

SURFTEST SJ-410 SERIES

PRE 1387



Portable surface roughness tester evolution.
Rich choice of options provide easier, smoother and
more accurate measurements.

Mitutoyo

Portable Surface Roughness Tester Evolves!

Enhanced power for making measurements on site

Colour-graphic LCD

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

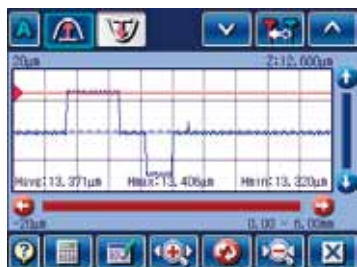
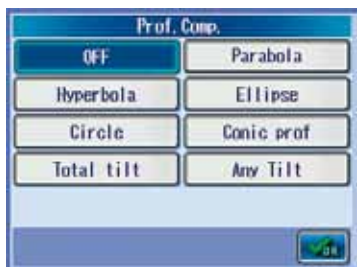
Touch screen for easier operations

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



Easy to use and highly functional

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



Multilingual support

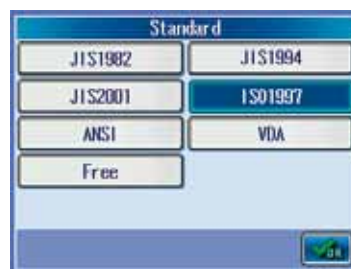
The display interface supports 16 languages.



Applicable standards

Complies with many industry standards

The Surftest SJ-410 complies with the following standards: DIN EN ISO, VDA, JIS, ANSI as well as customized settings.



High accuracy measuring

A wide range, high-resolution detector

Measuring range / resolution
800 μm / 0.0125 μm
80 μm / 0.00125 μm
8 μm / 0.000125 μm

High straightness drive unit

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

SJ-412

SJ-411



The Large Touch-screen, Colour-graphic LCD Ensures Both Intuitive Control and Advanced Operability

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

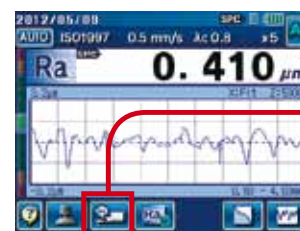
•Measurement result

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.

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.



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).



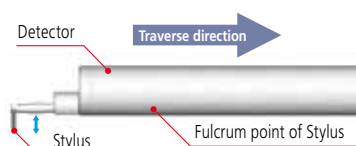
Enhanced Measuring Functions

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 roughness, but range is limited to the stylus travel available. The SJ-410 series supports a variety of surface feature measurements simply by replacing the stylus.



Measuring example of stepped features:
Skidless

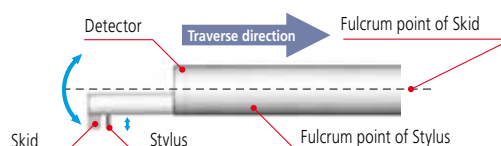


Measured profile



• 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.

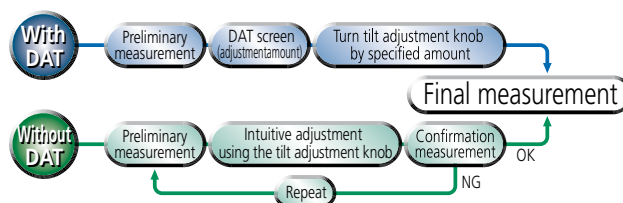
• Height/tilt adjustment unit (standard accessory)



Preliminary measurement



Amount of tilt adjustment

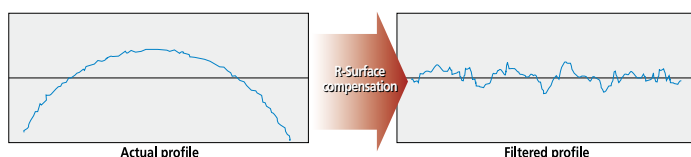


When the SJ-410 Series detector is mounted on the manual column stand*¹ for measurement, it can be combined with any of the optional products for easier leveling: leveling table*¹, 3-axis alignment table*¹ or tilt adjustment unit*¹.

