Surftest SJ-210
SERIES 178 — Portable Surface Roughness Tester

FEATURES

- The 2.4-inch color graphic LCD provides excellent readability and an intuitive display that is easy to use. The LCD also includes a backlight for improved visibility in dark environments.
- The Surftest SJ-210 can be easily operated using the buttons on the front of the unit and under the sliding cover.
- Up to 10 measurement conditions and one measured profile can be stored in the internal memory.
- An optional memory card can be used as an extended memory to store large quantities of measured profiles and conditions.

SPECIFICATIONS/CONFIGURATION

<table>
<thead>
<tr>
<th>Model No.</th>
<th>SJ-210</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No. (inch/mm)</td>
<td>178-561-01A</td>
</tr>
<tr>
<td>Drive unit</td>
<td>Standard type</td>
</tr>
<tr>
<td>Detector</td>
<td>0.75mN type (178-296)</td>
</tr>
<tr>
<td>Display unit</td>
<td>Compact type (178-253A)</td>
</tr>
<tr>
<td>Detector: Tip angle</td>
<td>60°</td>
</tr>
<tr>
<td>Stylus tip radius</td>
<td>2µm</td>
</tr>
<tr>
<td>Detector measuring force</td>
<td>0.75mN</td>
</tr>
</tbody>
</table>

Evaluation Capability: SJ-210

- Assessed profiles:
  - Primary profile, Roughness profile, DF profile, Roughness profile-Motif
- Evaluation parameters:
  - Ra, Ry, Rz, Rq, R, Rmax, Rp, Rv, R32, Rsk, Rku, Rc, Rkc, Rsm, Rz1max, S, HSC, RzJIS, Rppi, R
- Analysis graphs:
  - Bearing area curve / Amplitude distribution curve
  - Gaussian, 8CR75, PC75

DIMENSIONS

- Display unit, Drive unit

Function: SJ-210

- Customization: Desired parameters can be selected for calculation and display.
- Go/no-go judgment: By max value / 16% / Standard dev. / Storage of measurement condition: Save the conditions at power OFF
- Storage: Internal memory: Measurement condition (10 sets), Measured profile (1 set) / Memory card (Option): 500 measurement conditions, 10,000 measured profiles, 500 display images
- Text file (Measurement conditions / Measured profile / Assessed profile / Bearing area curve / Amplitude distribution curve)
- Calibration: Auto-calibration with the entry of numerical value / Average calibration with multiple measurement (Max. 5 times) is available
Surf test SJ-310

**FEATURES**

- The data processing unit offers large 5.7-inch color graphic LCD touch-panel for superior readability and operability. The LCD also includes a backlight for improved visibility in dark environments.
- The excellent user interface provides intuitive and easy-to-understand operability.

**SPECIFICATIONS/CONFIGURATION**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>SJ-310</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>178-571-01A</td>
</tr>
<tr>
<td>Drive unit</td>
<td>Standard type (178-230-2)</td>
</tr>
<tr>
<td>Detector</td>
<td>0.75mN type (178-296)</td>
</tr>
<tr>
<td>Display unit</td>
<td>Standard type with printer</td>
</tr>
<tr>
<td>Detector: Tip angle</td>
<td>60°</td>
</tr>
<tr>
<td>Stylus tip radius</td>
<td>2µm</td>
</tr>
<tr>
<td>Detector measuring force</td>
<td>0.75mN</td>
</tr>
</tbody>
</table>

**Standard accessories**

- Connecting cable
- Point-contact adapter
- V-type adapter
- Calibration stage
- Stylus pen
- Protection sheet
- Printer paper (5 pieces)
- Carrying case
- Roughness reference specimen (Ra 3µm), AC adapter, Philips screwdriver, Strap for stylus pen, Operation manual, Quick reference manual, Warranty

**DIMENSIONS**

<table>
<thead>
<tr>
<th>Display unit, Drive unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type unit (178-220-2)</td>
</tr>
<tr>
<td>Retractable type unit (178-225)</td>
</tr>
<tr>
<td>Transverse tracing unit (178-230-2)</td>
</tr>
</tbody>
</table>

**Function: SJ-310**

Customization: Desired parameters can be selected for calculation and display.

Statistical processing: Maximum value, minimum value, mean value, standard deviation, pass rate, histogram of each parameter

Go/no-go judgment: maximum value rule, 16% rule, average value rule, standard deviation (1σ, 2σ, 3σ)

Storage: Internal memory: Measurement condition (10 sets)

Memory card (Option): 500 measurement conditions, 10,000 measured profiles, 500 display images, Text file (Measurement conditions / Measured profile / Assessed profile / Bearing area curve / Amplitude distribution curve), 500 statistical data, etc.

