Portable surface roughness tester evolution
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.

**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.

**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)

Complies with many industry standards
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.

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**

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

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

- **Height/tilt adjustment unit (Standard accessory)**

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

*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.

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.

Narrow space measuring function

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.

Typical applications

- Narrow space measuring
- Step
- Step volume
- Dimensions
- Coordinate difference

Patent pending in Japan

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.

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: 250mm
Dimensions: 400x250x578mm
Mass: 20kg

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).

*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.

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

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

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.

The levelling 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.

DAT Function for the optional leveling table

The levelling 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.

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)

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

Precision vise

• Fits on the stand.

Reference step specimen

Used to calibrate detector sensitivity.

No.178-611
Step nominal values: 2µm/10µm
## Optional Accessories: Detectors / Styli

### Detectors

<table>
<thead>
<tr>
<th>Detectors</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>Measuring force</td>
</tr>
<tr>
<td>178-396-2</td>
<td>0.75mN</td>
</tr>
<tr>
<td>178-397-2</td>
<td>4mN</td>
</tr>
</tbody>
</table>

- 97ISO and ’01JIS compliant detectors
- 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

#### Standard stylus

<table>
<thead>
<tr>
<th>Tip</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>37.7</td>
</tr>
<tr>
<td>0.6</td>
<td>20.3</td>
</tr>
</tbody>
</table>

#### For small hole

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

#### For extra-small hole

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

#### For ultra-small hole

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

#### Double-length for deep hole *2

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

### For small hole *2 *4

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

### For ultra-small hole *4

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

### For small slotted hole *2

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>37.7</td>
</tr>
</tbody>
</table>

#### Color coding*3

- White
- Black
- No color
- Yellow
- No notch or color

*1: Tip angle 60°
*2: For downward-facing measurement only.
*3: Tip radius
*4: Used for calibration, a standard step gauge (Ref.No.178-611, option) is also required.
<table>
<thead>
<tr>
<th>Styli</th>
<th>Unit: mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For deep groove (10mm)</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image1" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC735 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB409 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB421 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td>*<em>For deep groove <em>2 (20mm)</em></em></td>
<td></td>
</tr>
<tr>
<td><img src="image2" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC736 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB408 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB420 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td>*<em>For deep groove <em>2 (30mm)</em></em></td>
<td></td>
</tr>
<tr>
<td><img src="image3" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC737 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB407 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB419 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td><strong>For gear tooth</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image4" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAB839 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB840 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB842 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td>*<em>For rolling circle waviness surface <em>4</em></em></td>
<td></td>
</tr>
<tr>
<td><img src="image5" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAB238 (φ1.588)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td>*<em>For knife-edge <em>4</em></em></td>
<td></td>
</tr>
<tr>
<td><img src="image6" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC738 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB841 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB843 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td>*<em>For eccentric arm <em>2</em></em></td>
<td></td>
</tr>
<tr>
<td><img src="image7" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC739 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB842 (5μm)</td>
<td></td>
</tr>
<tr>
<td>12AAB844 (10μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
<tr>
<td><strong>For hole bottom</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image8" alt="" /></td>
<td></td>
</tr>
<tr>
<td>12AAC899 (2μm)*</td>
<td></td>
</tr>
<tr>
<td>12AAB899 (5μm)</td>
<td></td>
</tr>
<tr>
<td>( ): Tip radius</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Tip radius</th>
<th>2μm</th>
<th>5μm</th>
<th>10μm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color coding</td>
<td>Black</td>
<td>No color</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

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

**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-SA).
SA for 120V, SD for 230V, SE for 230V (for UK), SD for 220V (for China), SK for 220V (for Korea)

SJ-410 → DP-1VR Connecting cable
1m: No.936937
2m: No.965014

**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 Microsoft Excel* macro.

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

**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.

**Optional accessories, consumables, and others for SJ-410**

- Printer paper (5 rolls)  
  No.270732
- Durable printer paper (5 rolls)  
  No.12AAA876
- Touch-screen protector sheet (10 sheets)  
  No.12AAN040
- Memory card (2GB)  
  No.12AAL069
- Connecting cable (for RS-232C)  
  No.12AAA882

*Requires the optional Surftest SJ-410 connection cable.

No.02AZD810D
U-WAVE-R
(Connects to the PC)

No.02AZD7880D
U-WAVE-T *
(Connects to the SJ-410)

No.02AZD790D
*Requires the optional Surftest SJ-410 connection cable.

No.02AZD880D
USB Input Tool Direct
USB-ITN-D
No.06ADV380D

No.06ADV380D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.

1m: No.936937
2m: No.965014

No.02AZD790D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.

