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Motorized Low Force High Precision Gauges LITEMATIC
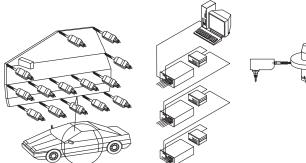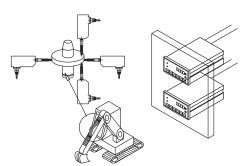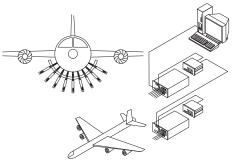**Page 378**

Linear Gauge Application Examples
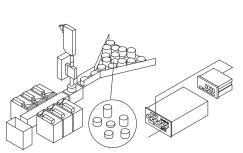
Linear Gage Applications
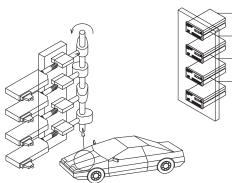

Multi-point measurement on car doors

Dimensional measurement of fluid flywheels
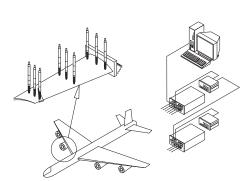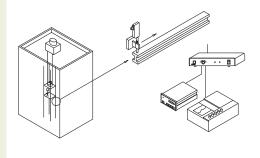

Measurement of aeroplane body deformation
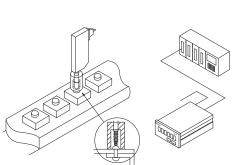

Sorting of parts according to size

Cam measurement

Multi-point measurement on turbine blades

Measurement of deflection of lift guiding rails

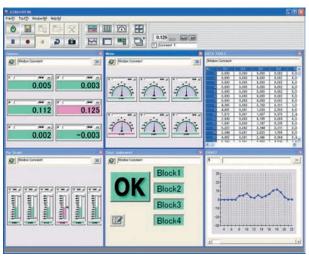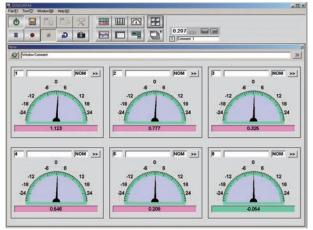
Rivet head testing

Mitutoyo

SENSORPAK

The SENSORPAK supports the development of measuring facilities and measuring stations. It offers you the following benefits:

- It can simultaneously display measurement values from up to 60 sensors in real time.
- You can make calculations using measurement values from up to 30 sensors in real time.
- It enables a huge range of different graphical presentations of using measurement, such as number representation, pointer representation, scale representation.
- Data registration can be made in control cards or data tables.
- You can also carry out further data processing with external software, such as Microsoft® Excel® or MeasurLink.

Measurement screen

Meter screen

Specifications

OS compatibility	Windows® 7 (32/64 bit) Windows® 8. 1 (32/64 bit) Excel® 2007, 2010, 2013
Delivered	License Key, Software CD

Optional accessories

No.	Description
12AAA807D	Cable RS-232C 2m

Model	SENSORPAK
No.	**02NGB072**
Output function	Direct output to Microsoft® Excel® spreadsheet, CSV file output (compatible with MeasurLink)
Total tolerance judgement	GO/NG judgement (by specifying gauges to be used for total tolerance judgement) GO/NG signal output with optional I/O cable
Input function	Trigger function : by means of keys timer or external TRG (with optional I/O cable) Data input frequency : Max. 9999 times (with 60 gages connected) to 60000 times (with 6 gages connected)
Applicable counter	Counters with RS-232C interface (EH and EV), with USB interface (EH)
Display	Display type : Counter, bar graph, meter, chart (capable of simultaneous display) Tolerance judgement result : Color display (green/red) Connectable gauges : Max. 60 gages

ABSOLUTE Digimatic Linear Gauge LGS Series

Series 575

The LGS is a compact ABS linear gauge that offers you the following benefits:
• Its ABSOLUTE Digimatic data output and IP-66 protection class give you best-of-breed technology.

ABSOLUTE®
IP 66

Specifications

Digital step	0,01 mm
Scale	Electrostatic capacitance-type ABSOLUTE linear encoder
Max. response speed	Unlimited (measuring by scanning cannot be performed)
Contact point	Ø3 mm carbide ball thread : M 2,5 x 0,45 mm
Cable length	2 m
Output signal	Digimatic
Environmental conditions	0 °C to 40 °C (20 % to 80 % rel. humidity, no condensation)
Bearing type	Slide bearing

Optional accessories

No.	Description
02ADF640	Extension Adaptor, for SPC Cables.
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
903594	Air Driving Device, for Indicator
542-007D	Display Unit EC-Counter, CEE, for Digimatic Gauges
542-016	Linear Gauge Counter EG, for Linear Gauge LGS, LGD, Scale Units
542-093-2	Linear Gauge Counter EB, for LGS, LGD, Scale Units
542-072D	Linear Gauge Counter EH, for LGS, LGD, Scale Units
542-064	Linear Gauge Counter EV-D, for LGS, LGD, Scale Units
63AAA033	Digimatic Interface DMX-8/2, 8x Digimatic Input, Serial D-SUB 9 Conne
63AAA026	Digimatic Interface DMX-16, 16x Digimatic Input, Serial D-SUB 9 Connector
63AAA106	Digimatic Interface DMX-16C, 16x Digimatic Input, Serial D-SUB 9 Connector

Consumable spares

No.	Description
238774	Silicon rubber boot for ID-C, ID-N, ID-S

575-303

Metric

No.	Range [mm]	Accuracy	Measuring force *1	Stem Ø	Direction of counting	Mass [g]
575-303	0-12,7	15 µm	2 N/1,8 N/1,6 N	8 mm	positive	190

*1 Spindle DOWN/Horizontal/UP

Air Drive Unit

• Provides smooth lifting and lowering of the contact point of a gauge by pneumatic cylinder.
• The speed of lift can be regulated by the throttle on the remote cylinder.

No.	Range [mm]	Remarks	Suitable for gage model	Air supply [MPa]	Mass [g]
903594	10	Need air filter, regulator and lubricator	LGS	0,5	60

Specifications

Throttle	Interior Ø 2,5 mm Exterior Ø 3,2 mm

Optional accessories

No.	Description
903594	Air Driving Device, for Indicator

Refer to the Linear Gauge documentation for more details

903594

Mitutoyo

ABSOLUTE Digimatic Linear Gauge LGD Series

Series 575

- Suitable for installation in machines, measuring devices and multi-position measurements.
- You can output data in Digimatic format, so you can document and determine measurement values via connected Digimatic data processing units and interface.

ABSOLUTE®
IP66

575-326

Metric

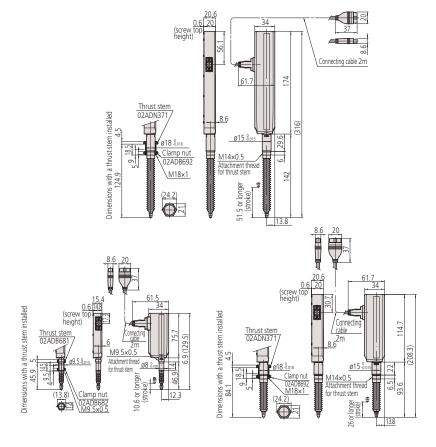| No.	Range [mm]	Accuracy	Measuring force *1	Stem Ø	Cable length [m]	Mass [g]
575-326	0-10	20 µm	1,2 N/1,1 N/1 N	8 mm	2	260
575-326-5	0-10	20 µm	1,2 N/1,1 N/1 N	8 mm	5	360
575-327	0-25	20 µm	4,6 N/4,3 N/4 N	15 mm	2	300
575-327-5	0-25	20 µm	4,6 N/4,3 N/4 N	15 mm	5	400
575-328	0-50	30 µm	5,7 N/5,3 N/4,9 N	15 mm	2	400
575-328-5	0-50	30 µm	5,7 N/5,3 N/4,9 N	15 mm	5	500

*1 Spindle DOWN/Horizontal/UP

Specifications

Digital step	0,01 mm
Scale	Electrostatic capacitance-type ABSOLUTE linear encoder
Max. response speed	Unlimited (measurement by scanning cannot be performed)
Contact point	Ø3 mm carbide ball, thread: M 2,5 x 0,45
Output signal	Digimatic
Environmental conditions	0 °C to 40 °C (20 % to 80 % rel. humidity, no condensation)
External input	Origin-setting signal
Bearing type	Linear ball bearing

Standard accessories

No.	Description
538610	Wrench Key/542
04GAA857	Spanner/368

Optional accessories

No.	Description
02ADF640	Extension Adaptor, for SPC Cables.
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
02ADB680	Thrust Stem (LGF 10mm)
02ADN370	THRUST STEM SET
02ADE230	Air Drive Unit for Linear Gauges, 10 mm
02ADE250	Air Drive Unit for Linear Gauges, 25 mm
02ADE270	Air Drive Unit for Linear Gauges, 50 mm
542-007D	Display Unit EC-Counter, CEE, for Digimatic Gauges
542-016	Linear Gauge Counter EG, for Linear Gauge LGS, LGD, Scale Units
542-093-2	Linear Gauge Counter EB, for LGS, LGD, Scale Units
542-072D	Linear Gauge Counter EH, for LGS, LGD, Scale Units
542-064	Linear Gauge Counter EV-D, for LGS, LGD, Scale Units
63AAA033	Digimatic Interface DMX-8/2, 8x Digimatic Input, Serial D-SUB 9 Conne
63AAA026	Digimatic Interface DMX-16, 16x Digimatic Input, Serial D-SUB 9 Connector
63AAA106	Digimatic Interface DMX-16C, 16x Digimatic Input, Serial D-SUB 9 Connector

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238772	Rubber Cap, 542-222/601/604,575-324
962504	Stem Guard 25mm/542
962505	Rubber Cap Assy/542, 50mm type for LGE-1050L

02ADF640

Refer to the Linear Gauge documentation for more details

Mitutoyo

Standard Linear Gauge LGF Series

Series 542

This is very robust and economical linear gauge that offers you the following benefits:

- The advanced construction of the plunger guidance assembly makes it very resistant to external shocks and vibration.
- Its differential square-wave signal output allows you to use it for a wide range of applications.
- It is very long lasting due to linear ball-bearings in the spindle unit.

IP66

542-161

Specifications

| Scale	Photoelectric linear encoder
Contact point	Ø3 mm carbide ball, thread: M 2,5 x 0,45
Cable length	2 m
Power supply	5 V (4,8 V to 5,2 V), 120 mA max.
Output signal	90° phase difference, differential square wave (RS-422A equivalent), minimum edge distance 1000 ns (5 µm type), 500 ns (1 µm type), 250 ns (0.5 µm type), 200 ns (0.1 µm type)
Environmental conditions	0 °C to 40 °C (20 % to 80 % rel. humidity, no condensation)
Bearing type	Linear ball bearing

Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories
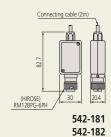
No.	Description
902432	Extension Cable 20m
902433	Extension Cable 10m
902434	Extension Cable 5 m, for Linear Gauge
02ADB680	Thrust Stem (LGF 10mm)
02ADN370	THRUST STEM SET
02ADE230	Air Drive Unit for Linear Gauges, 10 mm
02ADE250	Air Drive Unit for Linear Gauges, 25 mm
02ADE270	Air Drive Unit for Linear Gauges, 50 mm
542-015	Linear Gauge Counter EG, for Linear Gauge LGF, LGK, LGB,LGM, LGH
542-092-2	Linear Gauge Counter EB, for LGF, LGK, LGB, LG, LGM, LGH
542-075D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-071D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-063	Linear Gauge Counter EV, for LGF, LGK, LGB, LG, LGM, LGH

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238772	Rubber Cap, 542-222/601/604,575-324
962504	Stem Guard 25mm/542
962505	Rubber Cap Assy/542, 50mm type for LGE-1050L

No.	Range [mm]	Accuracy	Measuring force *1	Resolution [mm]	Stem Ø	Max. response speed	Signal pitch [µm]	Mass [g]
542-612	0-25	(7,5 + L/50) µm/s	4,6/4,3/4 N	0,005	15 mm	1500 mm/s	20	300
542-613	0-50	(7,5 + L/50) µm/s	5,7/5,3/4,9 N	0,005	15 mm	1500 mm/s	20	400
542-161	0-10	(1,5 + L/50) µm/s	1,2/1,1/1 N	0,001	8 mm	1500 mm/s	4	260
542-162	0-25	(1,5 + L/50) µm/s	4,6/4,3/4 N	0,001	15 mm	1500 mm/s	4	300
542-163	0-50	(1,5 + L/50) µm/s	5,7/5,3/4,9 N	0,001	15 mm	1500 mm/s	4	400
542-171	0-10	(1,5 + L/50) µm/s	1,2/1,1/1 N	0,0005	8 mm	1500 mm/s	2	260
542-172	0-25	(1,5 + L/50) µm/s	4,6/4,3/4 N	0,0005	15 mm	1500 mm/s	2	300
542-173	0-50	(1,5 + L/50) µm/s	5,7/5,3/4,9 N	0,0005	15 mm	1500 mm/s	2	400
542-181	0-10	(0,8 + L/50) µm/s	1,2/1,1/1 N	0,0001	8 mm	400 mm/s	0,4	310
542-182	0-25	(0,8 + L/50) µm/s	4,6/4,3/4 N	0,0001	15 mm	400 mm/s	0,4	350

*1 Spindle DOWN/Horizontal/UP

Connecting cable (2m)

82.7

(HIROSE)
RM12BPG-6PH

30 20.4

542-181
542-182

Mitutoyo

Linear Gauge with Reference Point LGF-Z Series

Series 542

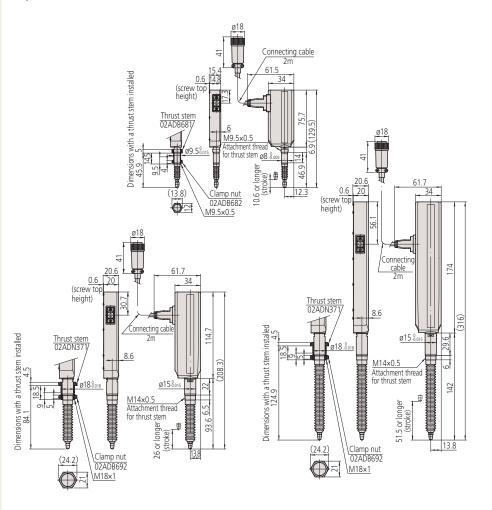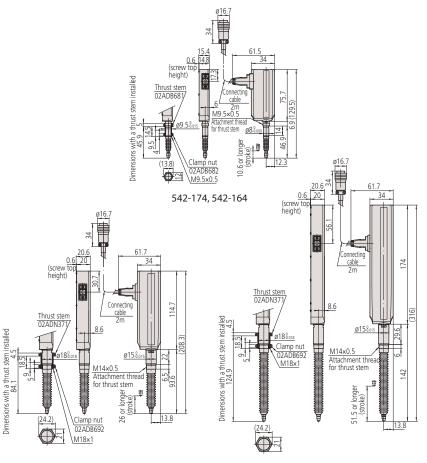This is a very robust and economical linear gauge with a reference Point that offers you the following benefits:

• The advanced construction of the plunger guidance assembly makes it very resistant to external shocks and vibration.
• Its differential square-wave signal output allows you to use it for a wide range of applications.
• It is very long lasting due to linear ball-bearings in the spindle unit.
• The origin point mark on its scale gives you a reference point.

IP66

542-164

No.	Range [mm]	Accuracy	Measuring force *1	Resolution [mm]	Stem Ø	Signal pitch [µm]	Mass [g]
542-174	0-10	(1,5 + L/50)µm	1,2 N/1,1 N/1 N	0,0005	8 mm	2	260
542-164	0-10	(1,5 + L/50) µm	1,2 N/1,1 N/1 N	0,001	8 mm	4	260
542-175	0-25	(1,5 + L/50) µm	4,6 N/4,3 N/4 N	0,0005	15 mm	2	300
542-165	0-25	(1,5 + L/50) µm	4,6 N/4,3 N/4 N	0,001	15 mm	4	300
542-176	0-50	(1,5 + L/50) µm	5,7 N/5,3 N/4,9 N	0,0005	15 mm	2	400
542-166	0-50	(1,5 + L/50) µm	5,7 N/5,3 N/4,9 N	0,001	15 mm	4	400

*1 Spindle DOWN/Horizontal/UP

542-174, 542-164

542-175, 542-165

542-176, 542-166

Specifications

Scale	Photoelectric linear encoder
Max. response speed	1.500 mm/s
Contact point	Ø3 mm carbide ball, thread: M 2,5 x 0,45
Cable length	2 m
Power supply	5 V (4,8 V to 5,2 V), 120 mA max.
Output signal	90° phase difference, differential square wave (RS-422A equivalent), minimum edge distance 200 ns (1 µm type), 250 ns (0,5 µm type)
Environmental conditions	0 °C to 40 °C (20 % to 80 % rel. humidity, no condensation)
Bearing type	Linear ball bearing
Scale reference point	3 mm from lowest rest point (10 mm type) 5 mm from lowest rest point (25,5 mm type)

Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories

No.	Description
02ADF260	Extension Cable 5m with Origin
02ADF280	Extension Cable 10m with Origin
02ADF300	Extension Cable 20m with Origin
02ADB680	Thrust Stem (LGF 10mm)
02ADN370	THRUST STEM SET
02ADE230	Air Drive Unit for Linear Gauges, 10 mm
02ADE250	Air Drive Unit for Linear Gauges, 25 mm
02ADE270	Air Drive Unit for Linear Gauges, 50 mm
542-017	Linear Gauge Counter EG, for Linear Gauge LGF-Z
542-094-2	Linear Gauge Counter EB, for LGF-Z
542-073D	Linear Gauge Counter EH, for LGF-Z
542-067	Linear Gauge Counter EV, for LGF-Z

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238772	Rubber Cap, 542-222/601/604,575-324
962504	Stem Guard 25mm/542
962505	Rubber Cap Assy/542, 50mm type for LGE-1050L

Refer to the Linear Gauge documentation for more details

Mitutoyo

Slim Head Linear Gauge LGK Series

Series 542

IP66

This is a slim type linear gauge that allows you to meet a variety of measurement needs.
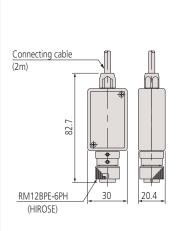The Linear Gage SLIM HEAD LGK offers you the following benefits:
- Differential square-wave signal output enables to use it for a wide range of applications.
- You can install it even where space is restricted, thanks to its small size.
- Its photoelectric scale gives it high precision across the entire measuring range.
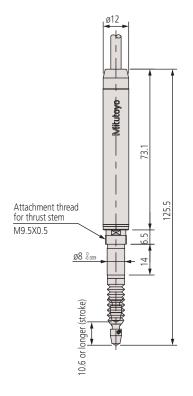- It is very long lasting due to linear ball-bearings in the spindle unit.

Specifications

Scale	Photoelectric linear encoder
Stem Ø	8 mm
Contact point	Ø 3 mm carbide ball, thread: M 2,5 x 0,45
Cable length	2 m
Power supply	5 V (4,5 V to 5,2 V), 80 mA max.
Output signal	90° phase difference, differential square wave (RS-422A equivalent) minimum edge distance 200 ns (0,1 µm type), 200 ns (0,5 µm type), 400 ns (1 µm type)
Environmental conditions	0° C to 40° C (20% to 80% rel. humidity, no condensation)
Bearing type	Linear ball bearing

Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories

No.	Description
902434	Extension Cable 5 m, for Linear Gauge
902433	Extension Cable 10m
902432	Extension Cable 20m
02ADE230	Air Drive Unit for Linear Gauges, 10 mm
02ADB680	Thrust Stem (LGF 10mm)
542-015	Linear Gauge Counter EG, for Linear Gauge LGF, LGK, LGB,LGM, LGH
542-092-2	Linear Gauge Counter EB, for LGF, LGK, LGB, LG, LGM, LGH
542-075D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-071D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-063	Linear Gauge Counter EV, for LGF, LGK, LGB, LG, LGM, LGH

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238772	Rubber Cap, 542-222/601/604,575-324

Refer to the Linear Gauge documentation for more details

542-156
542-157
542-158

No.	Range [mm]	Accuracy	Measuring force *1	Resolution [mm]	Signal pitch [µm]	Max. response speed	Mass [g]
542-156	0-10	(1,5 + L/50) µm	0,8 N/0,75 N/0,7 N	0,001	4	1500	175
542-157	0-10	(1,5 + L/50) µm	0,8 N/0,75 N/0,7 N	0,0005	2	1500	175
542-158	0-10	(0,8 + L/50) µm	0,8 N/0,75 N/0,7 N	0,0001	0,4	400	175

*1 Spindle DOWN/Horizontal/UP

ø12

73.1
125.5
6.5
14

Attachment thread for thrust stem
M9.5X0.5

ø8 ₋0.009

10.6 or longer (stroke)

Connecting cable (2m)

82.7
30
20.4

RM12BPE-6PH
(HIROSE)

Mitutoyo

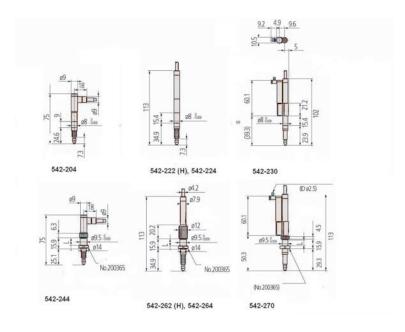# Slim Head Linear Gauge LGB Series

Series 542

This is an extra slim linear gauge that offers you the following benefits:
- Its differential square-wave signal output allows you to use it for a wide range of applications.
- It is very long lasting due to linear ball-bearings in the spindle unit.

IP 54

542-204
542-204H

542-222
542-222H
542-224

542-230

542-244

542-262
542-262H
542-264

542-270

No.	Range [mm]	Accuracy	Measuring force *1	Stem Ø	Remarks	Mass [g]
542-244	0-5	2 µm	0,65 N/0,6 N/0,55 N	9,5 mm	-	160
542-204	0-5	2 µm	0,65 N/0,6 N/0,55 N	8 mm	-	145
542-204H	0-5	1 µm	0,8 N/0,75 N/0,7 N	8 mm	-	145
542-222	0-10	2 µm	0,8 N/0,75 N/0,7 N	8 mm	-	150
542-222H	0-10	1 µm	0,8 N/0,75 N/0,7 N	8 mm	-	150
542-224	0-10	2 µm	0,6 N/0,55 N/0,5 N	8 mm	Low measuring force	165
542-230	0-10	2 µm	0,8 N/0,75 N/0,7 N	8 mm	w/pneumatic cylinder, 0,3 to 0,4 MPa	165
542-262	0-10	2 µm	0,8 N/0,75 N/0,7 N	9,5 mm	-	170
542-262H	0-10	1 µm	0,8 N/0,75 N/0,7 N	9,5 mm	-	170
542-264	0-10	2 µm	0,6 N/0,55 N/0,5 N	9,5 mm	Low measuring force	170
542-270	0-10	2 µm	0,8 N/0,75 N/0,7 N	9,5 mm	w/pneumatic cylinder, 0,3 to 0,4 MPa	170

*1 Spindle DOWN/Horizontal/UP

542-204

542-222 (H), 542-224

542-230

542-244

542-262 (H), 542-264

542-270

Specifications

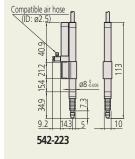|	
Scale	Photoelectric linear encoder
Max. response speed	900 mm/s
Contact point	Ø3 mm carbide ball, thread: M 2,5 x 0,45
Resolution	0,001 mm
Signal pitch	4 µm
Cable length	2 m
Power supply	5 V (4,5 V to 5,2 V), 80 mA max.
Output signal	90° phase difference, differential square wave (RS-422A equivalent)
Environmental conditions	0°C to 40°C (20% to 80% rel. humidity, no condensation)
Bearing type	Linear ball bearing

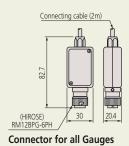### Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories

No.	Description
902434	Extension Cable 5 m, for Linear Gauge
902433	Extension Cable 10m
902432	Extension Cable 20m
02ADE230	Air Drive Unit for Linear Gauges, 10 mm
542-015	Linear Gauge Counter EG, for Linear Gauge LGF, LGK, LGB,LGM, LGH
542-092-2	Linear Gauge Counter EB, for LGF, LGK, LGB, LG, LGM, LGH
542-075D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-071D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-063	Linear Gauge Counter EV, for LGF, LGK, LGB, LG, LGM, LGH

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238773	Rubber Cap, 542-204/206/246
238772	Rubber Cap, 542-222/601/604,575-324

Compatible air hose (ID: ø2.5)

542-223

Connecting cable (2m)

(HIROSE) RM12BPG-6PH

Connector for all Gauges

Specifications

Scale	Photoelectric linear encoder
Max. response speed	380 mm/s
Contact point	Ø3 mm carbide ball, thread: M 2,5 x 0,45
Resolution	0,1 µm
Cable length	2 m
Power supply	5 V (4,5 V to 5,2 V), 150 mA max.
Output signal	90° phase difference differential square wave (RS422 A equivalent)
Environmental conditions	0°C to 30°C (20% to 80% rel. humidity, no condensation)
Bearing type	Linear ball bearing

Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories

| No.	Description
902434	Extension Cable 5 m, for Linear Gauge
902433	Extension Cable 10m
902432	Extension Cable 20m
542-015	Linear Gauge Counter EG, for Linear Gauge LGF, LGK, LGB,LGM, LGH
542-092-2	Linear Gauge Counter EB, for LGF, LGK, LGB, LG, LGM, LGH
542-075D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-071D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-063	Linear Gauge Counter EV, for LGF, LGK, LGB, LG, LGM, LGH

Consumable spares
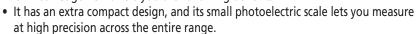
No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
238773	Rubber Cap, 542-204/206/246

Refer to the Linear Gauge documentation for more details

High Resolution Linear Gauge LGB Series

Series 542

The Linear Gage LGB offers you the following benefits:
- It has an extra compact design, and its small photoelectric scale lets you measure at high precision across the entire range.
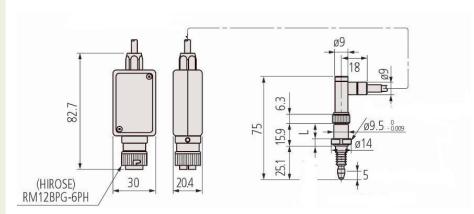- Differential square-wave signal output allows you to use it for a wide range of applications.
- You can install it in machines and measuring devices.
- Very long life due to the linear ball-bearings in the spindle unit.

542-246

No.	Range [mm]	Accuracy	Measuring force *1	Stem Ø	Mass [g]
542-246	0-5	0,8 µm	0,65 N/0,6 N/0,55 N	9,5 mm	160

*1 Spindle DOWN/Horizontal/UP

Mitutoyo

Air Drive Unit for Linear Gauges

LGF-110L

(1)

(85,48)

(2)

(3)

For Linear Gauge with 10 mm range

LGF-125L / LGF-150L

(1)

(2)

(3)
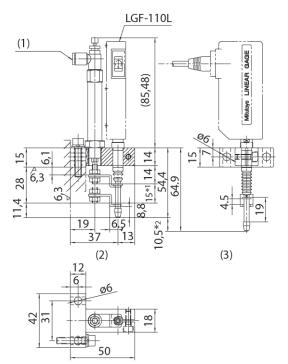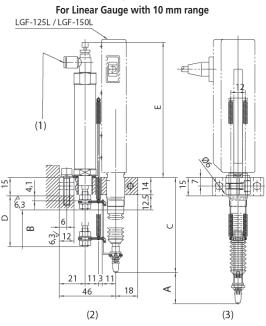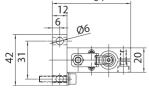
For Linear Gauge with 25 mm and 50 mm range
1. Speed controller
2. At air supply off
3. At air supply on

No.	Range [mm]	Remarks	Air supply [MPa]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
02ADE230	0-10	Need air filter, regulator and lubricator	0,2 to 0,4					
02ADE250	0-25	Need air filter, regulator and lubricator	0,2 to 0,4	25,5	30	77,6	41,5	110,5
02ADE270	0-50	Need air filter, regulator and lubricator	0,2 to 0,4	51	50	95,9	66,5	159,5

Large Measuring Range Linear Gauge LG / LGM Series

Specifications

Scale	Photoelectric linear encoder
Contact point	Ø 3 mm carbide ball, thread: M 2,5 x 0,45
Dimensions (WxDxH)	90 x 175 x 74 mm (control unit)
Cable length	2 m
Power supply	5 V (4,8 V to 5,2 V) (Control unit No. 542-313D: 230 V 50/60 Hz)
Output signal	90° phase difference, differential square wave (RS-422A equivalent)
Environmental conditions	0°C to 40°C (20% to 80% rel. humidity, no condensation)
Bearing type	Linear ball bearing

Optional accessories

No.	Description
542-015	Linear Gauge Counter EG, for Linear Gauge LGF, LGK, LGB, LGM, LGH
542-092-2	Linear Gauge Counter EB, for LGF, LGK, LGB, LG, LGM, LGH
542-075D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-071D	Linear Gauge Counter EH, for LGF, LGK, LGB, LG, LGM, LGH
542-063	Linear Gauge Counter EV, for LGF, LGK, LGB, LG, LGM, LGH

Consumable spares

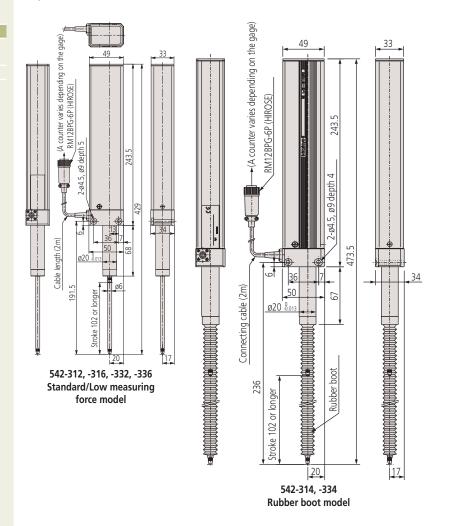| No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric
02ADA004	RUBBER CAP/LGM

Rubber boot for IP66 type only

Series 542

This linear gauge has a large measuring range 100 mm

IP54 **IP66** rubber boot type

542-312

No.	Range [mm]	Accuracy	Measuring force *1	Resolution [µm]	Remarks	Max. response speed	Mass [g]
542-312	0-100	(2 + L/100) µm ≤ 2,5 µm	8 N/6,5 N/5 N	0,1	Standard	400 mm/s	640
542-316	0-100	(2 + L/100) µm ≤ 2,5 µm	3 N/-/-	0,1	Low measuring force	400 mm/s	750
542-314	0-100	(2 + L/100) µm ≤ 2,5 µm	8 N/6,5 N/5 N	0,1	w/ rubber boot	400 mm/s	750
542-332	0-100	(2,5 + L/100) µm ≤ 3 µm	8 N/6,5 N/5 N	1	Standard	800 mm/s	750
542-336	0-100	(2,5 + L/100) µm ≤ 3 µm	3 N/-/-	1	Low measuring force	800 mm/s	750
542-334	0-100	(2,5 + L/100) µm ≤ 3 µm	8 N/ 6,5 N/5 N	1	w/ rubber boot	800 mm/s	750

*1 Spindle DOWN/Horizontal/UP

542-312, -316, -332, -336 Standard/Low measuring force model

542-314, -334 Rubber boot model

Mitutoyo

Laser Hologage LGH

Series 542

This is a highly precise dial gauge that uses optical interference so you can measure with unparalleled accuracy.

The Mitutoyo Laser Hologage offers you the following benefits:

- Through optical interference of laser light through a diffraction grating it gives you an extremely precise holographic scale with 0,00001mm resolution
- You can use the Laser Hologage for extremely precise measurements, as well as a transducer in ultra-precise positioning and control systems.

542-715D

No.	Range [mm]	Accuracy	Measuring force *[1]	Resolution [µm]	Stem Ø	Mass [g]
542-715D	0-10	0,2 µm	0,65 N/0,55 N/0,45 N	0,01	15 mm	220
542-716D	0-10	0,2 µm	0,12 N/ - / -	0,01	15 mm	220

*[1] Spindle DOWN/Horizontal/UP

Specifications

Repeatability	0,1 µm
Retrace error	0,1 µm
Scale	Laser-hologram measurement sensor
Max. response speed	700 mm/s
Contact point	Ø 3 mm carbide ball, thread: M 2,5 x 0,45
Output signal	90° phase difference, differential square wave (RS-422A equivalent)
Signal pitch	4 µm
Bearing type	High precision linear ball bearing
Environmental conditions	0C to 40°C (20% to 80% rel. humidity, no condensation)
Delivered	With Display Unit

Standard accessories

No.	Description
538610	Wrench Key/542

Optional accessories

No.	Description
971750	Laser Hologauge stand
971753	Spindle lifting cable
971751	Gage Fixture (A) LHG
971752	Fastening system, Laser Hologage

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric

Refer to the Linear Gauge documentation for more details

EC Counter for Linear Gauges

Series 542

This Digimatic display can be connected to any device with Digimatic output, including microme-ters, indicators, calipers and LGS/LGD Linear Gauge.
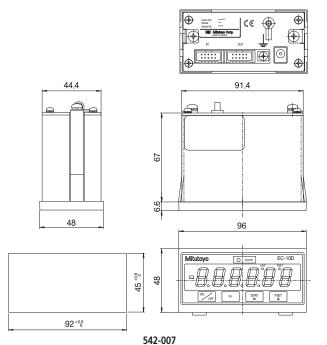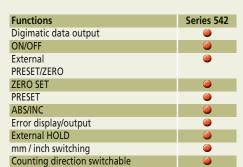It offers you the following benefits:
• It has a data output and tolerance evaluation function.

Functions	Series 542
Digimatic data output	●
ON/OFF	●
External PRESET/ZERO	●
ZERO SET	●
PRESET	●
ABS/INC	●
Error display/output	●
External HOLD	●
mm / inch switching	●
Counting direction switchable	●

Specifications

Power supply	+ 9 - 12 V DC 400 mA or AC adapter
Display	Green LED display, 6 digits plus sign
Tolerance judgement display	LED display (3 steps: Amber, Green, Red)

Standard accessories

No.	Description
06AEG302D	AC-Adapter, 9V 500mA, CEE Type

Optional accessories

No.	Description
C162-155	I/O Cable for Linear Gauge Counter 2m
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type

542-007

No.	Resolution [mm]	Input signal type	Applicable gauge	Gauge inputs
542-007D	0,001/0,01 (automatic setting by gauge)	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	1
542-007E	0,001/0,01 (automatic setting by gauge)	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	1

Refer to the Linear Gauge documentation for more details

542-007

Mitutoyo

EG Counter for Linear Gauges

Series 542

This is a compact counter with a control panel that offers you the following benefits:
• Its I/O control function enables tolerance judgement evaluation (3 or 5 steps) or parallel BCD output function.
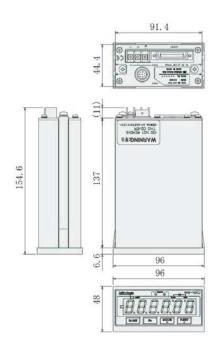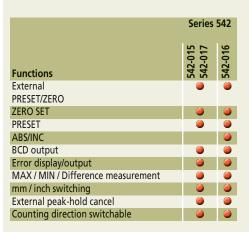
542-015

542-017

542-016

Functions	Series 542 542-015 542-017	542-016
External PRESET/ZERO	●	●
ZERO SET	●	●
PRESET	●	●
ABS/INC		●
BCD output	●	●
Error display/output	●	●
MAX / MIN / Difference measurement	●	●
mm / inch switching	●	●
External peak-hold cancel	●	●
Counting direction switchable	●	●

Specifications

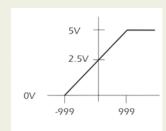|	
Power supply	Terminal block (M3 screws) 12 to 24 V DC, 6W or less (500 mA max.) external supply, AC-adapter is not standard accessory
Display	Green LED display 6 digits plus sign
Tolerance judgement display	LED display (3 steps : Amber, Green, Red/5 steps : Amber, Amber flashing, Green, Red flashing, Red)

Optional accessories

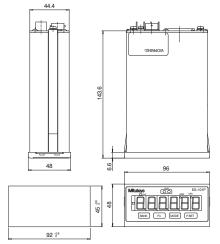| No.	Description
02ADB440	Data Plug I/O Interface, for Litematic
02ADN460	Adaptor 220V
02ZAA020	AC Cable
02ADD930	Connecting Cable, 3-Wires for AC Adapter
02ADF180	External Switch Box

02ADB440

02ADD930, 02ADN460, 02ZAA020

Refer to the Linear Gauge documentation for more details

No.	Resolution [mm]	Max. input frequency	Input signal type	Applicable gauge	Gauge inputs	Mass [g]
542-015	0,0001/0,0005/ 0,001/0,005/0,01	1,25 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave	LGF, LGK, LGB, LG, LGM, LGH (excluding LGF-Z with reference point, LGH with 0,01 µm resolution)	1	400
542-017	0,0001/0,0005/ 0,001/0,005/0,01	1,25 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave with reference point	LGF-Z with reference point	1	400
542-016	0,001/0,01 (automatic setting by gauge)	-	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	1	400

Mitutoyo

EB Counter for Linear Gauges

Series 542

- Its I/O control function enables tolerance judgement evaluation (3 or 5 steps) or serial BCD output function.
- Dynamic measurement possible with simplified analog output.

