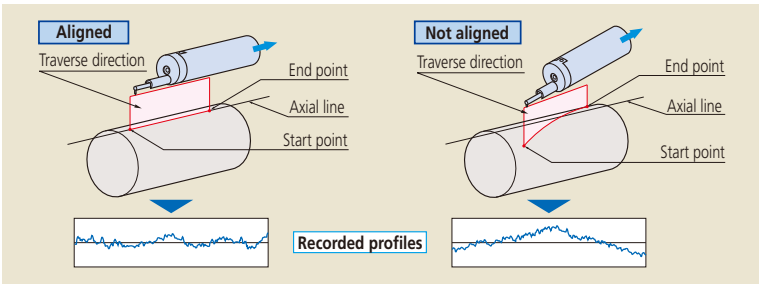


*Cannot be used when the tester's main unit is an older model (**SJ-401/402**).

3-axis Adjustment Table: 178-047

Patent registered in Japan, U.S.A., Patent pending in Germany

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.

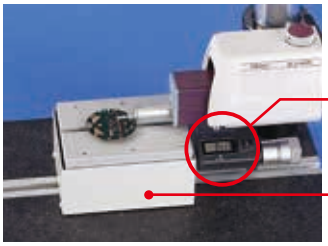


DAT Function for the optional leveling table

Patent registered in Japan, U.S.A., Patent pending in Germany

The leveling table can be used to align the surface to be tested with the detector reference plane. The operator is guided through the procedure by screen prompts.

No.178-048
Inclination adjustment angle: ±1.5°
Table dimensions: 130×100mm
Maximum load: 15kg



DAT screen guides the user when leveling

Digimatic micrometer head

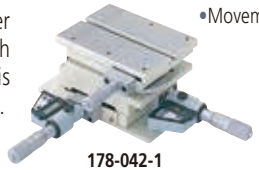
Amount of micrometer head adjustment required

Leveling table (DAT) (Option)

XY leveling tables

The tester includes X- and Y-axes micrometer heads. This makes axis alignment much easier because the tilt adjustment center is the same as the rotation center of the table. (Code No.**178-042-1/178-043-1**)

•Movement is in X- and Y-axes only.

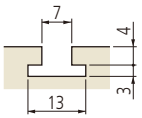


178-042-1

178-049

Order No.	**178-042-1**(mm) **178-052-1**(inch) *with digital heads	**178-043-1**(mm) **178-053-1**(inch) *with analog heads	**178-049**(mm) **178-058**(inch/mm) *with digital heads
Table dimensions	130×100mm		
Maximum load	15kg		
Inclination adjustment angle	±1.5°		—
Swiveling angle	±3°		—
X/Y-axis travel range	±12.5mm	±12.5mm	±12.5mm
Resolution	0.001mm	0.01mm	0.001mm
Dimensions (WxDxH)	262×233×83mm	220×189×83mm	262×233×55mm
Mass	6.3kg	6kg	5kg

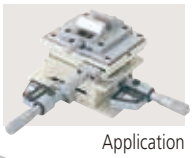
•T-groove dimensions



Unit: mm

Precision vise

•Fits on the stand.



Application

Order No.	**178-019**
Clamping method	Sliding jaws
Jaw opening	36mm
Jaw width	44mm
Jaw depth	16mm
Height	38mm

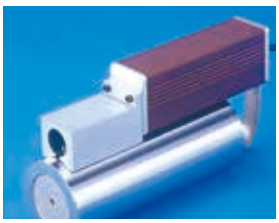
Cylinder attachment

This block can be positioned on top of cylindrical objects to perform measurements.

No.12AAB358
Diameter: ø15~60mm

Configuration:
•Cylindrical measurement block
•Auxiliary block
•Clamp

*Drive unit not included.



Reference step specimen

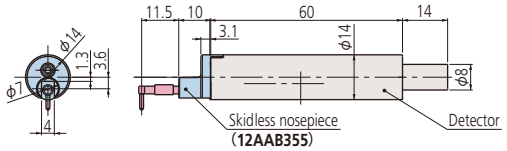
Used to calibrate detector sensitivity.

No.178-611
Step nominal values: 2µm/10µm

Optional Accessories: Detectors / Styli

Detectors

Unit: mm



Order No.	Measuring force	
178-396-2	0.75mN	'97ISO and '01JIS compliant detectors
178-397-2	4mN	Detectors that comply with previous standards, for general use, etc.

Extension rods

- **12AAG202** Extension rod 50mm

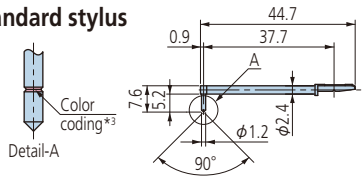
- **12AAG203** Extension rod 100mm

* No more than one extension rod can be connected.