*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.



Calc. Result		
Ra	↑ 1.103	μm
Rq	OK 1.427	μm
Rz	↓ 7.259	μm

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.

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

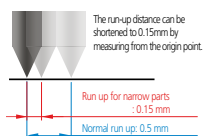
This function allows a sampling length to be arbitrarily set in 0.01 mm increments (SJ-411: 0.1 mm to 25 mm, SJ-412: 0.1 mm to 50 mm). It also allows the SJ-410 series to make both narrow and wide range measurements.

Narrow space measuring function

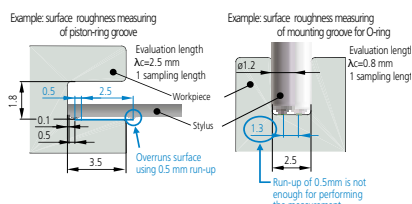
Patent pending in Japan

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 0.5 mm. This distance, however, can be shortened to 0.15 mm 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



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

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.

Optional Accessories

Simple column stand

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

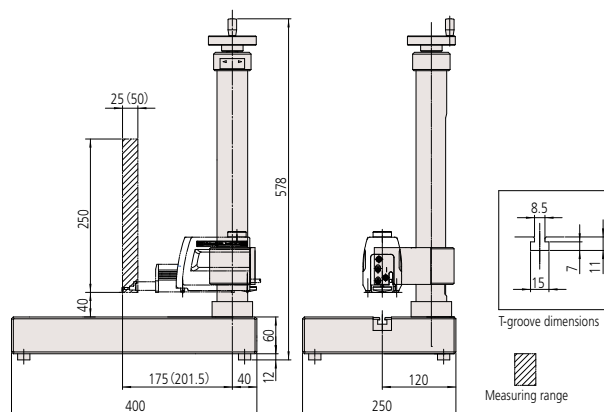
No.178-039

Vertical adjustment range: 250 mm
Dimensions: 400 × 250 × 578 mm
Mass: 20 kg



Example of mounting on simple column stand

Unit: mm



*The dimensions in parentheses indicate those for SJ-412

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.

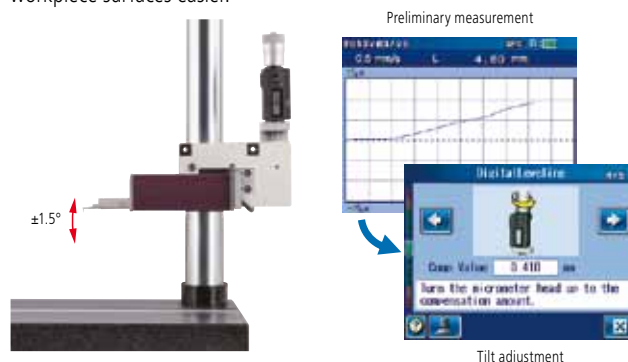
Auto-set unit* – 178-010

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).



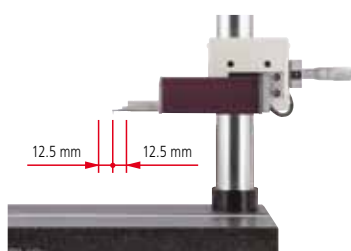
Tilting adjustment unit* – 178-030

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.