Functions	542-092-2	542-094-2	542-093-2
Series 542			
Digimatic data output	●	●	●
External PRESET/ZERO	●	●	●
ZERO SET	●	●	●
PRESET	●	●	●
ABS/INC			●
BCD output	●	●	●
Error display/output	●	●	●
External HOLD	●	●	●
MAX / MIN / Difference measurement	●	●	●
mm / inch switching	●	●	●
RS link		●	
Output I/O		●	●
Analogue output	●	●	●
Counting direction switchable	●	●	●

Specifications

Power supply	Terminal block (M3 screws) 12 to 24 V DC, 6W or less (500 mA max.) external supply, AC-adapter is not standard accessory
Display	Green LED display, 6 digit plus sign
Tolerance judgement display	LED display (3 steps : Amber, Green, Red/5 steps : Amber, Amber flashing, Green, Red flashing, Red)

Optional accessories

No.	Description
02ADB440	Data Plug I/O Interface, for Litematic
02ADN460	Adaptor 220V
02ZAA020	AC Cable
02ADD930	Connecting Cable, 3-Wires for AC Adapter
02ADF180	External Switch Box
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type

Specifications :
Output voltage: 2.5 V + counting value x voltage resolution (25mV/2.5 mV]
Full scale : 0 to 5 V
Response speed: 10 Hz (update time 5 MS)
Accuracy : ± 5 % (0 to 5 V) ± 0.5 % (2.5 V ± 200 mV, after Offset adjustment)
The accuracy is indicated with respect to full scale 5 V
Load resistance: 300 kΩ or more

542-092-2

542-094-2

542-093-2

No.	Resolution [mm]	Max. input frequency	Input signal type	Applicable gauge	Gauge inputs	Mass [g]
542-092-2	0,0001/0,0005/ 0,001/0,005/0,01	1,25 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave	LGF, LGK, LGB, LG, LGM, LGH (excluding LGF-Z with reference point, LGH with 0,01 µm resolution)	1	400
542-094-2	0,0001/0,0005/ 0,001/0,005/0,01	1,25 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave with reference point	LGF-Z with reference point	1	400
542-093-2	0,001/0,01 (automatic setting by gauge)	-	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	1	400

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Mitutoyo

EH Counter for Linear Gauges

Series 542

Multi-functional Counter
- The standard RS-232C and USB interfaces allows easy communication with an external PC (the USB can only be used with SENSORPAK).
- The built-in networking function allows you to easily create a multi-point measuring system (RS link, max. 10 Counter).
- The 2-gauge input type can calculate additions and subtractions between two gauges.
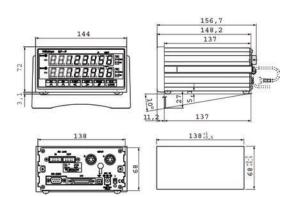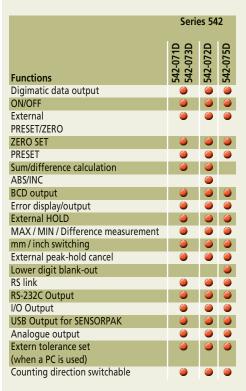
542-075D

542-071D, 542-073D, 542-072D

542-075D

542-071D

542-073D

542-072D

Functions	542-071D	542-073D	542-072D	542-075D
Digimatic data output	●		●	●
ON/OFF	●		●	●
External PRESET/ZERO	●		●	●
ZERO SET	●		●	●
PRESET	●		●	●
Sum/difference calculation	●		●	
ABS/INC			●	
BCD output	●		●	●
Error display/output	●		●	●
External HOLD	●		●	●
MAX / MIN / Difference measurement	●		●	●
mm / inch switching	●		●	●
External peak-hold cancel	●		●	●
Lower digit blank-out				●
RS link	●		●	●
RS-232C Output	●		●	●
I/O Output	●		●	●
USB Output for SENSORPAK	●		●	●
Analogue output	●		●	●
Extern tolerance set (when a PC is used)	●		●	●
Counting direction switchable	●		●	●

Specifications

Power supply	Via AC Adapter (12-24 V DC, 700 mA)
Display	Green LED display, 8 digit plus sign
Tolerance judgement display	LED display (3 steps : Amber, Green, Red/5 steps : Amber, Amber flashing, Green, Red flashing, Red)

Standard accessories

No.	Description
02ADN460	Adaptor 220V
02ZAA020	AC Cable

Optional accessories

No.	Description
02ADB440	Data Plug I/O Interface, for Litematic
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type
12AAA807D	Cable RS-232C 2m

02ADB440

No.	Resolution [mm]	Max. input frequency	Input signal type	Applicable gauge	Gauge inputs	Mass [g]
542-075D	0,0001/0,001/0,01	2,5 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave	LGF, LGK, LGB, LG, LGM, LGH (excluding LGF-Z with reference point, LGH with 0,01 μm resolution)	1	760
542-071D	0,0001/0,001/0,01	2,5 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave	LGF, LGK, LGB, LG, LGM, LGH (excluding LGF-Z with reference point, LGH with 0,01 μm resolution)	2	800
542-073D	0,0001/0,001/0,01	2,5 MHz (2-phase square wave), response speed depends on gauge specification	Differential square-wave with reference point	LGF-Z with reference point	2	800
542-072D	0,001/0,01 (automatic setting by gauge)	-	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	2	800

Mitutoyo

EV Counter for Linear Gauges

Series 542

- You can connect up to six gauges, and by using the RS Link function, you can connect up to 10 EV Counters to one PC.
- Multi-point measuring systems with a maximum of 60 gauges can be configured.
- You can select several different output modes, including I/O output for tolerance judgement and Segment output, BCD data output and RS-232C output.

Functions	Series 542		
	542-063 542-067		542-064
External PRESET/ZERO		●	●
ZERO SET		●	●
PRESET		●	●
ABS/INC			●
Calculation function		●	●
Error display/output		●	●
External HOLD		●	●
MAX / MIN / Difference measurement		●	●
mm / inch switching		●	●
RS link		●	●
RS-232C Output		●	●
Counting direction switchable		●	●

Specifications

Power supply	Terminal connector (M3 screws), 12 to 24V, (700 mA max. for EV-Counter) (200 mA max. for D-EV Display unit), AC-adapter is not standard accessory
Display	D-EV Unit: red LED display, 6 digit plus sign 8 digit internal to EV-Counter
Tolerance judgement display	LED display (3 steps: Amber, Green, Red)

Optional accessories

No.	Description
02ADD400	D-EV Display Unit
02ADB440	Data Plug I/O Interface, for Litematic
02ADN460	Adaptor 220V
02ZAA020	AC Cable
02ADD930	Connecting Cable, 3-Wires for AC Adapter
02ADD950	External Switch Box, EB Counter
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
12AAA807D	Cable RS-232C 2m

02ADD400

02ADB440

02ADD930, 02ADN460, 02ZAA020

542-063

542-067

542-064

542-063

No.	Resolution [mm]	Max. input frequency	Input signal type	Applicable gauge	Gauge inputs	Mass [g]
542-063	0,0005/0,001/0,005/0,01 (no display)	1,25 MHz (2-phase square wave), response speed depends on gauge specification. Max.counting speed: 5MHz	Differential square-wave	LGF, LGK, LGB, LG, LGM, LGH (excluding LGF-Z with reference point, LGH with 0,01 μm resolution)	6	910
542-067	0,0005/0,001/0,005/0,01 (no display)	1,25 MHz (2-phase square wave), response speed depends on gauge specification. Max.counting speed: 5MHz	Differential square wave with reference point	LGF-Z with reference point	6	910
542-064	0,001/0,01 (automatic setting by gauge)	-	Digimatic code	Digimatic Indicator Digimatic Scale Units Linear Gauge LGS/LGD	6	830

Specifications for 02ADD400

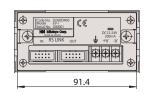| No.	Description
02ADD400	Allows external display and setting for one EV Counter **LED display:** channel display (also for judgement result display): 3 (3-color LED) measurement mode display (current data, max. value, min. value, range): 2 **Functions:** channel switching, measurement mode switching (current value, max. value, min. value, range), parameter setting, preset, and tolerance setting **Input/output:** RS Link connector: 1 each for IN, OUT **Error display:** overspeed and others

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Mitutoyo

Inductive Probe Mu-Checker

Series 519

- A half-bridge circuit connection.
- 519-321 lever head is provided with a direction switch.
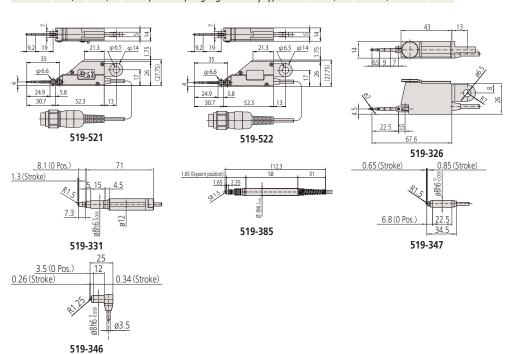- The contact point of 519-326 lever head can be orientated at any direction.

519-521

519-522

519-326

519-331

519-385

519-347

519-346

Cartridge type

No.	Range	Stroke [mm]	Remarks	Linearity [%]	Measuring force [N]
519-331	± 0,5	± 0,65	low force type	± 0,5	0,25
519-385	± 1,5	+ 2,3 - 1,7	standard type	± 0,3	0,7 ± 0,14 N
519-346	± 0,25	+0,34 -0,26	compact type inside	± 0,3	0,7
519-347	± 0,5	+ 0,85 - 0,65	compact type	± 0,3	0,7

Lever type

No.	Range	Stroke [mm]	Remarks	Linearity [%]	Measuring force [N]	Mass [g]
519-521	± 0,5	± 0,6	pivot bearing switch type reversible direction	± 0,3	0,2	112
519-522	± 0,5	± 0,6	pivot bearing low measuring force type	± 0,3	0,02	112
519-326	± 0,5	± 0,6	parallel spring high accuracy type	± 0,3	0,15	112

519-521

519-522

519-326

519-331

519-385

519-347

519-346

Specifications

Scale	Linear Voltage differential transformer (half bridge)
Calibration frequency	5 kHz
Calibration voltage	3 V rms (sine wave)
Connector	DIN 5pin
Delivered	with 2 m cable, carbide-tipped stylus ⌀ 1 mm (520940), stylus ⌀ 2 mm (520939), stylus ⌀ 3 mm (520938)

Optional accessories

No.	Description
900321	Swivel Clamp, for Ø4/8mm, Dovetail
900209	Holding Bar for Swivel Clamp, 9x9mm, 100mm Length
900211	Holding Bar for Swivel Clamp, Ø8mm, 115mm Length

902321

902802

902804

900209

900211

Display Mu-Checker

Series 519

	Series 519		
Functions	519-551D	519-553D	519-561D
ZERO SET	●	●	●
Calculation function		●	●
Digimatic Output			●

Specifications

Power supply	AC Adapter 230V 50/60Hz
Output Gain	± 1V/FS Linearity: ±0,1%/FS (Excepts a head's measuring error)
Dimensions (WxDxH)	134 x 183 x 208 mm

Optional accessories

No.	Description
934795	Signal Cable A
529035	Connector 7P, 519-413
934386	Extension Cord A
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m

*936937 and 965014 for 519-561D only

• The Analog Mu-Checker can output digital data via an optional interface unit.

| 519-551D | 519-553D | 519-561D |

No.	Linearity [%]	Response speed	Instant zero-setting effective zone	Channels	Mass [kg]
519-551D	± 1%/FS (Added to a head's measuring error)	approx. 0,3s	± 15%/FS	1	2,4
519-553D	± 1%/FS (Added to a head's measuring error)	approx. 0,3s	± 15%/FS	2	2,4
519-561D	± 3 digit ± 1 (added to a head measuring error)	approx. 0,3s	± 0,68 mm	2	2,6

FS=Full Screen

Mitutoyo

LITEMATIC VL-50
Motorized low force, high precision gauges

Series 318
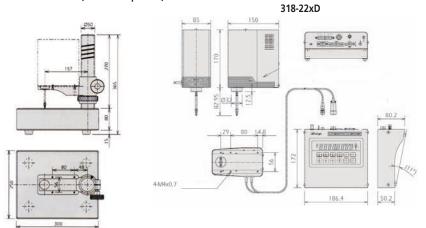
This is a high-accuracy gauge head with a separate controller.
The LITEMATIC VL-50 offers you the following benefits:
- It has a measuring force of **0,01 N** (1 gf) and a resolution of 0,01 µm.
- Its constant and low measuring force makes it especially suitable for measuring soft materials such as rubber, plastic, film thicknesses or sensitive form parts.
- The motor driven plunger gives you a range of approach and retraction speeds for safe and easy operation.
- The head is supplied with a separate controller so you can mount it in a measurement fixture, or on the optional comparator stand.

318-22xD   **(957460 is optional)**

318-22xD

957460 Comparator stand

No.	Accuracy	Measuring force	Type
318-226D	**(0,5 + L/100)**µm L = Measurement height	**0,01 N** (1 gf)	VL-50S-B
318-227D	**(0,5 + L/100)**µm L = Measurement height	**0,15 N** (15 gf)	VL-50S-15-B
318-228D	**(0,5 + L/100)**µm L = Measurement height	**1 N** (102 gf)	VL-50S-100-B

Functions	Series 318
ZERO/ABS	●
Data output	●
PRESET	●
Key lock	●
mm / inch switching	●
Tolerance input (3 or 5 levels)	●
Motorized plunger movement	●
Mode : max-min (TIR) reading	●
Counting direction switchable	●

Specifications

Measuring range (inside)	0-50 mm
Data output	DIGIMATIC RS 232C INTERFACE I/O

Optional accessories

No.	Description
957460	Litematic Head Stand
937179T	Footswitch for SPC
02ADB440	Data Plug I/O Interface, for Litematic
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
12AAA807D	Cable RS-232C 2m
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric

Refer to the LITEMATIC documentation for more details

LITEMATIC VL-50
Motorized low force, high precision gauges

Series 318
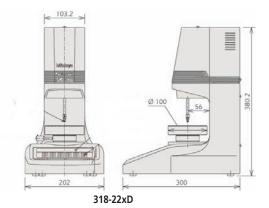
This is a high-accuracy motorised measuring machine with safe and easy operation.
The LITEMATIC VL-50 offers you the following benefits:
- It has a measuring force of **0,01 N** (1 gf) and a resolution of 0,01 µm.
- Its constant and low measuring force makes it especially suitable for measuring soft materials such as rubber, plastic, film thicknesses or sensitive form parts.
- The motor driven plunger gives you a range of approach and retraction speeds for safe and easy operation.

Functions	Series 318
ZERO/ABS	●
Data output	●
PRESET	●
Key lock	●
mm / inch switching	●
Tolerance input (3 or 5 levels)	●
Motorized plunger movement	●
Mode : max-min (TIR) reading	●
Counting direction switchable	●

Specifications

Measuring range (inside)	0-50 mm
Data output	Digimatic RS-232C INTERFACE I/O

Optional accessories

No.	Description
937179T	Footswitch for SPC
02ADB440	Data Plug I/O Interface, for Litematic
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
12AAA807D	Cable RS-232C 2m
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type

Consumable spares

No.	Description
901312	Contact Element Ball Point, 7,3mm Length, Carbide, Metric

Refer to the LITEMATIC documentation for more details

318-22xD

318-22xD

No.	Accuracy	Measuring force	Type
318-221D	(0,5 + L/100) µm L = Measurement height	0,01 N (1 gf)	VL-50 B
318-222D	(0,5 + L/100) µm L = Measurement height	0,15 N (15 gf)	VL-50-15-B
318-223D	(0,5 + L/100) µm L = Measurement height	1 N (102 gf)	VL-50-100-B

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Mitutoyo

Laser Scan Micrometer Measuring Unit and Display Unit Package

Functions	Series 544
GO/±NG judgement	●
OFFSET	●
Sample Measurement	●
Statistical calculations for DP-1VA	●
Data output	●
ZERO SET	●
PRESET	●
Group judgement	●
Workpiece position display	●
Transparent object measurement	●
Automatic measurement	●
Abnormal data elimination	●

Specifications

Linearity at 20°C *¹	Entire range : ±0,5 μm
	Narrow range : ±(0,3+0,1ΔD) μm
Positional error *²	±0,5 μm
Repeatability (±2σ)	±0,045 μm
Measuring region	3 x 25 mm
Laser wavelength	650 nm, Visible
Scanning rate	1600 scans/s
Scanning speed	56m/s
Applicable laser standards	IEC
Main display	16-digit fluorescent tube
Interface units equipped	RS-232C, Analog I/O, Footswitch
Power supply	100 - 240VAC, 40 VA, 50/60Hz

Optional accessories

No.	Description
02AGD180	Calibration Gauge Set, Ø1-25
02AGD270	Workstage for LSM
02AGD280	Workstage for LSM

*¹ At the centre of the measuring region
*² Potential measurement error due to variation in workpiece position within the measuring region
ΔD = Difference in diameter between the mastergauge and workpiece

Refer to the LSM brochure

Series 544

The LSM-6902H is a high accuracy, non-contact measuring system that uses a high speed scanning laser beam to accurately measure workpieces. It is ideal for measuring items that are difficult or impossible to measure with conventional instruments, such as elastic parts or soft parts that might deform under pressure.
The LSM-6902H offers you the following benefits:
• Suitable for pin and plug gauge measurements.
• It has a wide measuring range of 0,1 mm to 25 mm.
• Provides ultra-high accuracy with a linearity of ±0,5 μm over the entire measuring range and ±(0,3+0,1ΔD) μm in the narrow range.
• Ultra-high repeatability of ±0,045 μm.

LSM-6902H display unit and LSM-6902H measuring unit

Metric

No.	Range [mm]	Resolution (selectable)
544-498D	0,1-25	0,01-10 μm

LSM-6902H display unit

LSM-6902H measuring unit

Mitutoyo

Laser Scan Micrometer Measuring Unit
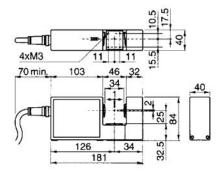
Series 544

LSM-500S

High Accuracy Non-contact Measuring System
- Measuring range starting from ø5 µm.
- Provides ultra-high accuracy with a linearity of ±0,3 µm over the entire measuring range (5 µm up to 2 mm).
- Ultra-high repeatability of ±0,03 µm.
- High scanning rate of 3200 scans/s

IP 64

Specifications

Linearity at 20°C *1	±0,3 µm
Positional error *2	±0,4 µm
Repeatability (±2σ)	±0,03 µm
Measuring region	1 x 2 mm
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	76m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGD110	Membrane sheet, LSM-9506
02AGD200	Wire guiding pulley, for LSM-500
02AGD220	Air Shield LSM-500S
957608	Air Cleaner for Air Shield
02AGN780A	Extension Signal Cable 5m
02AGN780B	Extension Signal Cable 10m
02AGN780C	Extension Signal Cable 15m

LSM-500S

Metric		
No.	Range [mm]	Resolution (selectable)
544-532	0,005-2	0,00001-0,01 mm

Series 544
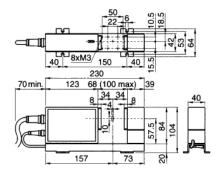
LSM-501S

High Accuracy Non-contact measuring system
- Provides ultra-high accuracy with a linearity of ±0,5 µm over the entire measuring range (0,05 mm to 10 mm) and ±(0,3+0,1∆D) µm in the narrow range.
- Ultra-High repeatability of ±0,04 µm.
- High scanning rate of 3200 scans/s

IP 64

Specifications

Linearity at 20°C *1	Entire range : ± 0,5 µm Narrow range : ±(0,3+0,1∆D) µm
Positional error *2	±0,5 µm
Repeatability (±2σ)	±0,04 µm
Measuring region	2 x 10 mm (ø0,05-0,1 mm) 4 x 10 mm (ø0,1-10 mm)
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	113 m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGD120	Calibration Gauge Set, Ø 0,1 - 10mm
02AGD210	Wire guiding pulley, for LSM 501S
02AGD400	Workstage for LSM
02AGD440	Centre support LSM-501S/503S/902
02AGD450	V-Block
02AGD230	Air Shield LSM-501S
957608	Air Cleaner for Air Shield
02AGC150A	Relay Extension Cable
02AGN780A	Extension Signal Cable 5m
02AGN780B	Extension Signal Cable 10m
02AGN780C	Extension Signal Cable 15m

02AGD440 and 02AGD450 : use with an adjustable workstage

*1 At the centre of the measuring region
*2 Potential measurement error due to variation in workpiece position within the measuring region
∆D = Difference in diameter between the mastergauge and workpiece

LSM-501S

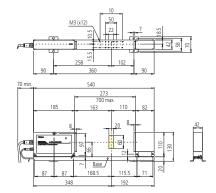| Metric		
No.	Range [mm]	Resolution (selectable)
544-534	0,05-10	0,00001-0,01 mm

Refer to the LSM brochure
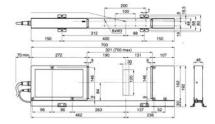
Laser Scan Micrometer Measuring Unit

Series 544

LSM-503S

IP64

High Accuracy Non-contact measuring system
- General-purpose type with a measuring range of 0,3 mm to 30 mm.
- Provides high accuracy with a linearity of ±1 μm over the entire measuring range and ±(0,6+0,1∆D) μm in the narrow range.
- Excellent repeatability of ±0,1 μm.
- High scanning rate of 3200 scans/s.

LSM-503S

Specifications

Linearity at 20°C *¹	Entire range : ±1 μm Narrow range : ±(0,6+0,1∆D) μm
Positional error *²	±1,5 μm
Repeatability (±2σ)	±0,11 μm
Measuring region	10 x 30 mm
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	226 m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGD130	Calibration Gauge Set, Ø 1 - 30 mm
02AGD490	Workstage for LSM
02AGD440	Centre support LSM-501S/503S/902
02AGD450	V-Block
02AGD240	Air Shield LSM-503S
957608	Air Cleaner for Air Shield
02AGC150A	Relay Extension Cable
02AGC150B	Relay Extension Cable

02AGD440 and 02AGD450 : use with an adjustable workstage

Metric

No.	Range [mm]	Resolution (selectable)
544-536	0,3-30	0,00002-0,1 mm

Series 544

LSM-506S

IP64

High Accuracy Non-contact Measuring System
- General-purpose type with a measuring range of 1 mm to 60 mm.
- Provides high accuracy with a linearity of ±3 μm over the entire measuring range and ±(1,5+0,5∆D) μm in the narrow range.
- Excellent repeatability of ±0,36 μm.
- High scanning rate of 3200 scans/s.

LSM-506S

Specifications

Linearity at 20°C *¹	Entire Range : ±3 μm Narrow range : ±(1,5+0,5∆D) μm
Positional error *²	±4 μm
Repeatability (±2σ)	±0,36 μm
Measuring region	20 x 60 mm
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	452 m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGD140	Calibration Gauge Set, Ø 1 - 60 mm
02AGD520	Workstage for LSM
02AGD580	Centre support LSM-506S/9506
02AGD590	V-Block
02AGD250	Air Shield LSM-506S
957608	Air Cleaner for Air Shield
02AGC150A	Relay Extension Cable
02AGC150B	Relay Extension Cable

02AGD580 and 02AGD590 : use with an adjustable workstage

*¹ At the centre of the measuring region   *² Potential measurement error due to variation in workpiece position within the measuring region
∆D = Difference in diameter between the mastergauge and workpiece

Refer to the LSM brochure

Metric

No.	Resolution (selectable)
544-538	0,00005-0,1 mm

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Laser Scan Micrometer Measuring Unit

Series 544

LSM-512S

IP 64

High Accuracy Non-contact measuring system
- General-purpose type with a wide measuring range of 1 mm to 120 mm.
- Provides high accuracy with a linearity of ±6 µm over the entire measuring range and ±(4+0,5ΔD) µm in the narrow range.
- Excellent repeatability of ±0,8 µm.
- High scanning rate of 3200 scans/s

LSM-512S

Metric

No.	Range [mm]	Resolution (selectable)
544-540	1-120	0,0001-0,1 mm

Specifications

Linearity at 20°C *¹	Entire range : ±6 µm Narrow range : ±(4+0,5ΔD) µm
Positional error *²	±8 µm
Repeatability (±2σ)	±0,8 µm
Measuring region	30 x 120 mm
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	904 m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGD150	Calibration Gauge Set, Ø 20-120 mm
02AGD260	Air Shield LSM-512S
957608	Air Cleaner for Air Shield
02AGC150A	Relay Extension Cable
02AGC150B	Relay Extension Cable
02AGC150C	Relay Extension Cable
02AGN780A	Extension Signal Cable 5m
02AGN780B	Extension Signal Cable 10m
02AGN780C	Extension Signal Cable 15m
02AGN780D	Extension Signal Cable 20m

Series 544
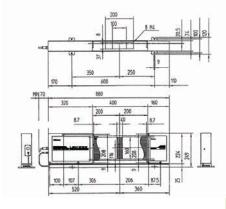
LSM-516S

IP 64

High Accuracy Non-contact measuring system
- General-purpose type with a wide measureming range of 1 mm to 160 mm.
- Provides high accuracy with a linearity of ±7 µm over the entire measuring range and ±(4+2ΔD) µm in the narrow range.
- Excellent repeatability of ±1,4 µm.
- High scanning rate of 3200 scans/s

LSM-516S

Metric

No.	Range [mm]	Resolution (selectable)
544-542	1-160	0,0001-0,1 mm

Specifications

Linearity at 20°C *¹	Entire range : ±7 µm Narrow range : ±(4+2ΔD) µm
Positional error *²	±8 µm
Repeatability (±2σ)	±1,4 µm
Measuring region	40 x 160 mm
Laser wavelength	650 nm, Visible
Scanning rate	3200 scans/s
Scanning speed	1206 m/s
Applicable laser standards	IEC, FDA

Optional accessories

No.	Description
02AGM300	Calibration Gage Set, LSM Ø 20-160mm
02AGC150A	Relay Extension Cable
02AGC150B	Relay Extension Cable
02AGC150C	Relay Extension Cable
02AGN780A	Extension Signal Cable 5m
02AGN780B	Extension Signal Cable 10m
02AGN780C	Extension Signal Cable 15m
02AGN780D	Extension Signal Cable 20m

*¹ At the centre of the measuring region
*² Potential measurement error due to variation in workpiece position within the measuring region
ΔD = Difference in diameter between the mastergauge and workpiece

Refer to the LSM brochure

Laser Scan Micrometer

Series 544

The LSM-9506 is a bench-top, non-contact measuring system that uses a high speed scanning laser beam to accurately measure workpieces. It is ideal for measuring items that are difficult or impossible to measure with conventional instruments, such as elastic parts or soft parts that might deform under pressure.

The LSM-9506 offers you the following benefits:
- Its measurement system has an integrated display, allowing easy bench-top inspection.
- A statistical calculation function is also provided.
- Includes standard RS-232C serial port and data output interface.

Functions	Series 544
GO/±NG judgement	⬤
OFFSET	⬤
Sample Measurement	⬤
Statistical calculations for DP-1VA	⬤
Data output	⬤
ZERO SET	⬤
PRESET	⬤
Group judgement	⬤
Workpiece position display	⬤
Transparent object measurement	⬤
Automatic measurement	⬤
Abnormal data elimination	⬤

Specifications

Linearity at 20°C *1	±2,5 µm
Positional error *2	±2,5 µm
Repeatability (±2σ)	±0,6 µm
Measuring region	10 x 60 mm
Laser wavelength	650 nm, Visible
Scanning rate	1600 scans/s
Scanning speed	226 m/s
Applicable laser standards	IEC
Main display	16-digit fluorescent tube
Interface units equipped	RS-232C, Digimatic, Foot Switch
Power supply	100-240VAC, 40VA, 50/60Hz

Refer to the LSM brochure
*1 At the centre of the measuring region
*2 Potential measurement error due to variation in workpiece position within the measuring region

LSM-9506

Metric

No.	Range [mm]	Resolution (selectable)
544-115D	0,5-60	0,00005-0,1 mm

Mitutoyo

Laser Scan Micrometer Display Unit

Series 544

The LSM-5200 Display Unit is a versatile display unit dedicated to Laser Scan Micrometers.
This dual-display design allows setup values to be continuously monitored with.
You can also get simultaneous readout of two measurement values, and segment measurement and edge measurement are both supported. Statistical calculation and abnormal-data elimination functions are provided as well.
The LSM-5200 Display Unit offers you the following benefits:
- Panel-mount type (with dimensions conforming to DIN 43700) making system integration easy.
- Capable of calculating mean, maximum, and range (maximum to minimum).
- You can select either segment measurement (7 segments max) or edge measurement (1 to 255 edges).
- USB, RS-232C, I/O and analogue interfaces are provided as standard.
- The arithmetical average or moving average can also be selected.
- GO/±NG judgement function.
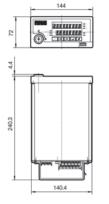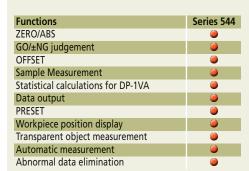
LSM-5200 display unit

No.
544-047

Functions	Series 544
ZERO/ABS	●
GO/±NG judgement	●
OFFSET	●
Sample Measurement	●
Statistical calculations for DP-1VA	●
Data output	●
PRESET	●
Workpiece position display	●
Transparent object measurement	●
Automatic measurement	●
Abnormal data elimination	●

Specifications

Main display	9-digit LED
Interface units equipped	USB2, RS-232C, Analog I/O, Foot Switch
Power supply	+24VDC ±10%, 1A

Laser Scan Micrometer Display Unit

Series 544

Functions	Series 544
GO/±NG judgement	●
OFFSET	●
Sample Measurement	●
Statistical calculations for DP-1VA	●
Data output	●
ZERO SET	●
PRESET	●
Group judgement	●
Workpiece position display	●
Transparent object measurement	●
Automatic measurement	●
Abnormal data elimination	●

Specifications

Applicable laser standards	IEC, FDA (544-534), JIS (544-533)
Main display	16-digit fluorescent tube
Interface units equipped	RS-232C, Analog I/O, Foot Switch
Power supply	100-240V AC, 40 VA, 50/60Hz

The LSM-6200 Display Unit is a versatile display unit dedicated to Laser Scan Micrometers. This dual-display design allows setup values to be continuously monitored with. You can also get simultaneous readout of two measurement values, and segment measurement and edge measurement are both supported. Statistical calculation and abnormal-data elimination functions are provided as well.

The LSM-5200 Display Unit offers you the following benefits:
• With this dual-display design, you can continuously monitor setup values, and also simultaneously display two measurement values.
• You can select either the segment measurement (7 segments max) or edge measurement (1 to 255 edges).
• Includes RS-232C and I/O and analogue interface capabilities.
• Includes statistical calculation and abnormal data eliminating functions.

LSM-6200 display unit

Metric

No.
544-071D
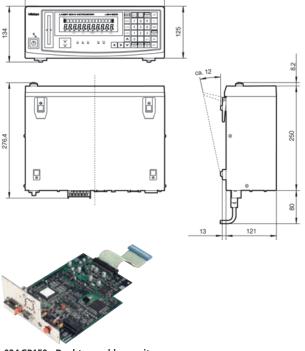
Refer to the LSM brochure

02AGP150 - Dual-type add-on unit

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Laser Scan Micrometer Optional Accessories

Series 544 - Accessories

No.	Application	Description
02AGD110	LSM-500S	Calibration gauge set (ø0,1-2 mm)
02AGD120	LSM-501S	Calibration gauge set (ø0,1-10 mm)
02AGD130	LSM-503S	Calibration gauge set (ø1-30 mm)
02AGD140	LSM-506S	Calibration gauge set (ø1-60 mm)
02AGD150	LSM-512S	Calibration gauge set (ø20-120 mm)
02AGD170	LSM-9506	Calibration gauge set (ø1-60 mm)
02AGD180	LSM-902	Calibration gauge set (ø1-25 mm)
02AGM300	LSM-516S	Calibration gage set (ø 20-160 mm)
02AGD200	LSM-500S	Wire guiding pulley
02AGD210	LSM-501S	Wire guiding pulley
02AGD220	LSM-500S	Air shield
02AGD230	LSM-501S	Air shield
02AGD240	LSM-503S	Air shield
02AGD250	LSM-506S	Air shield
02AGD260	LSM-512S	Air shield
957608	All LSM models	Air cleaner for air shield
02AGD270	LSM-501S/503S/902	Workstage
02AGD280	LSM-902	Adjustable workstage
02AGD370	LSM-9506	Adjustable workstage
02AGD400	LSM-501S	Adjustable workstage
02AGD490	LSM-503S	Adjustable workstage
02AGD520	LSM-506S	Adjustable workstage
02AGD680	LSM-9506	Adjustable workstage
02AGD440	LSM-501S/503S/902	Centre support
02AGD580	LSM-506S/9506	Centre support
02AGD450	LSM-501S/503S/902	Adjustable V-block
02AGD590	LSM-506S/9506	Adjustable V-block
937179T.		Footswitch

Laser Scan Micrometer Optional Accessories

Series 544 - Accessories

Refer to the LSM brochure

Digimatic (SPC) code-out unit

Extension relay cable

Extension signal cable

Dual-type add-on unit

No.	Application	Description
02AGC840	LSM-6200/6900	Digimatic (SPC) code-out unit
02AGC880	LSM-6200/6900	2nd I/O & analog interface
02AGC910	LSM-6200/6900	BCD interface unit
02AGC150A	All LSM models [1]	Extension relay cable 1 m
02AGC150B	All LSM models [1]	Extension relay cable 3 m
02AGC150C	All LSM models [1]	Extension relay cable 5 m
02AGC330A	All LSM models [1]	Output signal cable 5 m
02AGC330B	All LSM models [1]	Output signal cable 10 m
02AGN780A	All LSM models [2]	Extension signal cable 5 m
02AGN780B	All LSM models [2]	Extension signal cable 10 m
02AGN780C	All LSM models [2]	Extension signal cable 15 m
02AGN780D	All LSM models [2]	Extension signal cable 20 m
02AGN780E	All LSM models [2]	Extension signal cable 30 m
02AGP150	LSM-6200	Dual-type add-on unit

[1] Except for LSM-500S/902
[2] Except for LSM-902

Mitutoyo

Scale Units
Page 391

DRO linear scale & counter
Page 398

NC linear scales
Page 410

Mitutoyo

Horizontal ABSOLUTE Scale Coolant Proof IP66

Functions

Functions	Series 572 - Horizontal
ORIGIN (ABS-Zero)	●
Low voltage alarm	●
Data output	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Repeatability	0,01 mm
Max. response speed	Unlimited

Optional accessories
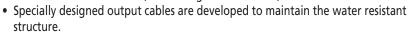
No.	Description
05CZA624	Digimatic Cable with Data Button IP Type, 1m, Caliper Type
05CZA625	Digimatic Cable with Data Button IP Type, 2m, Caliper Type
02AZD790A	U-WAVE-T Connection Cable A, with Data Button IP Caliper Type, with Data Button IP Caliper Type
06AFM380A	USB Input Tool Direct (Digimatic USB), Digi/Digi2, With Data Button IP Caliper Type

Consumable spares

No.	Description
938882	Battery SR44 1.5V

Series 572 - Horizontal

You can use this scale unit in adverse environments with water and cutting oil due to it new detection method (electromagnetic induction).
- Specially designed output cables are developed to maintain the water resistant structure.
- You will have no overspeed error since the ABSOLUTE scale does not depend on counting scale graduations.
- Once an absolute zero (origin) point is set, the Digimatic Scale Unit shows the absolute distance from this point when it is powered on, rather than „0".

IP66
ABSOLUTE®

572-601

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [g]
572-600	0-100	0,03 mm	209	185	390
572-601	0-150	0,03 mm	259	235	410
572-602	0-200	0,03 mm	311	287	430
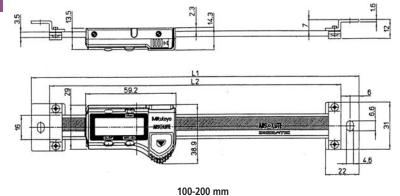
mm

Mitutoyo

Horizontal ABSOLUTE Scale Standard

Series 572

This unit has an ABSOLUTE capacitive-type scale.
- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
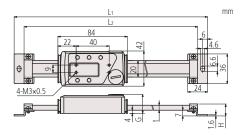- The display has large characters, making it easy to read.

ABSOLUTE

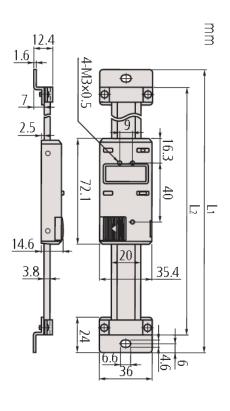**572-202-30**

Metric
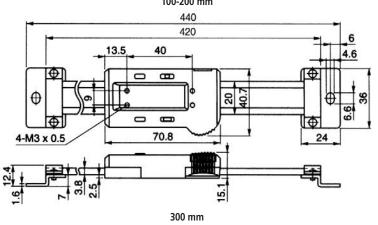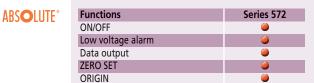
No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [g]
572-200-30	0-100	0,03 mm	209	185	230
572-201-30	0-150	0,03 mm	259	235	250
572-202-30	0-200	0,03 mm	311	287	270
572-203-10	0-300	0,04 mm	444	420	370

100-200 mm

300 mm

Functions

Functions	Series 572
ON/OFF	●
Low voltage alarm	●
Data output	●
ZERO SET	●
ORIGIN	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Max. response speed	Unlimited
Delivered	One battery

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
959143	Data Hold Unit
959149	Digimatic Cable, Straight, Data Button, 1m
959150	Digimatic Cable with Data Button, 2m
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button

Consumable spares

No.	Description
938882	Battery SR44 1.5V

Horizontal ABSOLUTE Scale Measurement Direction Switching

Functions	Series 572
ON/OFF	●
DATA/HOLD	●
Low voltage alarm	●
Data output	●
ZERO SET	●
ORIGIN	●
PRESET	●
Counting direction switchable	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Max. response speed	Unlimited
Delivered	One battery

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button

Consumable spares

| No.	Description
938882	Battery SR44 1.5V

Series 572

This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:
- The ZERO point is set only once and is stored as the ABSOLUTE ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.

572-461

Metric
Without diameter function, with reversible counting direction

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [g]
572-460	0-100	0,03 mm	244	220	250
572-461	0-150	0,03 mm	294	270	280
572-462	0-200	0,03 mm	344	320	310
572-463	0-300	0,04 mm	444	420	370
572-464	0-450	0,04 mm	594	570	760
572-465	0-600	0,05 mm	774	750	900
572-466	0-800	0,06 mm	974	950	1710
572-467	0-1000	0,07 mm	1174	1150	2040

100-300 mm

450-1000 mm

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Horizontal ABSOLUTE Scale Diameter Function

Series 572

ABSOLUTE

- The ZERO point is set only once and is stored as the ABSOLUTE ZERO point until the next battery replacement
- You can make the highest precision measurements even at the highest drive speed.