Calibration: Auto-calibration with the entry of numerical value / Average calibration with multiple measurement (Max.12 times available)

Power-saving function: Auto-sleep-function, Auto light-off of backlight by ECO mode.
Assessed profiles and calculation results and curves can be printed out by connecting the SJ-210-dedicated printer, which is palm sized (W x D x H: 93 x 125 x 70mm) and can run on an internal battery.

- Power supply can be selected. (AC adapter or battery pack)
- Printable items: Measurement conditions, calculation results, assessed profile, bearing area curve (BAC), amplitude distribution curve (ADC), and environment settings.

SJ-Printer for SJ-210

Assessed profiles and calculation results and curves can be printed out by connecting the SJ-210-dedicated printer, which is palm sized (W x D x H: 93 x 125 x 70mm) and can run on an internal battery.

- Power supply can be selected. (AC adapter or battery pack)
- Printable items: Measurement conditions, calculation results, assessed profile, bearing area curve (BAC), amplitude distribution curve (ADC), and environment settings.

DP-1VR

It is possible to process Digimatic data output from the Surftest SJ series with the DP-1VR. This compact, hand-held device can provide printouts of measurement data and various statistical analyses results such as histograms, D-charts, and Xbar-R control charts. With optional output cables, DP-1VR is also capable of RS-232C output of measurement data to a PC (cable 09EAA084) and go/no-go condition output (cable 965516).

**Standard detectors**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Measuring force</th>
<th>Stylus profiles</th>
<th>Remarks column</th>
</tr>
</thead>
<tbody>
<tr>
<td>178-296</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td>Dedicated to the standard retractable drive unit</td>
</tr>
<tr>
<td>178-300</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
<tr>
<td>178-302</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td>Dedicated to the transverse tracing drive unit</td>
</tr>
<tr>
<td>178-303</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
</tbody>
</table>

* Tip radius / Tip angles

**Small hole detectors**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Measuring force</th>
<th>Stylus profiles</th>
<th>Remarks column</th>
</tr>
</thead>
<tbody>
<tr>
<td>178-383</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td>Minimum measurable hole diameter: ø4.5mm</td>
</tr>
<tr>
<td>178-384</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
</tbody>
</table>

* Tip radius / Tip angles

**Extra small hole detectors**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Measuring force</th>
<th>Stylus profiles</th>
<th>Remarks column</th>
</tr>
</thead>
<tbody>
<tr>
<td>178-385</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td>Minimum measurable hole diameter: ø2.8mm</td>
</tr>
<tr>
<td>178-386</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
</tbody>
</table>

* Tip radius / Tip angles

**Gear-tooth surface detectors**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Measuring force</th>
<th>Stylus profiles</th>
<th>Remarks column</th>
</tr>
</thead>
<tbody>
<tr>
<td>178-387</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td></td>
</tr>
<tr>
<td>178-388</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
</tbody>
</table>

* Tip radius / Tip angles

**Deep groove detectors**

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Measuring force</th>
<th>Stylus profiles</th>
<th>Remarks column</th>
</tr>
</thead>
<tbody>
<tr>
<td>178-389</td>
<td>0.75mN</td>
<td>2µmR/90</td>
<td></td>
</tr>
<tr>
<td>178-390</td>
<td>4 mN</td>
<td>5µmR/90</td>
<td></td>
</tr>
</tbody>
</table>

* Tip radius / Tip angles

Example of the connection with SJ-210

Durable Printer paper (25m, 3 roll/set): 12AA8876
Printer paper (5 packs): 270732
RS-232C cable: 12AAL067

Connecting cable: 936937 40” (1m)
Connecting cable: 965014 80” (2m)
AC adapter: 09EAA088
Printer paper: 09EAA082

178-421A

*Not compatible with older SJ-201 models.
Nosepiece, Adapter
Nosepiece for flat surfaces
12AAA217
• SI-210/210R optional accessory.
• SJ-310/310R standard accessory.
• Not available for the transverse tracing drive unit.

V-type adapter
12AAE644
• SI-210/SJ-310 Transverse tracing type standard accessory.
• Dedicated to the transverse tracing drive unit.

Extension rod (50mm)
12AAA210
• Not available for the transverse tracing drive unit. (Note: Only one rod can be used.)

Magnetic stand adapter
12AAA221 (ø8mm)
12AAA220 (ø9.5mm)

Vertical positioning adapter
12AAA219
• Not available for the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension cable (1m)
12BAA303
• Only one cable can be used.

Setting attachments
* Not available for the transverse tracing drive unit.
Implements measurement efficiency by allowing the setup of workpieces of the same type and positioning of hard-to-access features of a workpiece.

