

Mitutoyo



MEASURING INSTRUMENTS CATALOG



Surftest

Performs brilliantly in many situations such as in the quality control room, on the factory floor and on the production line.

Surftest SJ-210 SERIES 178 — On-site Surface Roughness Tester

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo



Compact type all-in-one surface roughness tester has evolved by meeting customer demands

- The color LCD can display not only calculation results and measurement conditions, but also surface roughness waveforms. In addition, bigger character size contributes to visibility.
- Built-in rechargeable battery allows measurement without a mains power supply connection.

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SPECIFICATIONS

Model No.		Standard drive unit		Retractable drive unit		Transverse tracing drive unit	
		SJ-210 (0.75 mN type)	SJ-210 (4 mN type)	SJ-210 (0.75 mN type)	SJ-210 (4 mN type)	SJ-210 (0.75 mN type)	SJ-210 (4 mN type)
Order No.	mm	178-560-11	178-560-12	178-562-11	178-562-12	178-564-11	178-564-12
	inch/mm	178-561-11	178-561-12	178-563-11	178-563-12	178-565-11	178-565-12
Measuring range	X axis	16.0 mm				5.6 mm	
	Detector	360 μm (-200 μm to +160 μm)					
	Range/Resolution	360 μm/0.02 μm, 100 μm/0.006 μm, 25 μm/0.002 μm					
Measuring force/Stylus tip shape		Depends on the Order No.: 0.75 mN/2 μmR 60° (when the Order No. ends with "-11") 4 mN/5 μmR 90° (when the Order No. ends with "-12")					
Applicable standards		JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA					
Assessed profile		Primary profile, Roughness profile, DF profile, Roughness motif profile					

Surftest SJ-310 SERIES 178 — On-site Surface Roughness Tester

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo



Advanced handheld tester that is easy to operate and meets a variety of needs

- Equipped with a large, touch-screen color graphic LCD for intuitive operation and excellent ease of use.
- Equipped with a high-speed thermal printer (approx. 1.5 times faster than conventional models) as standard, allows for printing of BAC and ADC curves in addition to calculation results (including pass/fail judgments) and assessment profiles. The printer can also print horizontally to match the content displayed on the LCD, and has an easy-to-understand layout.

SPECIFICATIONS

Model No.		Standard drive unit		Retractable drive unit		Transverse tracing drive unit	
		SJ-310 (0.75 mN type)	SJ-310 (4 mN type)	SJ-310 (0.75 mN type)	SJ-310 (4 mN type)	SJ-310 (0.75 mN type)	SJ-310 (4 mN type)
Order No.	mm	178-570-11	178-570-12	178-572-11	178-572-12	178-574-11	178-574-12
	inch/mm	178-571-11	178-571-12	178-573-11	178-573-12	178-575-11	178-575-12
Measuring range	X axis	16.0 mm				5.6 mm	
	Detector	360 µm (-200 µm to +160 µm)					
Measuring force/Stylus tip shape	Range	360 µm/0.02 µm, 100 µm/0.006 µm, 25 µm/0.002 µm					
	Range/Resolution	360 µm/0.02 µm, 100 µm/0.006 µm, 25 µm/0.002 µm					
Measuring force/Stylus tip shape		Depends on the Order No.: 0.75 mN/2 µmR 60° (when the Order No. ends with "-11") 4 mN/5 µmR 90° (when the Order No. ends with "-12")					
Applicable standards		JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA					
Assessed profile		Primary profile, Roughness profile, DF profile, Roughness motif profile, Waviness motif profile					

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Optional Accessories for Surftest SJ-210/310

Unit: mm

• Standard detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-296	0.75 mN	2 $\mu\text{mR}/60^\circ$	Dedicated to the standard/retractable drive unit
178-390	4 mN	5 $\mu\text{mR}/90^\circ$	
178-387	0.75 mN	2 $\mu\text{mR}/60^\circ$	Dedicated to the transverse tracing drive unit
178-386	4 mN	5 $\mu\text{mR}/90^\circ$	
178-391	4 mN	10 $\mu\text{mR}/90^\circ$	Dedicated to the standard/retractable drive unit

* Tip radius / Tip angles

• Gear-tooth surface detectors

Order No.	Measuring force	Stylus profiles*
178-388	0.75 mN	2 $\mu\text{mR}/60^\circ$
178-398	4 mN	5 $\mu\text{mR}/90^\circ$