572-483-10

Functions	Series 572
ON/OFF	●
DATA/HOLD	●
Low voltage alarm	●
Data output	●
ZERO SET	●
PRESET	●
Diameter function	●
ORIGIN	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Max response speed	Unlimited
Delivered	One battery

Metric — Horizontal multi-function type with diameter displaying function
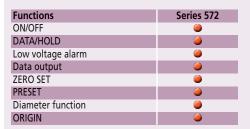
No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	t [mm]	Mass [g]
572-480-10	0-100	0,03 mm	244	220		250
572-481-10	0-150	0,03 mm	294	270		280
572-482-10	0-200	0,03 mm	344	320		310
572-483-10	0-300	0,04 mm	444	420		370
572-484-10	0-450	0,04 mm	594	570	6	760
572-485-10	0-600	0,05 mm	774	750	6	900
572-486-10	0-800	0,06 mm	974	950	10	1710
572-487-10	0-1000	0,07 mm	1174	1150	10	2040

100-300 mm

450-1000 mm

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button

Consumable spares

No.	Description
938882	Battery SR44 1.5V

Vertical ABSOLUTE Scale Standard

Series 572

This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:
- The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
- You can make the highest precision measurements even at the highest drive speed.
- The display has large characters, making it easy to read.

ABSOLUTE

Functions	Series 572
ON/OFF	●
Low voltage alarm	●
Data output	●
ZERO SET	●
ORIGIN	●
Counting direction switchable	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications. (excluding quantizing error)
Max. response speed	Unlimited
Delivered	One battery

Optional accessories

No.	Description
959143	Data Hold Unit
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
959149	Digimatic Cable, Straight, Data Button, 1m
959150	Digimatic Cable with Data Button, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button

Consumable spares

No.	Description
938882	Battery SR44 1.5V

572-302-10

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	Mass [g]
572-300-10	0-100	0,03 mm	244	220	250
572-301-10	0-150	0,03 mm	294	270	280
572-302-10	0-200	0,03 mm	344	320	310
572-303-10	0-300	0,04 mm	444	420	370
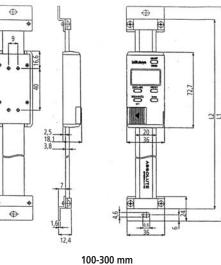
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Vertical ABSOLUTE Scale Measurement Direction Switching

Series 572

ABSOLUTE®
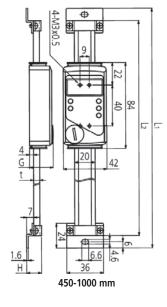
This unit has an ABSOLUTE capacitive-type scale.
It offers you the following benefits:

• The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
• The display has large characters, making it easy to read.
• Measurement direction switching function is included.

Functions	Series 572
ORIGIN (ABS-Zero)	●
ON/OFF	●
DATA/HOLD	●
Data output	●
ZERO SET	●
PRESET	●
Counting direction switchable	●

Specifications

Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Max. response speed	Unlimited
Delivered	One battery

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button

Consumable spares

No.	Description
938882	Battery SR44 1.5V

572-560

100-300 mm

450-1000 mm

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	G [mm]	t [mm]	Mass [g]
572-560	0-100	0,03 mm	244	220			250
572-561	0-150	0,03 mm	294	270			280
572-562	0-200	0,03 mm	344	320			310
572-563	0-300	0,04 mm	444	420			370
572-564	0-450	0,04 mm	594	570	23,2	6	760
572-565	0-600	0,05 mm	774	750	23,2	6	900
572-566	0-800	0,06 mm	974	950	27,2	10	1710
572-567	0-1000	0,07 mm	1174	1150	27,2	10	2040

Vertical ABSOLUTE Scale Diameter Function

Series 572

ABSOLUTE

This unit has an ABSOLUTE capacitive-type scale.
• The ZERO point is set only once and is stored as the absolute ZERO point until the next battery replacement.
• The display has large characters, making it easy to read.
• Diameter measurement function is included.

Functions	Series 572
ON/OFF	●
DATA/HOLD	●
Low voltage alarm	●
Data output	●
ZERO SET	●
PRESET	●
Diameter function	●
ORIGIN	●

Specifications
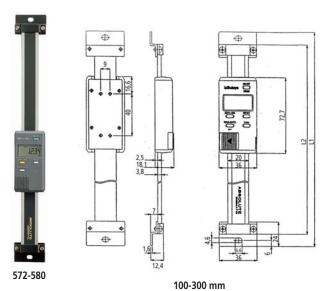
Digital step	0,01 mm
Accuracy	Refer to the list of specifications (excluding quantizing error)
Max. drive speed	Unlimited
Delivered	One battery

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
905409	Digimatic Cable, Flat Straight Type, 2m
905689	Digimatic Cable, Flat L-Shape Type, 1m
905690	Digimatic Cable, Flat L-Shape Type, 2m
905691	Digimatic Cable, Flat L-Shape Right Type, 1m
905692	Digimatic Cable, Flat L-Shape Right Type, 2m
905693	Digimatic Cable, Flat L-Shape Left Type, 1m
905694	Digimatic Cable, Flat L-Shape Left Type, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button

Consumable spares

No.	Description
938882	Battery SR44 1.5V

572-580

100-300 mm

450-1000 mm

Metric

No.	Range [mm]	Accuracy	L1 [mm]	L2 [mm]	G [mm]	H [mm]	t [mm]	Mass [g]
572-580-10	0-100	0,03 mm	244	220				250
572-581-10	0-150	0,03 mm	294	270				280
572-582-10	0-200	0,03 mm	344	320				310
572-583-10	0-300	0,04 mm	444	420				370
572-584-10	0-450	0,04 mm	594	570	23,2	14,6	6	760
572-585-10	0-600	0,05 mm	774	750	23,2	14,6	6	900
572-586-10	0-800	0,06 mm	974	950	27,2	18,6	10	1710
572-587-10	0-1000	0,07 mm	1174	1150	27,2	18,6	10	2040

All products to be sold to commercial customers. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon. For suggested retail prices, please refer to the separate price list.

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DRO LINEAR SCALES AT103

## Series 539 - sealed incremental - full size housing
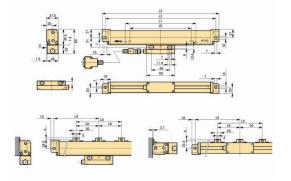
These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position

- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in hostile environments.
- The signal cable outlet can be positioned on either side of the slider so you can connect the signal cable from either direction.

IP53

539-133

Specifications

Accuracy	(5+5L/1.000) μm L = Effective range (mm)
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Max. drive speed	120 m/min.
Signal period	20 μm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Extension cable

Legend
L0 Effective range
L1 Travel range
L2 Bore centre distance
L3 Total length
L4-L6 Support bracket position

No.	Cable length [m]	Effective range	L¹ [mm]	L² [mm]	L³ [mm]	L⁴ [mm]	L⁵ [mm]	L⁶ [mm]	Mass [kg]
539-111-30	3	100 mm	120	248	268				1,5
539-112-30	3	150 mm	170	298	318				
539-113-30	3	200 mm	220	348	368				
539-114-30	3	250 mm	270	398	418				
539-115-30	3	300 mm	330	458	478				
539-116-30	3	350 mm	380	508	528				
539-117-30	3	400 mm	430	558	578				
539-118-30	3	450 mm	480	608	628				
539-119-30	3	500 mm	540	668	688				
539-121-30	3	600 mm	650	778	798				2,6
539-123-30	3	700 mm	760	888	908				2,8
539-124-30	3	750 mm	810	938	958				2,9
539-125-30	3	800 mm	860	988	1008				3
539-126-30	3	900 mm	960	1088	1108				3,3
539-127-30	5	1000 mm	1060	1188	1208	594			3,7
539-128-30	5	1100 mm	1160	1288	1308	644			4
539-129-30	5	1200 mm	1260	1388	1408	694			4,2
539-130-30	5	1300 mm	1360	1488	1508	744			4,4
539-131-30	5	1400 mm	1460	1588	1608	794			4,6
539-132-30	5	1500 mm	1560	1688	1708	844			4,8
539-133-30	5	1600 mm	1690	1818	1838		610		5,1
539-134-30	5	1700 mm	1790	1918	1938		650		5,3
539-135-30	5	1800 mm	1890	2018	2038		670		5,5
539-136-30	5	2000 mm	2100	2228	2248		740		6
539-137-30	5	2200 mm	2300	2428	2448		800		6,4
539-138-30	7	2400 mm	2500	2628	2648	1314	1300	650	7,1
539-139-30	7	2500 mm	2600	2728	2748	1364	1340	670	7,3
539-140-30	7	2600 mm	2700	2828	2848	1414	1400	700	7,5
539-141-30	7	2800 mm	2900	3028	3048	1514	1500	750	7,9
539-142-30	7	3000 mm	3100	3228	3248	1614	1600	800	8,3

Output waveform

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DRO LINEAR SCALES AT103

Specifications

Accuracy	(5+8L/1.000) μm L = Effective range (mm)
Output waveform	Two 90° phased-shifted sinusoidal signals (2Vpp)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Max. drive speed	50 m/min.
Signal period	20 μm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

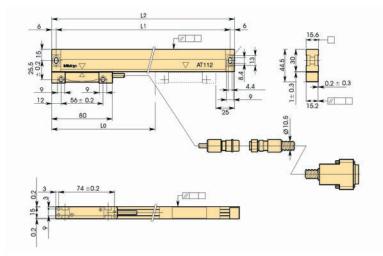| No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Extension cable

Legend
L0 Effective range
L1 Travel range
L2 Bore centre distance
L3 Total length
L4-L6 Support bracket position

Please refer to the DRO leaflet for more details.

Series 539 - sealed incremental - full size housing -larger measuring lenght

These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position
- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in harsh environments.
- The signal cable outlet can be positioned on either side of the slider, so you can connect the signal cable from either direction.

IP53

539-133

No.	Cable length [m]	Effective range	L^1 [mm]	L^3 [mm]	L^4 [mm]	L^5 [mm]	L^6 [mm]	Mass [kg]
539-143-30	10	3250 mm	3350	3470	135	3200	800	10,8
539-144-30	10	3500 mm	3600	3720	160	3400	850	11,4
539-145-30	10	3750 mm	3850	3970	125	3720	930	12
539-146-30	10	4000 mm	4100	4220	110	4000	1000	12,6
539-147-30	10	4250 mm	4350	4470	135	4200	1050	13,2
539-148-30	10	4500 mm	4600	4720	160	4400	1100	13,8
539-149-30	15	4750 mm	4850	4970	85	4800	800	15,2
539-150-30	15	5000 mm	5100	5220	120	4980	830	15,8
539-151-30	15	5250 mm	5350	5470	125	5220	870	16,4
539-152-30	15	5500 mm	5600	5720	130	5460	910	17
539-153-30	15	5750 mm	5850	5970	135	5700	950	17,6
539-154-30	15	6000 mm	6100	6220	110	6000	1000	18,2

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DRO LINEAR SCALES AT103 - High Accuracy

Series 539 - sealed incremental - full size housing- with very high repeatability
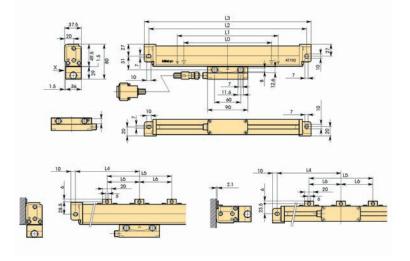
IP53

These linear scales offer : Sturdy construction-high resistance to vibration-protection rating are similar in upright and reclining position
- The innovative rubber lips keep out contaminants when you are using the scale in a machine shop.
- An armoured signal cable is used to connect the scale unit to the DRO counter, so you can operate it safely even in harsh environments.
- The signal cable outlet can be positioned on either side of the slider so you can connect the signal cable from either direction.

539-133

No.	Cable length [m]	Effective range	L^1 [mm]	L^2 [mm]	L^3 [mm]	L^4 [mm]	L^5 [mm]	Mass [kg]
539-111-40	3	100 mm	120	248	268			1,5
539-112-40	3	150 mm	170	298	318			
539-113-40	3	200 mm	220	348	368			
539-114-40	3	250 mm	270	398	418			
539-115-40	3	300 mm	330	458	478			
539-116-40	3	350 mm	380	508	528			
539-117-40	3	400 mm	430	558	578			
539-118-40	3	450 mm	480	608	628			
539-119-40	3	500 mm	540	668	688			
539-121-40	3	600 mm	650	778	798			2,6
539-123-40	3	700 mm	760	888	908			2,8
539-124-40	3	750 mm	810	938	958			2,9
539-125-40	3	800 mm	860	988	1008			3
539-126-40	3	900 mm	960	1088	1108			3,3
539-127-40	5	1000 mm	1060	1188	1208	594		3,7
539-128-40	5	1100 mm	1160	1288	1308	644		4
539-129-40	5	1200 mm	1260	1388	1408	694		4,2
539-130-40	5	1300 mm	1360	1488	1508	744		4,4
539-131-40	5	1400 mm	1460	1588	1608	794		4,6
539-132-40	5	1500 mm	1560	1688	1708	844		4,8
539-133-40	5	1600 mm	1690	1818	1838		610	5,1
539-134-40	5	1700 mm	1790	1918	1938		650	5,3
539-135-40	5	1800 mm	1890	2018	2038		670	5,5
539-136-40	5	2000 mm	2100	2228	2248		740	6

Specifications

Accuracy	(3+3L/1000) µm L = Effective range (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Scale reference points	every 50 mm
Signal period	20 µm
Dust/water protection level	IP53
Max. drive speed	up to 120 m/min.

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Extension cable

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L6 Support bracket position

Refer to the DRO System leaflet for more details.

DRO LINEAR SCALES AT113

Series 539 - sealed incremental - slimline scale housing
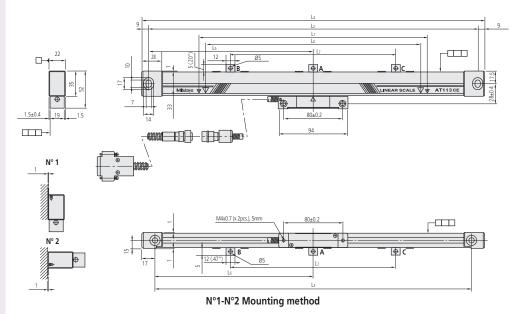
These linear scales are built for limited installation space
- Glass scale - Zero not coded
- Expansion factor $(8 \pm 1) \times 10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

Specifications

Accuracy	$(5+5L/1000)$ µm L = Effective range (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Max. drive speed	120 m/min
Signal period	20 µm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

539-201-30

No.	Cable length [m]	Effective range	L^1 [mm]	L^2 [mm]	L^3 [mm]	L^4 [mm]	L^5 [mm]	L^6 [mm]	L^7 [mm]	Mass [kg]
539-201-30	3,5	100 mm	120	258	242	276				0,9
539-202-30	3,5	150 mm	170	308	292	326				
539-203-30	3,5	200 mm	220	358	342	376				
539-204-30	3,5	250 mm	270	408	392	426				
539-205-30	3,5	300 mm	330	468	452	486				
539-206-30	3,5	350 mm	380	518	502	536				
539-207-30	3,5	400 mm	430	568	552	586				
539-208-30	3,5	450 mm	480	618	602	636				
539-209-30	3,5	500 mm	540	678	662	696	339	331		
539-211-30	3,5	600 mm	640	778	762	796	389	381		1,3
539-213-30	3,5	700 mm	740	878	862	896	439	431		1,3
539-215-30	3,5	800 mm	840	978	962	996	489	481		1,4
539-216-30	3,5	900 mm	940	1078	1062	1096	539	531		1,4
539-217-30	5	1000 mm	1040	1178	1162	1196	589	581		1,9
539-218-30	5	1100 mm	1140	1278	1262	1296			430	1,9
539-219-30	5	1200 mm	1240	1378	1362	1396			460	2
539-220-30	5	1300 mm	1340	1478	1462	1496			490	2,2
539-221-30	5	1400 mm	1440	1578	1562	1596			530	2,2
539-222-30	5	1500 mm	1540	1678	1662	1696			560	2,2

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L7 Support bracket position

Refer to the DRO System leaflet for more details.

N° 1

N° 2

N°1-N°2 Mounting method

Mitutoyo

DRO LINEAR SCALES AT113 - High Accuracy

Series 539 - sealed incremental - slimline housing - with very high repeatability
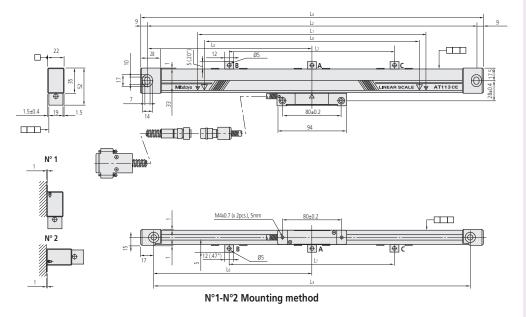
These linear scales are built for limited installation space
- Glass scale - Zero not coded
- Expansion factor $(8 \pm 1) \times 10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

539-201-40

Specifications

Accuracy	$(3+3L/1000)$ µm L = Effective range (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Max. drive speed	120 m/min
Signal period	20 µm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

No.	Cable length [m]	Effective range	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	Mass [kg]
539-201-40	3,5	100 mm	120	258	242	276				0,9
539-202-40	3,5	150 mm	170	308	292	326				
539-203-40	3,5	200 mm	220	358	342	376				
539-204-40	3,5	250 mm	270	408	392	426				
539-205-40	3,5	300 mm	330	468	452	486				
539-206-40	3,5	350mm	380	518	502	536				
539-207-40	3,5	400 mm	430	568	552	586				
539-208-40	3,5	450 mm	480	618	602	636				
539-209-40	3,5	500 mm	540	678	662	696	339	331		
539-211-40	3,5	600 mm	640	778	762	796	389	381		1,3
539-213-40	3,5	700 mm	740	878	862	896	439	431		1,3
539-214-40	3,5	750 mm	780	918	902	936	459	451		1,4
539-216-40	3,5	900 mm	940	1078	1062	1096	539	531		1,4
539-217-40	5	1000 mm	1040	1178	1162	1196	589	581		1,9
539-218-40	5	1100 mm	1140	1278	1262	1296			430	1,9
539-219-40	5	1200 mm	1240	1378	1362	1396			460	2
539-220-40	5	1300 mm	1340	1478	1462	1496			530	2,2
539-221-40	5	1400 mm	1440	1578	1562	1596			530	2,2
539-222-40	5	1500 mm	1540	1678	1662	1696			560	2,2

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L7 Support bracket position

Refer to the DRO System leaflet for more details.

N°1-N°2 Mounting method

Mitutoyo

DRO LINEAR SCALE AT112 - High Accuracy

Series 539 - sealed incremental - super slim housing - with very high repeatability

IP53

- Extra-slim construction
- Glass scale - Zero not coded
- Expansion factor $(8 \pm 1) \times 10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

Specifications

Accuracy	$(3+3L/1000)$ µm L = Effective range (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Max. drive speed	up to 72 m/min
Signal period	20 µm
Scale reference points	every 50 mm
Dust/water protection level	IP53
Delivered	Mounting set

Optional accessories

No.	Description
09AAA033A	Extension Cable 2M
09AAA033B	Extension Cable 5M
09AAA033C	Extension Cable 7M
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Refer to the DRO System leaflet for more details.

High accuracy

No.	Cable length [m]	Effective range	L^1 [mm]	L^2 [mm]	Mass [kg]
539-251-10	3	50 mm	143	155	0,72
539-252-10	3	70 mm	163	175	0,74
539-253-10	3	120 mm	213	225	0,8
539-254-10	3	170 mm	263	275	0,85
539-255-10	3	220 mm	313	325	0,9
539-256-10	3	270 mm	363	375	0,95
539-257-10	3	320 mm	413	425	1
539-258-10	3	370 mm	463	475	1,05
539-259-10	3	420 mm	513	525	1,1
539-260-10	3	470 mm	563	575	1,15
539-261-10	3	520 mm	613	625	1,2
539-262-10	3	570 mm	663	675	1,25
539-263-10	3	620 mm	713	725	1,3
539-264-10	3	670 mm	763	775	1,35
539-265-10	3	720 mm	813	825	1,4
539-266-10	3	770 mm	863	875	1,45
539-267-10	3	820 mm	913	925	1,5
539-268-10	3	920 mm	1013	1025	1,56
539-269-10	3	1020 mm	1113	1125	1,62

Legend
L0 Effective range
L1 Mount interval
L2 Overall length

Mitutoyo

DRO LINEAR SCALES AT116
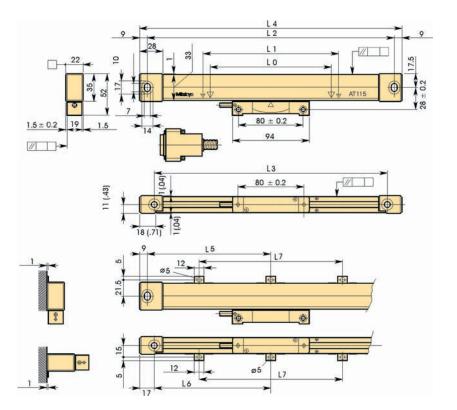
Series 539 - sealed incremental - slimline housing - price aggressive

IP53

- Suitable for milling machines, XY tables, jigs, etc.
- Glass scale - Zero not coded
- Expansion factor $(8 \pm 1) \times 10^{-6}/K^{-1}$
- An armoured inox signal cable is used to connect the DRO counter

539-271-30

No.	Cable length [m]	Effective range	L¹ [mm]	L² [mm]	L³ [mm]	L⁴ [mm]	L⁵ [mm]	L⁶ [mm]	L⁷ [mm]	Mass [g]
539-271-30	3,5	100 mm	120	258	242	276				550
539-272-30	3,5	150 mm	170	308	292		326			600
539-273-30	3,5	200 mm	220	358	342	376				700
539-274-30	3,5	250 mm	270	408	392	426				800
539-275-30	3,5	300 mm	330	468	452	486				900
539-276-30	3,5	350 mm	380	518	502	536				1000
539-277-30	3,5	400 mm	430	568	552	586				1050
539-278-30	3,5	450 mm	480	618	602	636				1150
539-279-30	3,5	500 mm	540	678	662	696	339	331		1250
539-281-30	3,5	600 mm	640	778	762	796	389	381		1450
539-283-30	3,5	700 mm	740	878	862	896	439	431		1600
539-284-30	3,5	750 mm	780	918	902	936	459	451		1700
539-285-30	3,5	800 mm	840	978	962	996	489	481		1800
539-286-30	3,5	900 mm	940	1078	1062	1096	539	531		1950
539-287-30	5	1000 mm	1040	1178	1162	1196	589	581		2350
539-288-30	5	1100 mm	1140	1278	1262	1296			430	2500
539-289-30	5	1200 mm	1240	1378	1362	1396			460	2700
539-290-30	5	1300 mm	1340	1478	1462	1496			490	2850
539-291-30	5	1400 mm	1440	1578	1562	1596			530	3050
539-292-30	5	1500 mm	1540	1678	1662	1696			560	3250

Specifications

Accuracy	$(5+5L/1000)$ µm, L = Effective range (mm)
Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
Max. drive speed	up to 50 m/min
Signal period	20 µm
Scale reference points	every 50 mm
Dust/water protection level	IP53

Optional accessories

No.	Description
09AAA720A	2M Cable for AT115, Conduit Armed
09AAA720B	5M Cable for AT115, Conduit Armed
09AAA720C	Cable, for Linear Scale 7m
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Extension cable

Legend
L0 Effective range
L1 Travel range
L2-L3 Mount interval
L4 Overall length
L5-L7 Support bracket position

Refer to the DRO System leaflet for more details.

DRO ABS LINEAR SCALES AT715

Series 539 - sealed Absolute - IP 67 protection - medium scale housing - specific for new and old manual machine
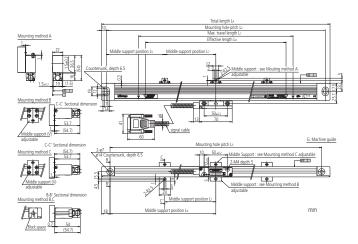
This linear scale is based on electro magnetic induction principle thus offering you high enviroment protection IP level , in the mean time reference point is not necessary after each power on.

Safety
Dust- and
Water-
Protected

TÜVRheinland
CERTIFIED
www.tuv.com
ID 0000007295

ABSOLUTE®

IP67

Specifications

Accuracy	100 to 500 mm ±5 µm
	600 to 1800 mm ±7 µm
	2000 to 3000 mm ±10 µm
Operation temperature	0-45 °C
Power supply	5V DC ± 10%
Max. drive speed	50 m/min
Signal period	20 µm
Measuring method	Electromagnetic induction system

Optional accessories

No.	Description
09AAB674A	Extension Cable 2m, for AT715
09AAB674B	Extension Cable 5m, for AT715
09AAB674C	Extension Cable 7m, for AT715
174-147D	Linear Scale Counter KLD-214
174-183D	Linear Scale Counter KA-212
174-185D	Linear Scale Counter KA-213

Legend
L0 Effective range
L1 Travel range
L2-L4 Mounting hole pitch
L5-L8 Middle support positions

Refer to the DRO System leaflet for more details.

No.	Cable length [m]	Effective range	L1 [mm]	L2 [mm]	L3 [mm]	L4 [mm]	L5 [mm]	L6 [mm]	L7 [mm]	L8 [mm]
539-801	3,5	100 mm	120	258	242	278				
539-802	3,5	150 mm	170	308	292	328				
539-803	3,5	200 mm	220	358	342	378				
539-804	3,5	250 mm	270	408	392	428				
539-805	3,5	300 mm	330	468	452	488				
539-806	3,5	350 mm	380	518	502	538				
539-807	3,5	400 mm	430	568	552	588				
539-808	3,5	450 mm	480	618	602	638				
539-809	3,5	500 mm	540	678	662	698	339	331		
539-811	3,5	600 mm	640	778	762	798	389	381		
539-813	3,5	700 mm	740	878	862	898	439	431		
539-814	3,5	750 mm	780	918	902	938	459	451		
539-815	3,5	800 mm	840	978	962	998	489	481		
539-816	3,5	900 mm	940	1078	1062	1098	539	531		
539-817	5	1000 mm	1040	1178	1162	1198	589	581		
539-818	5	1100 mm	1140	1278	1262	1298	424	416	430	
539-819	5	1200 mm	1240	1378	1362	1398	459	451	460	
539-820	5	1300 mm	1340	1478	1462	1498	494	486	490	
539-821	5	1400 mm	1440	1578	1562	1598	524	516	530	
539-822	5	1500 mm	1540	1678	1662	1698	559	551	560	
539-823	5	1600 mm	1640	1778	1762	1798	459	451	430	215
539-824	5	1700 mm	1740	1878	1862	1898	479	471	460	230
539-825	5	1800 mm	1840	1978	1962	1998	459	451	530	280
539-860	5	2000 mm	2040	2178	2162	2198	539	531	550	
539-861	5	2200 mm	2240	2378	2362	2398	469	461	480	
539-862	7	2400 mm	2440	2578	2562	2598	509	501	520	
539-863	7	2500 mm	2540	2678	2662	2698	529	521	540	
539-864	7	2600 mm	2640	2778	2762	2798	549	541	560	
539-865	7	2800 mm	2840	2978	2962	2998	489	481	500	
539-866	7	3000 mm	3040	3178	3162	3198	529	521	530	

Extended cable 2 m is attached to 2400-3000 mm of effective length at signal cable 5 m, and it is 7 m in total!

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Universal DRO KA-200 Counter

Series 174 - DRO counter for Linear Scales
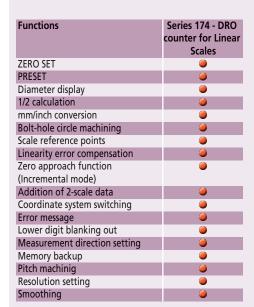
This counter displays length indication transmitted from a linear scale.
The KA-Counter offers you the following benefits:

- Can be used as a "standard counter" or a "lathe counter" by modifying parameters.
- Downsizing, weight saving and multiple function have been realized.
- Sub display for easy operation.
- Text data can be output using the optional USB interface.
- The optional external interface RS-232C enables connection to a PC and a printer.

174-185D

No.	Axes	Mass
174-183D	2	1,25 kg
174-185D	3	1,33 kg

Functions	Series 174 - DRO counter for Linear Scales
ZERO SET	●
PRESET	●
Diameter display	●
1/2 calculation	●
mm/inch conversion	●
Bolt-hole circle machining	●
Scale reference points	●
Linearity error compensation	●
Zero approach function (Incremental mode)	●
Addition of 2-scale data	●
Coordinate system switching	●
Error message	●
Lower digit blanking out	●
Measurement direction setting	●
Memory backup	●
Pitch machinig	●
Resolution setting	●
Smoothing	●

Specifications

Display	7-segment, 8-digit + sign + 8-character alphabet LED display
Power supply	100-240V-AC 50/60 Hz
Dimensions (WxDxH)	300 x 70 x 167 mm mm
Resolution	With AT100 Series: 0,05 - 0,0001 mm With AT715: 0,01 - 0,001 mm
Operation temperature	0°C to 45°C
Macro functions	Rectangular drilling and round milling newly added
Main features	Feed speed display; taper machining function; tool data; multipoint compensation; scale check function; calculation function
Output (optional)	RS-232C / USB

Optional accessories

No.	Description
06AET993	RS 232 C code out unit
06ACF941	Load/Zero Cable f. KA
937179T	Footswitch for SPC

*with Linear Scale AT1xx only

DRO KLD200 Counter

Specifications

Digital step	0,001 mm (Indication range: -9.999.999 mm to +99.999.999 mm) 0,005 mm (Indication range: -9.999.995 mm to +99.999.995 mm)
Power supply	100-120V/200-240V AC 50/60 Hz
Scale input ports	1
Display	9-Digit LED and a negative (-) sign

Optional accessories

No.	Description
965004	RS 232 C Extern Load Switch
937328	Extern load box
936553	Remote Switch

Series 174

The KLD200 Counter is a single axis linear scale display unit with limit signal output.
The KLD200 offers you the following benefits:
• The counter is designed to signal when a linear scale displacement value and a preset limit value coincide.
• You have a choice of two types of limit settings (2 step and 4 step).
• Ideal for controlling vertical positioning on an EDM or a grinding machine.
• You can connect it to a computer or a sequencer via an RS-232C Interface or limit signal output (offered as standard).
• You can connect the following linear scales to the counter: AT103/AT112/AT113/AT116/AT181/AT715.
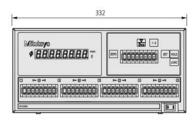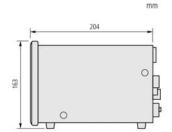
174-147

No.	Mass [kg]	Description
174-147D	3	4-step limit signal output
174-146D	3	2-step limit signal output

1. Relay signal output
2. Photocoupler signal output
3. Remote signal input
4. External load signal input
5. External zero-set signal input
6. Touch signal input
7. RS-232C interface
8. Input Linear Scale Signal

mm

407

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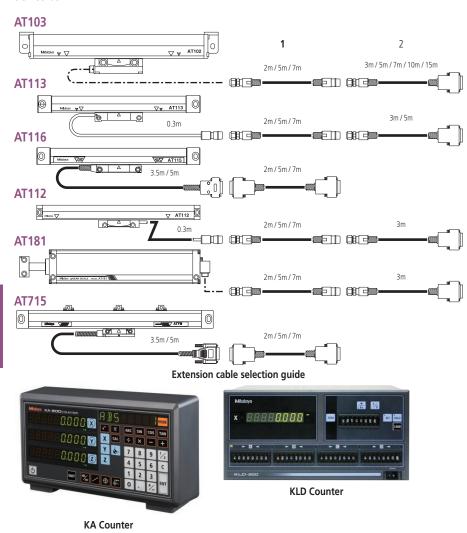
DRO Extension cables selection guide

Series 0944

AT103

1   **2**

2m / 5m / 7m   3m / 5m / 7m / 10m / 15m

AT113

0.3m   2m / 5m / 7m   3m / 5m

AT116

3.5m / 5m   2m / 5m / 7m

AT112

0.3m   2m / 5m / 7m   3m

AT181

2m / 5m / 7m   3m

AT715

3.5m / 5m   2m / 5m / 7m

Extension cable selection guide

KA Counter

KLD Counter

Mitutoyo

Overview of CNC Linear Scale System

	Scale Name (code)	Reference point	ABSOLUTE function	Main scale grating pitch	Signal output pitch	Signal unit	No. of Division	Resolution	Maximum response speed	Minimum edge interval
Separate Type Linear Scales	ST36B ST36C (ST36A) (ST36D)	○	×	8µm	4µm	– (PSU-200)	400	0.01µm	70mm/s	125ns
							200	0.02µm	150mm/s	
							80	0.05µm	260mm/s	
							40	0.1µm	720mm/s	
	ST24B ST24C	○	×	20µm	10µm	–	200	0.05µm	360mm/s	125ns
							100	0.1µm	720mm/s	
							20	0.5µm	1200mm/s	250ns
							10	1µm	1200mm/s	500ns
	ST46-EZA	○	×	20µm	20µm	–	400	0.05µm	900mm/s	50ns
							200	0.1µm	1800mm/s	
							40	0.5µm	2600mm/s	
							20	1µm	2600mm/s	
	ST422	○	×	40µm	40µm	–	200	0.2µm	1500mm/s	125ns
							80	0.5µm	3600mm/s	
							40	1µm	5000mm/s	
							8	5µm	5000mm/s	250ns
	ABS ST700 Compact type	–	○	3.072mm	3.072mm	–	30720	0.1µm	5000mm/s	–
Assembly Type Linear Scales	AT402E	○	△	20µm	20µm	–	–	–	2000mm/s	1Vp-p differential sine wave
	AT211	○	×	20µm	20µm	–	200	0.1µm	710mm/s	125ns
							100	0.2µm	1400mm/s	
							40	0.5µm	2000mm/s	
							20	1µm		250ns
							8	2.5µm		500ns
							4	5µm		1000ns
	AT203	○	×	20µm	20µm	–	200	0.1µm	333mm/s	250ns
							40	0.5µm	1833mm/s	
							20	1µm	2000mm/s	
	ABS AT500	–	○	20µm	20µm	–	4096	0.005µm	2500mm/s*1	–
							400	0.05µm		
	ABS AT300	–	○	20µm	20µm	–	400	0.05µm	2000mm/s	–

*1 Maximum response speed of H type with 0.005µm resolution is 1200mm/s.

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CNC LINEAR SCALES AT402E

Series 539 - sealed incremental - zero coded-standard size housing - high traverse speed

IP53
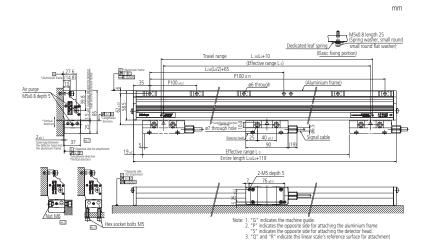
Universal & High vibration (20G) and shock (40G) - resistant type.
- 20 µm grating pitch
- output signal 1Vpp
- zero coded every 20 µm
- suggested resolution 1 - 0,5 µm

Specifications

Operation temperature	0°C to 45°C
Power supply	5V DC ± 10%
Accuracy	140 to 540 mm ±2 µm 640 to 3040 mm ± 3 µm
Max. drive speed	over 120 m/min
Signal period	20 µm
Output waveform	Two 90° phase-shifted sinusoidal signals (1 Vpp) Differential (RS-485)

Optional accessories

No.	Description
09AAC071A	Signal-Cable A, 1m/AT402E
09AAC071B	Signal-Cable A, 3m/AT402E
09AAC071C	Signal-Cable A, 6m/AT402E
09AAC071D	Signal-Cable A, 9m/AT402E
09AAC079A	Signal-Cable B, 1m/AT402E
09AAC079B	Signal-Cable B, 3m/AT402E
09AAC079C	Signal-Cable B, 6m/AT402E
09AAC079D	Signal-Cable B, 9m/AT402E
09AAC073A	Signal-Cable C, 1m/AT402E
09AAC073B	Signal-Cable C, 3m/AT402E
09AAC073C	Signal-Cable C, 6m/AT402E
09AAC073D	Signal-Cable C, 9m/AT402E

Without cable (-00)

No.	Effective range	L^1 [mm]	L^2 [mm]	L^3 [mm]
539-371-00	140 mm	259	135	150
539-373-00	240 mm	359	185	250
539-374-00	340 mm	459	235	350
539-375-00	440 mm	559	285	450
539-376-00	540 mm	659	335	550
539-377-00	640 mm	759	385	650
539-378-00	740 mm	859	435	750
539-379-00	840 mm	959	485	850
539-380-00	940 mm	1059	535	950
539-381-00	1040 mm	1159	585	1050
539-382-00	1140 mm	1259	635	1150
539-383-00	1240 mm	1359	685	1250
539-384-00	1340 mm	1459	735	1350
539-385-00	1440 mm	1559	785	1450
539-386-00	1540 mm	1659	835	1550
539-387-00	1640 mm	1759	885	1650
539-388-00	1740 mm	1859	935	1750
539-389-00	1840 mm	1959	985	1850
539-390-00	2040 mm	2159	1085	2050
539-391-00	2240 mm	2359	1185	2250
539-392-00	2440 mm	2559	1285	2450
539-393-00	2640 mm	2759	1385	2650
539-394-00	2840 mm	2959	1485	2850
539-395-00	3040 mm	3159	1585	3050

mm

Note: 1. "G" indicates the machine guide.
2. "P" indicates the opposite side for attaching the aluminium frame
   "S" indicates the opposite side for attaching the detector head.
3. "Q" and "R" indicate this linear scale's reference surface for attachment

CNC LINEAR SCALES AT203

Series 539 - sealed incremental -full size housing - high traverse speed-larger measuring lenght

IP 53

- Accuracy : from 100 up to 1500 mm =± 3 µm
- from 1600 up to 3040 mm= ± 5 µm
- from 3250 up to 6000 mm= +-10 um
- Protection from IP 53 up to IP 64 (pressure device connection)

Specifications

Power supply	5V DC ± 10%
Accuracy	100 to 1500 mm (3+3L/1000) µm 1600 to 3000 mm (5+5L/1000) µm 3250 to 6000 mm (5+8L/1000) µm L = Effective range (mm)
Max. drive speed	up to 120 m/min
Scale reference points	every 50 mm
Cable length	5 m
Output waveform	Two 90° phase-shifted quadrature signals (RS422) Differential line driver
Resolution	0,1; 0,5; 1

CNC LINEAR SCALES AT211

Series 539 - Sealed incremental - slimline size housing - high traverse speed-with very high repeateability

IP 53

- 20 µm grating pitch-output signal square wave (RS 422)
- suggested resolution 1 - 0,5 µm
- high traverse speed
- Accuracy - standard version: from 100 up to 1500 mm =± 3 µm
- Accuracy - high repeateability from 100 up to 1500 = ± 2 µm
- Protection from IP 53 up to IP 64 (pressure device connection)

AT211A

AT211B

Specifications

Power supply	5V DC ± 10%
Accuracy	100 to 1500 mm (3+3L/1000) µm (standard type) (2+2L/1000) µm (high-accuracy type) 500 to 1500 mm (3+3L/1000) µm L = Effective range (mm)
Max. drive speed	up to 120 m/min
Signal period	20 µm
Resolution	0,1; 0,5; 1 µm
Output waveform	Two 90° phase-shifted quadrature signals (RS422) Differential line driver

Mitutoyo

CNC ABS LINEAR SCALES AT300

Series 539 - Sealed Absolute type - Standard dimension

This sealed-type, ABSOLUTE linear scale gives you very fine resolution up to 0,05µm. The AT300 offers you the following benefits:
- You can connect it directly with NC machine tools.
- ABS AT303: Supports Mitutoyo standard serial interface.
- ABS AT343: Supports Mitsubishi® Electric high-speed serial interface.
- ABS AT353: Supports Fanuc® high-speed serial interface.
- Installation dimensions are available from Mitutoyo – please contact.