No. 178-033
V-type for measuring in the cylinder axis direction

No. 178-034
Setting attachment: Magnetic slider type

No. 178-035
Setting attachment: Inside diameter type

Point-contact adapter
12AAE643
• SI-210/SJ-310 Transverse tracing type standard accessory.
• Dedicated to the transverse tracing drive unit.

Free Communication Software
SJ-Tools
This program can be downloaded for FREE from the Mitutoyo website, http://www.mitutoyo.com
Output software based on Microsoft-Excel® for controlling the devices and reproducing and storing the measurement data.
* Microsoft-Excel is not included in the scope of supply.
Complete with exclusive accessories.
• Measurement device control
• Definition of measurement variables
• Graphic representation of the profile
• Storage of measurement records
• Documentation of measurement results
• Connecting cable

Optional cables (Required for software communication)
12AALE68: USB PC connecting cable (USB cable) for SJ-210
12AAAL62: USB PC connecting cable (USB cable) for SJ-310/410
12AAAL67: RS-232C cable for SJ-210
12AAAL68: RS-232C cable for SJ-310/410
12AAH490: USB PC connecting cable for SJ-500/SV-2100

Optional Accessories
12AAE272: SJ-210 Replacement Battery Pack
12AAE246: SJ-310 Replacement Battery Pack
12BA9920: SJ-210 Display Protection Sheet (1pc.)
12AAE066: SJ-210 Display Protection Sheet (5pcs.)
12BA9940: SJ-310 Display Protection Sheet (1pc.)
12BAA040: SJ-310 Display Protection Sheet (10pcs.)
178-601: Precision Reference Specimen (Ra 3.00 µm)
178-602: Precision Reference Specimen (Ra 3.00 µm)
178-603: Precision Reference Specimen – 2 values (GAR)
178-604: Precision Reference Specimen – 2 Values (MIT)
178-606: Precision Reference Specimen for Transverse Drive (Ra 0.039 µm / 0.10 µm)
178-029: Manual Column Stand, must use adapter 12AAA221 to mount SJ drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension rod (50mm)
12AAA210
• Not available for the transverse tracing drive unit. (Note: Only one rod can be used.)

Magnetic stand adapter
12AAA221 (ø8mm)
12AAA220 (ø9.5mm)

Vertical positioning adapter
12AAA219
• Not available for the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension cable (1m)
12BAA303
• Only one cable can be used.

Setting attachments
* Not available for the transverse tracing drive unit.
Improves measurement efficiency by allowing the setup of workpieces of the same type and the positioning of hard-to-access features of a workpiece.

No. 178-033
V-type for measuring in the cylinder axis direction

No. 178-034
Setting attachment: Magnetic slider type

No. 178-035
Setting attachment: Inside diameter type

Point-contact adapter
12AAE643
• SI-210/SJ-310 Transverse tracing type standard accessory.
• Dedicated to the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension rod (50mm)
12AAA210
• Not available for the transverse tracing drive unit. (Note: Only one rod can be used.)

Magnetic stand adapter
12AAA221 (ø8mm)
12AAA220 (ø9.5mm)

Vertical positioning adapter
12AAA219
• Not available for the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension cable (1m)
12BAA303
• Only one cable can be used.

Setting attachments
* Not available for the transverse tracing drive unit.
Improves measurement efficiency by allowing the setup of workpieces of the same type and the positioning of hard-to-access features of a workpiece.

No. 178-033
V-type for measuring in the cylinder axis direction

No. 178-034
Setting attachment: Magnetic slider type

No. 178-035
Setting attachment: Inside diameter type

Point-contact adapter
12AAE643
• SI-210/SJ-310 Transverse tracing type standard accessory.
• Dedicated to the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension rod (50mm)
12AAA210
• Not available for the transverse tracing drive unit. (Note: Only one rod can be used.)

Magnetic stand adapter
12AAA221 (ø8mm)
12AAA220 (ø9.5mm)

Vertical positioning adapter
12AAA219
• Not available for the transverse tracing drive unit.

Support feet set
12AAA216
• SI-210/210R optional accessory.
• SI-310/310R standard accessory.
• Not available for the detector side of the transverse tracing drive unit.

Extension cable (1m)
12BAA303
• Only one cable can be used.
Surftest SJ-410
SERIES 178 — Portable Surface Roughness Tester

FEATURES
• Both skidded and skidless measurement are possible with this series. Equipped with 46 roughness parameters that conform to the latest ISO, DIN, ANSI, and JIS standards.
• A wide-range, high-resolution detector and a drive unit provide superior high-accuracy measurement in its class.