* Tip radius / Tip angles

Detector

• Small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-383	0.75 mN	2 $\mu\text{mR}/60^\circ$	Minimum measurable hole diameter: $\phi 4.5\text{ mm}$
178-392	4 mN	5 $\mu\text{mR}/90^\circ$	

* Tip radius / Tip angles

• Extra small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-384	0.75 mN	2 $\mu\text{mR}/60^\circ$	Minimum measurable hole diameter: $\phi 2.8\text{ mm}$
178-393	4 mN	5 $\mu\text{mR}/90^\circ$	

* Tip radius / Tip angles

• Deep groove detectors

Order No.	Measuring force	Stylus profiles*	Remarks
178-385	0.75 mN	2 $\mu\text{mR}/60^\circ$	Not available for the transverse tracing drive unit
178-394	4 mN	5 $\mu\text{mR}/90^\circ$	

* Tip radius / Tip angles

Optional Accessories for Drive Units

• Nosepiece for flat surfaces

Nosepiece for flat surfaces 12AAA217	12AAA217 • Standard accessory for the standard/retractable drive unit of the SJ-310 Series • Not available for the transverse tracing drive unit
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• Nosepiece for cylindrical surfaces

Nosepiece for cylindrical surfaces 12AAA218	12AAA218 • Standard accessory for the standard/retractable drive unit of the SJ-310 Series • Not available for the transverse tracing drive unit
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• V-type adapter

12AAE644 • Transverse tracing type standard accessory. • Dedicated to the transverse tracing drive unit.

• Point-contact adapter

12AAE643 • Transverse tracing type standard accessory. • Dedicated to the transverse tracing drive unit.

• Extension rod (50 mm) (Note: Only one rod can be used.)

12AAA210 • Not available for the transverse tracing drive unit	12AAA210 • Not applicable to upward measurement.
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• Extension cable (1 m) (Note: Only one rod can be used.)

12BAA303 • For the connection between the calculation display unit and drive unit

• Adapter for flat surface

12AAA219 • Not available for the transverse tracing drive unit	12AAA219 • Adapter for flat surface
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• Support feet set

Support feet set 12AAA216	12AAA216 • Standard accessory for the standard/retractable drive unit of the SJ-310 Series • Not available for the transverse tracing drive unit • Adjustment range is 28 mm from bottom face.
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• Magnetic stand adapter

12AAA221 Mounting spigot diameter is 8 mm.	12AAA220 Mounting spigot diameter is 9.5 mm.
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• Height gage adapter

Note: Suitable for a height gage holder designed for 9x9 mm section scribes.	12AAA222 Height gage adapter
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Surftest SJ-410 SERIES 178 — Compact Surface Roughness Tester



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Data Management Software by Mitutoyo