ABSOLUTE® IP 53

Specifications

Power supply	5V DC ± 10%
Accuracy	100 to 1500 mm (3+3L/1000) µm 1600 to 3000 mm (5+5L/1000) µm L = Effective range (mm)
Max. drive speed	up to 120 m/min
Resolution	0,05 µm
Signal period	20 µm

Refer to the NC Linear Scale brochure for more details

AT300

CNC ABS LINEAR SCALES AT500

Series 539 - Sealed Absolute type - Slim line
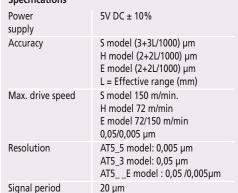
This sealed-type, ABSOLUTE linear scale gives you very fine resolution up to 0,05µm. The AT500 offers you the following benefits:
- You can connect it directly with NC machine tools.
- ABS AT505/AT503: Supports Mitutoyo standard serial interface.
- ABS AT545/AT543: Supports Mitsibishi® Electric high-speed serial interface.
- ABS AT555/AT553: Supports Fanuc® high-speed serial interface.
- You have a choice of two types:
  -SC model: high-rigidity type
  -HC model: high-accuracy type.
- Installation dimensions are available from Mitutoyo – please contact.

ABSOLUTE® IP 53

Specifications

Power supply	5V DC ± 10%
Accuracy	S model (3+3L/1000) µm H model (2+2L/1000) µm E model (2+2L/1000) µm L = Effective range (mm)
Max. drive speed	S model 150 m/min. H model 72 m/min E model 72/150 m/min 0,05/0,005 µm
Resolution	AT5_5 model: 0,005 µm AT5_3 model: 0,05 µm AT5_ _E model : 0,05 /0,005µm
Signal period	20 µm

Refer to the NC Linear Scale brochure for more details

AT553-HC

AT553-SC

CNC ABS LINEAR SCALES AT1100

Series 579 - Electromagnetic induction Absolute Scale

ABSOLUTE®

This scale unit leverages Mitutoyo's unique electromagnetic induction technology to provide excellent resistance to oil and water compared with the optical linear encoder type, elevating the ABS AT1100 to the level of a highly reliable NC machine-tool scale suitable for tough shop floor conditions.

- Additional factors in providing the high performance of the ABS AT1100 are the innovative shaping and location of the detector track in the aluminum frame and the extreme coolant resistance of the track-seal material. Together these combine in a highly effective first defence against contamination of the scale and sensor even in extremely severe installation environments.

Specifications

Detection Method	Electromagnetic induction
Resolution	0,05 µm
Maximum effective range	3040 mm
Cross section	85 x 37 mm
Accuracy	3+5L/1000) µm L= 140 to 2040 mm (5+5L/1000) µm L= 2240 to 3040 mm
Response speed	3 m/s
Compatible interface	FANUC Corporation's Serial Interface Mitsubishi Electric Corporation's High-speed Serial Interface

CNC LINEAR SCALES ST24

Series 579 - Open scales with Sine & Square-Wave Output

This standard-type linear scale gives you a maximum response speed of up to 1200mm/s
The AT500 offers you the following benefits:
- It Includes an LED alarm enabling you to detect overspeed and sinusoidal signal anomalies.
- Installation dimensions are available from Mitutoyo – please contact.

ST24

Specifications

Power supply	5V DC ± 10%
Accuracy	10 - 300 mm ±1 µm 350 - 500 mm ±2 µm 600 - 1000 mm ±3 µm 1100 - 3000 mm ±3 µm/m
Max. drive speed	Up to 1200 mm/sec
Scale reference points	10 - 80 mm Scale center point 100 - 3000 mm every 50 mm
Resolution	0,05; 0,1; 0,5; 1 µm
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp) Two 90° phase-shifted square-wave signals (RS422) Line driver
Signal period	10 µm

Model C

Model B/C

Mitutoyo

CNC LINEAR SCALES ST36

Series 579 - Open scales with Sine & Square-Wave Output

This is a high resolution, high accuracy, portable model designed for exposed installations.
The ST36 offers you the following benefits:
• High reliability with stable signal output.
• Outputs two-phase sinusoidal signal (signal pitch 4μm) and two-phase square-wave
  signal simultaneously.
• Outputs two-phase sinusoidal signal (signal pitch 4μm) and two-phase square-wave
  signal simultaneously.
• You are provided with a compact interface box as standard.
  Installation dimensions are available from Mitutoyo – please contact.
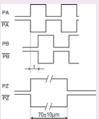
ST36

Specifications

Power supply	5V DC ± 10%
Accuracy	10 - 300 mm ±0,5 μm
	350 - 500 mm ±1 μm
	600 - 1000 mm ±2 μm
	1100 - 3000 mm ±2 μm/m
Max. drive speed	1200 mm/sec
Signal period	8 μm
Scale reference points	10 -75 mm Center point scale
	100 - 3000 mm every 50 mm
Signal period	4 μm
Resolution	0,01; 0,02; 0,05; 0,1 μm
Output waveform	Two 90° phase-shifted sinusoidal signals 2Vpp (Model A and C)
	Two 90° phase-shifted square-wave signals (Model B and C) RS422 Line Driver

Model A/C

Model B/C

CNC LINEAR SCALES ST422

Series 579 - Open scales with Sine & Square Wave Output

This compact-type, exposed-type incremental linear scale gives you a maximum response speed of 5000 mm/sec.
The ST422 offers you the following benefits:
• It is provided with alarm LED error indication with fault detection signal output for overspeed
  and sinusoidal signal anomalies.
• Installation dimensions are available from Mitutoyo – please contact.
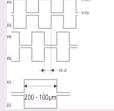
ST422

Specifications

Power supply	5V DC ± 10%
Accuracy	10 - 300 mm ±1 μm
	350 - 500 mm ±2 μm
	600 - 1000 mm ±3 μm
	1100 - 3000 mm ±3 μm
Max. drive speed	up to 5000 mm/sec
Scale reference points	10 - 75 mm Center point scale
	100 - 3000 mm every 50 mm
Signal period	40 μm
Resolution	0,2; 0,5; 1; 5 μm
Output waveform	Two 90° phase-shifted sinusoidal signals (2Vpp)
	Two 90° phase-shifted square-wave signals (RS422) Line driver

Two 90° phase-shifted square waves signals

Refer to the NC Linear Scale brochure for more details
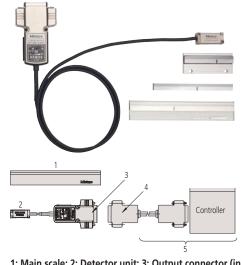
CNC Linear Scale ST46-EZA

Series 579 - Fotoelectric metal tape linear scales

- Grating pitch 20 µm
- Zero reference not coded
- Output signal sinusoidal 2Vpp or square wave signal(RS 422) sticky or double sided tape version
- LED display function anomalie
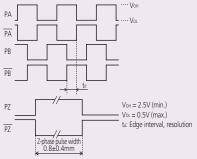
No.	Detection Method
ST46EZA Type B	Reflective photoelectric linear encoder
ST46EZA Type C	Reflective photoelectric linear encoder

1: Main scale; 2: Detector unit; 3: Output connector (included); 4: Feedback cable; 5: To be supplied by customer (feedback cable/controller)

Specifications
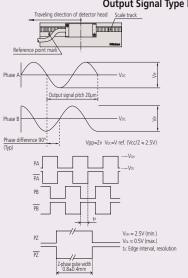
Effective range	10 to 3000 mm
Maximum response speed	2,6 m/s (at sine wave amplitude -3dB)
Internal expansion coefficient	$(8\pm1) \times 10\text{-}6°C$
Output signal	Type B: 2-phase square wave signals, reference point pulse, external reset input Type C: 2-phase square wave signals, reference point pulse, 2 phase sinusoidal signal
Scale reference point	With scale reference point (50 mm pitch, 10 to 80 mm: Center point)
Storage temperature/ humidity	-20 to 60°C, 20 to 80% RH (no condensation)
Operating temperature/ humidity	0 to 40°C, 20 to 80% RH (no condensation)
Power supply voltage	5VDC ± 5%
Scale specifications	Grating pitch 20 µm, Material: metal tape (Glas on request)

$V_{OH} = 2.5V$ (min.)
$V_{OL} = 0.5V$ (max.)
t_d: Edge interval, resolution

Z-phase pulse width 0.8±0.4mm

Output Signal Type B

$Vpp=2v$ $V_{DC}=V$ ref. (Vcc/2 ≒ 2.5V)

$V_{OH} = 2.5V$ (min.)
$V_{OL} = 0.5V$ (max.)
t_d: Edge interval, resolution

Z-phase pulse width 0.8±0.4mm

Output Signal Type C

Brochure on request

Mitutoyo

CNC LINEAR SCALES ST700

Series 579 - Electromagnetic induction Absolute Scale

ABSOLUTE scales have eliminated the need to re-establish the origin.
The ST700 offers you the following benefits:
• It is optimized for the control of linear motors.
• Optimized for high-speed, high-acceleration control.
• A non-contact detection system ensures a long service life for your product.
• Signal adjustment at installation is automatically performed with dedicated software.

ABSOLUTE®
IP65

Refer to the Linear Scale ST700 brochure for more details

Applicable system	Resolution 0,1 µm 50 mm head
	No.
[Amplifiers supporting Mitutoyo ENSIS interface] Nikki Denso Co., Ltd. VC Series Servoland Corporation SVF Series PMAC JAPAN Co., Ltd. controller	**ABS ST708A** **ABS ST708AL**
FANUC® Ltd. FS-I Series control unit, Power Mate® i	**ABS ST758** **ABS ST758L**
Mitsubishi® Electric Corporation MELDAS® Series Supported amplifier : MDS-Vn-V1/V2	**ABS ST748** **ABS ST748L**
Mitsubishi® Electric Corporation MR-J2S/MR-J3 Series	**ABS ST748A** **ABS ST748AL**
Panasonic Matsushita® Electric Industrial Co, Ltd., Motor Company MINAS® A4, A4P, A4N Series	**ABS ST778A** **ABS ST778L**
Yaskawa® Electric Corporation ∑-III Series	**ABS ST788A** **ABS ST788L**

Item / Scale Type	Scale base type	Glass scale type
Resolution	0.1µm (0.05µm: special order)	
Detection method	Electromagnetic induction Absolute position detection method*	
Shape	Separate type scale	
Effective range (accuracy guarantee range)	100 to 3000mm / 3200 to 6000mm	100 to 1100mm
Accuracy (20°C)	$(5+5L/1000)$ µm L: Effective range mm	$(3+3L/1000)$ µm L: Effective range mm
Maximum feed speed	5 m/s	
Thermal expansion coefficient	$(12.0\pm1.5)\times10^{-6}$ /°C (when attached to material equivalent to steel)	$(8\pm1.0)\times10^{-6}$/°C
Operating conditions — Temperature	0 to 50°C	
Operating conditions — Humidity	20 to 80%RH	
Storage conditions — Temperature	−20 to 70°C	
Storage conditions — Humidity	20 to 80%RH	
Power supply voltage	5V±10% (at the detector head) (Ripple and spike noise should not exceed 100mV)	
Current consumption	270mA (Max.)	
Vibration resistance	300m/s² (55 to 2000Hz)	100m/s² (55 to 2000Hz)
Shock resistance	500m/s² (half-sine, 11ms)	150m/s² (half-sine, 11ms)
Head cable — Length/cable diameter	1m / ø3.8mm (high-flex cable)	
Head cable — Connector	1) D-sub (15-pin pin type) connector (not waterproof) 2) D-sub (9-pin socket type) connector (not waterproof): for ST788A	
Maximum signal cable length	Up to 29m (head cable length included) (Please consult the user's manual)	
Detector mounting	1 location each on top and sides	
Direction of cable outlet	4 sides (top, bottom, left, right) can be selected	

Linear Scale ABS ST1300

Specifications

Range	max. 12 m
Accuracy	10 µm/m (± 5µm)
Applicable Interfaces	FANUS; Mitsubishi Electric; Yaskawa Electric; Panasonic; Mitutoyo ENSIS standard interface
Max. response speed	8 m/s (Varies according to the interface)
Min. resolution	1 nm / 10 nm
Scale specifications	Metal tape

Series 579 - High-speed, high-resolution Absolte Tape Scale

Long, fast and diverse connectivity

- Realizes a 12m maximum effective length, 8-m/s max. response speed and 1nm minimum resolution.
- Extensive interface compatibility. See specifications below for details.
- Outstanding robustness against contamination compared to earlier photoelectric types achieved using a new detection principle.
- Choice between double-sided tape and fixed-ends mounting methods.
- Signal validation program facilitates mounting adjustment and maintenance.
- Applicable Interfaces: FANUC; Mitsubishi Electric; Yaskawa Electric; Panasonic; Mitutoyo ENSIS standard interface
  *: dependent on controller

Mitutoyo

Linear Scale - Fiber Scale

Series 579 - Ultra-compact Linear Encoder

Small detector head allows reduction in size and weight of equipment
- Separating electronic components from the inside of the detector head using an optical fiber-guided wave enables an ultra-compact unit without a heat source and free of electromagnetic noise.
- The ultra-compact detector head, the world's smallest, is ideal for reducing the size and weight of systems.
- 2µm signal output cycle contributes to the development of high-resolution systems.
- LED indicators on the interface unit eliminate the need for an oscilloscope during detector head mounting adjustment, helping to reduce installation work.

Specifications

Signal output cycle	2 µm
Output signal	2-phase sine wave (2Vpp); 2-phase square wave
Effective length	max. 100 mm
Detector head dimensions	5 x 9,6 x 15 mm (S type); 6 x 20 x 10,4 mm (L Type)
Fiber-optic cable lenght	2, 3, 5, 10 m (or 20, 30 m by special order)
Max. response speed	0,8 m/s (with sine-wave output)
Min. resolution	10 nm (with square-wave output)

Optical Measuring Systems

Measuring Microscopes
Page 420

Microscope Units
Page 441

Objective Lenses and Eyepieces
Page 444

Measuring Projectors
Page 457

Mitutoyo

Measuring Microscope TM Generation B Series

Series 176

With this Toolmaker's Microscope you can measure dimensions and angles on small workpieces thanks to the optional analogue or digital micrometer heads and the built-in circular scale.
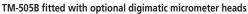
Further benefits of the TM Generation B include:
- Toolmakers microscopes well-suited for measuring dimensions and angles of features on small workpieces with the XY stage and rotating eyepiece scale.
- Compact design with recessed grips for better portability. The slim design makes this microscope ideal for use in areas with limited space.
- Powerful adjustable LED light sources for contour and surface illumination provide optimum lighting conditions for workpiece inspection.
- The TM Generation B is available with work stages of 50 x 50 mm or 100 x 50 mm.

Rotating eyepiece with angle reading

TM-505B fitted with optional digimatic micrometer heads

TM-1005B with optional LED ringlight (63AAA001), 0.37X Eyepiece adapter (63AAA060) and digital HDMI camera (63AAA059)

Specifications

Observation image	Erect
Angle reading	Range : 360° Minimum reading : 6' (by vernier)
Objective lens	2X **(176-138)** Working distance: 67 mm Optional: 5X, 10X
Eyepiece	15X **(176-116)**, View field ø13 mm Optional : 10X, 20X
Total magnification	30X
Transmitted illumination	Light source : White LED with green filter Functions: Light intensity adjustable
Surface illumination	Light source : White LED Functions: Light intensity adjustable
Power supply	100/240V AC, 50/60Hz
Mass	TM-505B: 14 [kg] TM-1005B: 15 [kg]

Standard accessories

No.	Description
176-116	Eyepiece for TM 15X
176-138	Objective Lens for TM 2X
176-126	Reticle for TM, 90° Broken Cross-hair

Optional accessories

No.	Description
63AAA001	LED Ringlight, for TM-500
63AAA353	HDMI USB camera set for TM microscopes, set consist of HDMI6MDPX camera, 0.37X optical adapter and mechanical adapter

63AAA353 - Set includes:
63AAA059 - HDMI6MDPX camera, including HDMI cable, mouse and simple calculation and reporting software on SD card
63AAA060 - 0,37X C-mount to Eyepiece adapter for TM microscopes
63AAA155 - Mechanical adapter for mounting the HDMI camera on the ocular tube

Optional LED Ring Light 63AAA001

Digital camera for TM microscopes
Mounting the HDMI6MDPX digital camera into the ocular tube transforms the TM microscope into a digital microscope.
- HDMI6MDPX, 6 megapixel colour camera with direct HDMI output to a monitor, no PC necessary
- Integrated SD card for saving images and pre-installed software for performing basic in-screen measurements
- Intuitive operation of the software with standard supplied USB mouse

Measuring Microscope TM Generation B Series
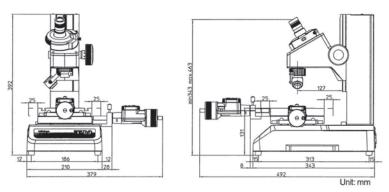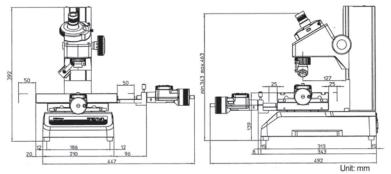
Series 176

Dimensions

Model	TM-505B	TM-1005B
No.	**176-818D**	**176-819D**
XY stage table top size	152 x 152 mm	240 x 152 mm
Effective area of table	96 x 96 mm	154 x 96 mm
XY stage travel range	50 x 50 mm	100 x 50 mm
Max. workpiece height mm	115	107

Unit: mm

TM-505B

Unit: mm

TM-510B

Mitutoyo

Accessories for Measuring Microscope TM Generation B

Series 176
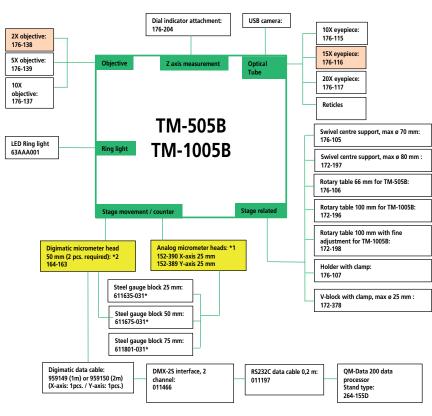
Accessories

Objective Lenses and Eyepieces

No.	Objective lens	Eyepiece 10X (176-115)	Eyepiece 15X (176-116)	Eyepiece 20X (176-117)
176-137	10X	100X (1,3 mm)	150X (1,3 mm)	200X (1 mm)
176-138	2X (1)	20X (6,5 mm)	30X (6,5 mm)	40X (5 mm)
176-139	5X	50X (2,6 mm)	75X (2,6 mm)	100X (2 mm)

(1) Standard accessory
The number in brackets is the diameter of the field of view

Optional accessories

No.	Description
176-115	Eyepiece for TM 10X
176-117	Eyepiece for TM 20X
176-139	Objective Lens for TM 5X
176-137	Objective Lens for TM 10X
152-390	Micrometer Head XY-Stage, Thimble 49mm, 0-25mm, X-Axis
152-389	Micrometer Head XY-Stage, Thimble 49mm, 0-25mm, Y-Axis
176-204	Dial Indicator Attachment, for TM
176-106	Rotary table
176-105	Fixture/clamping material, Swivel center support
172-197	Fixture/clamping material Swivel center support
172-378	Fixture/clamping material, V-block with clamp
176-107	Fixture/clamping material, Holder with clamp
990561	Fixture/clamping material, Workpiece holding clip for 172-Series
63AAA001	LED Ringlight, for TM-500
164-163	Digital Micrometer Head, 0-50mm, Digimatic
959149	Digimatic Cable, Straight, Data Button, 1m
959150	Digimatic Cable with Data Button, 2m
06AFM380C	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Straight, with Data Button
02AZD790C	U-WAVE-T Connection Cable C, Straight, with Data Button
611635-031	Gauge Block, Metric, Inspection Cert., ISO, Grade 1, Steel, 25mm
611675-031	Gauge Block, Metric, Inspection Cert., ISO, Grade 1, Steel, 50mm
172-196	Rotary table, 100 mm for TM-1005B
172-198	Rotary table, 100 mm with fine feed knob for TM-1005B

176-106 : for stage 50 x 50 mm
172-196 and 172-198 : for stage 100 x 50 mm

Diagram

- 2X objective: 176-138
- 5X objective: 176-139
- 10X objective: 176-137
- Dial indicator attachment: 176-204
- USB camera:
- 10X eyepiece: 176-115
- 15X eyepiece: 176-116
- 20X eyepiece: 176-117
- Reticles
- LED Ring light 63AAA001

Objective — **Z axis measurement** — **Optical Tube**

TM-505B TM-1005B

Ring light — **Stage movement / counter** — **Stage related**

- Swivel centre support, max ø 70 mm: 176-105
- Swivel centre support, max ø 80 mm : 172-197
- Rotary table 66 mm for TM-505B: 176-106
- Rotary table 100 mm for TM-1005B: 172-196
- Rotary table 100 mm with fine adjustment for TM-1005B: 172-198
- Holder with clamp: 176-107
- V-block with clamp, max ø 25 mm : 172-378

- Digimatic micrometer head 50 mm (2 pcs. required): *2 164-163
- Analog micrometer heads: *1 152-390 X-axis 25 mm / 152-389 Y-axis 25 mm
- Steel gauge block 25 mm: 611635-031*
- Steel gauge block 50 mm: 611675-031*
- Steel gauge block 75 mm: 611801-031*
- Digimatic data cable: 959149 (1m) or 959150 (2m) (X-axis: 1pcs. / Y-axis: 1pcs.)
- DMX-2S interface, 2 channel: 011466
- RS232C data cable 0,2 m: 011197
- QM-Data 200 data processor Stand type: 264-155D

Standard accessory

Necessary option either chose *1 or *2

* Necessary gauge blocks for extending stage travel range:

Stage travel range	TM with analog micrometer heads 0-25 mm	TM with digimatic micrometer heads 0-50 mm
Range 25-50 mm	X-axis:611635-031 Y-axis:611635-031	
Range 25-75 mm	X-axis:611675-031	
Range 25-100 mm	X-axis:611801-031	
Range 50-100 mm		X-axis:611675-031

Accessories for Measuring Microscope TM Generation B

Series 176

176-109

176-110

176-111

176-112

176-114

176-123

176-124

176-125

176-126

176-140

176-141

Reticles

No.	Remarks
176-109	Metric screw threads (pitch = 0,25 - 1 mm)
176-110	Metric screw threads (pitch = 1,25 - 2 mm)
176-111	Concentric circle (up to ø 4 mm, 0,05 mm increment)
176-112	20° involute gear teeth (normal rack type)
176-114	60° angle
176-123	Unified screw threads (80 - 28TPI)
176-124	Unified screw threads (24 - 14TPI)
176-125	Unified screw threads (13 - 10TPI)
176-126	Cross-hair (standard accessory)
176-140	ISO metric screw threads (0,075 - 0,7 mm)
176-141	ISO metric screw threads (0,75 - 2 mm)

Mitutoyo

Measuring Microscope MF Generation D Series

Series 176

MF Generation D Series: Manual models

This versatile measuring microscope, whether you use it to boost the performance with Mitutoyo's vision unit, for data management on a PC or other applications, offers you further improved measuring efficiency.

The MF offers you the following benefits:

• Measuring accuracy that is one of the highest in its class.
• Proven high-NA objectives from the ML optical series (long working distance type).
• Integration of metallurgical and measurement microscope functions enabling you to make high-resolution observations and high-accuracy measurements.
• Illumination unit (reflected/transmitted) gives you the option of a high-intensity LED or halogen bulb.
• The variable aperture diaphragm (reflected/ transmitted) allows observation measurement while suppressing light diffraction.
• Variety of standardized stages in sizes up to 400 × 200 mm.
• Quick-release mechanism enabling you to move the stage quickly when measuring large or numerous workpieces.
• High-magnification eyepiece observation up to 2000X.
• A good choice of optional accessories, including a Vision Unit, various digital cameras or data management on a PC, promises a wide field of application and excellent measuring efficiency.

Using optional slide type nosepiece with 2-lens mount (factory-fit option)

MF-B2017D

1010D
100x100 mm

2010D
200x100 mm

3017D
300x170 mm

4020D
400x200 mm

Specifications

Observation image	Erect image
Optical tube	Monocular or binocular tube (depression: 25"), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece	10X, 15X, 20X
Objective lens	Standard: 3X Optional: 1X, 5X, 10X, 20X, 50X, 100X
Transmitted illumination	Optical system: Telecentric illumination with adjustable aperture diaphragm Functions: Light intensity adjustable, non-stepped brightness adjustment
Surface illumination	Optical system: Koehler illumination with adjustable aperture diaphragm Functions: Light intensity adjustable, non-stepped brightness adjustment
Display unit	No. of axes: 2 (MF-A type) or 3 (MF-B type) Resolution: 0,001 mm/0,0005 mm/ 0,0001 mm Functions: Zero-setting, Direction switching, Data output (USB and RS-232C interface)
Indication accuracy (at 20°C)	XY-axis: (2,2+0,02L) µm Z-axis: (5+0,04L) µm L: Measuring length (mm) when not loaded, JIS B 7.153
Floating function	X and Y axes with Quick-release mechanism
Power supply	100/110/120/220/240 VAC, 50/60Hz

Reticle mounts (standard accessories)

176-392 Optional monocular

176-393 Optional binocular

Refer to the MF / MF-U microscopes brochure

Mitutoyo

Measuring Microscope MF Generation D Series

Series 176

Specifications/Dimensions

Optional accessories

No.	Description
12BAB345	Bulb, Halogen; 12V/50W (2 Pin Fitting)
176-308	Vibration Isolator, Spring Pad
375-056	Calibration Micro Scale
264-155D	2D Data processor, QM-Data 200, stand type
12AAJ088	Footswitch
63AAA355	Invenio 5SCIII camera set, set consists of Invenio USB camera and 0.5X C-mount adapter for MF/MF-U microscopes
Eyepieces	
176-393	Optical Tube, Binokular
176-392	Optical Tube, Monocular
375-043	Protractor Eyepiece 10X
176-313D	Eyepiece for MF Gen. B, Digital Protractor Type
378-856-5	Eyepiece 10X
378-857-5	Eyepiece 15X
378-858-5	Eyepiece 20X
Filters	
12AAA643	Illumination Filter ND2
12AAA644	Illumination Filter ND8
12AAA645	Illumination Filter GIF
12AAA646	Illumination Filter LB80
Invenio 5SCIII camera	
63AAA066	Mitutoyo MF package: This software package includes Insight Basic EEEF extended depth op focus Topography Segmentation and counting
Mounts	
375-054	Camera Adaptor, 0.5X incl. C-Mount
970441	Camera Adaptor, C-Mount
176-370-1	Slide Type Nosepiece, Parfocal
176-370-2	Slide Type Nosepiece, w. Magnification Guaranteed
Objective Lenses	
375-036-2	ML Objective Lens 1X
375-037-1	ML Objective Lens 3X
375-034-1	ML Objective Lens 5X
375-039	ML Objective Lens 10X
375-051	ML Objective Lens 20X
375-052	ML Objective Lens 50X
375-053	ML Objective Lens 100X

Digital camera for MF / MF-U microscopes

Mounting the Invenio camera onto the C-mount adapter transforms the MF microscope into a powerful digital microscope.
• Invenio 5SCIII, 5 megapixel colour camera with high speed USB3 communication
• Ideal for documentation and analysis for a wide range of applications
• Mitutoyo MF software package enhances the functionality of the microscope with:
• Reporting functionality of images and measurement results
• Images with extended depth of focus
• 3D topography observation by stacking images in Z-direction
• Counting of particles

Model	1010D	2010D	2017D	3017D	4020D
No.	**176-861-10** **176-866-10**	**176-862-10** **176-867-10**	**176-863-10** **176-868-10**	**176-864-10** **176-869-10**	**176-865-10** **176-870-10**
MF-A (2 axis) No.	176-861-10	176-862-10	176-863-10	176-864-10	176-865-10
MF-B (3 axis) No.	176-866-10	176-867-10	176-868-10	176-869-10	176-870-10
XY stage travel range	100 x 100 mm	200 x 100 mm	200 x 170 mm	300 x 170 mm	400 x 200 mm
Z-axis travel range mm	150	150	220	220	220
XY stage top size mm	280 x 280	350 x 280	410 x 342	510 x 342	610 x 342
Effective glass size mm	180 x 180	250 x 150	270 x 240	370 x 240	440 x 240
Swivelling function	-	-	±5° (left)	±5° (left)	±3° (left)
Max. stage loading kg	10	10	20	20	15
Max. workpiece height mm	150	150	220	220	220
Mass kg	65,5	69,5	130	138	144

Mitutoyo

Measuring Microscope MF Generation D Series

1010D

4020D

Focus pilot FP-05
Focus assisting system

QM-Data 200

Vision Unit
PC-based vision measuring system

Invenio digital camera (63AAA058) with
0.5X C-mount adapter (63AAA067) for advanced observations

Mitutoyo

Measuring Microscope MF Generation D Series

Series 176

MF Generation D Series: Models with motorized Z-axis movement

The MF Generation D version with a motorized Z-axis. This feature renders fast and accurate Auto Focus possible when used in combination with the optional Vision Unit. The MF with motorized Z-axis is available in 3 stage sizes and incorporates all the functionality of the standard MF Generation D series.

The MF Generation D with motorized Z-axis offers the following benefits:
- Auto Focus function when using the optional Vision Unit.
- A measuring accuracy that is one of the highest in its class.
- Proven high-NA objectives (long working distance type).
- Integration of metallurgical and measurement microscope functions enabling you to make high-resolution observations and high-accuracy measurements.
- Illumination unit (reflected/transmitted) offers the option of a high-intensity LED or halogen bulb.
- The variable aperture diaphragm (reflected/ transmitted) allows observation measurement while suppressing light diffraction.
- Variety of 3 standardized stages in sizes up to 400 × 200 mm.
- Quick-release mechanism enabling you to move the stage quickly when measuring large or numerous workpieces.
- High-magnification eyepiece observation up to 2000X.
- A large lineup of optional accessories, including a Vision Unit, various digital cameras and data management for a PC, grants a wide field of applications and excellent measuring efficiency.

Specifications

Observation image	Erect image
Optical tube	Monocular or binocular tube (depression: 25"), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece	10X, 15X, 20X
Objective lens	Standard: 3X Optional: 1X, 5X, 10X, 20X, 50X, 100X
Transmitted illumination	Optical system: Telecentric illumination with adjustable aperture diaphragm Functions: Light intensity adjustable, non-stepped brightness adjustment
Surface illumination	Optical system: Koehler illumination with adjustable aperture diaphragm Functions: Light intensity adjustable, non-stepped brightness adjustment
Display unit	No. of axes: 3 Resolution: 0,001 mm/0,0005 mm/ 0,0001 mm Functions: Zero-setting, Direction switching, Data output (USB and RS-232C interface)
Indication accuracy (at 20°C)	XY-axis: (2,2+0,02L) µm Z-axis: (5+0,04L) µm L: Measuring length (mm) when not loaded, JIS B 7.153
Floating function	X and Y axes with Quick-release mechanism
Power supply	100/110/120/220/240 VAC, 50/60Hz
Remote Box	- Speed adjustment - Coarse/Fine Speed switching - Jog shuttle - Emergency stop switch - AF button - Counter reset button - Data output button - Power switch - Limit setting (Z-axis) Remote Box

Optional accessories

No.	Description
63AAA355	Invenio 5SCIII camera set, set consists of Invenio USB camera and 0.5X C-mount adapter for MF/MF-U microscopes

Refer to the MF / MF-U microscopes brochure

Screen image before and after Auto Focus*
* When using optional Vision Unit

MF-J2017D

Mitutoyo

Measuring Microscope MF Generation D Series

Series 176

Specifications/Dimensions

MF Generation D: Models with motorized Z-axis movement

Model	MF-J2017D	MF-J3017D	MF-J4020D
No.	**176-891D**	**176-892D**	**176-893D**
XY stage travel range	200 x 170 mm	300 x 170 mm	400 x 200 mm
Z-axis travel range mm	220	220	220
XY stage top size mm	410 x 342	510 x 342	610 x 342
Effective glass size mm	270 x 240	370 x 240	440 x 240
Swivelling function	±5° (left)	±5° (left)	±3° (left)
Max. stage loading kg	20	20	15

Focus pilot FP-05
Focus assisting system

QM-Data 200

Vision Unit
PC-based vision measuring system

Invenio digital camera (63AAA058) with
0.5X C-mount adapter (63AAA067) for advanced observations

Optional accessories

No.	Description
12BAB345	Bulb, Halogen; 12V/50W (2 Pin Fitting)
176-308	Vibration Isolator, Spring Pad
375-056	Calibration Micro Scale
264-155D	2D Data processor, QM-Data 200, stand type
12AAJ088	Footswitch
Eyepieces	
176-392	Optical Tube, Monocular
176-393	Optical Tube, Binokular
375-043	Protractor Eyepiece 10X
176-313D	Eyepiece for MF Gen. B, Digital Protractor Type
378-856-5	Eyepiece 10X
378-857-5	Eyepiece 15X
378-858-5	Eyepiece 20X
Filters	
12AAA643	Illumination Filter ND2
12AAA644	Illumination Filter ND8
12AAA645	Illumination Filter GIF
12AAA646	Illumination Filter LB80
Invenio 5SCIII camera	
63AAA058	Invenio 5SCIII camera, including Insight LE software on 8GB USB stick and USB3.0 cable
63AAA066	Mitutoyo MF package: This software package includes Insight Basic EEEF extended depth op focus Topography Segmentation and counting
63AAA067	0,5x camera adapter with C-mount for MF/MF-U microscope
Mounts	
375-054	Camera Adaptor, 0.5X incl. C-Mount
970441	Camera Adaptor, C-Mount
176-370-1	Slide Type Nosepiece, Parfocal
176-370-2	Slide Type Nosepiece, w. Magnification Guaranteed
Objective Lenses	
375-036-2	ML Objective Lens 1X
375-037-1	ML Objective Lens 3X
375-034-1	ML Objective Lens 5X
375-039	ML Objective Lens 10X
375-051	ML Objective Lens 20X
375-052	ML Objective Lens 50X

Digital camera for MF / MF-U microscopes
Mounting the Invenio camera onto the C-mount adapter transforms the MF microscope into a powerful digital microscope.
• Invenio 5SCIII, 5 megapixel colour camera with high speed USB3 communication
• Ideal for documentation and analysis for a wide range of applications
• Mitutoyo MF software package enhances the functionality of the microscope with:
   • Reporting functionality of images and measurement results
   • Images with extended depth of focus
   • 3D topography observation by stacking images in Z-direction
   • Counting of particles

Accessories for Measuring Microscope MF Generation D

Series 176

Accessories/system diagram system for MF manual and motorized Z-axis models

Optional accessories

No.	Description
176-305	Rotary Table, Type A, D=240 mm
176-306	Rotary Table, Type B, D=270 mm
176-107	Fixture/clamping material, Holder with clamp
172-197	Fixture/clamping material Swivel center support
172-378	Fixture/clamping material, V-block with clamp
172-198	Rotary table, 100 mm with fine feed knob for TM-1005B
12AAA807D	Cable RS-232C 2m
12AAG806	Illumination Filter GIF
12AAG807	Illumination Filter LB80
12AAJ088	Footswitch
Eyepieces	
378-856	Eyepiece, 10X/24
378-856-5	Eyepiece 10X
Lighting	
176-343D	Twin Fiber Illumination, for MF, MF-U
176-367-2D	Ringlight LED
176-351-6	Oblique Surface Illumination for MF
Lighting (required option)	
176-445D	Illumination Unit LED
176-447D	Illumination Unit, Halogen
Reticles	
12AAG838	Reticle for MF, Broken Cross-hair (7 µm line width)
12AAG847	Reticle for MF Gen. B, Metric Coarse Screw Thread (p=0,5-1,0)
12AAG848	Reticle for MF, Metric Coarse Screw Thread (p=1,25-2,0)
12AAG849	Reticle for MF, Involute Gear Tooth 14.5° (m=0,1-1,0)
12AAG850	Reticle for MF, Involute Gear Tooth 20° (m=0,1-1,0)
12AAG851	Reticle for MF, Unified Screw Thread (80-28TPI)
12AAG852	Reticle for MF, Unified Screw Thread (24-14TPI)
12AAG853	Reticle for MF, Unified Screw Thread (13-10TPI)
12AAG836	Reticle for MF, Broken Cross-hair (5 µm line width)
12AAG873	Reticle for MF, Broken Cross-hair (3 µm line width)
12AAG840	Reticle for MF, Cross-hair and 60° Broken Lines
12AAG841	Reticle for MF, Zeiss Type Pattern
12AAG842	Reticle for MF, Cross-hair 20 mm scale (0,1 Reading)
12AAG843	Reticle for MF, Concentric Circles (1,2-18 mm)
12AAG844	Reticle for MF Gen. B, Scale 10 mm (0,1 mm Reading)
12AAG839	Reticle for MF, Cross-hair and 45° Broken Lines
12AAG845	Reticle for MF, Scale 5 mm (0,05 mm Reading)

All products to be sold to commercial customers. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon. For suggested retail prices, please refer to the separate price list.