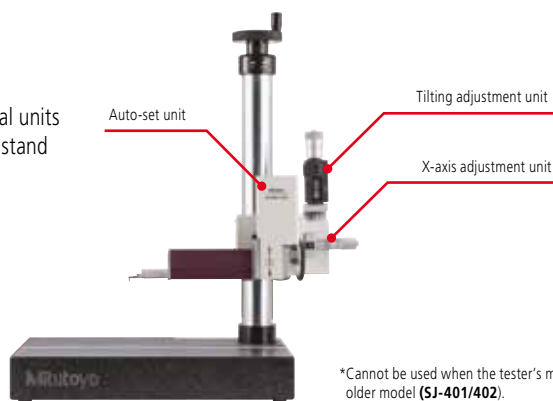


X-axis adjustment unit* – 178-020

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



Complete set of optional units for the manual column stand



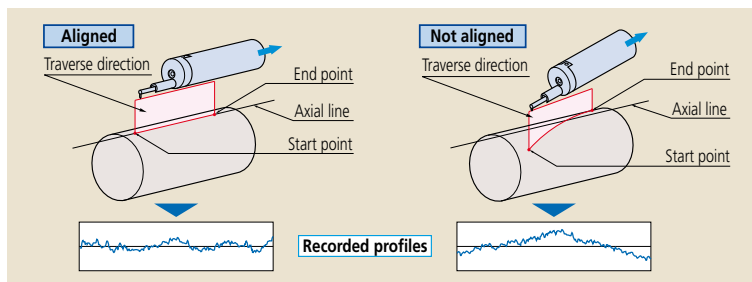
*Cannot be used when the tester's main unit is an older model (SJ-401/402).

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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

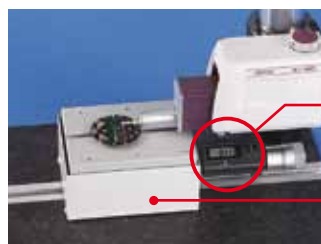
Patent registered in Japan, U.S.A.. Patent pending in Germany

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: $\pm 1.5^\circ$
Table dimensions: 130 x 100 mm
Maximum load: 15 kg

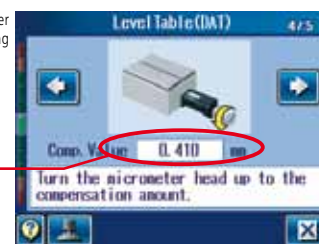


DAT screen guides the user when leveling

Digimatic micrometer head

Amount of micrometer head adjustment required

Leveling table (DAT) (option)



XY leveling tables

The table 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)



178-042-1



178-049

(Movement is in X- and Y-axes only.)

Precision vise

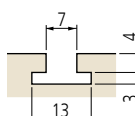


Fits on the stand.



Application

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 x 100 mm		
Maximum load	15 kg		
Inclination adjustment angle	$\pm 1.5^\circ$		
Swiveling angle	$\pm 3^\circ$		
X/Y-axis travel range	± 12.5 mm	± 12.5 mm	± 12.5 mm
Resolution	0.001 mm	0.01 mm	0.001 mm
Dimensions (WxDxH)	262 x 233 x 83 mm	220 x 189 x 83 mm	262 x 233 x 55 mm
Mass	6.3 kg	6 kg	5 kg



T-groove dimensions

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

Cylinder attachment

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

No.12AAB358

Diameter: ϕ 15-60 mm

Configuration:

- Cylindrical measurement block
- Auxiliary block
- Clamp

*Drive unit not included.



Reference step specimen

Used to calibrate detector sensitivity.

No.178-611

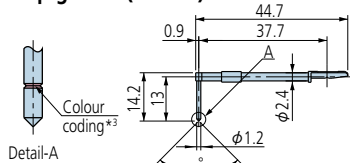
Step nominal values: 2 μ m / 10 μ m



Styli

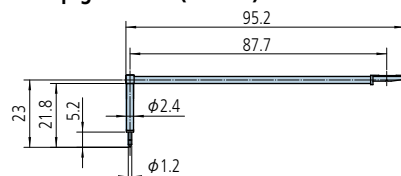
Unit: mm

For deep groove(10 mm)



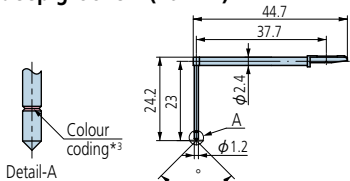
12AAC735 (R2 μm - 60°)
12AAB409 (R5 μm - 90°)
12AAB421 (R10 μm - 90°)

For deep groove *1 (20 mm)