SPECIFICATIONS

Model No.		SJ-411		SJ-412	
Order No.	mm inch/mm	178-580-11 178-581-11	178-580-12 178-581-12	178-582-11 178-583-11	178-582-12 178-583-12
Measuring range	X axis Z axis (detector)	25 mm 800 μm, 80 μm, 8 μm		50 mm Up to 2,400 μm when using an optional stylus.	
Detector	Detection method	Differential inductance			
	Resolution	0.01 μm (800 μm range), 0.001 μm (80 μm range), 0.0001 μm (8 μm range)			
	Stylus tip shape (Angle/Radius)	60°/2 μm	90°/5 μm	60°/2 μm	90°/5 μm
	Measuring force	0.75 mN	4 mN	0.75 mN	4 mN
	Radius of skid curvature	40 mm			
Drive unit (X axis)	Measuring methods	Skidless/Skidded (switchable)			
	Measuring speed	0.05, 0.1, 0.2, 0.5, 1.0 mm/s			
	Drive speed	0.5, 1, 2, 5 mm/s			
Up/down inclination unit	Straightness	0.3 μm/25 mm		0.5 μm/50 mm	
	Vertical travel Inclination adjustment angle	10 mm ±1.5°			
Applicable standards		JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA			
Parameter		Ra, Rq, Rz, Ry, Rp, Rt, R3z, Rsk, Rku, Rc, R _{PC} , R _{SM} , R _{max} *1, Rz1 _{max} *2, S, HSC, RzJIS*3, R _{ppi} , RΔa, RΔq, R _{lr} , R _{mr} , R _{mr} (c), Rσc, Rk, R _{pk} , R _{vk} , Mr1, Mr2, A1, A2, Vo, λa, λq, Lo, R _{pm} , tp*4, Htp*4, R, Rx, AR, W, AW, Wx, Wte Customizable			
Filtered profile		Primary profile, Roughness profile, DF profile, Waviness profile, Roughness motif profile, Waviness motif profile			
Analysis graph		Material ratio curve, Profile height amplitude distribution curve			
Data compensation functions		Parabola, Hyperbola, Ellipse, Circle, Tilt, No compensation			
Filter		2CR, PC75, Gaussian			
Cutoff value		λ _c λ _s *5 0.08, 0.25, 0.8, 2.5, 8 mm 2.5, 8, 25 μm			
Sampling length		0.08, 0.25, 0.8, 2.5, 8, 25 mm			
Number of intervals		x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16, x17, x18, x19, x20			
Arbitrary length		0.1 to 25 mm		0.1 to 50 mm	
Calculation display unit	Customization	Selection of display/evaluation roughness parameter			
	Simplified contour analysis function	Step, Step quantity, Area, Coordinate difference			
	DAT (Digimatic Adjustment Table) function	Helps to level workpiece prior to skidless measurement			
	Real sampling function	Inputs the displacement of the detector while stopping the drive unit			
	statistical processing	Calculates the maximum value, minimum value, average value, standard deviation, pass rate and histogram for each parameter.			
	Judgment*6	Maximum value rule, 16 % rule, mean value rule, standard deviation (1σ, 2σ, 3σ)			
	Storing measurement condition	Max. 10 (calculation display unit)			
	Print function (Built-in thermal printer)	Measurement condition/Calculation result/Judgment result/Calculation result per segment/Tolerance value/Evaluation curve/Graphic curve/Material ratio curve/Profile height amplitude distribution curve/Environmental setting items/Statistical result (Histogram)			
	Display language	16 languages (Japanese, English, German, French, Italian, Spanish, Portuguese, Korean, Chinese (simplified/traditional), Czech, Polish, Hungarian, Turkish, Swedish, Dutch)			
	Storage function	Built-in memory: Measurement condition (Up to 10) Memory card (optional): 500 measurement conditions, 10000 measured profiles, 500 display images, 10000 text files, 500 statistical data, 1 backup file of device setting data, 10 data of Trace 10			
External I/O functions		USB I/F, Digimatic output, RS-232C I/F, Foot switch I/F			
Power supply	Battery	Built-in battery (rechargeable Ni-MH battery)/AC adapter			
	Charging time/Endurance	Charging time of the built-in battery: about 4 hours (may vary due to ambient temperature) Endurance: about 1000 measurements (differs slightly due to use conditions/environment)			
External dimensions (WxDxH)	Max. power consumption	50 W			
	Calculation display unit	275x198x109 mm			
	Up/down inclination unit	130.9x63x99 mm			
Mass	Drive unit	128x35.8x46.6 mm		154.5x35.8x46.6 mm	
	Calculation display unit	1.7 kg			
	Up/down inclination unit	0.4 kg			
Standard Accessories	Drive unit	0.6 kg		0.64 kg	
	Detector*7/Standard stylus*8				
	178-601	Roughness specimen (Ra3 μm)		AC adapter, Power cable, Flat-blade screwdriver, Phillips screwdriver, Hex wrench, Strap for the touch pen, Operation manual, One-sheet manual, Warranty card	
	270732	Receipt paper (Standard type: 5-roll set)			
	12BAL402	Protective sheet for the LCD (x1 sheet)			
	12BAR507	Touch pen			
	12AAN041	Carrying case			

*1 Calculation is available only when selecting the VDA, ANSI, or JIS 1982 standards.

*2 Calculation is available only when selecting the ISO 1997 standard. *3 Calculation is available only when selecting the JIS 2001 standard.

*4 Calculation is available only when selecting the ANSI standard. *5 Not available when selecting the JIS 1982 standard.

*6 Only the mean value rule is available for the ANSI standard. 16 % rule is not available when selecting the VDA standard.

*7 Depending on the Order No. of the SJ-410 Series main unit, 178-396 or 178-397 is provided as standard.

*8 Standard stylus (12AAC731 or 12AAB403) supporting the provided detector is provided as standard.

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLin



An inspection certificate is supplied as standard.