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Measuring Microscope MF-U Generation D Series

Series 176

MF-U Generation D Series: Manual models
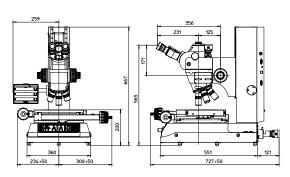
This high-power multi-function measuring microscope gives you detailed observation with a clear and flare-less erect image and a wide field of view.
The MF-U offers you the following benefits:

- Measuring accuracy that is one of the highest in its class.
- Proven high-NA objectives from the FS optical system (long working distance type).
- Integration of metallurgical and measurement microscope functions enabling you to make high-resolution observations and high-accuracy measurements.
- Illumination unit (reflected/transmitted) gives you the option of a high-intensity LED or halogen bulb.
- The variable aperture diaphragm (reflected/ transmitted) allows observation measurement while suppressing light diffraction.
- Variety of standardized stages in sizes up to 400 × 200 mm.
- Quick-release mechanism enabling you to move the stage quickly when measuring large or numerous workpieces.
- High-magnification eyepiece observation up to 2000X.
- A good choice of optional accessories, including a Vision Unit, various digital cameras or data management on a PC, promises a wide field of application and excellent measuring efficiency.

MF-UB 3017D
(turret, objectives and illumination are optional)

1010D

4020D

Optional 5 positions motorized turret

Specifications

Observation image	Erect image
Optical tube	Siedentoph type (pupil distance adjustment : 51 - 76 mm), 1X tube lens, Binocular tube (depression : 30°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount : 50/50)
Focusing method	Manual (coarse focusing : 10 mm/rev., fine focusing : 0,1 mm/rev.)
Indication accuracy (at 20°C)	XY-axis: (2,2+0,02L) µm Z-axis: (5+0,04L) µm L: Measuring length (mm) when not loaded, JIS B 7.153
Floating function	X and Y axes with Quick-release mechanism
Power supply	220/240V AC, 50/60Hz
Eyepiece lens	10X (field No.: 24 mm) Optional : 15X, 20X
Turret (optional)	Manual or motorized
Objective lens (optional)	M / BD Plan Apo objective from 1X to 100X
Transmitted illumination optional	Light source : Halogen bulb (12V, 50W) Optical system : Telecentric illumination with adjustable aperture diaphragms Functions : Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination optional	Light source : Optional halogen illumination unit (fiber-optic cold light illumination) Optical system : Koehler illumination with adjustable aperture diaphragms Functions : Light intensity adjustable, Non-stepped brightness adjustment
Display unit	Resolution: 0,001mm / 0,0005mm / 0,0001mm No. of axis : 2 axis or 3 axis Functions : Zero-setting, Direction switching, Data output (USB and RS-232C interface)

Optional accessories

No.	Description
63AAA355	Invenio 5SCIII camera set, set consists of Invenio USB camera and 0.5X C-mount adapter for MF/MF-U microscopes

Polarized light

Differential interference contrast

Dark field

Bright field

Refer to the MF / MF-U microscopes brochure

Measuring Microscope MF-U Generation D Series

Series 176 - High-power Multi-function

Optional accessories

No.	Description
375-054	Camera Adaptor, 0.5X incl. C-Mount
970441	Camera Adaptor, C-Mount
375-056	Calibration Micro Scale
172-378	Fixture/clamping material, V-block with clamp
176-305	Rotary Table, Type A, D=240 mm
176-306	Rotary Table, Type B, D=270 mm
264-155D	2D Data processor, QM-Data 200, stand type
12AAJ088	Footswitch
Bulbs	
12BAB345	Bulb, Halogen; 12V/50W (2 Pin Fitting)
517181	Bulb, Halogen, 12V/100W
12BAD602	Bulb, Halogen; 12V/100W
DIC Units	
378-076	DIC Unit, 100X, SL80X, SL50X
378-078	DIC Unit, 50X, SL20X
378-079	DIC Unit 20X
378-080	DIC Unit, 5X, 10X
Eyepieces	
378-857	Eyepiece, 15X/16
378-858	Eyepiece, 20X/12
Filters	
12AAA643	Illumination Filter ND2
12AAA644	Illumination Filter ND8
12AAA645	Illumination Filter GIF
12AAA646	Illumination Filter LB80
12AAG806	Illumination Filter GIF
12AAG807	Illumination Filter LB80
Lighting (required option)	
176-343D	Twin Fiber Illumination, for MF, MF-U
176-315D	Illumination Unit, 100W Fiber Optic
176-316D	Illumination Unit, 150 W Fiber Optic
176-448D	Illumination Unit, Halogen
Reticles	
12AAG876	Reticle for MF-U Gen. B, Broken Cross-hair (3 µm line width)
12AAG877	Reticle for MF-U Gen. B, Broken Cross-hair (5 µm line width)
12AAG878	Reticle for MF-U Gen. B, Broken Cross-hair (7 µm line width)
12AAG879	Reticle for MF-U Gen. B, Cross-hair and 45° Broken Lines
12AAG880	Reticle for MF-U Gen. B, Cross-hair and 60° Broken Lines
12AAG881	Reticle for MF-U Gen. B, Zeiss Type Pattern
Stands	
176-308	Vibration Isolator, Spring Pad
176-107	Fixture/clamping material, Holder with clamp
172-197	Fixture/clamping material Swivel center support
Turrets (required option)	
378-018	Turret, Manual (BF), 4 Pos.
378-216D	Turret, Motorized (BF), 5 Pos.
176-211	Turret for MF-U, Manual (BD), 4 Pos.
176-212D	Turret for MF-U, Motorized (BD), 4 Pos.

Model 1010D

Model 2010D

Model 1010D
XY stage travel range : 100 x 100 mm
Z-axis travel range : 150 mm
XY stage top size : 280 x 280 mm
Effective glass size : 180 x 180 mm
Max. stage loading : 10 kg
Max. workpiece height : 150 mm
Mass : 65,5 kg

Model	MF-UA1010D	MF-UB1010D	MF-UC1010D	MF-UD1010D
No.	176-871-10	176-876-10	176-881-10	176-886-10
Measurement system	X and Y axis (2 axes)	X, Y and Z axis (3 axes)	X and Y axis (2 axes)	X, Y and Z axis (3 axes)
Observation type	Bright Field (BF)	Bright Field (BF)	Bright/Dark Field (BF/DF)	Bright/Dark Field (BF/DF)

Model 2010D
XY stage travel range : 200 x 100 mm
Z-axis travel range : 150 mm
XY stage top size : 350 x 280 mm
Effective glass size : 250 x 150 mm
Max. stage loading : 10 kg
Max. workpiece height : 150 mm
Mass : 69,5 kg

Model	MF-UA2010D	MF-UB2010D	MF-UC2010D	MF-UD2010D
No.	176-872-10	176-877-10	176-882-10	176-887-10
Measurement system	X and Y axis (2 axes)	X, Y and Z axis (3 axes)	X and Y axis (2 axes)	X, Y and Z axis (3 axes)
Observation type	Bright Field (BF)	Bright Field (BF)	Bright/Dark Field (BF/DF)	Bright/Dark Field (BF/DF)

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Measuring Microscope MF-U Generation D Series

Series 176

Model 2017D

Model 3017D

Model 4020D

Model 2017D
XY stage travel range : 200 x 170 mm
Z-axis travel range : 220 mm
XY stage top size : 410 x 342 mm
Effective glass size : 270 x 240 mm
Swivelling function (left) : ±5°
Max. stage loading : 20 kg
Max. workpiece height : 220 mm
Mass : 130 kg

Model	MF-UA2017D	MF-UB2017D	MF-UC2017D	MF-UD2017D
No.	**176-873-10**	**176-878-10**	**176-883-10**	**176-888-10**
Measurement system	X and Y axis (2 axes)	X, Y and Z axis (3 axes)	X and Y axis (2 axes)	X, Y and Z axis (3 axes)
Observation type	Bright Field (BF)	Bright Field (BF)	Bright/Dark Field (BF/DF)	Bright/Dark Field (BF/DF)

Model 3017D
XY stage travel range : 300 x 170 mm
Z-axis travel range : 220 mm
XY stage top size : 510 x 342 mm
Effective glass size : 370 x 240 mm
Swivelling function (left) : ±5°
Max. stage loading : 20 kg
Max. workpiece height : 220 mm
Mass : 138 kg

Model	MF-UA3017D	MF-UB3017D	MF-UC3017D	MF-UD3017D
No.	**176-874-10**	**176-879-10**	**176-884-10**	**176-889-10**
Measurement system	X and Y axis (2 axes)	X, Y and Z axis (3 axes)	X and Y axis (2axes)	X, Y and Z axis (3 axes)
Observation type	Bright Field (BF)	Bright Field (BF)	Bright/Dark Field (BF/DF)	Bright/Dark Field (BF/DF)

Model 4020D
XY stage travel range : 400 x 200 mm
Z-axis travel range : 220 mm
XY stage top size : 610 x 342 mm
Effective glass size : 440 x 240 mm
Swivelling function (left) : ±3°
Max. stage loading : 15 kg
Max. workpiece height : 220 mm
Mass : 144 kg

Model	MF-UA4020D	MF-UB4020D	MF-UC4020D	MF-UD4020D
No.	**176-875-10**	**176-880-10**	**176-885-10**	**176-890-10**
Measurement system	X and Y axis (2 axes)	X, Y and Z axis (3 axes)	X and Y axis (2 axes)	X, Y and Z axis (3 axes)
Observation type	Bright Field (BF)	Bright Field (BF)	Bright/Dark Field (BF/DF)	Bright/Dark Field (BF/DF)

Measuring Microscope MF-U Generation D Series

Series 176

MF-U Generation D Series: Models with motorized Z-axis movement

The MF-U Generation D version with a motorized Z-Axis. This feature renders fast and accurate Auto Focus possible when used in combination with the optional Vision Unit. The MF-U with motorized Z-axis is available in 3 stage sizes and incorporates all the functionality of the standard MF-U Generation D series.

The MF-U Generation D with motorized Z-axis offers you the following benefits:
- Auto Focus function when using the optional Vision Unit.
- A measuring accuracy that is one of the highest in its class.
- Proven high-NA objectives from the FS optical system (long working distance type).
- Integration of metallurgical and measurement microscope functions enabling you to make high-resolution observations and high-accuracy measurements.
- Illumination unit (reflected/transmitted) gives you the option of a high-intensity LED or halogen bulb.
- The variable aperture diaphragm (reflected/ transmitted) allows observation measurement while suppressing light diffraction.
- Variety of 3 standardized stages in sizes up to 400 × 200 mm.
- Quick-release mechanism enabling you to move the stage quickly when measuring large or numerous workpieces.
- High-magnification eyepiece observation up to 2000X.
- A large lineup of optional accessories - including a Vision Unit, various digital cameras or data management on a PC - grants a wide field of application and excellent measuring efficiency.

Screen image before and after Auto Focus*
* When using optional Vision Unit

MF-UJ 2017D
(turret, objectives and illumination are optional)

Specifications

Observation image	Erect image
Optical tube	Siedentoph type (pupil distance adjustment : 51 - 76 mm), 1X tube lens, Binocular tube (depression : 30°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount : 50/50)
Focusing method	Manual (coarse focusing : 10 mm/rev., fine focusing : 0,1 mm/rev.)
Indication accuracy (at 20°C)	XY-axis : $(2{,}2+0{,}02L)$ μm Z-axis : $(5+0{,}04L)$ μm L : Measuring length (mm) when not loaded, JIS B 7.153
Floating function	X and Y axes with Quick-release mechanism
Power supply	220/240V AC, 50/60Hz
Eyepiece lens	10X (field No.: 24 mm) Optional : 15X, 20X
Turret (optional)	Manual or motorized
Objective lens (optional)	M / BD Plan Apo objective from 1X to 100X
Transmitted illumination optional	Light source : Halogen bulb (12V, 50W) Optical system : Telecentric illumination with adjustable aperture diaphragms Functions : Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination optional	Light source : Optional halogen illumination unit (fiber-optic cold light illumination) Optical system : Koehler illumination with adjustable aperture diaphragms Functions : Light intensity adjustable, Non-stepped brightness adjustment
Display unit	Resolution: 0,001mm / 0,0005mm / 0,0001mm No. of axis : 2 axis or 3 axis Functions : Zero-setting, Direction switching, Data output (USB and RS-232C interface)
Remote Box	- Speed adjustment - Coarse/Fine Speed switching - Jog shuttle - Emergency stop switch - AF button - Counter reset button - Data output button - Power switch - Limit setting (Z-axis) Remote Box

Optional accessories

No.	Description
63AAA355	Invenio 5SCIII camera set, set consists of Invenio USB camera and 0.5X C-mount adapter for MF/MF-U microscopes

Refer to the MF / MF-U microscopes brochure

Mitutoyo

Measuring Microscope MF-U Generation D Series

Series 176

MF-U Generation D: Models with motorized Z-axis

1. Bright Field Observation

Model	MF-UJ2017D	MF-UJ3017D	MF-UJ4020D
No.	**176-894D**	**176-895D**	**176-896D**
XY stage travel range	200 x 170 mm	300 x 170 mm	400 x 200 mm
Effective glass size mm	270 x 240	370 x 240	440 x 240
Z-axis travel range mm	220	220	220
XY stage top size mm	410 x 342	510 x 342	610 x 342
Max. stage loading kg	20	20	15

2. Bright Field/ Dark Field Observation

Model	MF-UK2017D	MF-UK3017D	MF-UK4020D
No.	**176-897D**	**176-898D**	**176-899D**
XY stage travel range	200 x 170 mm	300 x 170 mm	400 x 200 mm
Effective glass size mm	270 x 240	370 x 240	440 x 240
Z-axis travel range mm	220	220	220
XY stage top size mm	410 x 342	510 x 342	610 x 342
Max. stage loading kg	20	20	15

Optional accessories

No.	Description
375-054	Camera Adaptor, 0.5X incl. C-Mount
970441	Camera Adaptor, C-Mount
375-056	Calibration Micro Scale
172-378	Fixture/clamping material, V-block with clamp
176-305	Rotary Table, Type A, D=240 mm
176-306	Rotary Table, Type B, D=270 mm
264-155D	2D Data processor, QM-Data 200, stand type
12AAJ088	Footswitch
Bulbs	
12BAB345	Bulb, Halogen; 12V/50W (2 Pin Fitting)
517181	Bulb, Halogen, 12V/100W
12BAD602	Bulb, Halogen; 12V/100W
DIC Units	
378-076	DIC Unit, 100X, SL80X, SL50X
378-078	DIC Unit, 50X, SL20X
378-079	DIC Unit 20X
378-080	DIC Unit, 5X, 10X
Eyepieces	
378-857	Eyepiece, 15X/16
378-858	Eyepiece, 20X/12
Filters	
12AAA643	Illumination Filter ND2
12AAA644	Illumination Filter ND8
12AAA645	Illumination Filter GIF
12AAA646	Illumination Filter LB80
12AAG806	Illumination Filter GIF
12AAG807	Illumination Filter LB80
Lighting (required option)	
176-343D	Twin Fiber Illumination, for MF, MF-U
176-315D	Illumination Unit, 100W Fiber Optic
176-316D	Illumination Unit, 150 W Fiber Optic
176-448D	Illumination Unit, Halogen
Reticles	
12AAG876	Reticle for MF-U Gen. B, Broken Cross-hair (3 µm line width)
12AAG877	Reticle for MF-U Gen. B, Broken Cross-hair (5 µm line width)
12AAG878	Reticle for MF-U Gen. B, Broken Cross-hair (7 µm line width)
12AAG879	Reticle for MF-U Gen. B, Cross-hair and 45° Broken Lines
12AAG880	Reticle for MF-U Gen. B, Cross-hair and 60° Broken Lines
12AAG881	Reticle for MF-U Gen. B, Zeiss Type Pattern
Stands	
176-308	Vibration Isolator, Spring Pad
176-107	Fixture/clamping material, Holder with clamp
172-197	Fixture/clamping material Swivel center support
Turrets (required option)	
378-018	Turret, Manual (BF), 4 Pos.
378-216D	Turret, Motorized (BF), 5 Pos.
176-211	Turret for MF-U, Manual (BD), 4 Pos.
176-212D	Turret for MF-U, Motorized (BD), 4 Pos.

Accessories for Measuring Microscope MF-U Generation D

Optional accessories

No.	Description
375-054	Camera Adaptor, 0.5X incl. C-Mount
970441	Camera Adaptor, C-Mount
375-056	Calibration Micro Scale
172-378	Fixture/clamping material, V-block with clamp
176-305	Rotary Table, Type A, D=240 mm
176-306	Rotary Table, Type B, D=270 mm
12AAJ088	Footswitch
Bulbs	
12BAB345	Bulb, Halogen; 12V/50W (2 Pin Fitting)
517181	Bulb, Halogen, 12V/100W
12BAD602	Bulb, Halogen; 12V/100W
DIC Units	
378-076	DIC Unit, 100X, SL80X, SL50X
378-078	DIC Unit, 50X, SL20X
378-079	DIC Unit 20X
378-080	DIC Unit, 5X, 10X
Eyepieces	
378-857	Eyepiece, 15X/16
378-858	Eyepiece, 20X/12
Filters	
12AAA643	Illumination Filter ND2
12AAA644	Illumination Filter ND8
12AAA645	Illumination Filter GIF
12AAA646	Illumination Filter LB80
12AAG807	Illumination Filter LB80
12AAG806	Illumination Filter GIF
Lighting	
176-343D	Twin Fiber Illumination, for MF, MF-U
176-315D	Illumination Unit, 100W Fiber Optic
176-316D	Illumination Unit, 150 W Fiber Optic
176-448D	Illumination Unit, Halogen
Reticles	
12AAG876	Reticle for MF-U Gen. B, Broken Cross-hair (3 µm line width)
12AAG877	Reticle for MF-U Gen. B, Broken Cross-hair (5 µm line width)
12AAG878	Reticle for MF-U Gen. B, Broken Cross-hair (7 µm line width)
12AAG879	Reticle for MF-U Gen. B, Cross-hair and 45° Broken Lines
12AAG880	Reticle for MF-U Gen. B, Cross-hair and 60° Broken Lines
12AAG881	Reticle for MF-U Gen. B, Zeiss Type Pattern
Stands	
176-308	Vibration Isolator, Spring Pad
Turrets (required option)	
378-018	Turret, Manual (BF), 4 Pos.
378-216D	Turret, Motorized (BF), 5 Pos.
176-211	Turret for MF-U, Manual (BD), 4 Pos.
176-212D	Turret for MF-U, Motorized (BD), 4 Pos.
378-016D	Turret, Motorized (BF), 4 Pos.
Workpiece Fixture	
176-107	Fixture/clamping material, Holder with clamp
172-197	Fixture/clamping material Swivel center support

System configuration diagram with the following labeled components:

- C-mount 970441
- 0.5X TV adapter unit 375-054
- 10X eyepiece 378-866 (two)
- 15X eyepiece 378-857 (two)
- 20X eyepiece 378-858 (two)
- DIC unit: 378-080: for 5X and 10X; 378-079: for 20X; 378-078: for 50X and SL20X; 378-076: for 100X, SL50X, and SL80X
- Polarization unit (BF/BD) 378-092
- Reticles
- GIF filter 12AAA645
- LB80 filter 12AAA646
- ND2 filter 12AAA643
- ND8 filter 12AAA644
- Control unit Remote box (only models with motorized Z-axis)
- Focus pilot FP-05 (LED type) 375-067 (Gr.*)/375-068 (Red) *factory installed option
- RS-232C (crossing) cable 12AAA807 x1 Note: D-sub 9-pin female-female cable
- Vision Unit 10D (shipped with main unit) 359-763
- QM-Data 200 264-155D
- Foot switch (highly rigid type) 12AAJ088
- Vision AF cable: 12AAN358 (only models with motorized Z-axis)
- Calibration chart 02AKN020
- Real-time process control program MeasurLink
- Thermal printer DPU414: 12AAD032 (with connection cable) FD unit: 12AAA799 Foot switch (highly rigid type): 12AAJ088 Externe printer (ESC/P) Cable: 12AAA804
- RS-232C (crossing) Cable: 12AAA807 Note: D-sub 9-pin female-female cable
- GIF filter (for light source) 12AAG806
- LB80 filter (for light source) 12AAG807
- External light source control cable 12AAG888
- External light source control cable 12AAD128
- LED illumination unit 176-446
- Fiber optics illuminator (100W) 176-315
- Fiber optics illuminator (150W) 176-316
- Halogen illumination unit 176-448
- Twin fiber optics illuminator (100W) 176-343
- MF-UD Manual models Models with motorized Z-axis
- TV observation/image saving; Focus detection; Data calculation processing, Display data transfer, Display data printing; Main unit LED illumination (reflected + transmitted); Main unit halogen illumination; External reflected illumination; Optical tube; Main unit transmitted illumination; Power focusing; Stage-related; Turret/objective
- Reflected / Transmitted / BD / BF
- Adjustable manual BF revolver (4-hole) 378-018
- Adjustable power BF revolver (5-hole) 378-216D
- Adjustable power BF revolver (4-hole) 378-016
- Manual BD revolver (4-hole) 176-211
- Power BF revolver (4-hole) 176-210
- FS objective conversion adapter (Attaches BF lens to BD revolver) 378-026-1
- LED ring light for FS objective Note: Applicable only for 10X or lower
- FS objective M plan Apo series
- FS objective M plan Apo SL series
- FS objective M plan Apo HR series
- FS objective G plan Apo series
- FS objective BD plan Apo series
- FS objective BD plan Apo SL series
- FS objective BD plan Apo HR series
- Vibration damping stand 176-308
- Stage micrometer 375-056
- Halogen lamp 12V 50W (transmitted) 513667
- Long life type halogen lamp 12V 50W (transmitted) 12BAB345
- 1010 size
- 2010 size
- 2017/3017/4020 size
- Rotary table with fine feed wheel (A) 176-305
- Stage adapter B 176-310
- Stage adapter 176-304
- Rotary table with fine feed wheel (B) 176-306
- Holder with clamp 176-107; V-block with clamp 172-378; Swivel center support 172-197
- Rotary table with fine feed wheel (A) (with scale) 172-198
- Holder with clamp 176-107*; V-block with clamp 172-378*; Swivel center support 172-197; *Usable with stage adapter (176-304)
- Holder with clamp 176-107; V-block with clamp 172-378; Swivel center support 172-197
- Digital rotary head (for ø 20) 176-954

Legend:
- Standard accessory
- Required

Mitutoyo

Optional Light Sources for Measuring Microscopes MF/MF-U Generation D

Series 176

Dual Swan-neck Light-pipe

**LED Ring Light
(for FS Objective lenses)**

Dual Swan-neck Light-pipe illuminator
Applicable microscopes : MF, MF-U models
Length of fibre cable : 700 mm
Light source : Halogen bulb (12V, 100W) **(517181 : halogen bulb)**
Dimensions : Light unit 235 x 76 x 120 mm

No.
176-343D

Fibre-optic Ring Light
Applicable microscopes : MF models
Length of fibre cable : 1000 mm
Light source : Halogen bulb (12V, 100W) **(517181 : halogen bulb)**
Dimensions : Light unit 235 x 76 x 120 mm

No.
176-366CED

LED Ring Light
Applicable microscopes : MF models with 1X, 3X, 5X, 10X objective
Light source : White LED
Length of LED cable : 1500 mm

No.
176-367-2D

Fibre-optic Ring Light

LED Ring Light

Dual Swan-neck Light-pipe

Fibre-optic Ring Light

LED Ring Light

Accessories for MF/MF-U Generation D

Focus Pilot is factory set option

Manual and Power Turrets

**Stage Micrometer
375-056**

Focus Pilot FP-05 /FP-05U

By installing this system on the camera mount of an MF series measuring microscope and projecting the focusing chart onto the workpiece surface, you can detect the focal point with high accuracy and high repeatability.

The Focus Pilot FP-05 / FP-05U offers you the following benefits:

- You can easily adjust the brightness of the image.
- You can achieve a wide view field observation on the monitor using a CCD camera (a C-mount adapter is included).
- You are offered a choice of four chart patterns, so you can select the pattern that works best with your workpiece surface texture type.

Concentric circle   **Slit**

Focus Pilot

Magnification : 0.5X, Accuracy : 0.1% (within 2/3 area from the centre of field of view)
Camera adapter : C-mount (provided)
Applicable CCD camera : Up to 2/3-inch / **16,9 mm**
Mass : 1.8 kg

No.	Model	Light source
375-057D	MF	Green LED
375-058D	MF	Red LED
375-067D	MF-U	Green LED
375-068D	MF-U	Red LED

Manual Turrets for MF-U

No.	Objective lens	Remarks
176-211	Bright Field / Dark Field	4 Mounts
378-018	Bright Field	4 Mounts

Power Turrets for MF-U

Power supply : 240V AC, 50/60 Hz
Dimensions : Turret : 164 x 65 x 137 mm
Control Box : 108 x 72 x 193 mm

No.	Objective lens	Remarks
176-212D	Bright Field / Dark Field	4 Mounts
378-016D	Bright Field	4 Mounts
378-216D	Bright Field	5 Mounts

Set includes:

63AAA058 - Invenio 5SCIII camera, including Insight LE software on 8GB USB stick and USB3.0 cable
63AAA067 - 0,5x camera adapter with C-mount for MF/MF-U microscope

No.
63AAA355

Stage Micrometer

No.	Range [mm]	Accuracy	Mass [g]
375-056	1	(1+L) µm L : Measuring length (mm)	16

Mitutoyo

Measuring Microscope Hyper MF/MF-U Generation B Series

Series 176

This measuring microscope has one of the highest XY measuring accuracies at 0,9+3L/1000 µm. The Hyper MF-B/MF-UB offers you the following benefits:
- One of the highest XY measuring accuracies in the world (0,9+3L/1000)[1] µm
- Selectable LAF (Laser Auto Focus) function.
- High operability and repeatability.
- Three-axis motorized control.
- You are offered the power-drive auto focus unit as standard.
- A range of useful fixtures is available that includes a wafer holder and swivel-centre support.

1. (L = measured length (mm) in XY plane, stage unloaded).

Hyper MF-UF2515B
with optional turret and objective lenses

Measuring unit : Linear encoder
Resolution : 0,01 µm
Max. workpiece height : 150 mm

Model	Hyper MF-B2515B	Hyper MF-UB2515B	Hyper MF-UD2515B	Hyper MF-UE2515B	Hyper MF-UF2515B
No.	176-430D	176-431D	176-432D	176-433D	176-434D
Laser auto focus function	-	-	-	Available	Available
XY stage travel range	250 x 150 mm	250 x 150 mm	250 x 150 mm	250 x 150 mm	250 x 150 mm
Effective glass size mm	300 x 200	300 x 200	300 x 200	300 x 200	300 x 200
Observation type	Bright Field	Bright Field	Bright Field or Bright Field/Dark Field	Bright Field	Bright Field or Bright Field/Dark Field
XY stage top size mm	460 x 350	460 x 350	460 x 350	460 x 350	460 x 350
Max. stage loading kg	30	30	30	30	30
Mass	14 kg (power unit) **Hyper MF** : 250 kg (main unit) **Hyper MF-U** : 255 kg (main unit)	14 kg (power unit) **Hyper MF** : 250 kg (main unit) **Hyper MF-U** : 255 kg (main unit)	14 kg (power unit) **Hyper MF** : 250 kg (main unit) **Hyper MF-U** : 255 kg (main unit)	14 kg (power unit) **Hyper MF** : 250 kg (main unit) **Hyper MF-U** : 255 kg (main unit)	14 kg (power unit) **Hyper MF** : 250 kg (main unit) **Hyper MF-U** : 255 kg (main unit)

Specifications

Observation image	Erect image
Optical tube	Reticle projection method, with TV mount, Optical path ratio **Hyper MF** : Monocular or binocular tube (optional depression : 25°) **Hyper MF-U** : Siedentoph type (pupil distance adjustment : 51 - 76 mm), 1X tube lens, Binocular tube (depression : 25°)
Eyepiece	**Hyper MF** : Optional 10X, 15X, 20X **Hyper MF-U** : 10X (field No. : 24 mm), Optional : 15X, 20X
Turret (optional)	**Hyper MF-U** : Motorized Objective (optional) : M / BD Plan Apo objective from 1X to 100X
Transmitted illumination	Light source : Halogen bulb (12V, 100W)**(fiber-optic cold light illumination)** **Optical system : Telecentric illumination with adjustable aperture diaphragms** **Functions : Light intensity adjustable, 100 steps brightness adjustment**
Surface illumination	Light source : Halogen bulb (12V, 50W) Optical system : Koehler illumination with adjustable aperture diaphragms Functions : Light intensity adjustable, 100 steps brightness adjustment
Data output	Via RS-232C interface
Power supply	220/240V AC, 50/60 Hz
Optional Accessories	See MF accessories for Hyper MF or MF-U models
Dimensions (WxDxH)	160 x 476 x 381 mm (power unit) **Hyper MF** : 880 x 913 x 730 mm (main unit) **Hyper MF-U** : 880 x 913 x 770 mm (main unit) mm

Control panel for fast traverse and three-axis positioning

Laser Auto Focus Optical Tube

Refer to the Hyper MF / MF-U brochure
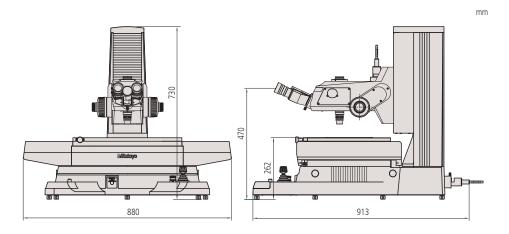
Mitutoyo

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Measuring Microscope Hyper MF/MF-U Generation B Series

Series 176

Optional accessories
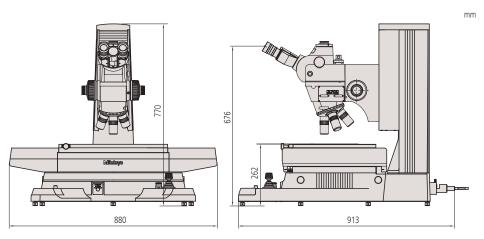
No.	Description
264-159D	2D Data processor, QM-Data 200 for Hyper MF

See MF accessories for Hyper MF models or MF-U accessories for Hyper MF-U models

mm

730

470

262

880

913

Hyper MF-B2515B

mm

770

676

262

880

913

Hyper MF-UB2515B

QM-Data 200
2-D data processing unit

Vision Unit
PC-based vision measuring system

Mitutoyo

Vision Unit

Series 359

This vision system retrofit for microscopes allows you to complete your measurement in one easy step with its automatic edge-detection tools and various macro icons.
The Vision Unit offers you the following benefits:
- Easy operation due to the graphics and measurement navigation functions.
- Image data input/storage function.
- Measurement results are output to Microsoft® Excel®; this lets you generate an inspection table on the same computer.
- The unit allows you to verify that measurement results are within the tolerance zones and to carry out various types of statistical processing for each item.
- Combined use with the focus pilot gives you high accuracy in height measurements (patent pending).
- You can perform a series of measuring operations using just one screen display.
- The auto-brightness control function reproduces type and degree of illumination used.
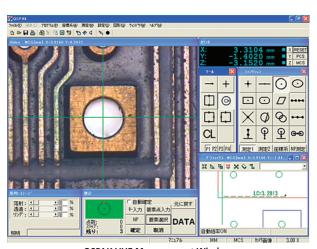
The PC system, QSPAK VUE software and microscope are optional.

No.	Model	Description
359-763	Vision Unit 10D	For MF-D / MF-UD generation manual and motorized models
359-727	Vision Unt 9D	For MF-C generation
359-729	Vision Unit 9UD	For MF-UC generation
359-717	Vision Unit 8D	For MF-B generation
359-719	Vision Unit 8UD	For MF-UB generation
359-779	Vision Unit 7D	For Hyper MF-B / Hyper MF-UB generation
359-707	Vision Unit 6D	For MF-A generation
359-709	Vision Unit 6UD	For MF-UA generation

QSPAK VUE Measurement Window

Specifications

Projected image	Inverted
Camera unit	Image sensor : 1/2" / **12,7 mm** color CMOS camera Dimensions : 100 x 58 x 89 mm (W x D x H) Mass : 0,4 kg
Adapter unit	Operating software : QSPAK VUE (optional) Dimensions : 45 x 123 mm Magnification : 0,5X Mass : 0,3 kg
Magnification	19X - 1900X on 22" / **56 cm** monitor (image resizable)
QSPAK VUE, optional software	**For observation/comparison of form** - Template matching function - Manual pattern matching function **For simple measurement** - One-click edge detection tool function - Smart tool function - User macro function **Functions for repeated measurement/auto-measurement** - Quick navigation - Playback - Graphic - External data output - Statistical calculation
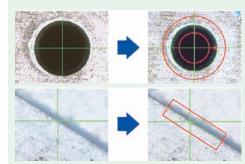
Standard accessories
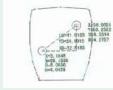
No.	Description
12AAJ088	Footswitch

One-click Edge Detection
Just by clicking the mouse near the edge of a workpiece, QSPAK automatically scans the edge and detects it, showing its coordinates. This function also works with the point tool, box tool, circle tool and auto-focus tool.

Graphic Window
The measurement results and measured elements are plotted in the graphic window in real-time. By using this function the user can check the current measuring position at a glance. The graphic window can be used for geometrical calculations.

Mitutoyo

Microscope Unit FS70 Series

Series 378 - Microscope Unit for Semiconductor Inspection

- Excellent operability with the inward rotating turret and high quality objective lenses with long working distance.
- Ideal as the microscope unit of a prober station for semiconductors.
- The L- and L4-models support YAG laser wavelength ranges from 266 up to 1064 nm allowing laser cutting of thin films and liquid crystal substrates.
- Ergonomic design with combined knob for coarse- and enlarged fine focus adjustment.

Specifications

Focus adjustment	**Method :** With concentric coarse and fine focusing wheels (right and left) **Range :** 50mm travel range, 0,1mm/rev. for fine adjustment, 3,8mm/rev. for coarse adjustment
Trinocular tube Image	Erect image
Interpupillary distance	Siedentopf type, adjustment range : 51-76mm
Field number	24
Tilt angle	0°- 20° (only - TH, - THS models)
Illumination system	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm)
Light source	12 V / 100 W fibre-optic, non-stopped adjustment, light guide length 1,5m, power consumption 150W
Objective lens (optional)	M Plan Apo, M Plan Apo SL, G Plan Apo
FS-70L/L4	• The FS70L supports three YAG laser wavelengths (1.064 nm, 532 nm and 355 nm), while the FS70L4 supports two wavelengths (532 nm and 266 nm), thus expanding the scope of laser applications, allowing laser-cutting of thin-films used in semiconductors and liquid crystal substrates. However, Mitutoyo assumes no responsibility whatever for the performance and/or safety of the laser system used with Mitutoyo microscopes. A careful examination is recommended when selecting a laser-emission unit. • Bright field, Differential Interference Contrast (DIC) and polarized observations are standard with the FS70Z. The FS70L and FS70L4 do not support the DIC method. • By employing an inward-leaning turret, the long working distance objectives provide excellent operability.

Refer to the Microscope Units and objective lenses brochure

FS70Z FS70L FS70L4

Model	FS70	FS70-TH	FS70Z	FS70Z-TH
No.	**378-184-1**	**378-184-3**	**378-185-1**	**378-185-3**
Model short base	FS70-S	FS70-THS	FS70Z-S	FS70Z-THS
Order No. short base model	**378-184-2**	**378-184-4**	**378-185-2**	**378-185-4**
Optical pass ratio	50/50	50/50	50/50	50/50
Tube lens	1X	1X	1X, 2X zoom	1X, 2X zoom
Camera mount	C-mount (using optional adapter B)	C-mount (using optional adapter B)	C-mount (using optional adapter B)	C-mount (using optional adapter B)
Loading (*¹) kg	14,5	13,6	14,1	13,2
Mass kg	6,1	7,1	6,6	7,5

(***¹**) Loading on optical tube excluding weight of objective lenses and eyepieces.

Model	FS70L	FS70L-TH	FS70L4	FS70L4-TH
No.	**378-186-1**	**378-186-3**	**378-187-1**	**378-187-3**
Model short base	FS70L-S	FS-70L-THS	FS70L4-S	FS70L4-THS
Order No. short base model	**378-186-2**	**378-186-4**	**378-187-2**	**378-187-4**
Optical pass ratio	100/0 or 0/100	100/0 or 0/100	100/0 or 0/100	100/0 or 0/100
Protective filter	Built-in laser beam filter	Built-in laser beam filter	Built-in laser beam filter	Built-in laser beam filter
Tube lens	1X	1X	1X	1X
Applicable laser	1064/532//355 nm	1064/532/355 nm	532/266 nm	532/266 nm
Camera mount	Use a laser with TV port.	Use a laser with TV port.	C-mount receptacle (with green filter switch)	C-mount receptacle (with green filter switch)
Objective, optional (for laser-cutting)	M/LCD Plan NIR M/LCD Plan NUV	M/LCD Plan NIR M/LCD Plan NUV	M Plan UV	M Plan UV
Loading (*¹) kg	14,2	13,5	13,9	13,1
Mass kg	6,4	7,2	6,7	7,5

(***¹**) Loading on optical tube excluding weight of objective lenses and eyepieces.

Mitutoyo

Video Microscope Unit VMU Series

Series 378

The VMU is a compact, lightweight and easy-to-install microscope unit for CCD camera monitoring in semiconductor fabrication facilities.
The VMU offers you the following benefits:

• The optical system features ultra-long working distance objectives and correction for the wide range of radiation wavelengths in use.
• Reflected illumination keeps your workpiece free from thermal expansion (the fibreoptic illuminator is required.)
• Also available with a laser mount or turret (objective mount).

VMU-H
378-506

VMU-V
378-505

VMU-LB
378-513

VMU-L4B
378-514

Specifications

Magnification of tube	1X
Reflected illumination	- Telecentric system with aperture stop system - Fibre-optic illuminator (optional) is required
Light source	Halogen bulb (21V, 150W) (optional)
Objective lenses for bright field observation (Optional accessory)	M Plan Apo, M Plan Apo SL, G Plan Apo
Objective lenses for laser cutting (Optional accessory)	M plan Apo NIR, LCD Plan Apo NIR, M Plan Apo NUV and LCD Plan Apo NUV
Objective lenses for laser machining (Optional accessory)	M Plan UV **(for 378-514 only)**

Refer to the microscope units and objective lenses brochure

Selection Guide to System Configuration
(Depends on each system configuration)

No.	Applicable Wavelength	Vertical CCD camera mount	Horizontal CCD camera mount	YAG laser mount	Fibre optic illumination unit mount	Mass [g]
378-505	Near-infrared and visible radiation	Yes			Yes	570
378-506	Near-infrared and visible radiation		Yes		Yes	590
378-513	Near-infrared, visible, near-ultraviolet radiation	Yes		Yes	Yes	1270
378-514	Near infrared, visible, near ultraviolet and ultraviolet radiation	Yes		Yes	Yes	1300

Video Microscope Unit VMU Series

Series 378

The WIDE VMU series takes video microscopy to the next level with a 7 times bigger field of view than conventional models. It supports both bright field and dark field observation.