1m: No.936937
2m: No.965014

No.02AZD880D
USB Input Tool Direct
USB-ITN-D
No.06ADV380D

No.06ADV380D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.

1m: No.936937
2m: No.965014

No.02AZD790D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.

1m: No.936937
2m: No.965014

No.02AZD880D
USB Input Tool Direct
USB-ITN-D
No.06ADV380D

No.06ADV380D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.

1m: No.936937
2m: No.965014

No.02AZD790D
USB keyboard signal conversion type*
IT-012U
No.264-012-10

*Requires the optional Surftest SJ-410 connection cable.
### Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>SI-411</th>
<th>SI-412</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Order No.</strong></td>
<td><strong>178-580-01</strong></td>
<td><strong>178-580-02</strong></td>
</tr>
<tr>
<td><strong>Measuring range</strong></td>
<td><strong>X axis</strong></td>
<td><strong>25mm (1 inch)</strong></td>
</tr>
<tr>
<td><strong>Detector</strong></td>
<td><strong>Height adjustment</strong></td>
<td><em>Up to 2,400µm with an optional stylus</em></td>
</tr>
<tr>
<td><strong>Stylus tip</strong></td>
<td><strong>60°/2µm (80µinch)</strong></td>
<td><strong>90°/5µm (200µinch)</strong></td>
</tr>
<tr>
<td><strong>Drive unit: X-axis</strong></td>
<td><strong>X axis</strong></td>
<td><strong>25mm (1 inch)</strong></td>
</tr>
<tr>
<td><strong>Drive speed</strong></td>
<td><strong>0.1~2.5 mm/s (0.002, 0.04, 0.08 inch/s)</strong></td>
<td><strong>1.0mm/s (0.02, 0.04, 0.08 inch/s)</strong></td>
</tr>
<tr>
<td><strong>Height adjustment unit</strong></td>
<td><strong>Height adjustment</strong></td>
<td><strong>10mm (0.39inch)</strong></td>
</tr>
<tr>
<td><strong>Sample length</strong></td>
<td><strong>0.18, 25.8, 2.5, 8.0, 25.0mm</strong></td>
<td><strong>1.0mm (0.04 inch)</strong></td>
</tr>
<tr>
<td><strong>Number of sampling lengths</strong></td>
<td><strong>x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16, x17, x18, x19, x20</strong></td>
<td><strong>0.1~25mm</strong></td>
</tr>
</tbody>
</table>

#### Measuring conditions

- **Resolution**: 0.01µm (8000µinch) / 0.001µm (800µinch) / 0.0001µm (80µinch) / 0.00001µm (8µinch)
- **Drive unit**: X-axis
- **Drive speed**: 0.5, 1.0, 2.0, 5.0, 10.0mm/s (0.02, 0.04, 0.08, 0.2 inch/s)
- **Steadiness**: 0.3µm / 25mm (12µinch / 1 inch)
- **Height adjustment**: 10mm (0.39inch)

#### Measured profiles

- Primary: Roughness, DF, Filtered waviness curve, R-Motif, W-Motif
- Secondary: Skidded measurement / skidless measurement
- Graph analysis: Parabola, Hyperbola, Ellipse, Circle, Conic, Tilting, Compensation off
- Storage functions: 10 measuring conditions can be stored in internal memory

#### Printing function

- Measurement conditions / Calculation results / GO / NG judgement
- Statistical processing: Standard deviation, histogram and pass rate is possible

#### Storage

- Internal memory: Measurement condition (10 sets)
- Memory card (option): 500 measurement condition, 10000 measuring data, 10000 text data, 500 statistic data,

#### Power supply

- 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)

#### Standard accessories

- Detector**, Stylus**, Roughness specimen
- Touch-screen protection sheet
- Touch pen
- Carrying case
- AC adapter, Philips screwdriver, Strap for stylus pen, Operation manual, Quick reference manual, Warranty

---

*1: Only for VDA/ANSI/ISO 82 standards.
*2: Only for JIS97 standard.
*3: Only for JIS01 standard.
*4: Only for ANSI standard.
*5: As 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.12AAE371 or No.12ABAB403), 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

*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.

*The dimensions in parentheses indicate those for SJ-412

Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this pamphlet, as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs, dimensions and weights.

The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. Only quotations submitted by ourselves may be regarded as definitive.

Our products are classified as regulated items under Japanese Foreign Exchange and Foreign Trade Law. Please consult us in advance if you wish to export our products to any other country. If the purchased product is exported, even though it is not a regulated item (Catch-All controls item), the customer service available for that product may be affected. If you have any questions, please consult your local Mitutoyo sales office.

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