Detector
Measuring range: 800µm
Resolution: 0.000125µm (at 8µm range)
Order No. Model No.
Surftest SJ-410

A skidless detector and a curved surface compensation function provide efficient evaluation of cylinder surface roughness.

Skidless measurement

FEATURES
• Ultra-fine steps, straightness and waviness can be measured by using the skidless measurement function.
• The handheld data processing unit and the 5.7-inch color graphic LCD touch-panel provides superior readability and operability. The LCD also includes a backlight for improved visibility in dark environments.
• The excellent user interface provides intuitive and easy-to-understand operability.
• Measured data can be output to a PC with optional RS-232C or USB cable.
• Digital filter function for non-distorted roughness profiles.
• Go/no-go judgment function.
• Auto-calibration function.
• The display interface supports 16 languages, which can be freely switched.
• Simplified contour analysis function supports the four types of measurement: step, level change, area and coordinate difference.
• Access to each feature can be password-protected, which prevents unintended operations and allows you to protect your settings.
• The optional attachments for mounting on a column stand significantly increase the operability.

SPECIFICATIONS

Model No.
Surftest SJ-410

Order No. (inch/mm)
178-581-01A
178-581-02A
178-583-01A
178-583-02A

Detector measuring force
0.75mN
4mN
0.75mN
4mN

Evaluation range
25mm
25mm
50mm
50mm

Tip angle
60º
90º
60º
90º

Tip radius
2µm
5µm
2µm
5µm

Technical Data: X axis (drive unit)

Measuring range:
1" (25mm) (SJ-411), 2" (50mm) (SJ-412)

Measuring speed: 0.02, 0.04, 0.08, 0.2, 0.4µm/s (0.05, 0.1, 0.5, 1.0, 2.0µm/s)

Return speed: 0.02, 0.04, 0.08, 0.2, 0.4µm/s (0.5, 1.0, 2.0mm/s)

Traversing direction: Backward

Traverse linearity: 12 µm / 1" (0.3µm/25mm) (SJ-411), 20 µm / 2" (0.5µm/50mm) (SJ-412)

Positioning: ±1.5µm (tilting), 10µm (up/down)

Detector Range / resolution:
80µm / 0.0125µm (up to 2400µm with an optional stylus)

Detector Range / resolution: 800µm / 0.000125µm (up to 2400µm with an optional stylus)

Detector Range / resolution: 80µm / 0.0125µm, 80µm /
0.000125µm (up to 2400µm with an optional stylus)

Measuring force:
0.75N (4mN)

Tip radius:
5µm

Tip angle:
60º

Power supply:
Via AC adapter / rechargeable battery

Batteries:
Max. app. 1000 measurements (w/o printing)

Recharge time:
4 hours Data output / Via USB interface / RS-232C interface / SPI output

Storage:
Internal memory: Measurement condition (10 sets)

Memory card (Option): 500 measurement conditions, 10,000 measured profiles, 500 display images, Text file (Measurement conditions / Measured profile / Assessed profile / Bearing area curve / Amplitude distribution curve), 500 statistical data, etc.

Dimensions (WxDxH):
Display unit: 10.84x3.7x8.275x109x198mm

Height-adjustment unit: 5.16x2.48x9.713x63x99mm

Drive unit: 5.04x4.1x9.125x56x97mm (SJ-411), 6.1x4.1x8.33x155x36x147mm (SJ-412)

Mass Control unit: Approx. 3.75lb (1.7kg)

Height-adjustment unit: Approx. 9lb (0.4kg)

Drive unit: 1.36x0.96x2.25x0.7x3.9lb (45x25.5x10.5x3.9) (SJ-412)

Analysis graphs:
Bearing Area Curve (BAC), Amplitude Distribution Curve (ADC)

Digital filter:
2CR, PC75, Gaussian

Cutoff length:
λc: 0.03, 0.05, 0.07, 0.1, 0.25, 0.5, 1.0, 2.5, 5, 10µm

Sampling length:
0.08, 0.25, 0.25, 2.5, 8, 25µm; or arbitrary length in range 0.1 to 25mm

Number of sampling lengths: 1, 2, 3, 20 (limited by traverse range)

Printer:
Thermal type

Printing width:
48mm (paper width: 58mm)

Recording magnification:
Vertical magnification: 10X to 100,000X, Auto
Horizontal magnification: 1X to 1,000X, Auto

Function:
Customize:
Selection of display/evaluation parameter

Data compensation:
R-surface, Tilt compensation

Ruler function:
Step, level change, area and coordinate difference

D.A.T. function:
Helps to level workpiece prior to skidless measurement displacement detection mode enables the stylus displacement to be input while the drive unit is stopped.