The WIDE VMU offers the following benefits:
- Supported sensor size of 2-inch-equivalent, APS-C format
- Image field of ø30 mm with 1X tube lens
- Both F-mount and C-mount cameras can be mounted
- BF observations are supported by the WIDE VMU-V and -H models ,
- BD observations are supported by the WIDE VMU-BDV and -BDH models
- With the flexible orientation for camera and illumination mounting very compact arrangements can be configured.

WIDE VMU-V

WIDE VMU-H

WIDE VMU-BDV

WIDE VMU-BDH

Highly compact configuration of 4 WIDE VMU units

No.	Camera mount	Observation type	Illumination mount	Suitable objectives
378-515	Vertical	Bright field (BF)	Single port	M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo
378-516	Horizontal	Bright field (BF)	Single port	M Plan Apo, M Plan Apo HR, M Plan Apo SL, G Plan Apo
378-517	Vertical	Bright field / Dark field (BD)	Dual port	BD Plan Apo, BD Plan Apo HR, BD Plan Apo SL
378-518	Horizontal	Bright field / Dark field (BD)	Dual port	BD Plan Apo, BD Plan Apo HR, BD Plan Apo SL

Optional accessories: Motorized turret, focusing unit, polarizer

Refer to the microscope units and objective lenses brochure

Mitutoyo

Wide Field Eyepiece WF

Series 378

- Extra-wide field of view type.
- Optional reticles are available.
- Applicable microscope models: MF-C, MF-UC, Hyper MF, Hyper MF-U, FS70.

378-856-5   **378-857-5**   **378-858-5**

Individual

No.	Magnification	Field number	Correction range	Eye point	Mass [g]
378-856-5	10X	24	-10D to +5D	High	85
378-857-5	15X	16	-8D to +5D	Normal	40
378-858-5	20X	12	-8D to +5D	Normal	55

Two-piece sets

No.	Magnification	Field number	Correction range	Eye point	Mass [g]
378-856	10X	24	-10D bis +5D	High	85
378-857	15X	16	-8D to +5D	Normal	40
378-858	20X	12	-8D to +5D	Normal	55

Optional accessories

No.	Description
516848	Reticle, Cross hair
516576	Reticle, Broken Cross hair and 60° Angle
516578	Reticle, Concentric Circles
516577	Reticle, Cross hair with 20 mm Scale
516849	Reticle, 10 mm Scale (0,01 mm Reading)
516850	Reticle, 5 mm Scale (0,005 mm Reading)

Refer to the microscope units and objective lenses brochure

Finity Corrected Objective Lens ML-Series

Series 375

The Mitutoyo 375 Series finity corrected objective lenses realize clear images and long working distance.

Specifications

Abbreviations in product table	Mag. : Magnification N.A. : Numerical aperture W.D. : Working distance D.F. : Focal depth

No.	Magnification	N.A.	W.D. [mm]	D.F. [µm]
375-036-2	1X	0,03	61	306
375-037-1	3X	0,09	77	34
375-034-1	5X	0,13	61	23
375-039	10X	0,21	51	6,2
375-051	20X	0,42	20	1,6
375-052	50X	0,55	13	0,9
375-053	100X	0,7	6	0,6

Objective Lens M Plan Series

Series 378

The Mitutoyo 378 Series objectives have one of the world's longest working distances and an infinitycorrection optical system. These objectives give you flexible observation at high magnifications and independent correction of chromatic aberration.

Specifications

Features
- The long working distance type objective lenses provide excellent clearance between the lens surface and the workpiece surface in focus, making it possible to observe workpieces which are usually hard-to-focus because of awkward projections.

- The metallurgical plan apochromatic (M Plan Apo) objective lens is an excellent optical system. This objective provides a flat, chromatic aberration-free image throughout the field of view, making it suitable for any type of microscope.

- Specially designed objective lenses are also available with correction for the near-infrared, near-ultraviolet and ultraviolet regions of the spectrum, or various thicknesses of LCD screen glass.

- The mounting screw threads of objective lenses are designed to conform to JIS B-7141-1994.

Refer to the microscope units and objective lenses brochure

**M Plan Apo and M Plan Apo SL
Objectives for bright field observation**

**BD Plan Apo and BD Plan Apo SL
Objectives for bright/dark field observation**

Near-ultraviolet wavelength corrected M Plan Apo NUV objectives

Ultraviolet wavelength corrected M Plan UV objectives

Near-infrared wavelength corrected M Plan Apo NIR objectives

All products to be sold to commercial customers. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon. For suggested retail prices, please refer to the separate price list.

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Objective Lens for Brightfield Observation
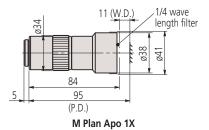
Series 378 - M Plan Apo
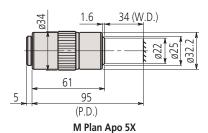
M Plan Apo for Bright Field Observation
Compatible with microscope types VMU / FS-70 / MF-U / Hyper MF-U
Note : Polarizing unit **(378-074)** is required when using 1X objective.
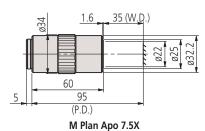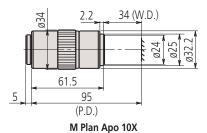
No.	Model	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [μm]	D.F. [μm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-800-3	M Plan Apo 1X	0,025	11	95	200	11	440	ø24	4,8x6,4	300
378-801-6	M Plan Apo 2X	0,055	34	95	100	5	91	ø12	2,4x3,2	220
378-802-6	M Plan Apo 5X	0,14	34	95	40	2	14	ø4,8	0,96x1,28	240
378-807-3	M Plan Apo 7,5X	0,21	35	95	26,67	1,3	6,2	ø3,6	0,64x0,85	240
378-803-3	M Plan Apo 10X	0,28	34	95	20	1	3,5	ø2,4	0,48x0,64	230
378-804-3	M Plan Apo 20X	0,42	20	95	10	0,7	1,6	ø1,2	0,24x0,32	270
378-805-3	M Plan Apo 50X	0,55	13	95	4	0,5	0,9	ø0,48	0,1x0,13	290
378-806-3	M Plan Apo 100X	0,7	6	95	2	0,4	0,6	ø0,24	0,05x0,06	320

M Plan Apo 1X

M Plan Apo 2X

M Plan Apo 5X

M Plan Apo 7.5X

M Plan Apo 10X

M Plan Apo 20X

M Plan Apo 50X

M Plan Apo 100X

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

Objective Lens for Brightfield Observation

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

Series 378 - M Plan Apo HR

M Plan Apo HR for Bright Field Observation
Compatible with microscope types VMU / FS-70 / MF-U / Hyper MF-U
Note : These objectives offer extra-high resolving power.

No.	Model	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-787-4	M Plan Apo HR 5X	0,21	25,5	95	40	1,3	6,2	ø4,8	0,96x1,28	285
378-788-4	M Plan Apo HR 10X	0,42	15	95	20	0,7	1,6	ø2,4	0,48x0,64	460
378-814-4	M Plan Apo HR 50X	0,75	5,2	95	4	0,4	0,49	ø0,48	0,1x0,13	400
378-815-4	M Plan Apo HR 100X	0,9	1,3	95	2	0,3	0,34	ø0,24	0,05x0,06	410

M Plan Apo HR 5X

M Plan Apo HR 10X

M Plan Apo HR 50X

M Plan Apo HR 100X

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Objective Lens for Brightfield Observation

Series 378 - M Plan Apo SL

M Plan Apo SL for Bright Field Observation
Compatible with microscope types VMU / FS-70 / MF-U / Hyper MF-U
Note : These objectives offer extra-long working distance.

No.	Model	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-810-3	M Plan Apo SL 20X	0,28	30,5	95	10	1	3,5	ø1,2	0,24x0,32	240
378-811-15	M Plan Apo SL 50X		20,5	95	4	0,7	1,6	ø0,48	0,1x0,13	280
378-813-3	M Plan Apo SL 100X	0,55	13	95	2	0,5	0,9	ø0,24	0,05x0,06	290

Specifications

Abbreviations in product table	N.A. : Numerical aperture
	W.D. : Working distance
	P.D. : Parfocal distance
	f : Focal distance
	R : Resolving power
	D.F. : Focal depth
	FOV 1 : Field of view when using ø24 mm eyepiece
	FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

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Objective Lens for Brightfield Observation

Series 378 - G Plan Apo

Specifications

Abbreviations in product table

Mag. : Magnification
N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure
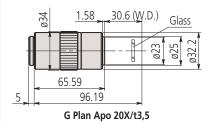
Glass Thickness Corrected
G Plan Apo for Bright Field Observation
Compatible with microscope types VMU / FS-70 / MF-U / Hyper MF-U
Note : The G Plan Apo Series are designed for observing a workpiece through glass (thickness : 3,5 mm).
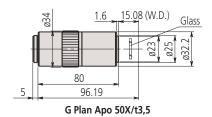
No.	Model	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-847	G Plan Apo 20X	0,28	29,42	96,19	10	1	3,5	ø1,2	0,24x0,32	270
378-848-3	G Plan Apo 50X	0,5	13,89	96,19	4	0,6	1,1	ø0,48	0,1x0,13	320

ø34   1.58   30.6 (W.D.)   Glass
ø23   ø25   ø32.2
65.59
5   96.19

G Plan Apo 20X/t3,5

ø34   1.6   15.08 (W.D.)   Glass
ø23   ø25   ø32.2
80
5   96.19

G Plan Apo 50X/t3,5

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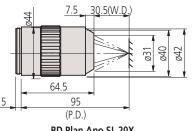
Objective Lens for Brightfield/Darkfield Observation FS-Series
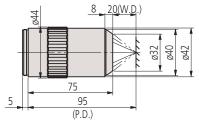
Series 378 BD Plan Apo SL
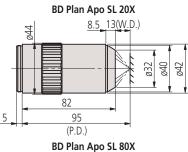
BD Plan Apo SL for Bright/Dark Field Observation
Compatible with microscope types MF-U / Hyper MF-U
Note : These objectives offer extra-long working distance.
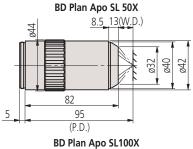
No.	Model	Magnification	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [μm]	D.F. [μm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-840-7	BD Plan Apo SL 20X	20X	0,28	30,5	95	10	1	3,5	ø1,2	0,24x0,32	350
378-841-7	BD Plan Apo SL 50X	50X	0,42	20	95	4	0,7	1,6	ø0,48	0,1x0,13	410
378-842-7	BD Plan Apo SL 80X	80X	0,5	13	95	2,5	0,6	1,1	ø0,3	0,06x0,08	430
378-843-7	BD Plan Apo SL 100X	100X	0,55	13	95	2	0,5	0,9	ø0,24	0,05x0,06	440

BD Plan Apo SL 20X

BD Plan Apo SL 50X

BD Plan Apo SL 80X

BD Plan Apo SL100X

Objective Lens for Brightfield/Darkfield Observation FS-Series

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

Series 378 - BD Plan Apo
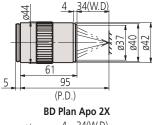
BD Plan Apo for Bright/Dark Field Observation
Compatible with microscope types MF-U / Hyper MF-U
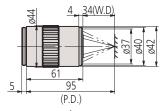
No.	Model	Magnification	N.A.	W.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-831-7	BD Plan Apo 2X	2X	0,055	34	100	5	91	ø12	2,4x3,2	340
378-832-7	BD Plan Apo 5X	5X	0,14	34	40	2	14	ø4,8	0,96x1,28	350
378-830-7	BD Plan Apo 7,5X	7,5X	0,21	34	26,67	1,3	6,2	ø3,6	0,64x0,85	350
378-833-7	BD Plan Apo 10X	10X	0,28	34	20	1	3,5	ø2,4	0,48x0,64	350
378-834-7	BD Plan Apo 20X	20X	0,42	20	10	0,7	1,6	ø1,2	0,24x0,32	400
378-835-7	BD Plan Apo 50X	50X	0,55	13	4	0,5	0,9	ø0,48	0,1x0,13	440
378-836-7	BD Plan Apo 100X	100X	0,7	6	2	0,4	0,6	ø0,24	0,05x0,06	460
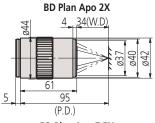
BD Plan Apo HR for Bright/Dark Field Observation
Compatible with microscope types MF-U / Hyper MF-U
Note : These objectives offer extra-high resolving power.
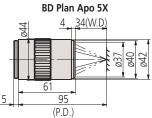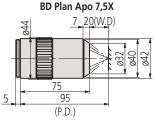
No.	Model	Magnification	N.A.	W.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-845-7	BD Plan Apo HR 50X	50X	0,75	5,2	4	0,4	0,49	ø0,48	0,1x0,13	530
378-846-7	BD Plan Apo HR 100X	100X	0,9	1,3	2	0,3	0,34	ø0,24	0,05x0,06	545

BD Plan Apo 2X

BD Plan Apo 5X

BD Plan Apo 7,5X

BD Plan Apo 10X

BD Plan Apo 20X

BD Plan Apo 50X

BD Plan Apo 100X

BD Plan Apo HR 50X

BD Plan Apo HR 100X

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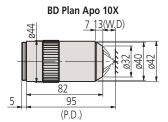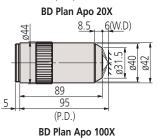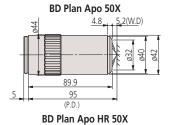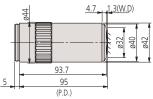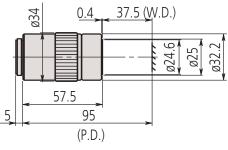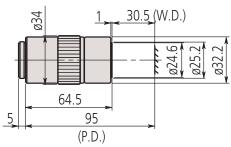
Objective Lens for NIR, NUV and UV Observation FS-Series

Series 378 - M Plan Apo NIR / M Plan Apo NIR HR
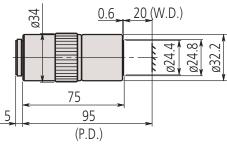
No.	Model	Magnifica-tion	N.A.	W.D. [mm]	P.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-822-5	M Plan Apo NIR 5X	5X	0,14	37,5	95	40	2	14	ø4,8	0,96x1,28	220
378-823-5	M Plan Apo NIR 10X	10X	0,26	30,5	95	20	1,1	4,1	ø2,4	0,48x0,64	250
378-824-5	M Plan Apo NIR 20X	20X	0,4	20	95	10	0,7	1,7	ø1,2	0,24x0,32	300
378-825-5	M Plan Apo NIR 50X	50X	0,42	17	95	4	0,7	1,6	ø0,48	0,1x0,13	315
378-826-5	M Plan Apo NIR 100X	100X	0,5	12	95	2	0,6	1,1	ø0,24	0,05x0,06	335
378-863-5	M Plan Apo NIR HR 50X	50X	0,65	10	95	4	0,42	0,65	ø0,48	0,1x0,13	450
378-864-5	M Plan Apo NIR HR 100X	100X	0,7	10	95	2	0,39	0,56	ø0,24	0,05x0,06	450
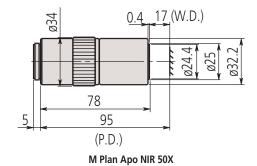
M Plan Apo NIR 5X
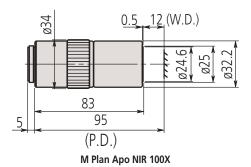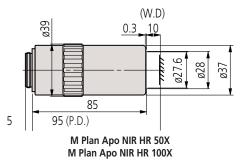
M Plan Apo NIR 10X

M Plan Apo NIR 20X

M Plan Apo NIR 50X

M Plan Apo NIR 100X

M Plan Apo NIR HR 50X
M Plan Apo NIR HR 100X

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

M Plan Apo NIR

Note :
These objective lenses are designed so that the image of a workpiece remains focused within the focal depth even when the wavelength used is changed from within the visible range up to the near-infrared (480 to 1800 nm). Therefore the M Plan NIR Series are suitable for laser repair. However, when the wavelength used exceeds 1100 nm, the focussing position may deviate slightly from that in the visible range due to changes in glass dispersion and refractive index.

Refer to the microscope units and objective lenses brochure

Objective Lens for NIR, NUV and UV Observation FS-Series

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Focal depth
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

M Plan Apo NIR

Note :
These objective lenses are designed so that the image of a workpiece remains focused within the focal depth even when the wavelength used is changed from within the visible range up to the near-infrared (480 to 1800 nm). Therefore the M Plan NIR Series are suitable for laser repair. However, when the wavelength used exceeds 1100 nm, the focussing position may deviate slightly from that in the visible range due to changes in glass dispersion and refractive index.

Refer to the microscope units and objective lenses brochure

Series 378 - M Plan Apo NIR B

No.	Model	Magnification	N.A.	W.D. [mm]	f [mm]	P.D. [mm]	R [μm]	D.F. [μm]	FOV 1 [mm]	FOV 2 [mm]
378-867-5	M Plan Apo NIR B 20X	20X	0,4	25,5	10	95	0,7	1,7	1,2	0,24x0,32
378-868-5	M Plan Apo NIR B 50X	50X	0,42	25,5	4	95	0,7	1,6	0,48	0,24x0,13

M Plan Apo NIR B 20X

M Plan Apo NIR B 50X

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Objective Lens for NIR, NUV and UV Observation FS-Series
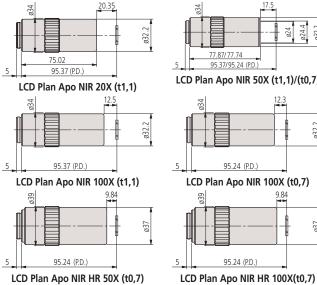
Series 378 - LCD Plan Apo NIR - LCD Plan Apo NIR HR
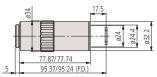
Near-infrared wavelength with LCD Glass Thickness Correction
LCD Plan Apo NIR for Bright Field Observation
Compatible with microscope types VMU / FS-70
Note : W.D. is just measured in air, not through an LCD glass
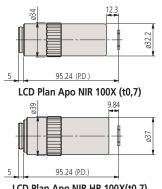
No.	Model	Mag./glass thickness [mm]	N.A.	W.D. [mm]	f [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-827-5	LCD Plan Apo NIR 20X (t1,1)	20X/t1,1	0,4	19,98	10	0,7	1,7	ø1,2	0,24x0,32	305
378-828-5	LCD Plan Apo NIR 50X (t1,1)	50X/t1,1	0,42	17,13	3,9	0,7	1,6	ø0,48	0,1x0,13	320
378-829-5	LCD Plan Apo NIR 50X (t0,7)	50X/t0,7	0,42	17,26	3,9	0,7	1,6	ø0,48	0,1x0,13	320
378-752-15	LCD Plan Apo NIR 100X (t1,1)	100X/t1,1	0,5	12,13	2	0,6	1,1	0,24	0,05x0,06	335
378-754-15	LCD Plan Apo NIR 100X (t0,7)	100X/t0,7	0,5	12,06	2	0,6	1,1	0,24	0,05x0,06	335
378-869-5	LCD Plan Apo NIR HR 50X (t 0,7)	50X/t0,7	0,65	9,6	4	0,4	0,7	0,48	0,1x0,13	450
378-870-5	LCD Plan Apo NIR HR 100X (t 0,7)	100X/t0,7	0,7	9,6	2	0,4	0,6	0,24	0,05x0,06	450

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Depth of focus
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

LCD Plan Apo NIR 20X (t1,1)

LCD Plan Apo NIR 50X (t1,1)/(t0,7)

LCD Plan Apo NIR 100X (t1,1)

LCD Plan Apo NIR 100X (t0,7)

LCD Plan Apo NIR HR 50X (t0,7)

LCD Plan Apo NIR HR 100X(t0,7)

Objective Lens for NIR, NUV and UV Observation FS-Series

Specifications

Abbreviations in product table

N.A. : Numerical aperture
W.D. : Working distance
P.D. : Parfocal distance
f : Focal distance
R : Resolving power
D.F. : Depth of focus
FOV 1 : Field of view when using ø24 mm eyepiece
FOV 2 : Field of view when using a digital camera with 1/2" chip size

Refer to the microscope units and objective lenses brochure

Series 378 M Plan Apo NUV/LCD Plan Apo NUV/M Plan UV/LCD Plan UV
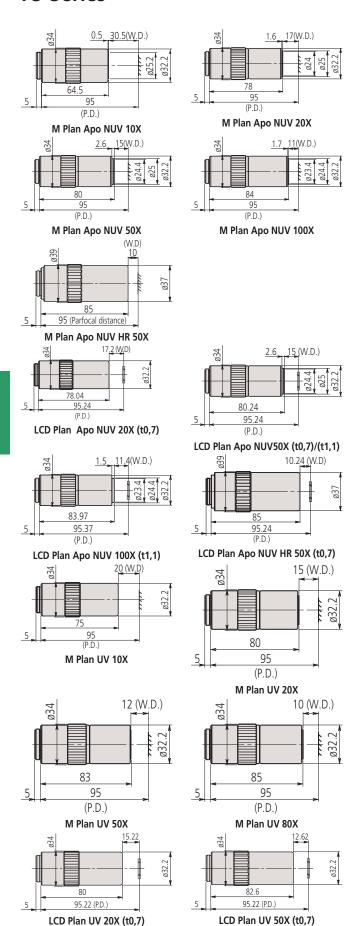
No.	Model	Magni-fication	Mag./ glass thick-ness [mm]	N.A.	W.D. [mm]	f [mm]	P.D. [mm]	R [µm]	D.F. [µm]	FOV 1 [mm]	FOV 2 [mm]	Mass [g]
378-809-5	M Plan Apo NUV 10X	10X		0,28	30,5	20	95	1	3,5	ø2,4	0,48x0,64	255
378-817-8	M Plan Apo NUV 20X	20X		0,42	17	10	95	0,7	1,7	1,2	0,24x0,32	340
378-818-6	M Plan Apo NUV 50X	50X		0,42	15	4	95	0,7	1,6	ø0,48	0,1x0,13	350
378-819-4	M Plan Apo NUV 100X	100X		0,5	11	2	95	0,6	1,1	ø0,24	0,05x0,06	380
378-888-6	M Plan Apo NUV HR 50X	50X		0,65	10	4	95	0,42	0,65	ø0,48	0,1x0,13	500
378-890-8	LCD plan Apo NUV 20X (t0,7)	20X	20X/t0,7	0,42	16,96	10	95	10	1,7	1,2	0,24x0,32	340
378-753-6	LCD Plan Apo NUV 50X (t1,1)	50X	50X/t1,1	0,42	14,53	4	95	0,7	1,6	ø0,48	0,1x0,13	310
378-820-8	LCD Plan Apo NUV 50X (t0,7)	50X	50X/t0,7	0,44	14,76	4	95	0,7	1,6	0,48	0,1x0,13	350
378-751-4	LCD Plan Apo NUV 100X (t1,1)	100X	100X/ t1,1	0,5	11,03	2	95	0,6	1,1	ø0,24	0,05x0,06	380
378-891-6	LCD plan Apo NUV HR 50X (t0,7)	50X	50X/t0,7	0,65	9,76	4	95	0,4	0,7	ø 0,48	0,1x0,13	500
378-844-15	M Plan UV 10X	10X		0,25	20	20	95	1,1	4,4	ø2,4	0,48x0,64	310
378-837-7	M Plan UV 20X	20X		0,36	15	10	95	0,8	2,1	ø1,2	0,24x0,32	330
378-838-8	M Plan UV 50X	50X		0,4	12	4	95	0,7	1,7	ø0,48	0,1x0,13	400
378-839-5	M Plan UV 80X	80X		0,55	10	2,9	95	0,5	0,9	ø0,3	0,06x0,08	380
378-892-8	LCD Plan UV 20X (t0,7)	20X	20X/t0,7	0,37	15	10	95	0,8	2,1	1,2	0,24x0,32	370
378-893-8	LCD Plan UV 50X (t0,7)	50X	50X/t0,7	0,41	12,4	4	95	0,7	1,6	ø0,48	0,1x0,13	400

Mitutoyo

Objective Lens for NIR, NUV and UV Observation
FS-Series

M Plan Apo NUV 10X

M Plan Apo NUV 20X

M Plan Apo NUV 50X

M Plan Apo NUV 100X

M Plan Apo NUV HR 50X

LCD Plan Apo NUV 20X (t0,7)

LCD Plan Apo NUV50X (t0,7)/(t1,1)

LCD Plan Apo NUV 100X (t1,1)

LCD Plan Apo NUV HR 50X (t0,7)

M Plan UV 10X

M Plan UV 20X

M Plan UV 50X

M Plan UV 80X

LCD Plan UV 20X (t0,7)

LCD Plan UV 50X (t0,7)

Mitutoyo

Measuring Projector PJ-A3000 Series

Series 302

The PJ-A3000 Series profile projector is a medium-sized model that gives you excellent versatility and easy operation.
The PJ-A3000 offers you the following benefits:
- The easy-to-read digital XY counter is located near the projection screen to minimize eye movement.
- You can measure angles easily with the digital readout protractor screen.

302-701-1D

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 315 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine feed and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-202)** Optional : 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric Functions : 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination with adjustable condenser lens Functions : Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution	0,001 mm (0,001 mm : digital head)
Power supply	220 - 240V AC, 50/60Hz

D : Max. workpiece diameter
W : Working distance
H : Max. workpiece height

mm

		Magnification			
		10X	20X	50X	100X
View field		ø31.5	ø15.7	ø6.3	ø3.1
W		66 (20)	32.5 (2)	12.6	5
H	-50 models*	123.5	123.5	123.5	123.5
	-100 models	91	91	91	91
	-150 models	103.5	103.5	103.5	103.5
	200 models	92.5	92.5	92.5	92.5
D	-50 models*	224 (198)	87 (61)	27	10
	-100 models	182	87 (61)	27	10
	-150 models	207 (198)	87 (61)	27	10
	200 models	185	87 (61)	27	10

( ) When using surface illumination

Refer to the PJ-A3000 brochure

Detector mounting plate: 12AAE671
Optoeye-200: 332-151

Standard scale 50 mm: 172-116
Reading scale 200 mm: 172-118
Reading scale 300 mm: 172-161
Overlay chart, 12 sheet set: 12AAM027
Green filter: 172-160-3

QM-Data 200 Arm mount type: 264-156D
QM-Data 200 Stand Type 264-155D

RS232 Cable 12AAA807D

Projection screen
- 2D Data processor / counter
- Edge detection

PJ-A3000

Stage pheripheral
Projection lens

Swivel Center support: 176-105
Swivel Center Support: 172-197
Rotary Table 100mm: 172-196
Rotary Table 100mm (with fine adjustment) 172-198
Rotary Table (PJ-A3005D-50): 176-106
Holder with clamp: 176-107
V Block and Clamp: 172-378
Fixture mount adapter for PJ-A3010F-200: 999678D

Standard accessory

Projection lens 10X : 172-202
Oblique illumination mirror 172-229

Projection lens 20X : 172-203
Oblique illumination mirror 172-230

Projection lens 50X (With half reflecting mirror: 172-204

Projection lens 100X (with half reflecting mirror) : 172-207

Mitutoyo

Measuring Projector PJ-A3000 Series

Series 302 - Metric model

Metric

XY stage 50 x 50 or 150 x 50 or 100 x100 or 200 x 100 mm

Model	PJ-A3005D-50	PJ-A3005F-150	PJ-A3010F-100	PJ-A3010F-200
No.	302-704-1D 302-704-1E	302-702-1D	302-703-1D 302-703-1E	302-701-1D 302-701-1E
XY stage [mm]	50 x 50	150 x 50	100 x 100	200 x 100
XY stage [mm]	50 x 50	-	100 x 100	200 x 100
Measuring method	Digimatic micrometer head	Linear encoder	Linear encoder	Linear encoder
Measuring method	Digimatic micrometer head	-	Linear encoder	Linear encoder
Quick-release mechanism	_	X and Y axes	X and Y axes	X and Y axes
Quick-release mechanism	_	-	X and Y axes	X and Y axes
XY stage table top size [mm]	152 x 152	280 x 152	250 x 250	380 x 250
XY stage effective area [mm]	82 x 82	185 x 84	142 x 142	266 x 170
Stage glass No.	380405	381349	12BAE041	382762
Table swiveling function	_	_	_	±3°
Table swiveling function	_	-	_	±3°
Max stage loading [kg]	10	8	10	8
Mass kg	107	116	112	140

mm

A = 593 mm : 302-701-1D, A = 446 mm : 302-702-1D
A = 427 mm : 302-703-1D

264-155D, QM-Data 200

OPTOEYE-200

302-701-1D

302-704-1D

302-702-01D

302-703-1D

Standard accessories

No.	Description
172-202	Projection lens set, 10X magnification
383876	Cover, Vinyl cover for PJ-3010F projector
512305	Halogen Lamp for Measuring Projector, 24V/150W

Optional accessories

No.	Description
172-116	Inspection tool, Standard scale 50 mm/0,1 mm
172-160-3	Green Filter, Colour filter
172-161	Inspection tool, Reading Scale 300 mm/0,5 mm
172-197	Fixture/clamping material Swivel center support
172-203	Projection lens set, 20X magnification
172-204	Projection lens set, 50X magnification
172-207	Projection lens set, 100X magnification
172-229	Lens accessory, Oblique reflecting mirror for 10X lens
172-230	Lens accessory, Oblique reflecting mirror for 20X lens
172-378	Fixture/clamping material, V-block with clamp
176-107	Fixture/clamping material, Holder with clamp
172-118	Inspection tool, Reading scale 200 mm/0,5 mm
172-160-2	Green filter
176-105	Fixture/clamping material, Swivel center support
999678D	Adapter, Stage mount adapter
512305	Halogen Lamp for Measuring Projector, 24V/150W
12AAE671	Attachment, Optoeye-200 Attachment A, 250-350 mm
332-151	Sensor, Optoeye-200 edge detection sensor
176-106	Rotary table
172-196	Rotary table, 100 mm for TM-1005B
172-198	Rotary table, 100 mm with fine feed knob for TM-1005B
264-155D	2D Data processor, QM-Data 200, stand type
264-156D	2D Data processor, QM-Data 200, arm mount type

176-106 : for stage 150 x 50 mm
172-196 and 172-198 : for stage 100 x 100 and 200 x 100 mm

	METRIC - (INCH/METRIC)	
	302-700D - (302-714E) 302-704D - (302-718E) 302-708D - (302-719E) 302-709D	302-701D - (302-711E) 302-702D - (302-712E) 302-703D - (302-713E) 302-705D 302-706D 302-707D
176-106	X	—
172-196	—	X*
172-198	—	X*
176-105	X	X*
172-197	—	X*
176-107	X	X*
172-378	X	X*

* Fixture mount adapter (999678)
is required for 302-701-1D

172-116

172-229

172-160-3

Measuring Projector PJ-H30 Series

Series 303

This measuring projector has adjustable incident illumination.
The PJ-H30 offers you the following benefits:
- By rotating the condenser lens and changing the angle of the mirror in the objective, you can represent even poorly reflecting surfaces optimally.
- Improved light intensity of a projected subject thanks to the new optical contour illumination system.
- High measuring accuracy (above JIS standard).
- Measuring stage with rapid single-handed adjustment on both axes enabling you to switch smoothly between quick positioning and fine adjustment.
- Constant current power supply unit with acceleration control to maximize the service life of the halogen lamp.
- Easily read digital counter with large digit display.
- The PJ-H30D models also offer you a built-in precision edge detector (Optoeye).
- RS-232C output.

303-735-1D

Vertical / oblique switchable surface illumination

Vertical illumination

Oblique illumination

1010B

2010B

2017B

Specifications

Accuracy	(3+0,02L) µm L : Max length measurement
Projected image	Erect
Projector screen	Effective diameter : 306 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-472)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric zoom Functions : Continuously variable brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical/Oblique illumination with an adjustable condenser lens Functions : Continuously variable brightness adjustment, Heat-absorbing filter, Cooling fan
Power supply	220V AC, 50/60Hz
Resolution	0,001 mm

Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø61.2	ø30.6	ø15.3	ø6.12	ø3.06
H	105	105	105	105	105
W	66	70.5	56.5	50	50
D	148	197	137	114	114

Profile Projector brochure on request

Measuring Projector PJ-H30 Series

Series 303

Model 1010B - 100 x 100 mm
XY stage table size : 300 x 240 mm
XY stage effective area : 180 x 150 mm
Stage glass No. : **380412**
Swiveling function : ±3°
Max stage loading : 10 kg
Mass : 176 kg

Model	PJ-H30A	PJ-H30D
No.	303-712-1D	303-732-1D
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 2010B - 200 x 100 mm
XY stage table size : 350 x 280 mm
XY stage effective area : 250 x 150 mm
Stage glass No. : **382762**
Swiveling function : ±3°
Max stage loading : 10 kg
Mass : 178 kg

Model	PJ-H30A	PJ-H30D
No.	303-713-1D	303-733-1D
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 2017B - 200 x 170 mm
XY stage table size : 410 x 342 mm
XY stage effective area : 270 x 240 mm
Stage glass No. : **12BAD363**
Swiveling function : ±5°
Max stage loading : 20 kg
Mass : 205 kg

Model	PJ-H30A	PJ-H30D
No.	303-714-1D	303-734-1D
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Model 3017B - 300 x 170 mm
XY stage table size : 510 x 342 mm
XY stage effective area : 370 x 240 mm
Stage glass No. : **12BAD330**
Swiveling function : ±5°
Max stage loading : 20 kg
Mass : 212 kg

Model	PJ-H30A	PJ-H30D
No.	303-715-1D	303-735-1D
Focusing	Manual	Power focus
Edge detector	Optional	Built-In

Measuring Projector PJ-H30 Series

Series 303

Optional accessories
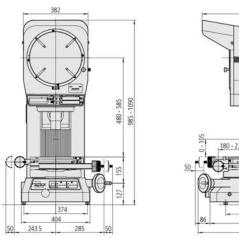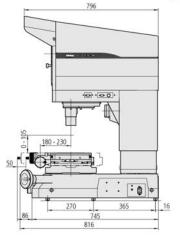
No.	Description
332-151	Sensor, Optoeye-200 edge detection sensor
12AAE671	Attachment, Optoeye-200 Attachment A, 250-350 mm
12AAG983	Attachment, Optoeye-200 Attachment for PJ-H30 Series
12AAG981	Filter, Green filter for PJ-H30 Series projector
172-116	Inspection tool, Standard scale 50 mm/ 0,1 mm
172-118	Inspection tool, Reading scale 200 mm/ 0,5 mm
172-161	Inspection tool, Reading Scale 300 mm/ 0,5 mm
172-271	Projection lens, 5X magnification for PJ-311
172-473	Projection lens, 20X magnification for PJ-H30 Series
172-474	Projection lens, 50X magnification for PJ-H30 Series
172-475	Projection lens, 100X magnification for PJ-H30 Series
176-105	Fixture/clamping material, Swivel center support
172-197	Fixture/clamping material Swivel center support
172-198	Rotary table, 100 mm with fine feed knob for TM-1005B
172-378	Fixture/clamping material, V-block with clamp
176-305	Rotary Table, Type A, D=240 mm
176-306	Rotary Table, Type B, D=270 mm
011534	MC Special Cleaner
12AAA807D	Cable RS-232C 2m
12AAG982	Stand, Stand for QM-Data 200 on PJ-H30 Series
264-155D	2D Data processor, QM-Data 200, stand type
264-156D	2D Data processor, QM-Data 200, arm mount type

**264-155D
QM-Data 200**

1010B model

3017B model

Thermal Printer DPU414: **12AAD032** (with the connecting cable)
FD-unit: **12AAA799**
Footswitch: **937179T**
External printer (ESC/P) cable: **12AAA804**

Real-time control program MeasurLink
Inspection table generation program MeasureReport
Note: A appropriate PC is required

RS-232C-cable (cross): **12AAA807**
Note: The connectors at both ends are D-sub 9-pin female

PC transferprogram option

QM-Data200 (arm-type specification) **264-156**

QM-Data200 (mounting stand:) **12AAG982**

QM-Data200 (stand-type specification) **264-155**

OPTOEYE 200: **332-151**

RS-232C-cable (cross): **12AAA807D**
Note: The connectors at both ends are D-sub 9-pin female

Footswitch: **12AAA846**

Detector mounting plate A: **12AAE671**

Detector mounting bracket: **12AAG983**
for PJ-H30 and PJ-H30A only

Projection screen

Edge detection

Data calculation processing
Counter data transfer
Counter data printing

Standard scale 50 mm: **172-116**

Reading scale 200 mm: **172-118**

Reading scale 300 mm: **172-161**

Overlay chart, 12-sheet set: **12AAM027**

Green filer: **12AAG981**

Main unit contour illumination

Standard accessory

Projection lens 5X **172-271**

Projection lens 10X **172-472**

Projection lens 20X **172-473**

Projection lens 50X **172-474**

Projection lens 100X **172-475**

Halogen bulb 24V/150W (for contour/surface illumination): **515530**

Long-life halogen bulb 24V/150W (for contour/surface illumination): **512305**

Stage peripheral

Projection lens

PJ-H30

Size **1010**

Size **2010**

Size **2017/3017**

Rotary table with fine feed wheel (A): **176-305**

Stage adapter C: **176-317**

Stage adapter A: **176-304**

Rotary table with fine feed wheel (B): **176-306**

Holder with clamp: **176-107**
V-block with clamp: **172-378**
Swivel center support: **172-197**
Swivel center support (small): **176-105**

Rotary table with fine feed wheel (with built-in scale) **172-198**

Holder with clamp: **176-107**
V-block with clamp: **172-378**
Swivel center support: **172-197**
Swivel center support (small): **176-105**

Holder with clamp: **176-107**
V-block with clamp: **172-378**
Swivel center support: **172-197**
Swivel center support (small): **176-105**

Digital rotary head (up to ø13): **176-653**
Digital rotary head (up to ø20): **176-654**

Mitutoyo

Measuring Projector PV-5110

Series 304

- This measuring projector is a robust stand-alone device.
- The large rotatable screen guarantees you good observation and easy measuring.