Dramatic improvement on compact type surface roughness testers

- Equipped with a large, touch-screen color graphic LCD to achieve both intuitive operation and high operability.
- Skidded and skidless measurement are switchable to perform optimum evaluation according to the measurement setup.
- A wide-range, high-resolution detector and a very accurate drive unit provide superior high-accuracy measurement in its class.

• Detector

Measuring range: 800 µm

Resolution: 0.0001 µm (when the measuring range is 8 µm)

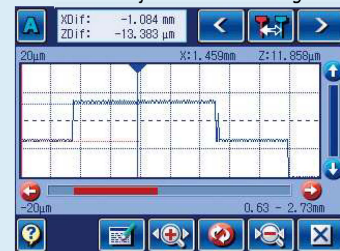
• Drive unit

Straightness/Drive length: 0.3 µm/25 mm (SJ-411)

Straightness/Drive length: 0.5 µm/50 mm (SJ-412)

- Simplified contour analysis (Step, Step quantity, Area, Coordinate difference) is available using the point cloud data collected to evaluate the surface roughness.

Allows the evaluation of detailed shapes that cannot be achieved by contour measuring instruments.



- Allows the evaluation of surface roughness in a circumferential direction using the skidless measurement and R-surface compensation functions.
- Conforms to the latest ISO standard and ANSI/VDA standard in addition to the JIS standard (2001/1994/1982).
- Achieves the performance of a desktop type surface roughness tester in combination with the simplified stand and associated optional accessories.

Optional Accessories for SJ-410 Consumables

- Receipt paper Standard type (5-roll set) **270732**
- Receipt paper High-durability paper (5-roll set) **12AAA876**
- Protective sheet for the touch panel (x10 sheets) **12AAN040**
- Memory card (2 GB) **12AAW452**

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An inspection certificate is supplied as standard.

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

- Equipped with a 7.5-inch, color TFT LCD, color icons and touch panel controls, the display unit is easy to read and simple to operate.
- A built-in joystick on the control unit allows quick and easy positioning. The manual adjustment knob allows fine positioning of a small stylus for measuring small holes.
- In addition to the roughness parameters compliant with ISO/JIS/ANSI/VDA surface roughness standards, contour analysis is also available.

SPECIFICATIONS

Model No.	SJ-500		SV-2100M4*1	SV-2100S4*1	SV-2100H4*1	SV-2100W4*1
Stand type	(Optional)*2		Manual stand	Motorized stand		
Measuring range	Z1 axis (detector)	800 μm, 80 μm, 8 μm				
	X axis	50 mm	100 mm			
	X axis	0.05 μm				
Resolution	Z1 axis (detector)	0.01 μm (800 μm), 0.001 μm (80 μm), 0.0001 μm (8 μm)				
	Z2 axis (column)	—	—	1 μm		
	Assessed profile	Primary profile, Roughness profile, Waviness profile, DF profile, Roughness motif profile, Waviness motif profile				

*1 While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

*2 Stand for **SJ-500** is optional.

Surftest SJ-500/SV-2100 SERIES 178 — Dedicated Control Unit Type Surface Roughness Tester

MeasurLink ENABLED
Data Management Software by Mitutoyo



A superior data processing tester with PC data analysis for higher efficiency.

Surftest SJ-500P/SV-2100M4 Data Processing Unit (PC) Surface Roughness Testers

MeasurLink ENABLED
Data Management Software by Mitutoyo



FORMTRACEPAK: Best-selling Surface Roughness Analysis Program

Best-selling dedicated software for surface roughness measurement and analysis. Features a flexible printer format and creation of an original inspection certificate.

SPECIFICATIONS

Type of data processing unit	PC type	
Model No.	SJ-500P	SV-2100M4*2
Elevating shaft mechanism of stand	—*1	Manual operation only
Measuring range	X axis	100 mm
	Z1 axis (detector)	800 µm, 80 µm, 8 µm
Z2-axis (column) travel range	—	350 mm
	X axis	0.05 µm
Resolution	Z1 axis (detector)	0.01 µm (800 µm), 0.001 µm (80 µm), 0.0001 µm (8 µm)
	Z2 axis (column)	—
Applicable standards	JIS 1982/JIS 1994/JIS 2001/ISO 1997/ANSI/VDA	
Assessed profile	Primary profile, Roughness profile, Waviness profile, Filtered waviness profile, Rolling circle waviness profile, Rolling circle center line waviness profile, Envelope residual profile, DIN4776 profile, Roughness motif profile, Waviness motif profile	

*1 The simplified stand or manual column stand is available as an optional accessory.