Styli

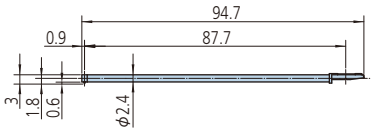
Unit: mm

Standard stylus



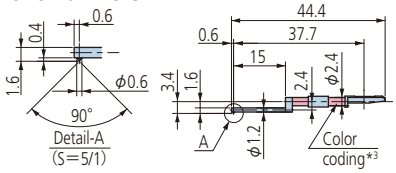
12AAE882 (1μm)*1
12AAE924 (1μm)
12AAC731 (2μm)*1
12AAB403 (5μm)
12AAB415 (10μm)
12AAE883 (250μm)*4
( ): Tip radius

Double-length for deep hole *2



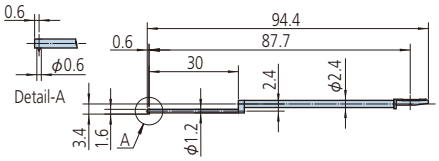
12AAE898 (2μm)*1
12AAE914 (5μm)
( ): Tip radius

For small hole



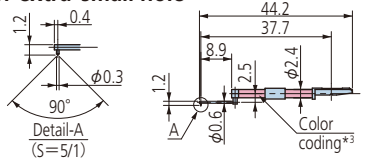
12AAC732 (2μm)*1
12AAB404 (5μm)
12AAB416 (10μm)
( ): Tip radius

For small hole / Double-length for deep hole *2



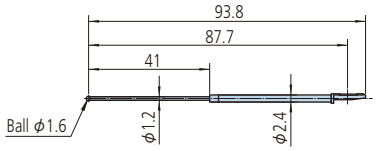
12AAE892 (2μm)*1
12AAE908 (5μm)
( ): Tip radius

For extra-small hole



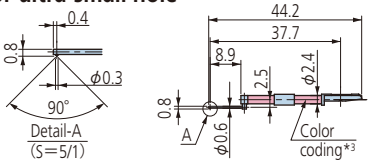
12AAC733 (2μm)*1
12AAB405 (5μm)
12AAB417 (10μm)
( ): Tip radius

For small hole *2 *4



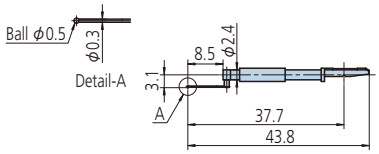
12AAE884 (φ1.6mm)
( ): Tip radius

For ultra-small hole



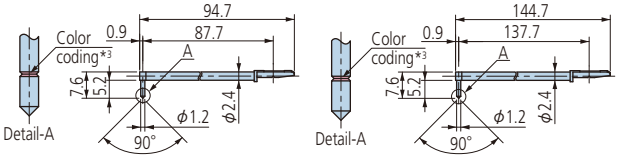
12AAC734 (2μm)*1
12AAB406 (5μm)
12AAB418 (10μm)
( ): Tip radius

For ultra-small hole *4



12AAJ662 (φ0.5mm)
( ): Tip radius

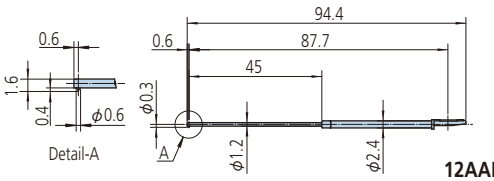
For deep hole (double-length and triple-length) *2



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

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

For small slotted hole *2



12AAE938 (2μm)*1
12AAE940 (5μm)
( ): Tip radius

*1: Tip angle 60°
*2: For downward-facing measurement only.

*3:

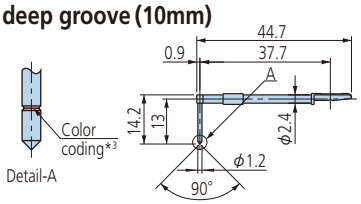
Tip radius	1μm	2μm	5μm	10μm	250μm
Color coding	White	Black	No color	Yellow	No notch or color

*4 : Used for calibration, a standard step gauge (**No.178-611**, option) is also required.