304-919D
Counter is optional

KA Counter   **QM-Data 200**

OPTOEYE 200

Specifications

Projected image	Inverted
Projector screen	Effective diameter : 508 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle reading : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-402)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric zoom Functions : 2-step (High/Low) brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, Oblique illumination (for 5X, 10X and 20X), Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution	0,001 mm
Power supply	220 - 240V AC, 50/60Hz
Mass	210 kg

					mm
	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

( ) When using surface illumination

Profile Projector brochure on request

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Measuring Projector PV-5110

Series 304 - Accessories/Dimensions

Standard accessories

No.	Description
172-402	Projection lens set, 10X magnification
512305	Halogen Lamp for Measuring Projector, 24V/150W
12AAF182	Counter stand, For PV-5110 projector
382762	Stage glass, 280 x 180 mm, for projector
172-422	Illumination, Surface illumination unit PV-5110

Optional accessories
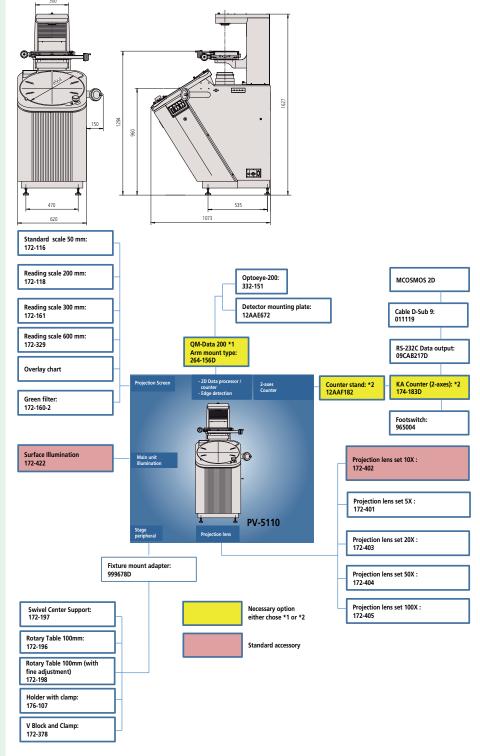
No.	Description
172-401	Projection lens set, 5X magnification
172-403	Projection lens set, 20X magnification
172-404	Projection lens set, 50X magnification
172-405	Projection lens set, 100X magnification
172-116	Inspection tool, Standard scale 50 mm/ 0,1 mm
172-330	Inspection tool, Standard scale 80 mm/ 0,1 mm
172-161	Inspection tool, Reading Scale 300 mm/ 0,5 mm
172-329	Inspection tool, Reading scale 600 mm/ 0,5 mm
172-160-2	Green filter
172-319	Canopy
510189	Vinyl cover for PV500/600 projector
172-198	Rotary table, 100 mm with fine feed knob for TM-1005B
172-197	Fixture/clamping material Swivel center support
176-107	Fixture/clamping material, Holder with clamp
172-378	Fixture/clamping material, V-block with clamp
011534	MC Special Cleaner
174-183D	Linear Scale Counter KA-212
12AAE672	Attachment, Optoeye-200 Attachment B, 500-600 mm
264-156D	2D Data processor, QM-Data 200, arm mount type

172-319

Model	PV-5110
No.	304-919D
XY stage [mm]	200 x 100
Measuring method	Linear encoder
Quick-release mechanism	X and Y axes
XY stage table top size [mm]	380 x 250
XY stage effective area [mm]	266 x 170
Stage glass No.	382762
Table swiveling function	±3°
Max stage loading [kg]	5

mm

Standard scale 50 mm: 172-116

Reading scale 200 mm: 172-118

Reading scale 300 mm: 172-161

Reading scale 600 mm: 172-329

Overlay chart

Green filter: 172-160-2

Surface Illumination 172-422

Optoeye-200: 332-151

Detector mounting plate: 12AAE672

QM-Data 200 *1 Arm mount type: 264-156D

Projection Screen

- 2D Data processor / counter
- Edge detection

2-axes Counter

Main unit illumination

Stage peripheral

Projection lens

PV-5110

MCOSMOS 2D

Cable D-Sub 9: 011119

RS-232C Data output: 09CAB217D

KA Counter (2-axes): *2 174-183D

Counter stand: *2 12AAF182

Footswitch: 965004

Projection lens set 10X : 172-402

Projection lens set 5X : 172-401

Projection lens set 20X : 172-403

Projection lens set 50X : 172-404

Projection lens set 100X : 172-405

Fixture mount adapter: 999678D

Swivel Center Support: 172-197

Rotary Table 100mm: 172-196

Rotary Table 100mm (with fine adjustment) 172-198

Holder with clamp: 176-107

V Block and Clamp: 172-378

Necessary option either chose *1 or *2

Standard accessory

Mitutoyo

Measuring Projector PH-A14

Series 172

Measuring Projector PH-A14
- Due to the PH-A14's horizontal-beam illumination, you can easily measure larger and heavier workpieces including toothed racks and punching tools.
- You can use the projector for a wide range of applications due to its generous 203 x 102 mm stage travel and 45 kg allowable stage loading.
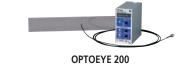
172-810-20D

KA Counter

QM-Data 200

OPTOEYE 200
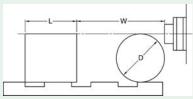
Specifications

Range	200 x 100
Projected image	Inverted
Projector screen	Effective diameter : 356 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine adjustment and clamp Angle reading : Vernier, graduation : 1' Resolution : 1' or 0,01° (switchable) Range : ±370° Reference lines : Cross-hairs
Projection lens	10X **(172-11)** Optional : 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric Functions : Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution	0,001 mm (using optional KA counter)
Power supply	220 - 240V AC, 50/60Hz
Mass	140 kg

L : Max. workpiece width
W : Working distance
D : Max. workpiece diameter

PH-A14   mm

	Magnification			
	10X	20X	50X	100X
View field	35.6	17.3	7.12	3.56
L	235	235	80	109
W	93	40	14.6	9.5
D	130	116	30.4	19

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Measuring Projector PH-A14

Series 172 - Accessories/Dimensions

Specifications

Range	200 x 100

Standard accessories
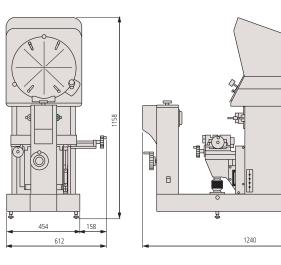
No.	Description
172-011	Projection lens set, 10X magnification for PH-A14
512305	Halogen Lamp for Measuring Projector, 24V/150W

Optional accessories
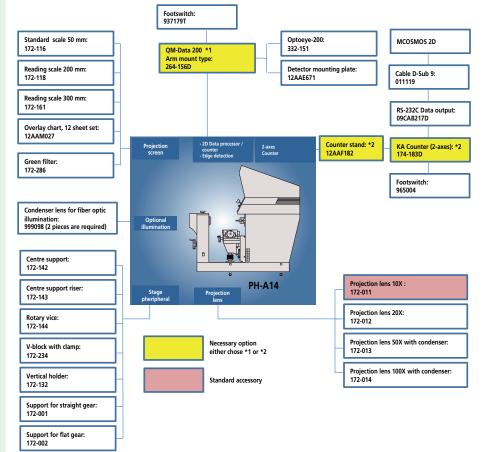
No.	Description
174-183D	Linear Scale Counter KA-212
172-013	Projection lens set, 50X magnification for PH-A14
172-012	Projection lens set, 20X magnification for PH-A14
172-014	Projection lens set, 100X magnification for PH-A14
172-116	Inspection tool, Standard scale 50 mm/ 0,1 mm
172-118	Inspection tool, Reading scale 200 mm/ 0,5 mm
172-286	Filter, Colour filter
172-143	Fixture/clamping material, Riser for center stage
172-144	Fixture/clamping material, Rotary vise
172-234	Fixture/clamping material, V-block with clamp
172-132	Fixture/clamping material, Vertical workpiece holder
172-161	Inspection tool, Reading Scale 300 mm/ 0,5 mm
172-001	Fixture/clamping material, Support for straight gear
172-002	Fixture/clamping material, Support for flat gear
172-142	Fixture/clamping material, Center support
011534	MC Special Cleaner
332-151	Sensor, Optoeye-200 edge detection sensor
12AAE671	Attachment, Optoeye-200 Attachment A, 250-350 mm
264-156D	2D Data processor, QM-Data 200, arm mount type
12AAF182	Counter stand, For PV-5110 projector

mm

Model	PH-A14
No.	172-810-20D
XY stage [mm]	203 x 102
Measuring method	Linear encoder
XY stage table top size [mm]	407 x 153
Max stage loading [kg]	45

Footswitch: 937179T

Standard scale 50 mm: 172-116

Reading scale 200 mm: 172-118

Reading scale 300 mm: 172-161

Overlay chart, 12 sheet set: 12AAM027

Green filter: 172-286

QM-Data 200 *1 Arm mount type: 264-156D

Optoeye-200: 332-151

Detector mounting plate: 12AAE671

MCOSMOS 2D

Cable D-Sub 9: 011119

RS-232C Data output: 09CAB217D

Projection screen

- 2D Data processor / counter
- Edge detection

2-axes Counter

Counter stand: *2 12AAF182

KA Counter (2-axes): *2 174-183D

Footswitch: 965004

Condenser lens for fiber optic illumination: 999098 (2 pieces are required)

Optional illumination

PH-A14

Centre support: 172-142

Centre support riser: 172-143

Rotary vice: 172-144

V-block with clamp: 172-234

Vertical holder: 172-132

Support for straight gear: 172-001

Support for flat gear: 172-002

Stage pheripheral

Projection lens

Projection lens 10X : 172-011

Projection lens 20X: 172-012

Projection lens 50X with condenser: 172-013

Projection lens 100X with condenser: 172-014

Necessary option either chose *1 or *2

Standard accessory

Mitutoyo

Measuring Projector PH-3515F

Series 172

Measuring Projector PH-3515F

- Due to the PH-3515F's horizontal-beam illumination, you can easily measure larger and heavier workpieces including toothed racks and punching tools. You can use the projector for a wide range of applications due to its generous 254 x 152 mm stage travel and 45 kg allowable stage loading.
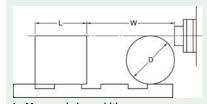
Model	PH-3515F
No.	172-868D
XY stage [mm]	254 x 152
Measuring method	Linear encoder
Quick-release mechanism	X axis
XY stage table top size [mm]	450 x 146
Table swiveling function	±10°
Max stage loading [kg]	45

172-868D

Specifications

Range	254 x 152
Projected image	Erect
Projector screen	Effective diameter : 353 mm Screen material : Fine-ground glass Screen rotation : ±360°, fine feed and clamp Angle display : Digital counter (LED) Resolution : 1' or 0,01° (switchable) Range : ±370° ABS/INC mode switching, Zero Set Reference lines : Cross-hairs
Projection lens	10X **(172-184)** Optional : 5X, 20X, 50X, 100X
Magnification accuracy	Contour illumination : ±0,1% or better Surface illumination : ±0,15% or better
Contour illumination	Light source : Halogen bulb (24V, 150W) Optical system : Telecentric system Functions : 2-step (High/Low) brightness adjustment, Heat-absorbing filter, Cooling fan
Surface illumination	Light source : Halogen bulb (24V, 150W) Optical system : Vertical illumination Functions : Adjustable condenser lens, 2-step (High/Low) brightness adjustment, Heat-absorbing filter, Cooling fan
Focusing	Manual
Resolution	0,001 mm
Power supply	220 - 240V AC, 50/60Hz
Mass	150 kg

L : Max. workpiece width
W : Working distance
D : Max. workpiece diameter

PH-3515F (mm)

	Magnification				
	5X	10X	20X	50X	100X
View field	70.6	35.3	17.65	7.06	3.5
L	175	235	235	80	109
W	160 (64)	93 (35)	40	14.6	9.5
D	152.4	152.4	116	30.4	19

( ) When using surface illumination

Measuring Projector PH-3515F

Series 172 - Accessories/Dimensions

Standard accessories

No.	Description
383228	Cover, Vinyl cover for PH3500 projector
172-184	Projection lens, 10X magnification for PH-3515F
512305	Halogen Lamp for Measuring Projector, 24V/150W
12BAA637	Bulb, Halogen 24V/200W for PH-3515F twin fiber

Optional accessories

No.	Description
172-145	Projection lens set, 5X magnification
172-173	Projection lens, 20X magnification for PH-3515F
172-165	Projection lens set, 50X magnification for PH-3515F
172-166	Projection lens set, 100X magnification for PH-3515F
172-423	Illumination, Surface illumination unit PH-3515F
172-116	Inspection tool, Standard scale 50 mm/0,1 mm
172-118	Inspection tool, Reading scale 200 mm/0,5 mm
172-161	Inspection tool, Reading Scale 300 mm/0,5 mm
172-286	Filter, Colour filter
172-142	Fixture/clamping material, Center support
172-143	Fixture/clamping material, Riser for center stage
172-144	Fixture/clamping material, Rotary vise
172-234	Fixture/clamping material, V-block with clamp
172-132	Fixture/clamping material, Vertical workpiece holder
12AAM027	Overlay chart set, for Measuring Projector No. 11-22
12AAF182	Counter stand, For PV-5110 projector
011534	MC Special Cleaner
174-183D	Linear Scale Counter KA-212
332-151	Sensor, Optoeye-200 edge detection sensor
12AAE671	Attachment, Optoeye-200 Attachment A, 250-350 mm
264-156D	2D Data processor, QM-Data 200, arm mount type

KA Counter

QM-Data 200

mm

Footswitch: 937179T

Standard scale 50 mm: 172-116

Reading scale 200 mm: 172-118

Reading scale 300 mm: 172-161

Overlay chart, 12 sheet set: 12AAM027

Green filter: 172-286

Vertical surface illumination: 172-423

Centre support: 172-142

Centre support riser: 172-143

Rotary vice: 172-144

V-block with clamp: 172-234

Vertical holder: 172-132

Support for straight gear: 172-001

Support for flat gear: 172-002

QM-Data 200 *1 Arm mount type: 264-156D

Optoeye-200: 332-151

Detector mounting plate: 12AAE671

MCOSMOS 2D

Cable D-Sub 9: 011119

RS-232C Data output: 09CAB217D

KA Counter (2-axes): *2 174-183D

Footswitch: 965004

Counter stand: *2 12AAF182

Projection screen

- 2D Data processor / counter
- Edge detection

Counter

Optional illumination

Stage pheripheral

Projection lens

PH-3515F

Projection lens 5X with condensor : 172-145

Projection lens 10X : 172-184

Projection lens 20X: 172-173

Projection lens 50X with condenser: 172-165

Projection lens 100X with condenser: 172-166

Necessary option either chose *1 or *2

Standard accessory

Mitutoyo

Data Processing Unit QM-Data 200

Series 264

The Data Processing Unit QM 200 has been especially designed to process measurement data generated by a profile projector or measuring microscope.
The QM-Data 200 offers you the following benefits:
- Measuring instructions, measuring values and calculation results for various operations are shown on the back-lit LCD in a clear, easy to understand style.
- You can also print measuring results, either on a small and convenient thermal printer (available as a special option) or on an ESC/P printer and continuous paper.
- By connecting an optional floppy disk drive newly created part programs, you can store and/or load measurement results as well as calculation results.
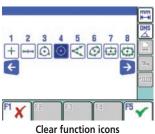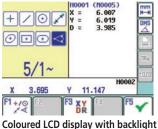
Arm-mount type
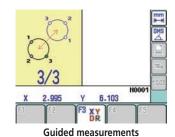
No.	Mass [kg]	Description
264-155D	2,9	Stand-mount type
264-156D	2,8	Arm-mount type
264-159D	2,9	Stand-mount type for Hyper MF / MF-U

Intuitive panel design

Clear function icons   **Coloured LCD display with backlight**   **Guided measurements**

Specifications

Resolution	1 / 0,1 μm
Dimensions [mm]	260 x 242 x 310 : Stand-mount type 318 x 153 x 275 : Arm-mount type
Screen	Colour graphic TFT LCD (320 x 240 dots, with background lighting)
Power supply	100/240V AC, 50/60 Hz
Program functions	Part program creation, execution, editing
Statisical processing	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram
Data output	USB, RS-232C, Printer
Display language	Japanese/English/German/French/ Italian/Spanish/Portuguese/Chech/ Traditional Chinese/Simplified Chinese/Korean/Turkish/Swedish/ Polish/Dutch/Hungarian
Measuring of Geometric Elements	Maximum of 1000 elements, point, line, circle, distance, ellipse, rectangular hole, slotted hole, intersection and intersecting angle and point & angle, plus a number of functions for evaluation, e.g. perpendicularity and parallelism are provided.
Measurement result file output	CSV format; MUX-10F format
Functions	**Mitutoyo's AI Function :** The AI function (AI=Artificial Intelligence) renders choosing the element type before measuring obsolete. Point measurements are analysed by the QM-Data and the results for basic elements calculated, thus accelerating the measuring procedure. **Customized Operation :** Macro functions and the creation of part programs speed up single and repetition measurements. Additionally macro commands and part programs as well as frequently used standard operations can be stored as user menus.
Data input	USB, RS-232C, X/Y/Z-axis signal, Footswitch

Optional accessories

No.	Description
12AAD033	Printer, Receipt printer QM-Data 200, 230V
908353-1	Printer paper, 1 roll
I-1525612	Cable FX-85 IBM
937179T	Footswitch for SPC
12AAA807D	Cable RS-232C 2m
63AAA108	RS-232C Signal Cable, D-Sub-25-D-Sub-9, 2m

Mitutoyo

Edge Detection Sensor OPTOEYE 200

Specifications

Image detection	Directivity : All directions
Min. diameter	2 mm on the screen
Min. width	1 mm on the screen
Applicable illumination	Type : Surface/Contour illumination Range : 30 to 2000 Lux on the screen Bright-Dark field difference : 20 Lux
Function	Automatic detection of feature edges for use in measurement

Optional accessories

No.	Description
12AAE671	Attachment, Optoeye-200 Attachment A, 250-350 mm
12AAE672	Attachment, Optoeye-200 Attachment B, 500-600 mm

Series 332

This edge sensor allows you to make accurate measurements whatever your skill level by automatically detecting edges used in measurement.
The Optoeye 200 offers you the following benefits:
- Optoeye 200 reduces the effect of operator skill level on accuracy by automatically detecting edges used in measurement.
- PJ-H30: You can use the Optoeye edge detector on models PJ-H30A (requires adapter plate 12AAG983). The PJ-H30D models have a built-in edge detector.
- PV-5110, PJ-3515F and PJ-A14: You can use the Optoeye edge detector in conjunction with the QM-Data 200.
- PJ-A3000: You can use the Optoeye edge detector on models 302-701/302-702/302-703 in conjunction with the QM-Data 200.
- When you are using the Optoeye all projector scales must be connected to QM-Data 200 directly and built-in counters can no longer be used (except PJ-H30D type).

No.	Description
332-151	Edge detection sensor OPTOEYE 200

Mitutoyo

Accessories for Measuring Projectors

Group 1

For measuring projectors

These standard overlay charts increase the range of application and the efficiency of Mitutoyo profile projectors.

This chart set offers you the following benefits:

- The charts are supplied in sizes ø250, 300, 340, 500 and 600 mm to suit the screens of Mitutoyo projectors.
- A large range of scales and profiles is provided that enables you to test workpiece features quickly and easily. You can test length, height, parallelism, angle, radius, taper, bore position, diameter, as well as all standardized thread and tooth profiles.
- All charts are made of a distortion-free special plastics compound and are provided with a protective coating.

Additional Specifications

Grid divisions	10X	: 0,1 mm
	20X	: 0,05 mm
	50X	: 0,02 mm
	100X	: 0,01 mm

Combination chart

Angle : Divisions at 10° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15" intervals at **279mm**/11" diameter.

Features : All purpose chart for checking diameters, angles, radii and linear divisions

No.	Diameter [mm]
512651	250
512652	300
512653	340
512654	500
512655	600

Combination chart

Grid/protractor chart

Angle : 15° increments

Features : Ideal for checking diameters, concentricity of diameters, radii, angles and cams.

No.	Diameter [mm]
201380	250
201386	300
201392	340
512621	500
511843	600

Grid/protractor chart

Radius/protractor chart

Angle : Divisions at 1° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15" intervals at **279mm**/11" diameter.
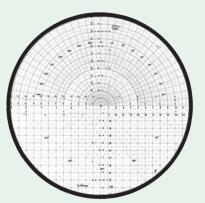
Features : Ideal for checking diameters, concentricity of diameters, radii, angles, radii and cams

No.	Diameter [mm]
201383	250
201389	300
201395	340
512624	500
511846	600

Radius/protractor chart

Mitutoyo

Accessories for Measuring Projectors

Additional Specifications

Grid divisions

10X	: 0,1 mm
20X	: 0,05 mm
50X	: 0,02 mm
100X	: 0,01 mm

Group 1

For measuring projectors
These standard overlay charts increase the range of application and the efficiency of Mitutoyo profile projectors.
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- A large range of scales and profiles is provided that enables you to test workpiece features quickly and easily. You can test length, height, parallelism, angle, radius, taper, bore position, diameter, as well as all standardized thread and tooth profiles.
- All charts are made of a distortion-free special plastics compound and are provided with a protective coating.

Involute gear teeth

No.	Diameter [mm]
201385	250
201391	300
201397	340
512626	500
511848	600

Involute gear teeth

ISO Metric threads

No.	Diameter [mm]
201384	250
201390	300
201396	340
512625	500
511847	600

ISO Metric threads

Protractor chart
Angle : Divisions at 1° and 30' intervals at **178mm**/7" diameter increasing to **381mm**/15' intervals at **279mm**/11" diameter.
Features : Dedicated chart especially designed for checking angles with exceptional clarity. Suitable for use at any magnification.

No.	Diameter [mm]
201381	250
201387	300
201393	340
512622	500
511844	600

Protractor chart

Radius chart
Features : Dedicated chart especially designed for checking radii, diameters and concentricity with exceptional clarity.

No.	Diameter [mm]
201382	250
201388	300
201394	340
512623	500
511845	600

Radius chart

Mitutoyo

Accessories for Measuring Projectors

Group 2 - Makes inspection of projected images an easy process.
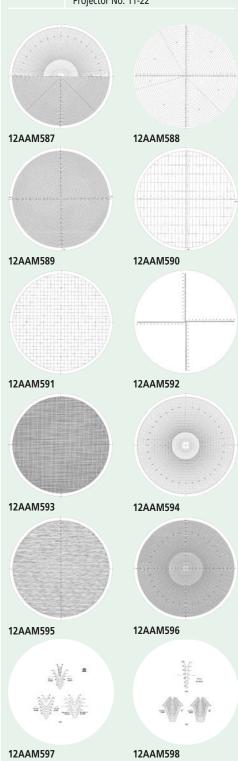
Description	ø 300 mm
	No.
Concentric circles 1 mm pitch	**12AAM589**
Concentric circles at 1 mm pitch with radial index 1° increments	**12AAM596**
Crossed lines with 0,5 mm pitch	**12AAM592**
Crossed lines with 1 mm graduation and concentric circles 5 mm pitch	**12AAM588**
Grid chart (10 x 10 mm)	**12AAM591**
Grid chart (1 mm pitch)	**12AAM593**
Horizontal for 20X, vertical for 50X with 1 mm graduations	**12AAM590**
Horizontal lines 1 mm pitch	**12AAM595**
Metric threads 0,075 - 0,225 mm, 100X involute gear teeth : 20° MOD 0,2-1, 14,5° MOD 0,2-1	**12AAM598**
Metric threads 0,2-2 mm, unified threads 28-12 TPI 20X Whitworth threads 20-10 TPI 20X	**12AAM597**
Radial index 1° increments	**12AAM594**
Radial index 1° increments (upper) concentric circle 1 mm pitch (lower)	**12AAM587**

Optional accessories

No.	Description
12AAM027	Overlay chart set, for Measuring Projector No. 11-22

12AAM587

12AAM588

12AAM589

12AAM590

12AAM591

12AAM592

12AAM593

12AAM594

12AAM595

12AAM596

12AAM597

12AAM598
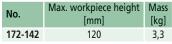
Accessories for Measuring Projectors

Workpiece Fixtures

For Profile Projectors and Measuring Microscopes

172-142

Centre Support

No.	Max. workpiece height [mm]	Mass [kg]
172-142	120	3,3

172-143
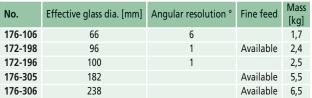
Centre Support Riser

No.	Max. workpiece height [mm]	Mass [kg]
172-143	240	3,3

176-107

Holder with Clamp

No.	Max. workpiece height [mm]	Mass [kg]
176-107	35	0,42

Rotary Tables

No.	Effective glass dia. [mm]	Angular resolution °	Fine feed	Mass [kg]
176-106	66	6		1,7
172-198	96	1	Available	2,4
172-196	100	1		2,5
176-305	182		Available	5,5
176-306	238		Available	6,5

176-106

172-198

Rotary Vice

No.	Rotary range	Angle graduations °	Max. workpiece height [mm]	Mass [kg]
172-144	360°	5	60	2,8

172-144

Swivel Centre Support

No.	Max workpiece dia. [mm]	Swivel range	Max. workpiece length [mm]	Mass [kg]
176-105	70 (45) when swiveled 10°	±10°	140	2,4
172-197	80 (65) when swiveled 10°	±10°	140	2,5

172-197

V-Block with Clamp

No.	Max workpiece dia. [mm]	Width of block [mm]	Mass [kg]
172-378	25	41	0,8
172-234	50	60	1,24
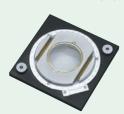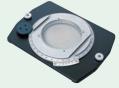
172-234 - 172-378

Vertical Holder

No.	Mass [kg]
172-132	1,3

172-132

Mitutoyo

Surface Roughness Measuring Instruments
Surftest
Page 475

Contour Measuring Instruments
Contracer
Page 491

Surface Roughness & Contour Measuring Instruments
Formtracer
Page 495

Accessories Surftest, Contracer, Formtracer
Page 504
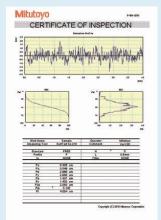
Form Measuring Instruments
Roundtest
Page 515

Surftest SJ-210

Specifications

Drive unit

Measuring range	16 mm, 4,8 mm [S-type]
Traverse	17,5 mm, 5,6 mm [S-type]
Measuring speed	0,25 mm/s; 0,5 mm/s; 0,75 mm/s

Detector

Measuring method	Differential inductance
Range	360 µm
Stylus	Diamond Tip
Skid radius	40 mm

Display unit

Profiles	Roughness Profile (R), R-Motif, DF-Profile and more
Roughness standard	EN ISO, VDA, JIS, ANSI and customize settings
Digital filter	Gauss, 2CR75, PC75
Cut-off length	λc : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm λs : 2,5 µm; 8 µm
Tolerance	Coloured upper / lower limit
Interface	USB, Digimatic, RS-232C, Foot switch
Power supply	AC adapter or rechargeable battery

**Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page
Optional Software USB Communication Tool)**

Refer to Surftest SJ-210 brochure

Scan QR Code with your mobile device and watch our product videos on YouTube

Series 178 - Portable Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-210 offers you the following benefits:
- Skid system gives you user friendly and intuitive menu navigation.
- It works independently of mains power, allowing you to make on-site measurements.
- The **6 cm** [2,4"] colour graphic, back-lit LCD gives you excellent readability.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- Different drivers expanding the range of applications.
- Calculation results, assessed profiles, bearing and amplitude curves can be displayed.
- Support of 21 languages.
- Operation by keys on the front and under the sliding cover.

SJ-210

Metric	Switchable between 16 languages: Japanese, English, German, French, Italian, Spanish, Portuguese, Czech, Polish, Hungarian, Turkish, Swedish, Dutch, Korean, Traditional Chinese, Simplified Chinese

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]	Description	Mass
178-560-01D	0,75	60°	2	SJ-210 model	500 g
178-562-01D	0,75	60°	2	SJ-210R model	500 g
178-564-01D	0,75	60°	2	SJ-210S model	500 g

Metric	Switchable between 16 languages: Japanese, English, Russian, Slovenian, Rumanian, Bulgarian, Finnish, German, French, Italian, Spanish, Czech, Polish, Hungarian, Turkish, Swedish

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]	Description	Mass
178-560-03D	0,75	60°	2	SJ-210 model	500 g

Standard

R-type

S-type

Mitutoyo

Surftest SJ-210
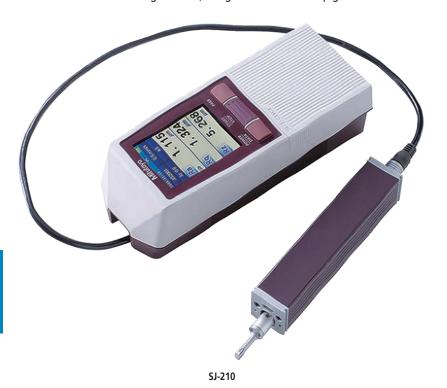
Series 178 - Portable Surface Roughness Measuring Instrument
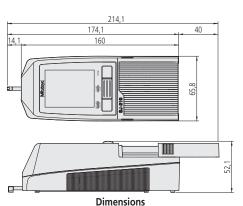
The SJ-210R – Retract System is a portable measuring instrument for surface roughness that includes a safety system.
- The detector starts in a safety position, not in contact with the workpiece surface. When measurement starts, the detector is lowered onto the workpiece while the drive unit moves in X measuring direction. During the return movement, the detector lifts up from the workpiece surface before returning to the start position. This is useful for avoiding stylus damage in applications where you cannot easily see the test surface.

SJ-210S (detailed information further on in this chapter)
- The SJ-210S model is a portable measuring instrument for surface roughness that has a transverse drive capability. This allows you to test shrouded surfaces in the transverse direction, such as crankshaft bearing surfaces, flanged features or deep grooves.

SJ-210

Dimensions

214,1
174,1
40
14,1
160
65,8
52,1

178-029 (displayed with SJ-210)

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section.

Optional accessories

No.	Description
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
12AAA221	Adapter for magnetic stand; D8mm, for Surftest SJ-210 / SJ-310
12BAA303	Connection cable for extension 1 m, for Surftest SJ-210
178-029	Granite stand, for Surftest SJ-210 / SJ-310*
178-033	Device for cylindrical workpieces, for Surftest SJ-210 / SJ-310
178-034	Device as universal fixture
178-035	Device for measuring inside diameter
178-230-2	Standard drive unit 17,5mm, for SJ-210 / SJ-310 series
178-233-2	S-type drive unit 5,6mm, for SJ-210 / SJ-310 series
178-235	R-type drive unit 17,5mm, for SJ-210 / SJ-310 series
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m

* 12AAA221 is needed for SJ-210 / SJ-310

Keyboard protective cover open

Back view

Mitutoyo

Surftest SJ-310

Series 178 - Portable Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-310 offers you the following benefits:
- Skid system with touch-screen functionality and built-in printer.
- It works independently of mains power, allowing you to make on-site measurements.
- Easy and intuitive menu navigation.
- The large **14,5 cm** [5,7"] colour LCD gives you high visibility.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- You can store up to 10 different measuring conditions inside the SJ-310, and up to 500 with an optional SD card.
- Statistical analysis and coloured tolerance judgement.
- 2 different evaluation conditions within 1 measurement adjustable.
- You can separately password protect many functions.
- It comes with support for 16 languages.

Specifications

Drive unit

Measuring range	16 mm 4,8 mm [S-type]
Traverse	17,5 mm 5,6 mm [S-type]
Measuring speed	0,25 mm/s; 0,5 mm/s; 0,75 mm/s

Detector

Measuring method	Differential inductance
Range	360 µm
Stylus	Diamond Tip
Skid radius	40 mm

Display unit

Profiles	Roughness Profile (R), R-Motif, DF-Profile and more
Roughness standard	EN ISO, VDA, JIS, ANSI and customize settings
Digital filter	Gauss, 2CR75, PC75
Cut-off length	λc : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm λs : 2,5 µm; 8 µm
Printer	Thermal Printer
Tolerance	Coloured upper / lower limit
Interface	USB, Digimatic, RS-232C, Foot switch
Mass	1,7 kg
Power supply	AC adapter or rechargeable battery

CERTIFICATE OF INSPECTION

Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page
Optional Software USB Communication Tool)

Refer to Surftest SJ-310 brochure

Scan QR Code with your mobile device and watch our product videos on YouTube

SJ-310

Metric					
No.	**Detector measuring force [mN]**	**Stylus tip angle**	**Stylus tip radius [µm]**	**Description**	**Mass**
178-570-01D	0,75	60°	2	SJ-310 model	1,7 kg
178-572-01D	0,75	60°	2	SJ-310R model	1,7 kg
178-574-01D	0,75	60°	2	SJ-310S model	1,7 kg

Standard

R-type

S-type

Mitutoyo

Surftest SJ-210 and SJ-310 - S-Type

Series 178 – Portable Transverse Measurement with S-Type Drive Unit

This is an S-Type drive unit for the Surftest SJ-210 and SJ-310 that provides portable transverse measurement.

It offers you the following benefits:
- It is compatible with the conventional drive units of the Surftest SJ-210 and SJ-310.
- You can simply connected it to the display unit.
- A typical application would be to position the S-Type unit on a crankshaft journal bearing, as shown in the photograph below. Once started the S-Type drive will track the stylus across the surface transversely to its own axis and reliably measure surface roughness in the direction of the crankshaft axis. Transverse tracking simplifies the measurement of surface roughness even in very confined situations, which has long been a problem with conventional instruments which allow only longitudinal measurement.

178-234-2 S-Type Drive Unit Set: [incl. 178-233-2 - 12AAE644 - 12AAE643]

S - Type Drive Unit Set: [incl. 178-233-2 - 12AAE644 - 12AAE643]
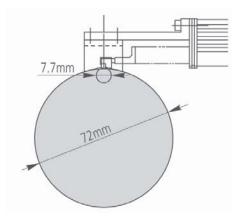
No.	Traverse	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-234-2	5,6 mm	0,75	60°	2
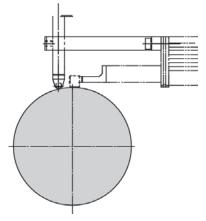
12AAE644
V-type adapter

12AAE643
Point - contact adapter

7.7mm

72mm

Specifications
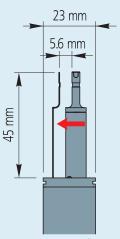
Traverse	5,6 mm
Measuring speed	0,25 mm/s; 0,5 mm/s; 0,75 mm/s

Optional accessories

No.	Description
12AAA221	Adapter for magnetic stand; D8mm, for Surftest SJ-210 / SJ-310
178-029	Granite stand, for Surftest SJ-210 / SJ-310*
178-230-2	Standard drive unit 17,5mm, for SJ-210 / SJ-310 series
178-233-2	S-type drive unit 5,6mm, for SJ-210 / SJ-310 series
178-235	R-type drive unit 17,5mm, for SJ-210 / SJ-310 series

*12AAA221 is needed for SJ-210 / SJ-310

23 mm

5.6 mm

45 mm

Linear movement of S-Type

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Accessories for SJ-210 and SJ-310

Series 178 - Standard and Optional Accessories for Surftest SJ-210 / SJ-310
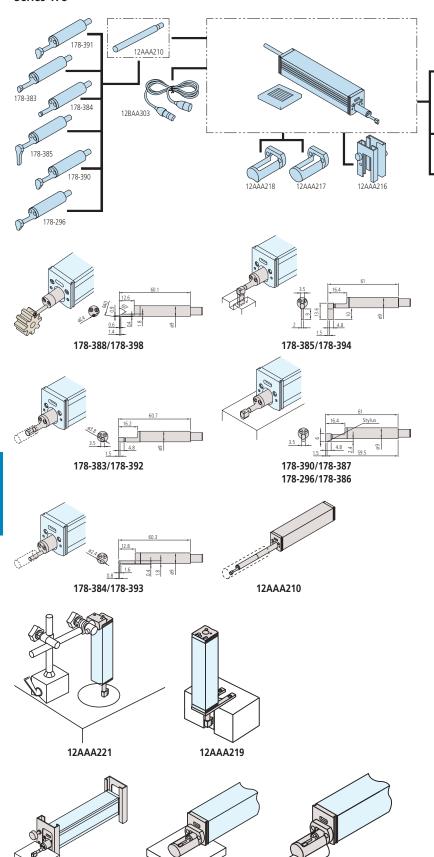
Model No.	Description	SJ-210 Std	SJ-210 Opt	SJ-210R Std	SJ-210R Opt	SJ-210S Std	SJ-210S Opt	SJ-310 Std	SJ-310 Opt	SJ-310R Std	SJ-310R Opt	SJ-310S Std	SJ-310S Opt
12AAA210	Extension rod length 50 mm		●		●				●		●		
12AAA216	Height adjustment feet		●		●			●					
12AAA217	Nosepiece (flat)		●		●			●		●			
12AAA218	Nosepiece (cylindrical)		●		●			●		●			
12AAA219	Adapter for vertical position		●		●				●		●		
12AAA221	Adapter for magnetic stand		●		●		●		●		●		●
12AAA222	Height gauge adapter		●		●		●		●		●		●
12AAA882D	RS-232C connection cable								●		●		●
12AAD510	USB cable for SJ-310 / SJ-410								●		●		●
12AAE643	Point - contact adapter					●						●	
12AAE644	V-type adapter					●						●	
12AAJ088	Footswitch		●		●		●		●		●		●
12AAL066	Protective sheets for display (5 sheets)		●		●		●						
12AAL067	RS-232C cable for printer		●		●		●						
12AAW452	Memory card		●		●		●		●		●		●
12AAN040	Protective film								●		●		●
12AAN046	Battery							●		●		●	
12BAA303	Connecting cable for extension 1 m	●		●		●			●		●		●
12BAG834	Touch pen							●		●		●	
12BAK700	Calibration table	●		●		●		●		●		●	
12BAK728	AC adapter 9V	●		●		●							
12BAL402	Touch Panel Protection							●		●		●	
178-029	Granite stand		●		●		●		●		●		●
178-230-2	Standard Drive unit 17,5 mm	●			●		●	●			●		●
178-233-2	S-Type drive unit 5,6 mm		●		●	●			●		●	●	
178-235	R-Type drive unit 17,5 mm		●	●			●		●	●			●
178-296	Standard detector 2 µm; 0,75 mN	●		●				●		●			
178-383	Detector for small holes Ø4,5 mm; 2 µm; 0,75 mN		●		●				●		●		
178-384	Detector for small holes Ø2,8mm		●		●				●		●		
178-385	Deep groove detector 2 µm; 0,75 mN		●		●				●		●		
178-386	Detector for S-drive 5 µm; 4 mN		●		●	●			●		●	●	
178-387	Detector for S-drive 2 µm; 0,75 mN		●		●	●			●		●	●	
178-388	Detector for gear tooth surface 2 µm; 0,75 mN		●		●				●		●		
178-390	Detector 5 µm; 4 mN		●		●				●		●		
178-391	Detector for soft materials 10 µm; 4 mN		●		●				●		●		
178-392	Detector for small holes Ø4,5 mm; 5 µm; 4 mN		●		●				●		●		
178-393	Detector for small holes Ø2,8 mm; 5 µm; 4 mN		●		●				●		●		
178-394	Deep groove detector 5 µm; 4 mN		●		●				●		●		
178-398	Detector for geartooth surface 5 µm; 4 mN; 90°		●		●				●		●		
178-421DDS	Printer set for SJ-210		●		●		●						
178-601	Roughness specimen Ra 3 µm	●		●			●	●		●		●	
178-604	Roughness specimen Ra 0,4 µm /3 µm		●		●		●		●		●		●
178-605	Roughness specimen Ra 1 µm		●		●	●			●		●	●	
270732	Printer papers (5 rolls)		●		●		●	●		●		●	
357651	AC Adapter 12V							●		●		●	
63AAA211	USB cable for SJ-210		●		●		●						

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METRIC MÕÕTETEHNIKA

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Accessories for SJ-210 and SJ-310

Series 178

178-391
12AAA210
178-383
178-384
12BAA303
178-385
178-390
178-296

12AAA219
12AAA222
12AAA221
(ø 8 mm)

12AAA218   12AAA217   12AAA216

178-388/178-398

178-385/178-394

178-383/178-392

178-390/178-387
178-296/178-386

Stylus

178-384/178-393

12AAA210

12AAA221

12AAA219

12AAA216

12AAA217

12AAA218

Optional accessories
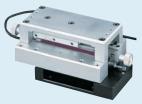
No.	Description
178-033	Device for cylindrical workpieces, for Surftest SJ-210 / SJ-310
178-034	Device as universal fixture
178-035	Device for measuring inside diameter

178-029
(displayed with 12AAA221 + SJ-210)

178-033

178-034

178-035

Surftest SJ-410

Series 178 - Portable Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

Specifications
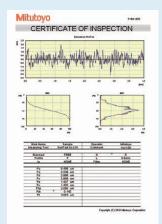
Drive unit

Traverse	SJ-411: 25 mm SJ-412: 50 mm
Measuring speed	0,05 mm/s; 0,1 mm/s; 0,2 mm/s; 0,5 mm/s; 1 mm/s

Detector

Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Positioning	±1,5° (tilting), 10 mm (up/down)

Display unit

Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standard	EN ISO, VDA, JIS, ANSI and customize settings
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75
Cut-off length	λc : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm λs : 2,5 µm; 8 µm; 25 µm
Printer	Thermal Printer
Tolerance	Coloured upper / lower limit
Interface	USB, Digimatic, RS-232C, Foot switch
Power supply	AC adapter or rechargeable battery

The Surftest SJ-410 offers you the following benefits:

- Skidless system with touch-screen functionality and built-in printer.
- It works independently of mains power, allowing you to make on-site measurements.
- Easy and intuitive menu navigation.
- The large **14,5 cm** [5,7"] colour LCD gives you high visibility.
- The skidless detector allows you to measure the primary profile (P), roughness profile (R), waviness profile (W) and more.
- Surface compensation of curved, radial and tilted surfaces.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- You can store up to 10 different measuring conditions inside the SJ-410, and up to 500 with an optional SD card.
- It allows two different evaluation conditions within one measurement adjustable.
- You can separately password protect many functions.
- It comes with support for 16 languages.
- Available options include an auto-set unit, X-axis fine adjustment and digital levelling unit.