Statistical processing:
Max. value, Min. value, Mean value, Standard deviation (s), Pass ratio, Histogram

GONG judgement:
Maximum value rule, 16% rule, average value rule, standard deviation (s), 2σ, 3σ

Calibration:
Auto-calibration with the entry of numerical value/average calibration with multiple measurement (Max. 12 times) is available.

Power saving function:
Auto-sleep-function, Auto light-off of backlight by ECO mode.

* Only for SJ-412
Surftest SJ-410
SERIES 178 — Portable Surface Roughness Tester

Free Communication Software
SJ-Tools
This program can be downloaded for FREE from the Mitutoyo website. http://www.mitutoyo.com

Output software based on Microsoft-Excel* for controlling the devices and reproducing and storing the measurement data.
*Microsoft-Excel is not included in the scope of supply.

Complete with exclusive accessories.
- Measurement device control
- Definition of measurement variables
- Graphic representation of the profile
- Storage of measurement results
- Documentation of measurement results

Optional cables (Required for software communication)
12AADO510: USB PC connecting cable (USB cable)
12AAAB882: RS-232C connecting cable

Optional Accessories
178-611: Step gage (2µm, 10µm)
178-612: Step gage (2µm, 10µm, 79µin, 394µin)
178-610: Step gage (step: 1µm, 2µm, 5µm, 10µm)
12AAM556: Height/tilt adjustment unit for SJ-410
178-039: Manual column stand (granite base)
 (vertical travel: 250mm)
178-010: Auto-set unit for 178-039
178-020: X-axis adjustment unit for 178-039
178-030: Tilting adjustment unit (Inclination adjustment unit) for 178-039
12AAAB358: Cylindrical surface adapter
(workpiece dia.: 15 - 60mm)
178-016: Leveling table
(tilting: ±1.5°, max. loading: 15kg)
178-048: Leveling table with D.A.T function (mm)
(tilting: ±1.5°, max. loading: 15kg)
178-058: Leveling table with D.A.T function (inch)
(tilting: ±1.5°, max. loading: 15kg)
178-043-1: XY leveling table (25 x 25mm)
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-053-1: XY leveling table (1" x 1")
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-042-1: Digital XY leveling table (25 x 25mm)
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-052-1: Digital XY leveling table (1" x 1")
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-049: Digital XY leveling table (25 x 25mm)
(max. loading: 15kg)
178-059: Digital XY leveling table (1" x 1")
(max. loading: 15kg)
178-019: Precision vise for XY leveling table
(jaw opening: 36mm)
998291: Precision V-block for XY leveling table
(workpiece dia.: 1 - 160mm)
12AAAB41: Memory card (8GB)
965014: SPC cable (2m)
264-012-10: Input tool (USB type)
264-504-5A: DP-1VR

Detectors, Styli, and nosepieces
(See pg. J-22/23.)

Consumables
12AAN040: LCD protective sheet (10 sheets/set)
12AAN876: Durable printer paper (25m, 5 rolls/set)
270352: Printer paper (5 pack)
12AAN046: Replacement battery
12AAJ088: Footswitch

DIMENSIONS

MEASUREMENT APPLICATIONS

Carrying case is a standard accessory.
Surftest SJ-500/P, SV-2100
SERIES 178 — with Dedicated Control / PC System / Display Unit

High-precision and high-performance surface roughness tester with a dedicated control unit, achieving user-friendly display and simple operation.

FEATURES

- User-friendly display and simple operation equipped with a highly visible color 7.5-inch TFT LCD.
- Easy positioning. A joy stick built in the dedicated control unit allows easy and quick positioning. Fine positioning of a small stylus, required for measuring the inner side of a small hole, easily can be made using the manual knob.

Evaluation Capability

Cutoff length
- \( l_s: 0.25 \mu m, 0.8 \mu m, 2.5 \mu m, 8 \mu m, 25 \mu m, 250 \mu m, \) no filter
- \( l_c*: 0.025 \mu m, 0.08 \mu m, 0.25 \mu m, 0.8 \mu m, 2.5 \mu m, 8 \mu m, 25 \mu m, 250 \mu m, \) no filter
- \( \) if: 0.08 \mu m, 0.25 \mu m, 0.8 \mu m, 2.5 \mu m, 8 \mu m, 25 \mu m

Sampling length (L)*
- 0.025 \mu m, 0.08 \mu m, 0.25 \mu m, 0.8 \mu m, 2.5 \mu m, 8 \mu m, 25 \mu m, 80 \mu m (SV-2100 only)

Data compensation functions
- Parabola compensation, hyperbola compensation, ellipse compensation, R-plane (curved surface) compensation, conic compensation, tilt compensation

*Arbitrary length can be specified in the range from 0.02 \mu m to 50 \mu m.