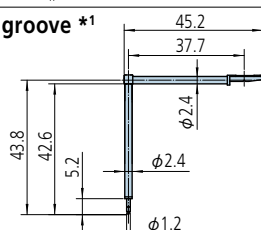
12AAE893 (R2 μm - 60°)
12AAE909 (R5 μm - 90°)

For deep groove*1 (20 mm)



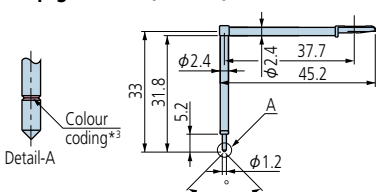
12AAC736 (R2 μm - 60°)
12AAB408 (R5 μm - 90°)
12AAB420 (R10 μm - 90°)

For deep groove *1 (40 mm)



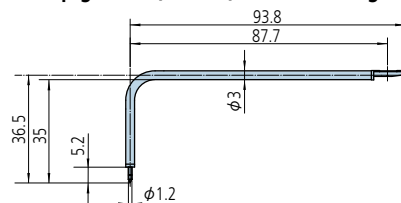
12AAE895 (R2 μm - 60°)
12AAE911 (R5 μm - 90°)

For deep groove*1 (30 mm)



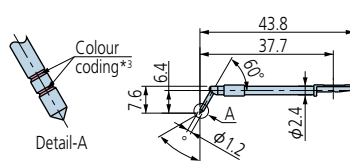
12AAC737 (R2 μm - 60°)
12AAB407 (R5 μm - 90°)
12AAB419 (R10 μm - 90°)

For deep groove (30 mm) / Double-length for deep hole *1



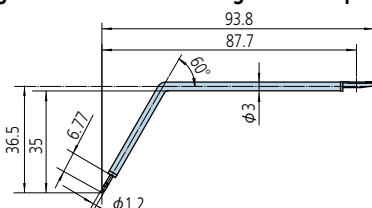
12AAE894 (R2 μm - 60°)
12AAE910 (R5 μm - 90°)

For gear tooth



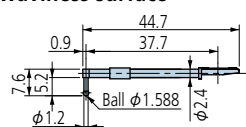
12AAB339 (R2 μm - 60°)
12AAB410 (R5 μm - 90°)
12AAB422 (R10 μm - 90°)

For gear tooth / Double-length for deep hole *1



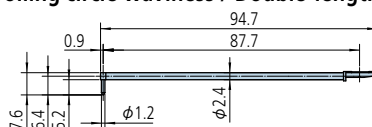
12AAE896 (R2 μm - 60°)
12AAE912 (R5 μm - 60°)

For rolling circle waviness surface *2



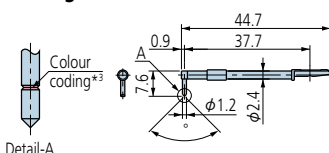
12AAB338 (ϕ 1.588 mm)

For rolling circle waviness / Double-length for deep hole *1 *2



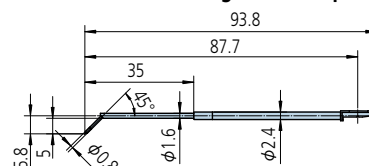
12AAE886 (R250 μm - 60°)

For knife-edge *2



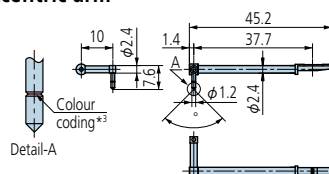
12AAC738 (R2 μm - 60°)
12AAB411 (R5 μm - 90°)
12AAB423 (R10 μm - 90°)

For corner hole / Double-length for deep hole *1



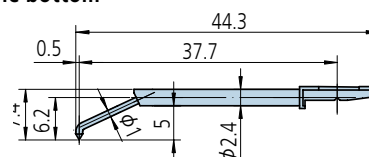
12AAM601 (R2 μm - 60°)
12AAM603 (R5 μm - 90°)

For eccentric arm *1



12AAC739 (R2 μm - 60°)
12AAB412 (R5 μm - 90°)
12AAB424 (R10 μm - 90°)

For hole bottom



12AAE899 (R2 μm - 60°)
12AAE915 (R5 μm - 90°)

*1: For downward-facing measurement only. Customized special interchangeable styli are available on request, please contact any Mitutoyo office for more information.