Styli

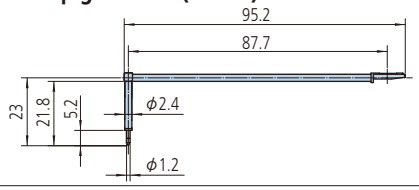
Unit: mm

For deep groove (10mm)



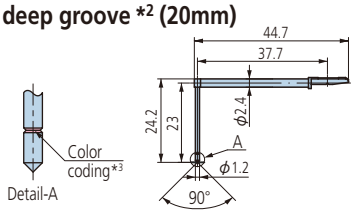
12AAC735 (2μm) *1
12AAB409 (5μm)
12AAB421 (10μm)
( ): Tip radius

For deep groove *2 (20mm)



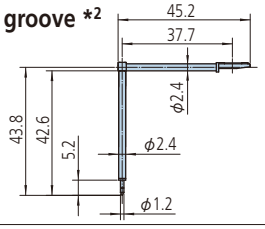
12AAE893 (2μm) *1
12AAE909 (5μm)
( ): Tip radius

For deep groove *2 (20mm)



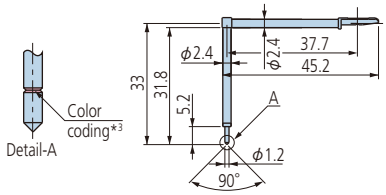
12AAC736 (2μm) *1
12AAB408 (5μm)
12AAB420 (10μm)
( ): Tip radius

For deep groove *2 (40mm)



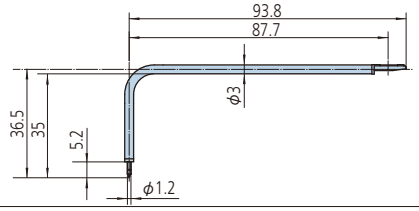
12AAE895 (2μm) *1
12AAE911 (5μm)
( ): Tip radius

For deep groove *2 (30mm)



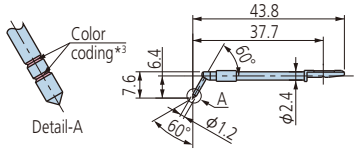
12AAC737 (2μm) *1
12AAB407 (5μm)
12AAB419 (10μm)
( ): Tip radius

For deep groove (30mm) / Double-length for deep hole *2



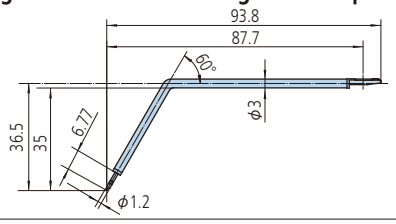
12AAE894 (2μm) *1
12AAE910 (5μm)
( ): Tip radius

For gear tooth



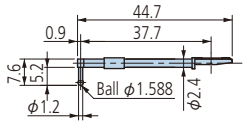
12AAB339 (2μm) *1
12AAB410 (5μm)
12AAB422 (10μm)
( ): Tip radius

For gear tooth / Double-length for deep hole *2



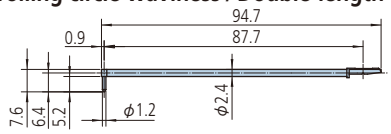
12AAE896 (2μm) *1
12AAE912 (5μm) *1
( ): Tip radius

For rolling circle waviness surface *4



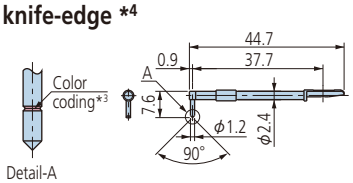
12AAB338 (ϕ1.588)
( ): Tip radius

For rolling circle waviness / Double-length for deep hole *2 *4



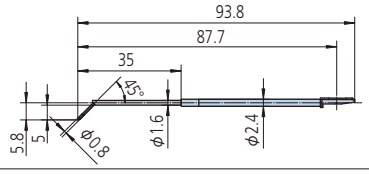
12AAE886 (250μm)
( ): Tip radius

For knife-edge *4



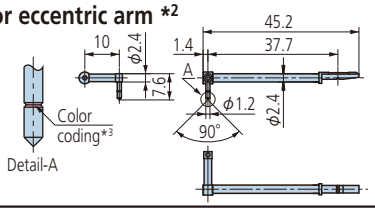
12AAC738 (2μm) *1
12AAB411 (5μm)
12AAB423 (10μm)
( ): Tip radius

For corner hole / Double-length for deep hole *2



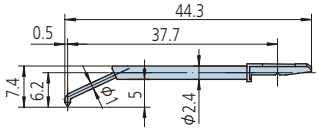
12AAE897 (2μm) *1
12AAE913 (5μm) *2
( ): Tip radius

For eccentric arm *2



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

For hole bottom



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

*1: Tip angle 60°
*2: For downward-facing measurement only.
※Customized special interchangeable styli are available on request, Please contact any Mitutoyo office for more information.