12AAAA876: High durable printer paper (5 Rolls/set)
270732: Standard type printer paper (5pcs.)
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Model no.</th>
<th>SJ-500P</th>
<th>SJ-500</th>
<th>SV-2100M4</th>
<th>SV-2100S4</th>
<th>SV-2100H4</th>
<th>SV-2100W4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Data processing</td>
<td>PC System</td>
<td>Dedicated Data Processor</td>
<td>Dedicated Data Processor</td>
<td>Dedicated Data Processor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order No. (inch)</td>
<td>178-531-02A</td>
<td>178-533-02A</td>
<td>178-637-01A</td>
<td>178-681-01A</td>
<td>178-683-01A</td>
<td>178-685-01A</td>
</tr>
<tr>
<td>Measuring force of detector</td>
<td>4mN</td>
<td>4mN</td>
<td>0.75mN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis measuring range</td>
<td>2” (50mm)</td>
<td>4” (100mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical travel</td>
<td>Optional stand</td>
<td></td>
<td>13.8” (350mm) manual column</td>
<td>13.8” (350mm) power column</td>
<td>21.6” (550mm) power column</td>
<td></td>
</tr>
<tr>
<td>Granite base size (WxD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions of SJ-500 w/ manual column stand 178-085</td>
<td>13.7 x 10.4 x 3.4” (350 x 263 x 86mm)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Dimensions (main unit, WxDxH)</td>
<td>16.7 x 3.7 x 6.3” (425 x 94 x 160mm)</td>
<td>28.2 x 17.7 x 34” (716 x 450 x 863mm)</td>
<td>28.2 x 17.7 x 38” (716 x 450 x 966mm)</td>
<td>28.2 x 17.7 x 46” (716 x 450 x 1166mm)</td>
<td>44 x 17.7 x 46.3” (1116 x 450 x 1176mm)</td>
<td></td>
</tr>
<tr>
<td>Main unit Mass</td>
<td>5.9 lbs. (2.7 kg)</td>
<td>308.6 lbs. (140 kg)</td>
<td>308.6 lbs. (140 kg)</td>
<td>330 lbs. (150 kg)</td>
<td>485 lbs (220 kg)</td>
<td></td>
</tr>
<tr>
<td>Assessed profiles</td>
<td>Dedicated data processor type: P (primary profile), R (roughness profile), WC, envelope residual profile, roughness motif, waviness motif</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluation parameters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis graphs</td>
<td>Dedicated data processor type: ADC, BAC, power spectrum graph</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curved surface compensation</td>
<td>Dedicated data processor type: Parabolic compensation, Hyperbolic compensation, Elliptical compensation, Circular compensation, Conic compensation, Inclination (Entire, Arbitrary)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contour analysis</td>
<td>Dedicated data processor type: Area, Circle, Angle, Coordinate difference, Step, Inclination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filters</td>
<td>Dedicated data processor type: 2CR-75%, 2CRPC-75%, Gaussian, Robust-spline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SPECIFICATIONS continued**

<table>
<thead>
<tr>
<th>No.178-085</th>
<th>Does not include measuring unit</th>
<th></th>
<th>Dimensions of SJ-500 w/ manual column stand 178-085</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical adjustment range: 11.8” (300mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension (W x D x H): 23.6” x 17.7” x 28”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(600 x 450 x 710mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight: 242 lbs (110kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.178-089</td>
<td>Does not include measuring unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical adjustment range: 9.8” (250mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimension (W x D x H): 15.7 x 9.8 x 2.4”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(400 x 250 x 60mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight: 44 lbs (20kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Manual column stand options: 178-085 and 178-089 (for SJ-500)**

<table>
<thead>
<tr>
<th>No.178-085</th>
<th>Does not include measuring unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical adjustment range: 11.8” (300mm)</td>
<td></td>
</tr>
<tr>
<td>Dimension (W x D x H): 23.6” x 17.7” x 28”</td>
<td></td>
</tr>
<tr>
<td>(600 x 450 x 710mm)</td>
<td></td>
</tr>
<tr>
<td>Weight: 242 lbs (110kg)</td>
<td></td>
</tr>
</tbody>
</table>


This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this tedious operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.

<table>
<thead>
<tr>
<th>Inclination adjustment angle</th>
<th>±2°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum load</td>
<td>15.4 lbs (7kg)</td>
</tr>
<tr>
<td>Table dimensions</td>
<td>5.12 x 3.94” (130 x 100mm)</td>
</tr>
<tr>
<td>Mass</td>
<td>7.7 lbs (3.5kg)</td>
</tr>
</tbody>
</table>

**Suitable for desktop use in inspection rooms and such.**
Surftest SV-3200
SERIES 178 — Surface Roughness Testers

FEATURES

• Mitutoyo’s Surftest SV-3200 Series provides high-accuracy, high-level analysis and multi-functionality in measurement of surface roughness.