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

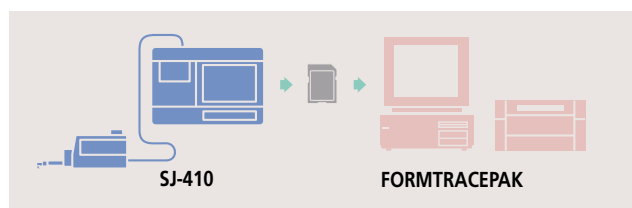
*3

Tip radius	2 μm	5 μm	10 μm
Colour coding	Black	No colour	Yellow

Optional Accessories: For External Output

Contour / Roughness analysis software FORMTRACEPAK

More advanced analysis can be performed by loading SJ-410 series measurement data to software program FORMTRACEPAK via a memory card (option) for processing back at base.



Simplified communication program for SURFTEST SJ series

The Surftest SJ-410 series has a USB interface, enabling data to be transferred to a spreadsheet or other software. We also provide a program that lets you create inspection record tables using a Excel® macro.

This program can be downloaded free of charge from the Mitutoyo website.
<http://www.mitutoyo.eu>

Required environment

- **OS:** Windows® XP (SP3)
Windows Vista®
Windows® 7
- **Spreadsheet software:** Excel® 2002
Excel® 2003
Excel® 2007
Excel® 2010

The optional USB cable is also required.

- USB cable for SJ-410 series **No.12AAD510**

Digimatic mini processor DP-1VR

By connecting this printer to the Surftest SJ-410's digimatic output, you can print calculation results, perform a variety of statistical analyses, draw a histogram or D chart, and also perform complicated operations for X-R control charts.



No.264-504

To denote your AC line voltage add the following suffixes (e.g.264-504-5A).

5A for 120V, 5D for 230V, 5E for 230V (for UK), 5DC for 220V (for China), 5K for 220V (for Korea)

SJ-410 DP-1VR Connecting cable

1m: **No.936937**

2m: **No.965014**

Digimatic mini processor DP-1VR

This unit allows you to load Surftest SJ-410 calculation results (SPC output) into commercial spreadsheet software on a PC via a USB connector. You can essentially use a one-touch operation to enter the calculation results (values) into the cells in the spreadsheet software.



USB Input Tool Direct
USB-ITN-D

No.06ADV380D



USB keyboard signal conversion type*
IT-012U

No.264-012-10

* Requires the optional Surftest SJ-410 connection cable.

1 m: **No.936937**

2 m: **No.965014**

Measurement Data Wireless Communication System U-WAVE

This unit allows you to remotely load Surftest SJ-410 calculation results (SPC output) into commercial spreadsheet software on a PC. You can essentially use a one-touch operation to enter the calculation results (values) into the cells in the spreadsheet software.



U-WAVE-R

(Connects to the PC)

No.02AZD810D



U-WAVE-T*

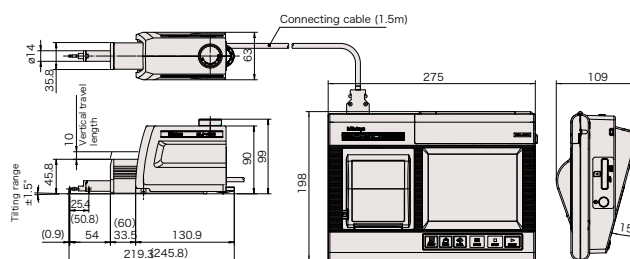
(Connects to the SJ-410)

No.02AZD880D

*Requires the optional Surftest SJ-410 connection cable.