*2 While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

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Performs brilliantly in many situations such as in the quality control room, on the factory floor and on the production line.

Surftest Extreme SV-3000CNC/SV-M3000CNC SERIES 178 — CNC Surface Roughness Testers

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

MeasurLink[®] ENABLED
Data Management Software by Mitutoyo

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink.



An inspection certificate is supplied as standard.



SV-3000CNC
(Inclinable drive unit + Y-axis table)



SV-M3000CNC
(Surface Roughness Tester with built-in Y axis.)
(The photo represents a special specification model.)

SV-3000CNC SPECIFICATIONS

Model No.	SV-3000CNC	
X1 axis (drive unit)	Measuring range	200 mm
	Resolution	0.05 μ m
	Scale type	Reflective-type linear encoder
	Drive speed	CNC mode Joystick mode
	Measuring speed	Max. 200 mm/s 0 to 50 mm/s
	Measuring direction	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 mm/s Backward
	Straightness	0.5 μ m/200 mm
Y axis (table)	Measuring range	200 mm
	Resolution	0.05 μ m
	Drive speed	CNC mode Joystick mode
	Maximum table loading	Max. 200 mm/s 0 to 50 mm/s 20 kg
Z2 axis (column)	Travel range	Z2 axis (column, type S) 300 mm Z2 axis (column, type H) 500 mm
	Resolution	0.05 μ m
	Scale type	Reflective-type linear encoder
	Drive speed	CNC mode Joystick mode
	Measuring speed	Max. 200 mm/s 0 to 50 mm/s
Base unit	Base size (widthxdepth)	750x600 mm
	Base material	Granite

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

SV-M3000CNC SPECIFICATIONS

Model No.	SV-M3000CNC	
X1 axis (drive unit)	Measuring range	200 mm
	Resolution	0.05 μ m
	Scale type	Reflective-type linear encoder
	Drive speed	CNC mode Joystick mode
	Measuring speed	Max. 200 mm/s 0 to 50 mm/s
	Straightness	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 mm/s 0.5 μ m/200 mm
	When using a standard detector	
Z2 axis (column)	Measuring range	500 mm
	Resolution	0.05 μ m
	Scale type	Reflective-type linear encoder
	Drive speed	CNC mode Joystick mode
	Measuring speed	Max. 200 mm/s 0 to 50 mm/s
Y axis	Measuring range	800 mm
	Resolution	0.05 μ m
	Scale type	Reflective-type linear encoder
	Drive speed	CNC mode Joystick mode
	Measuring speed	Max. 200 mm/s 0 to 50 mm/s 0.02 to 2 mm/s
	Straightness	When using a standard detector holder
		Narrow range 0.5 μ m/50 mm Wide range 2 μ m/800 mm
Base unit	Base size (widthxdepth)	600x1500 mm
	Base material	Steel
	Maximum table loading	300 kg

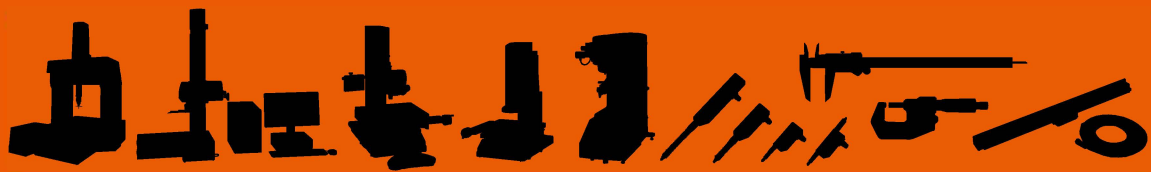
- The X1, Y and Z2 axes have a maximum drive speed of 200 mm/s. This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- Capable of inclined plane measurement through 2 axis simultaneous control in X and Y.
- Models equipped with the α axis allow continuous measurement on horizontal and inclined surfaces by power-tilting the X1 axis.
- It is possible to expand the measuring range for multiple workpieces through positioning in Y.
- All connecting cables are contained within the measuring instrument to eliminate any inconvenience during measurement.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop if it touches a workpiece or fixture.
- Surftest Extreme **SV-M3000CNC** (CNC Surface Roughness Tester with a movable Y-axis table) that handles measurement of large/heavy workpieces, such as engine blocks or crankshafts, is also available.
- Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.

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Refer to the CNC Form Measuring Instrument Series Brochure (E15021) for more details.

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