• Peripheral devices such as the auto-leveling table are available to enhance operability and to enable automatic measurement.

• FORMTRACEPAK V5, dedicated data-analyzing software, is installed. This software allows data management in a consistent format, from the work site to the laboratory.

• Ceramic, which is known for its superb anti-abrasive property, is used as the X-axis drive unit guide. No lubrication of the guide is required.

• High-accuracy glass scales are built-in on X-axis (resolution: 1.97µm (0.05µm) and ZZ-axis (column, resolution: 39.4µm (1µm)) to ensure high-accuracy positioning.

The Surftest SV-3200 Series provide high-accuracy, high-level analysis and multi-functionality in measurement of surface roughness.

The SV-3200 series manifest high-reliability especially in the horizontal roughness parameters (S, Sm), that require high-accuracy of the X-axis travel.

• When equipped with high accuracy Y-axis table and 3D surface analysis software MCubeMap, this offers CNC type capabilities usually performed on Extreme series machines.

• Various optional detector holders such as Crank Rotary type and Manual Rotary type make this versatile for many different applications.

• New optional Digital Automatic Tilt (DAT) function is best suited for workpieces that are too large for leveling tables.

Evaluation Capability: FORMTRACEPAK V5

Assessed profiles
P (primary profile), R (roughness profile), WC, WCA, WE, WEA, DIN4776 profile, envelope residual profile, roughness motif, waviness motif.

Analysis graphs
ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart.

Digital filter
2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian-50%

Cutoff length
Lc: 0.001, 0.003, 0.01, 0.03, 1, 3, 10 µin

Sampling length (Ls): 0.001, 0.003, 0.01, 0.03, 0.1, 1, 3, 10 µin

Data compensation functions
Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, quadratic curve automatic compensation, polynomial compensation, polynomial automatic compensation

*Arbitrary length can be specified in the range from 0.001 to 0.025mm to the maximum traverse length.
Optional Accessories

**178-602-1**: Reference Specimen (Supports ISO)

**178-611**: Reference Step Specimen (2µm, 10µm)

**178-612**: Reference Step Specimen (2µm, 10µm, 79µin, 394µin)

**178-610**: Step gage (1µm, 2µm, 5µm, 10µm)

**178-047**: Three-axis adjustment table (including 998291 precision V-block.)

**178-016**: Leveling table

**178-042-1**: Digmatic XY leveling table (25 x 25mm)

**178-052-1**: Digmatic XY leveling table (1 x 1"

**178-043-1**: XY leveling table (25 x 25mm)

**178-053-1**: XY leveling table (1 x 1"

**178-019**: Precision vise*

**998291**: Precision V-block*

**181-302-10**: V-block set with clamp (Max. workpiece dia.: 25mm)

**181-901-10**: V-block set with clamp (Max. workpiece dia.: 1"

(See page J-22/23.) Detectors, styli, and nosepieces

*Use with an XY leveling table

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**Optional Accessories**

A wide range of peripherals are available to support various challenging measurement needs.

- **Y-axis Table** 178-097 for multiple workpiece measurement
- **3D-Auto Leveling Table** 178-077
- **Digital Advanced Tilting Unit** 178-040

*Contact Sales Rep for details. Recommend to be installed in manufacturer’s facility.

(See page J-25 for more accessories.)
FEATURES

• High-accuracy CNC surface roughness measuring instrument allows surface roughness measurement in both axes.
• Each axes has the maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
• For models with the α-axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-titling the drive unit.
• For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.

• Using optional rotary table Ø1 and Ø2 designed to use with the CNC models enables it to expand the CNC measurement application range.
• Inclined plane measurements is possible through 2-axis simultaneous control in the X- and Y-axis directions.
• Since the detector unit incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or fixture.
• Supplied with an easy-to-operate Remote Box. The user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
• Communication with the data processing/analysis section is via USB.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>SV-3000CNC</th>
<th>SV-3000CNC</th>
<th>SV-3000CNC</th>
<th>SV-3000CNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>178-521-1</td>
<td>178-541-1</td>
<td>178-522-1</td>
<td>178-542-1</td>
</tr>
<tr>
<td>X1-axis measuring range</td>
<td>8&quot; (200mm)</td>
<td>8&quot; (200mm)</td>
<td>8&quot; (200mm)</td>
<td>8&quot; (200mm)</td>
</tr>
<tr>
<td>Z2-axis vertical travel</td>
<td>12&quot; (300mm)</td>
<td>20&quot; (500mm)</td>
<td>12&quot; (300mm)</td>
<td>20&quot; (500mm)</td>
</tr>
<tr>
<td>Y-axis table unit</td>
<td>—</td>
<td>—</td>
<td>Installed</td>
<td>Installed</td>
</tr>
<tr>
<td>α-axis unit</td>
<td>—</td>
<td>—</td>
<td>Installed</td>
<td>Installed</td>
</tr>
</tbody>
</table>