No.02AZD790D

Unit: mm



*The dimensions in parentheses indicate those for SJ-412

Specifications

Model No.		SJ-411		SJ-412	
Order No.	mm	178-580-01	178-580-02	178-582-01	178-582-02
	inch/mm	178-581-01	178-581-02	178-583-01	178-583-02
Measuring range	X-axis	25 mm (1 inch)		50 mm (2 inch)	
	Z1-axis (detector unit)	800 µm, 80 µm, 8 µm *Up to 2,400 µm with an optional stylus			
Detector	Measuring principle	Differential inductance			
	Resolution	0.01 µm (800 µm range) / 0.001 µm (80 µm range) / 0.0001 µm (8 µm range) 0.4 µinch (32000 µinch) / 0.04 µinch (3200 µinch) / 0.004 µinch (320 µinch)			
	Stylus tip	60°/2 µm (80 µinch)	90°/5 µm (200 µinch)	60°/2 µm (80 µinch)	90°/ 5 µm (200 µinch)
	Measuring force	0.75 mN	4 mN	0.75 mN	4 mN
	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, 1.0 mm/s (0.002, 0.004, 0.008, 0.02, 0.04 inch/s)			
	Drive speed	0.5, 1, 2, 5 mm/s (0.02, 0.04, 0.08, 0.2 inch/s)			
	Straightness	0.3 µm / 25 mm (12 µinch / 1 inch)		0.5 µm / 50 mm (20 µinch / 2 inch)	
Height-tilt adjustment unit	Height adjustment	10 mm (0.39 inch)			
	Tilt adjustment	± 1.5°			
Standards		JIS1982 / JIS1994 / JIS2001 / ISO1997 / ANSI / VDA			
Parameters		Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku, Rc, R _{PC} , R _{Sm} , R _{max} ^{*1} , R _{z1max} ^{*2} , S, HSC, RzJIS ^{*3} , R _p _{pi} , R _{Δa} , R _{Δq} , R _{lr} , R _{mr} , R _{mr} (c), R _{oc} , R _k , R _{pk} , R _{vk} , Mr1, Mr2, A1, A2, Vo, λ _a , λ _q , Lo, R _{pm} , 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	λ _c	0.08, 0.25, 0.8, 2.5, 8.0 mm			
	λ _s ^{*5}	2.5, 8.0, 25 µm (100, 320, 1000 µinch)			
Sample length		0.08, 0.25, 0.8, 2.5, 8.0, 25.0 mm			
Number of sampling lengths		x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16, x17, x18, x19, x20			
Arbitrary length		0.1~25 mm		0.1~50 mm	
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)			
Power supply	External I/O	USB I/F, Digimatic output, RS-232C I/F, External SW I/F			
	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	50 W			
Size (WxDxH)	Display unit	275×198×109 mm (10.83×4.29×7.80 inch)			
	Height adjustment unit	130.9×63×99 mm (5.16×2.48×3.90 inch)			
	Drive unit	128×35.8×46.6 mm (5.04×1.41×1.83 inch)		154.5×35.8×46.6 mm (6.08×1.41×1.83 inch)	
Mass	Display unit	1.7 kg			
	Height adjustment unit	0.4 kg			
	Drive unit	0.6 kg		0.64 kg	
Standard accessories		Detector ^{*7} , Stylus ^{*8} , Roughness specimen 270732 Printing paper 12BAL402 Touch-screen protection sheet		AC adapter, Philips screwdriver, Strap for stylus pen, Operation manual, Quick reference manual, Warranty 12BAG834 Touch pen 12AAN041 Carrying case	

*1: Only for VDA/ANSI/JIS'82 standards.

*2: Only for ISO'97 standard.

*3: Only for JIS'01 standard.

*4: Only for ANSI standard.

*5: λ_s 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)

Optional accessories, consumables, and others for SJ-410

- Printer paper (5 rolls)
- Durable printer paper (5 rolls)
- Touch-screen protector sheet (10 sheets)
- Memory card (2GB) *
- Connecting cable (for RS-232C)

No.270732
No.12AAA876
No.12AAN040
No.12AAL069
No.12AAA882

* micro SD card (with a conversion adapter to SD card)

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Note: Product illustrations are without obligation. Product descriptions respectively capability characteristics are only binding when explicitly agreed upon.

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