*3:

Tip radius	2μm	5μm	10μm
Color coding	Black	No color	Yellow

*4: Used for calibration, a standard step gauge (**No.178-611**, option) is also required.

Mitutoyo

Specifications

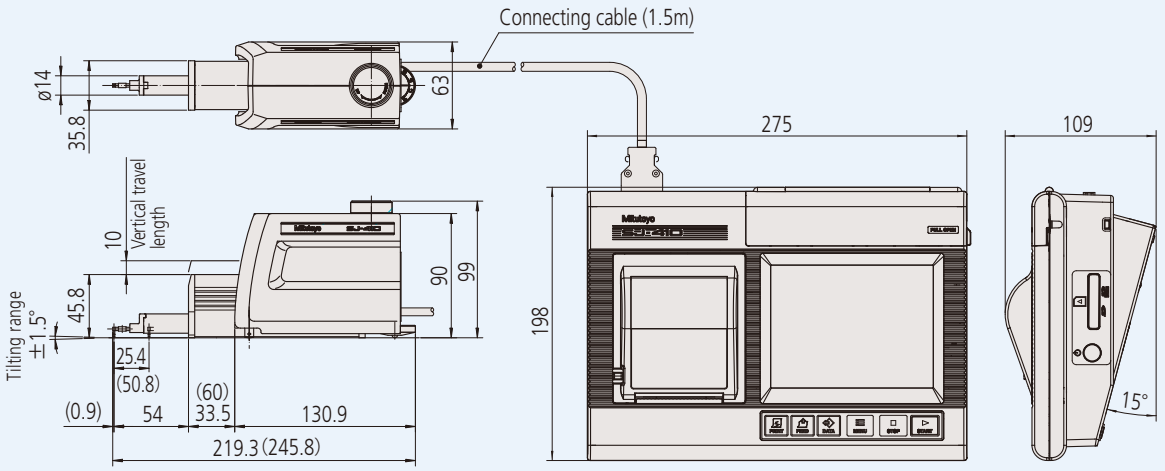
Model No.		SJ-411	SJ-412
Order No.	inch/mm	**178-581-01**	**178-583-01**
Measuring range	X-axis	25mm (1inch)	50mm (2inch)
	Z1-axis (detector unit)	800µm, 80µm, 8µm *Up to 2,400µm with an optional stylus	
Detector	Measuring principle	Differential inductance	
	Resolution	0.01µm (800µm range) / 0.001µm (80µm range) / 0.0001µm (8µm range) 0.4µinch (32000µinch) / 0.04µinch (3200µinch) / 0.004µinch (320µinch)	
	Stylus tip	60°/2µm (80µinch)	60°/2µm (80µinch)
	Measuring force	0.75mN	0.75mN
	Radius of skid curvature	R40 mm (R1.57")	
	Measuring method	Skidded measurement / skidless measurement	
Drive unit: X-axis	Measuring speed	0.05, 0.1, 0.2, 0.5, 1.0mm/s (0.002, 0.004, 0.02, 0.04 inch/s)	
	Drive speed	0.5, 1, 2, 5mm/s (0.02, 0.04, 0.08, 0.2 inch/s)	
	Straightness	0.3µm / 25mm (12µinch/ 1inch)	0.5µm / 50mm (20µinch/ 2inch)
Height-tilt adjustment unit	Height adjustment	10mm (0.39inch)	
	Tilt adjustment	±1.5°	
Standards		JIS1982 / JIS1994 / JIS2001 / ISO1997 / ANSI / VDA	
Parameters		Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, RPc, RSm, Rmax*1, Rz1max*2, S, HSC, RzJIS*3, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rσc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, λa, λq, Lo, Rpm, tp*4, Htp*4, R, Rx, AR, W, AW, Wx, Wte, Possible Customize	
Measured profiles		Primary, Roughness, DF, Filtered waviness curve, R-Motif, W-Motif	
Graph analysis		BAC and ADC curves	
Data compensation		Parabola/ Hyperbola/ Ellipse/ Circle/ Conic/ Tilting, Compensation off	
Filter		2CR, PC75, Gaussian filter	
Cut-off length	λc	0.08, 0.25, 0.8, 2.5, 8.0mm	
	λs *5	2.5, 8.0, 25mm (100, 320, 1000µinch)	
Sample length		0.08, 0.25, 0.8, 2.5, 8.0, 25.0mm	
Number of sampling lengths		×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9, ×10, ×11, ×12, ×13, ×14, ×15, ×16, ×17, ×18, ×19, ×20	
Arbitrary length		0.1~25mm	0.1~50mm
Functions	Customization	Desired parameters can be selected for calculation and display	
	Simple contour analysis function	Step, Step volume, Dimensions, Coordinate difference	
	DAT function	Helps to adjust leveling during skidless measurement	
	Real sampling function	Samples stylus displacement for a specified time without engaging detector traverse.	
	Statistical processing	Static measurement (max. 3 parameters) is possible. Static processing for MAX, MIN, AVERAGE, standard deviation, histogram and pass rate is possible	
	GO/ NG judgement*6	Max rule / 16% rule / Average rule / Standard deviation (1σ, 2σ, 3σ)	
	Storage functions	10 measuring conditions can be stored in internal memory	
	Printing function	Measurement conditions / Calculation results / GO / NG judgement result / Calculation results for each sampling length / Measurement curve / BAC / ADC / Environmental setting information	
	Display languages	Japanese, English, German, French, Italian, Spanish, Portuguese, Korean, Traditional Chinese, Simplified Chinese, Czech, Polish, Hungarian Turkish, Swedish, Dutch	
	Storage	Internal memory: Measurement condition (10 sets) Memory card (option): 500 measurement condition, 10000 measuring data, 10000 text data, 500 statistic data, 1 backup of machine setting, the last ten traces (Trace 10)	
	External I/O	USB I/F, Digimatic output, RS-232C I/F, External SW I/F	
Power supply	Battery	Two-way power supply: battery (rechargeable Ni-MH battery) and AC adapter *Charging time: about 4 hours (may vary due to ambient temperature) *Endurance: about 1500 measurements (differs slightly due to use conditions / environment)	
	Power consumption	50W	
Size (W×D×H)	Display unit	275×198×109mm (10.83×4.29×7.80inch)	
	Height adjustment unit	130.9×63×99mm (5.16×2.48×3.90 inch)	
	Drive unit	128×35.8×46.6mm (5.04×1.41×1.83 inch)	154.5×35.8×46.6mm (6.08×1.41×1.83inch)
Mass	Display unit	1.7kg	
	Height adjustment unit	0.4kg	
	Drive unit	0.6kg	0.64kg
Standard accessories		Detector*7, Stylus*8, Roughness specimen **270732** Printing paper **12BAG834** Touch pen AC adapter, Philips screwdriver, **12BAL402** Touch-screen protection sheet **12AAN041** Carrying case Strap for stylus pen, Operation manual, Quick reference manual, Warranty	