Technical Data: SV-3000CNC

X1-axis
- Measuring range: 8" (200mm)
- Resolution: 1.9µm (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 0.078"/s (200nm/s, max., CNC)
- Measuring speed: 0.078"/s (200nm/s, max., CNC)
- Traversing direction: Backward
- Traverse linearity: 20µm/180° (0.5µm/200mm)
- Mass: 178 lbs (80kg)

Y-axis table unit
- Measuring range: 8" (200mm)
- Resolution: 1.9µm (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 0.078"/s (200nm/s, max., CNC)
- Measuring speed: 0.078"/s (200nm/s, max., CNC)
- Traversing direction: Backward
- Traverse linearity: 20µm/180° (0.5µm/200mm)
- Mass: 178 lbs (80kg)

Optional Accessories

- Vibration isolation stand
- Vibration isolation mechanism: Diaphragm air spring
- Natural frequency: 2.5 - 5Hz
- Damping mechanism: Orifice
- Leveling mechanism: Automatic control with mechanical valves
- Air supply pressure: 0.14MPa
- Allowable loading capacity: 772 lbs (350kg)
- Dimensions (W x D x H): 39.4 x 35.2 x 28.1" (1000 x 895 x 715mm)
- Mass: 617 lbs (280kg)
Technical Data: SV-M3000CNC

X1-axis
- Measuring range: 8" (200mm)
- Resolution: 1.97µin (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 7.87"/s (200mm/s) (max., CNC)
- Measuring speed: 0.0076" - 0.08"/s (0.2 - 2mm/s)
- Traverse linearity: 20µin/8" (0.5µm/200mm)
- Resolution: 1.97µin (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 7.87"/s (200mm/s) (max., CNC)
- Measuring speed: 0 - 1.97"/s (0 - 50mm/s) (joystick)
- Traverse linearity: 28µin/8" (0.7µm/200mm)

α-axis
- Inclination angle: -45° to +10°
- Resolution: 0.000225°
- Rotating speed: 1rpm

Z2-axis (column)
- Vertical travel: 20" (500mm)
- Resolution: 1.97µin (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 7.87"/s (200mm/s) (max., CNC)
- Measuring speed: 0 - 1.97"/s (0 - 50mm/s) (joystick)

Y-axis
- Measuring range: 32" (800mm)
- Resolution: 1.97µin (0.05µm)
- Measurement method: Reflective-type linear encoder
- Drive speed: 7.87"/s (200mm/s) (max., CNC)
- Measuring speed: 0.0076" - 0.08"/s (0.2 - 2mm/s)
- Traverse linearity: 20µin/2" (0.5µm/50mm), 80µin/32" (2µm/800mm), 28µin/2" (0.7µm/50mm), 120µin/32" (3µm/800mm)

FEATURES
- CNC Surface Roughness Tester covers measurement of large/heavy workpieces such as engine blocks, crankshafts, etc.
- In combination with the surface roughness detector rotating unit, S-3000AR (optional), it can perform continuous measurement over the bottom, top and side surfaces of a workpiece.
- Compatible with the optional large table for supporting a load of 220 lbs (100 kg) or a large Ø2 table. Enables continuous automatic measurement of large-size workpieces.
- Suitable for automatic surface roughness measurement on large and heavy workpieces.
- Employs the column-moving type configuration that is not restricted by workpiece size. This is advantageous for measuring heavy workpieces, such as engine blocks, crankshafts, etc.
- Provides 31.5" (800mm) of Y-axis stroke. This makes it possible to measure multiple profiles on large workpieces.
- Load table has a self-contained structure to ensure that various size workpieces, jigs, auto-feed devices, etc., are easily accommodated and can be specified, if required, by special order.

SPECIFICATIONS

- Model No.: SV-M3000CNC
- Order No. (100V - 120V): 17B-549-1
- X1-axis: 8" (200mm)
- Z2-axis: 20" (500mm)
- Y-axis: 32" (800mm)
- α-axis: -45° (CCW), +10° (CW)

Software
FORMTRACEPAK V5
Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, analysis results can be saved in the "html", "mhtml" or pdf format which allows Internet Explorer or MS-Word compatibility, allowing PC without layout editing programs to view analysis results.

SV-M3000CNC with personal computer system and software
* PC stand not included