*1: Only for VDA/ANSI/JIS'82 standards.
*2: Only for JIS'97 standard.
*3: Only for JIS'01 standard.
*4: Only for ANSI standard.
*5: λs may not be switchable depending on standard selected.
*6: Standard deviation only can be selected in ANSI.16% rule cannot be selected in VDA.
*7: Either **No.178-396** or **No.178-397** is supplied as a standard accessory depending on the Order No. of the main unit for SJ-410 Series.
*8: The standard stylus (**No.12AAC731** or **No.12AAB403**), which is compatible with the detector supplied, is a standard accessory.

To denote your AC line voltage add the following suffixes (e.g. **178-570-01A**).
A for 120V, C for 100V, D for 230V, E for 230V (for UK), DC for 220V (for China), K for 220V (for Korea)

Dimensions

Unit: mm

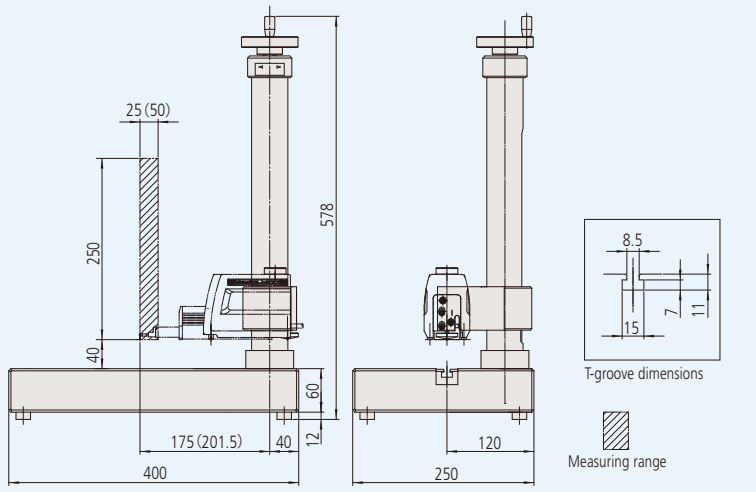


*The dimensions in parentheses indicate those for **SJ-412**

Example of mounting on simple column stand. (Code No. **178-039**)*

*For details see page 6.

Unit: mm



*The dimensions in parentheses indicate those for **SJ-412**

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

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