SJ-410

Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page
Optional Software USB Communication Tool)

Refer to Surftest SJ-410 brochure

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Surftest SJ-411
Traverse : 25 mm
Traverse straightness : 0,3 µm / 25 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-580-01D	0,75	60°	2
178-580-02D	4	90°	5

Surftest SJ-412
Traverse : 50 mm
Traverse straightness : 0,5 µm / 50 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-582-01D	0,75	60°	2
178-582-02D	4	90°	5

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Surftest SJ-410

Series 178 - Portable Surface Roughness Measuring Instrument
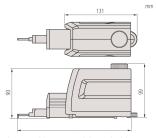
Deep groove measurement

R-surface measurement

SJ-411: 207,5 mm / SJ-412: 234 mm
Drive unit

Optional:
- **Autoset unit 178-010**
- **X-axis adjustment unit 178-020**
- **Digital leveling unit 178-030**

Scope of delivery

178-039
(displayed with SJ-411)

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Optional accessories

No.	Description
02AZD790D	U-WAVE-T Connection Cable D, Flat 10-Pin Type
12AAB358	Cylinder attachment Ø15-60mm
12AAD510	USB cable for SJ-310 / SJ-410 series
12AAL069	Memory card 4GB, for Surftest SJ-210
178-019	Precision vise
178-042-1	Digital XY leveling table [mm], Leveling range +/- 1,5°; 25 x 25mm
178-043-1	XY leveling table [mm], Leveling range +/- 1,5°; 25 x 25mm
178-047	Digital three-axis adjustment table
178-048	Leveling table D.A.T
178-396-2	Detector, 0,75mN
178-397-2	Detector, 4mN
178-605	Roughness specimen Ra 1µm [mm], Ra 1µm
178-610	Step gauge, (1, 2, 5, 10)µm
178-611	Step gauge, mm, (2, 10)µm
936937	Digimatic Cable, Flat 10-Pin Type, 1m
965014	Digimatic Cable, Flat 10-Pin Type, 2m
Stands	
178-039	Granite stand, for SJ-410
178-093	Desktop vibration isolation stand

Consumable spares

No.	Description
12AAB355	Nosepiece skidless type
12AAN046	Replacement battery, for Surftest SJ-310 / SJ-410
12BAG834	Touch pen, for Surftest SJ-310/410/500, SV-2100
12BAL402	Touch Panel Protecting Sheet
270732	Printer paper, 5 rolls, for SJ-301

12AAB358
Cylinder attachment

178-048
Leveling table D.A.T.

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Surftest SJ-500

Series 178 - Surface Roughness Measuring Instrument

This is a measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-500 offers you the following benefits:
- The skidless detector allows you to measure the primary profile (P), roughness profile (R), waviness profile (W) and more.
- User friendly control unit for high precision surface roughness measurement.
- The large **19 cm** [7,5"] colour TFT LCD with touch-screen functionality gives you high visibility and ease of use.
- The display menu is easy to read and simple to operate.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- The built-in joystick on the control unit enables quick and easy positioning. The manual adjustment knob allows you to finely position a small stylus to measure the inside surface of small holes.
- The detector unit allows a 90° displacement of the stylus, which is ideal for crankshaft and narrow space measurement.
- You can use the instrument stand-alone or mounted on a stand.

SJ-500

Specifications

Drive unit
Traverse	50 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	0 - 20 mm/s or joystick operation
Traverse straightness	0,2 µm / 50 mm

Detector
Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Positioning	±1,5° (tilting) 30 mm (up/down)

Display unit
Standard	EN ISO, VDA, JIS, ANSI and customize setting
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75, RobustSpline
Cut-off length	λc : 0,025 mm; 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm λs : 0,25 µm; 0,8 µm; 2,5 µm; 8 µm; 25 µm; 80 µm; 250 µm; None λf : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8mm; 25mm; None
Printer	Thermal printer

Optional accessories

No.	Description
12AAG202	Extension rod, 50mm
12AAG203	Extension rod, 100mm
178-042-1	Digital XY leveling table [mm], Leveling range +/- 1,5°; 25 x 25mm
178-043-1	XY leveling table [mm], Leveling range +/- 1,5°; 25 x 25mm
178-047	Digital three-axis adjustment table
178-048	Leveling table D.A.T
178-085	Granite stand for SJ-500
178-089	Column stand
178-397-2	Detector, 4mN
178-396-2	Detector, 0,75mN
178-093	Desktop vibration isolation stand

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-532-01D	0,75	60°	2
178-532-02D	4	90°	5

**Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page
Optional Software USB Communication Tool)**

Refer to SURFACE MEASUREMENT brochure

SJ-500 with optional manual column stand

Preview

**178-085
600x450x710 mm**

**178-089
400x250x578 mm**

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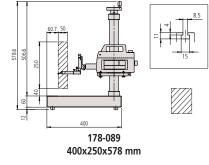
Surftest SV-2100

Series 178 - Surface Roughness Measuring Instrument

This is a stationary measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SV-2100 offers you the following benefits:
- It is mounted on a granite base with a manual or power column.
- The large **19 cm** [7,5"] colour TFT LCD gives you high visibility and touch-screen functionality.
- It has a user friendly display unit for high precision surface roughness measurement.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- Designed for usage in workshop areas.

SV-2100S4   **SV-2100M4**

SV-2100H4 model
Vertical travel : 550 mm power column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-682-01D	0,75	60°	2

SV-2100M4 model
Vertical travel : 350 mm manual column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-636-01D	0,75	60°	2

SV-2100S4 model
Vertical travel : 350 mm power column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-680-01D	0,75	60°	2

SV-2100W4 model
Vertical travel : 550 mm power column
Granite base size (WxD) : 1000 x 450 mm

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-684-01D	0,75	60°	2

Specifications

Drive unit
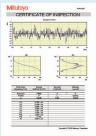
Traverse	100 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0-40 mm/s Z2 = 0-20 mm/s or joystick operation
Traverse straightness	0,15 µm / 100 mm

Detector

Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)

Display unit

Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standard	EN ISO, VDA, JIS, ANSI and customize settings
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75, RobustSpline
Cut-off length	λc : 0,025 mm; 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm; 80 mm λs : 0,25 µm; 0,8 µm; 2,5 µm; 8 µm; 25 µm; 80 µm; 250 µm; none λf : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm; 80 mm; none
Printer	Thermal printer

Optional accessories

No.	Description
12AAG202	Extension rod, 50mm
12AAG203	Extension rod, 100mm
218-001	Cross-travel table [mm], 100 x 50mm XY travel
218-003	Rotary vise

Preview

Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page
Optional Software USB Communication Tool)

Refer to SURFACE MEASUREMENT brochure

Surftest SJ-500P

Specifications

Drive unit
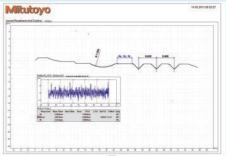
Traverse	50 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	0-20 mm/s
Traverse straightness	0,2 µm / 50 mm

Detector

Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Positioning	±1,5° (tilting) 30 mm (up/down)
Software	**FORMTRACEPAK**

Formtracepak layout

Series 178 - Surface Roughness Measuring Instruments with Software FORMTRACEPAK

These are surface roughness measuring instruments with software FORMTRACEPAK.

Software FORMTRACEPAK offers you the following benefits:
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It can be used for several contour calculations within the measuring range.
- It offers total support for measurement system control, analysis and inspection report.
- All advantages of the SJ-500 also apply to the P Type.

SJ-500P

No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-530-01D	0,75	60°	2
178-530-02D	4	90°	5

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Surftest SV-2100P

Series 178 - Surface Roughness Measuring Instruments with Software FORMTRACEPAK

These are surface roughness measuring instruments with software FORMTRACEPAK.
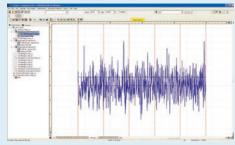
Software FORMTRACEPAK offers you the following benefits:
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It can be used for several contour calculations within the measuring range.
- It offers total support for measurement system control, analysis and inspection report.
- All advantages of the SV-2100 also apply to the P Type.

SV-2100P
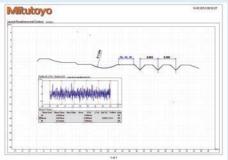
No.	Detector measuring force [mN]	Stylus tip angle	Stylus tip radius [µm]
178-634-01D	0,75	60°	2
178-634-02D	4	90°	5

Specifications

Drive unit	
Traverse	100 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0-40 mm/s Z2 = 0-20 mm/s
Traverse straightness	0,15 µm / 100 mm

Detector	
Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Software	**FORMTRACEPAK**

Refer to SURFACE MEASUREMENT brochure

Surftest SV-3200

Series 178 - Surface Roughness Measuring Instrument
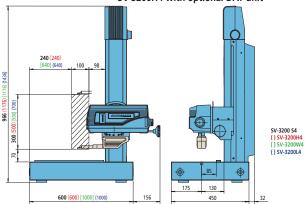
This is a stationary surface roughness measuring instrument with FORMTRACEPAK software that allows you to take highly accurate measurements.

The Surftest SV-3200 offers you the following benefits:
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It also supports contour calculation features within the measuring range of the styli software.
- Part programing as well as motorised axes give you many features of a CNC instrument.
- You can choose from a huge number of styli that are easy to replace.
- Detector holders for downward/upward measurement and crank position available as optional.
- Optional accessories like DAT unit and 3D/Y-axis table have been added to product line.
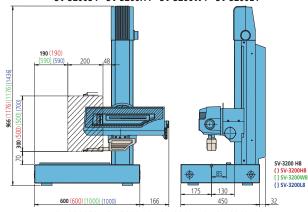
Specifications

Traverse	100 mm / 200 mm
Range	800 μm; 80 μm; 8 μm (up to 2.4 mm with an optional stylus)
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 30 mm/s
Measuring speed	0,02 - 20 mm/s
Inclining range	±45°
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standard	EN ISO, VDA, JIS, ANSI and customize setting
Software	**FORMTRACEPAK** • Enables control of all axes and rotary table for realizing efficient measurement automation. • Perform contour evaluation that allows free analysis of level differences, angles, pitch, area and other characteristics as well as surface roughness evaluation. • Able to create an original inspection certificate by setting the print format to suit particular requirements.

Detector holder S-3000C

Detector holder S-3000CR

Detector holder S-3000MR

SV-3200H4 with optional DAT unit

SV-3200S4 - SV-3200H4 - SV-3200W4 - SV-3200L4

SV-3200 S4
( ) SV-3200H4
[ ] SV-3200W4
{ } SV-3200L4

SV-3200S8 - SV-3200H8 - SV-3200W8 - SV-3200L8

SV-3200 H8
( ) SV-3200H8
[ ] SV-3200W8
{ } SV-3200L8

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Surftest SV-3200

X-axis measuring range: 100 mm
X-axis traverse straightness: (0,05+0,001L) µm, L = Measurement length (mm)

Model	SV-3200S4	SV-3200S4.	SV-3200H4	SV-3200H4.
No.	178-434-11D	178-434-12D	178-435-11D	178-435-12D
Detector measuring force [mN]	0,75	4	0,75	4
Stylus tip angle	60°	90°	60°	90°
Stylus tip radius [µm]	2	5	2	5
Vertical travel [mm]	300	300	500	500
Granite base size (WxD) [mm]	600 x 450	600 x 450	600 x 450	600 x 450

Model	SV-3200W4.	SV-3200W4	SV-3200L4	SV-3200L4.
No.	178-436-11D	178-436-12D	178-474-11D	178-474-12D
Detector measuring force [mN]	0,75	4	0,75	4
Stylus tip angle	60°	90°	60°	90°
Stylus tip radius [µm]	2	5	2	5
Vertical travel [mm]	500	500	700	700
Granite base size (WxD) [mm]	1000 x 450	1000 x 450	1000 x 450	1000 x 450

X-axis measuring range: 200 mm
X-axis traverse straightness: (0,1+0,002L) µm, L = Measurement length (mm)

Model	SV-3200S8	SV-3200S8.	SV-3200H8	SV-3200H8.
No.	178-437-11D	178-437-12D	178-438-11D	178-438-12D
Detector measuring force [mN]	0,75	4	0,75	4
Stylus tip angle	60°	90°	60°	90°
Stylus tip radius [µm]	2	5	2	5
Vertical travel [mm]	300	300	500	500
Granite base size (WxD) [mm]	600 x 450	600 x 450	600 x 450	600 x 450
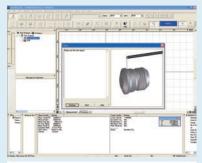
Model	SV-3200W8	SV-3200W8.	SV-3200L8	SV-3200L8.
No.	178-439-11D	178-439-12D	178-475-11D	178-475-12D
Detector measuring force [mN]	0,75	4	0,75	4
Stylus tip angle	60°	90°	60°	90°
Stylus tip radius [µm]	2	5	2	5
Vertical travel [mm]	500	500	700	700
Granite base size (WxD) [mm]	1000 x 450	1000 x 450	1000 x 450	1000 x 450
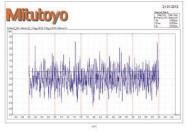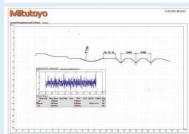
SV-3200 with 178-096 and 178-077

Optional accessories

No.	Description
12AAD975	Theta-1 axis, Rotary Axis
12AAG202	Extension rod, 50mm
12AAG203	Extension rod, 100mm
12AAR859	Detector stand
178-023	Manual vibration isolator
178-024	Stand for vibration isolator, for178-023, 178-025
178-025	Automatically charged vibration isolator, with max loading mass 200kg
178-040	D.A.T unit
178-074	Detector holder S-3000C
178-075	Detector holder S-3000CR
178-076	Detector holder S-3000MR
178-077	3D leveling table, (for SV-3200 only with 178-096)
178-078	Theta-2 axis, Rotary Axis
178-087	2D auto-leveling table, for Surftest SV, Contracer, Formtracer
178-096	3 D/Y-axis table
178-097	Y-axis table, for Surftest SV, Contracer, Formtracer
178-396-2	Detector, 0,75mN
178-397-2	Detector, 4mN
178-611	Step gauge, mm, (2, 10)µm
218-001	Cross-travel table [mm], 100 x 50mm XY travel
218-003	Rotary vise

FORMTRACEPAK

Surftest Extreme SV-3000CNC

Series 178 – CNC Surface Roughness Measuring Instrument

These is a fully CNC surface roughness measuring instrument with powerful software FORMTRACEPAK.

The Surftest Extreme SV-3000CNC offers you the following benefits:
- It is perfectly made for increased throughput of multiple profile and workpiece measurement tasks.
- Each axis has a drive speed of up to 200 mm/s.
- You can take continuous measurement over horizontal and inclined surfaces by power-tilting the drive unit.
- Within the measuring range of the styli software FORMTRACEPAK supports contour calculation features.
- 3D topography measurement as option available.
- Inclined plane measurement is possible through 2-axis simultaneous control in the X and Y directions.
- The detector unit incorporates an anti-collision safety device, causing it to automatically stop if its main body collides with a workpiece or jig.
- All models equipped with Y-axis.
- Z-axis tracking measurement for models without α-axis.

Specifications

Traverse	X = 200 mm Y = 200 mm
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0 - 50 mm/s
Traverse straightness	0,5 µm / 200 mm
Inclining range	-45° (CCW) to +10° (CW)
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standard	EN ISO, VDA, JIS, ANSI and customize setting
Software	**FORMTRACEPAK** • Allows control of all axis, motor-driven Y-axis table and optional rotary table for efficient automated measurement. • Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Optional accessories

No.	Description
12AAD975	Theta-1 axis, Rotary Axis
12AAE032	Special anti-vibration table
12AAE449	Cabin for H-type used with CNC series, for Z2=500mm
178-037	2D auto-leveling table, for CNC Surftest and Formtracer
178-077	3D leveling table, (for SV-3200 only with 178-096)
178-078	Theta-2 axis, Rotary Axis

Refer to SURFACE MEASUREMENT brochure

SV-3000CNC

Model	SV-3000CNC-S	SV-3000CNC-H	SV-3000CNC-S.	SV-3000CNC-H.
No.	**178-508-12**	**178-509-12**	**178-528-12**	**178-529-12**
Z2-axis range [mm]	300	300	500	500
Y-axis table unit	Installed	Installed	Installed	Installed
α-axis unit	-	Installed	-	Installed

Automatic measurement

Mitutoyo

Surftest Extreme SV-M3000CNC

Series 178 - CNC Surface Roughness Measuring Instrument

This is a top performance CNC surface roughness measuring instrument with powerful software FORMTRACEPAK.

The Surftest Extreme SV-M3000CNC offers you the following benefits:
- You can measure large and heavy workpieces such as engine blocks and crankshafts.
- It has an 800mm moving column configuration to largely eliminate workpiece size restrictions.
- Each axis has a drive speed of up to 200 mm/s.
- When combined with the optional detector swivelling unit, continuous measurement over the bottom, top and side surface of a workpiece is possible.
- The huge load table has a self-contained structure ensuring that you can easily accommodate various size workpieces, standard and custom jigs, and auto-feed devices.

Specifications

Traverse	X = 200 mm Y = 800 mm Z2 = 500 mm
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0 - 50 mm/s
Traverse straightness	X = 0,5 µm / 200 mm (standard) X = 0,7 µm / 200 mm (long-type detector) X = 0,5 µm / 200 mm (rotary-type detector) Y = 0,5 µm / 50 mm; 2 µm / 800 mm (standard) Y = 0,7 µm / 50 mm; 3 µm / 800 mm (long-type detector) Y = 0,7 µm / 50 mm; 3 µm / 800 mm (rotary-type detector)
Inclining range	-45° (CCW) to +10° (CW)
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standard	EN ISO, VDA, JIS, ANSI and customize setting
Loading weight	300 kg
Software	**FORMTRACEPAK** • Enables control of all axes for realizing efficient measurement automation. • Perform contour evaluation that allows free analysis of level differences, angles, pitch, area and other characteristics as well as surface roughness evaluation. • Able to create an original inspection certificate by setting the print format to suit particular requirements.

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Refer to SURFACE MEASUREMENT brochure

No.	Model	Detector hold type (Essential option)
178-549-2	178-071	Standard
	178-072	Long type
	178-073	Rotary type

Typical measurement task

Contracer CV-2100

Series 218 - Contour Measuring Instruments

This contour measuring instrument is designed to support "easy to use" and "speedy" measurements.

The Contracer CV-2100N4 and CV-2100M4 offer you the following benefits:
- Extensive contour measurement quick and easy.
- Quick movement in Z2 because of an easy to use quick grip. [M4 type]
- Auto execution and multi point measurement with the new stylus up-and down function.
- X-axis drive up to 20 mm/s by jog shuttle.
- Easy part programming as well as single measurement with software FORMTRACEPAK.
- Automatic evaluation, best fit of contours, CAD comparison and many more features as standard.
- CV-2100 M4 mounted with quick grip stand on a granite base.
- CV-2100 N4 can be mounted on an optional granite base with a manual column.
- Centralized front control panel.

Specifications

Measuring range	Z1 = 50 mm X = 100 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0 - 20 mm/s
Accuracy	X = (2,5 + 0,02L) µm [L: drive length (mm)] Z1 = (2,5 + l0,1HI) µm [H: Measurement height from the horizontal position (mm)]
Traverse straightness	2,5 µm / 100 mm
Column type	M4: 350 mm
Software	**FORMTRACEPAK** • Allows control of measuring conditions for efficient automated measurement. • Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

FORMTRACEPAK

Refer to CV-2100 brochure

Scan QR Code with your mobile device and watch our product videos on YouTube

CV-2100M4

CV-2100N4

Mitutoyo

Contracer CV-2100

Series 218 - Contour Measuring Instruments

Specifications and accessories

Model	CV-2100N4	CV-2100M4
No.	218-613D	218-633D
Z2-axis range [mm]	-	350
Z1-axis range [mm]	50	50
Z2-axis column type	Optional: Manual	Manual: Quick up-and-down motion, fine feed
X1-axis range [mm]	100	100

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Optional accessories

No.	Description
178-023	Manual vibration isolator
178-024	Stand for vibration isolator, for178-023, 178-025
218-001	Cross-travel table [mm], 100 x 50mm XY travel
218-003	Rotary vise
218-042	Column Stand, for CV-2100N4

Optional column stand 218-042

CV-2100 stylus up-and-down function

CV-2100M4 with column and quick grip

Easy and quick movement in Z2

Contracer CV-3200 and CV-4500

Series 218 - Contour Measuring Instruments

These are high accuracy semi-automatic contour measuring instruments equipped with powerful software FORMTRACEPAK.

The Contracer CV-3200 offers you the following benefits:
- Huge measuring range of Z = 60 mm comes as standard.
- Easy exchange of magnetic stylus arm gives you excellent flexibility.
- The CV-3200 provides excellent accuracy and resolution in Z1-axis measurement.
- Its high positioning speed reduces the total measurement time.
- It has a fully automatic calibration routine.

The Contracer CV-4500 offers you the following benefits:
- It has a dual stylus system for upward/downward measurement at double sided contours.
- Variable measuring force is controlled by software FORMTRACEPAK.
- Easy exchange of magnetic stylus arm gives you excellent flexibility.
- The CV-4500 provides the highest accuracy and resolution possible.
- The motorised axes have a high positioning speed.
- The dual stylus system has a fully automatic calibration routine.

Specifications

Traverse	Z2 = 300 mm / 500 mm / 700 mm
Measuring range	Z1 = 60 mm X = 100 mm / 200 mm
Measuring speed	0,02 - 20 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 30 mm/s
Accuracy	X = (0,8+0,01L) µm (S4, H4, W4, L4 model) X = (0,8+0,02L) µm (S8, H8, W8, L8 model) [L : Drive length (mm)] **CV-3200 :** Z1 = (1,4+I2HI/100) µm **CV-4500 :** Z1 = (0,8+I2HI/100) µm [H : Measurement height from the horizontal position (mm)]
Inclining range	±45°
Software	**FORMTRACEPAK**

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
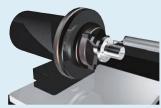
Optional Y-axis - 178-097

Optional Rotary table θ1 - 12AAD975

Optional Rotary table θ2 - 178-078

Refer to CONTOUR MEASUREMENT brochure

Contracer CV-3200
(CV-4500 equipped with dual stylus system)

Drive unit CV-3200

Drive unit CV-4500

493

Mitutoyo

Contracer CV-3200 and CV-4500
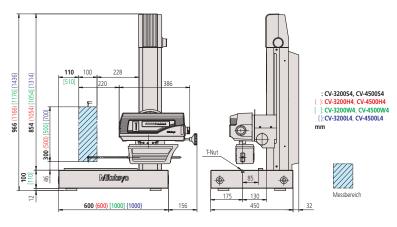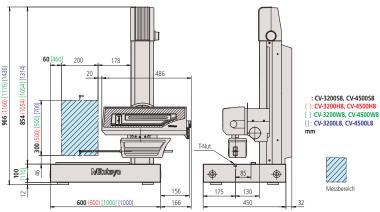
Series 218 - Contour Measuring Instruments

Dimensions and specifications

: CV-3200S4, CV-4500S4
( ): CV-3200H4, CV-4500H4
[ ]: CV-3200W4, CV-4500W4
{ }: CV-3200L4, CV-4500L4
mm

Messbereich

: CV-3200S8, CV-4500S8
( ): CV-3200H8, CV-4500H8
[ ]: CV-3200W8, CV-4500W8
{ }: CV-3200L8, CV-4500L8
mm

Messbereich

CV-3200

Model	CV-3200S4	CV-3200H4	CV-3200W4	CV-3200L4
No.	218-481-10D	218-482-10D	218-483-10D	218-484-10D
X1-axis range [mm]	100	100	100	100
Vertical travel [mm]	300	500	500	700
Granite base size (WxD) [mm]	600x450	600x450	1000x450	1000x450

Model	CV-3200S8	CV-3200H8	CV-3200W8	CV-3200L8
No.	218-486-10D	218-487-10D	218-488-10D	218-489-10D
X1-axis range [mm]	200	200	200	200
Vertical travel [mm]	300	500	500	700
Granite base size (WxD) [mm]	600x450	600x450	1000x450	1000x450

CV-4500

Model	CV-4500S4	CV-4500H4	CV-4500W4	CV-4500L4
No.	218-441-10D	218-442-10D	218-443-10D	218-444-10D
X1-axis range [mm]	100	100	100	100
Vertical travel [mm]	300	500	500	700
Granite base size (WxD) [mm]	600x450	600x450	1000x450	1000x450
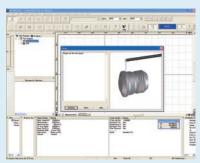
Model	CV-4500S8	CV-4500H8	CV-4500W8	CV-4500L8
No.	218-446-10D	218-447-10D	218-448-10D	218-449-10D
X1-axis range [mm]	200	200	200	200
Vertical travel [mm]	300	500	500	700
Granite base size (WxD) [mm]	600x450	600x450	1000x450	1000x450

Specifications
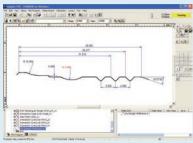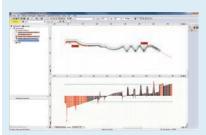
Software **FORMTRACEPAK**
- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.

Measurement control screen

Contour analysis screen

Contour comparison

FORMTRACEPAK

Mitutoyo

Formtracer SV-C3200 and SV-C4500

Series 525 - Surface and Contour Measuring System

These are high accuracy semi-automatic contour and roughness measuring instruments equipped with powerful software FORMTRACEPAK.

The Formtracer SV-C3200 offers you the following benefits:
- It is as powerful as two separate, specialised instruments.
- It economically combines roughness & contour measurement into a single device.
- You have access to a huge contour measuring range of Z = 60 mm as standard, and a roughness measurement range of 800 µm as standard.
- Easy exchange of the magnetic contour stylus arm gives you excellent flexibility.
- The SV-C3200 provides you with excellent accuracy and resolution in Z1-axis measurement.

The Formtracer SV-C4500 offers you the following benefits:
- It economically combines roughness & dual stylus upward/downward contour measurement into a single device.
- You have access to a huge contour measuring range of Z = 60 mm as standard, and a roughness measurement range of 800 µm as standard.
- Its variable measuring force is controlled by software FORMTRACEPAK.
- Easy exchange of the magnetic contour stylus arm gives you excellent flexibility.
- The SV-C4500 provides you with high accuracy and resolution.

Specifications

Traverse	Z2 = 300 mm / 500 mm / 700 mm
Measuring range	X = 100 mm / 200 mm **Contour:** Z1 = 60 mm **Roughness:** Z1 = 800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 20 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 30 mm/s
Accuracy	X = (0,8+0,01L) µm (S4, H4, W4, L4 model) X = (0,8+0,02L) µm (S8, H8, W8, L8 model) [L : Drive length (mm)] **SV-C3200 :** Z1 = (1,4+I2HI/100) µm **SV-C4500 :** Z1 = (0,8+I2HI/100) µm [H : Measurement height from the horizontal position (mm)]
Inclining range	±45°
Measuring force	**SV-C3200 Contour :** 30 mN **SV-C4500 Contour :** 10, 20, 30, 40, 50 mN software controlled **Roughness :** 0,75 mN / 4 mN (dependent on model)
Software	**FORMTRACEPAK**

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Refer to Formtracer SV-C3200 / 4500 brochure

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Formtracer SV-C3200

Surface roughness drive unit

[Surface roughness measurement : Complies with EN ISO, VDA, JIS, ANSI and other international surface roughness standards.]

Contour drive unit SV-C3200

Contour drive unit SV-C4500

Mitutoyo

Formtracer SV-C3200 and SV-C4500

Series 525 - Surface and Contour Measuring System

Metric — SV-C3200

No.	Model	Detector 0,75 mN	Detector 4 mN	X-axis 100 mm	X-axis 200 mm	Z2-axis 300 mm	Z2-axis 500 mm	Z2-axis 700 mm	Granite size (WxD) [mm]
525-481-11D	SV-C3200S4	●		●		●			600 x 450
525-481-12D	"		●	●		●			600 x 450
525-482-11D	SV-C3200H4	●		●			●		600 x 450
525-482-12D	"		●	●			●		600 x 450
525-483-11D	SV-C3200W4	●		●			●		1000 x 450
525-483-12D	"		●	●			●		1000 x 450
525-484-11D	SV-C3200L4	●		●				●	1000 x 450
525-484-12D	"		●	●				●	1000 x 450
525-486-11D	SV-C3200S8	●			●	●			600 x 450
525-486-12D	"		●		●	●			600 x 450
525-487-11D	SV-C3200H8	●			●		●		600 x 450
525-487-12D	"		●		●		●		600 x 450
525-488-11D	SV-C3200W8	●			●		●		1000 x 450
525-488-12D	"		●		●		●		1000 x 450
525-489-11D	SV-C3200L8	●			●			●	1000 x 450
525-489-12D	"		●		●			●	1000 x 450

Metric — SV-C4500

No.	Model	Detector 0,75 mN	Detector 4 mN	X-axis 100 mm	X-axis 200 mm	Z2-axis 300 mm	Z2-axis 500 mm	Z2-axis 700 mm	Granite size (WxD) [mm]
525-441-11D	SV-C4500S4	●		●		●			600 x 450
525-441-12D	"		●	●		●			600 x 450
525-442-11D	SV-C4500H4	●		●			●		600 x 450
525-442-12D	"		●	●			●		600 x 450
525-443-11D	SV-C4500W4	●		●			●		1000 x 450
525-443-12D	"		●	●			●		1000 x 450
525-444-11D	SV-C4500L4	●		●				●	1000 x 450
525-444-12D	"		●	●				●	1000 x 450
525-446-11D	SV-C4500S8	●			●	●			600 x 450
525-446-12D	"		●		●	●			600 x 450
525-447-11D	SV-C4500H8	●			●		●		600 x 450
525-447-12D	"		●		●		●		600 x 450
525-448-11D	SV-C4500W8	●			●		●		1000 x 450
525-448-12D	"		●		●		●		1000 x 450
525-449-11D	SV-C4500L8	●			●			●	1000 x 450
525-449-12D	"		●		●			●	1000 x 450

Using Y-axis table

Using rotary table θ1
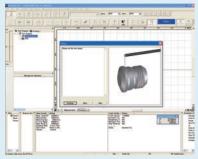
Using rotary table θ2
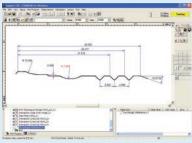
Specifications

Software — **FORMTRACEPAK**
- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.
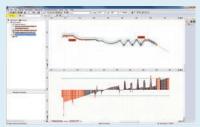
Measurement control screen

Contour analysis screen
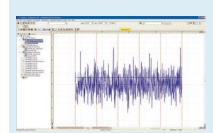
Contour comparison

Roughness analysis

Mitutoyo

Formtracer CS-3200

Specifications

Traverse	Z2 = 300 mm
Measuring range	X = 100 mm Z1 = 5 mm (up to 10 mm with an optional stylus)
Measuring speed	Roughness measurement: 0,02 / 0,05 / 0,1 / 0,2 mm/s Contour measurement: 0,02 / 0,05 / 0,1 / 0,2 / 0,5 / 1 / 2 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 20 mm/s
Accuracy	X = (0,8+0,01L) µm [L : Drive length (mm)] Z1 = (1,5+I2HI/100) µm H : Measurement height from the horizontal position (mm)
Inclining range	±45°
Traverse straightness	X = 0,2 µm / 100 mm
Software	**FORMTRACEPAK** • Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement. • Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

Refer to Formtracer CS-3200 brochure

Scan QR Code with your mobile device and watch our product videos on YouTube

Series 525 - Surface and Contour Measuring System

This provides all-in-one surface roughness and contour measurement within one drive unit.

The Formtracer CS-3200 offers you the following benefits:
• You can carry out simultaneous analysis of roughness and contour with one measurement.
• It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS and customized settings).
• It gives you the best measuring condition with a vibration stand as standard.
• The high drive speed reduces the total measurement time.
• The detector unit can be extended to avoid interference between the drive unit and workpiece.

CS-3200S4
(with optional Y-axis 178-097)

1: Outside diameter
2: Outside diameter
3: Inside diameter
4: Measurement element
5: Positioning element

Continuous measurement example:

The drive unit (X-axis) and column (Z2-axis) are equipped with high-accuracy linear scales (ABS type) enabling fully automatic measurement combining vertical and horizontal movement. This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurements of parts which are difficult to position

Mitutoyo
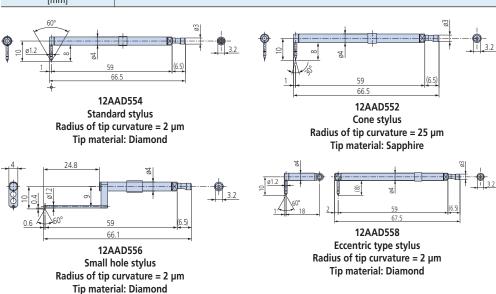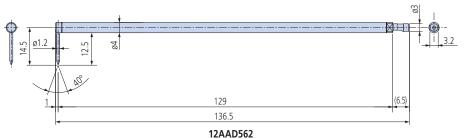
Formtracer CS-3200

Series 525 - Surface and Contour Measuring System

Specifications and Styli

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
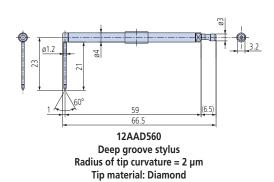
Model	CS-3200S4
No.	**525-401D**
Z2-axis range [mm]	300
X1-axis range [mm]	100

12AAD554
Standard stylus
Radius of tip curvature = 2 μm
Tip material: Diamond

12AAD552
Cone stylus
Radius of tip curvature = 25 μm
Tip material: Sapphire

12AAD556
Small hole stylus
Radius of tip curvature = 2 μm
Tip material: Diamond

12AAD558
Eccentric type stylus
Radius of tip curvature = 2 μm
Tip material: Diamond

12AAD562
2x-long stylus*[1]
Radius of tip curvature = 5 μm
Tip material: Diamond

*[1]: Measuring force is 4 mN and the Z1 measuring and resolution is double that of the standard stylus.
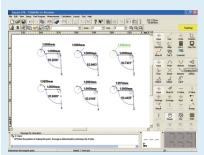
12AAD560
Deep groove stylus
Radius of tip curvature = 2 μm
Tip material: Diamond
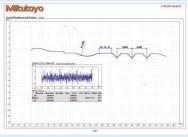
Measuring instrument control

Contour analysis screen

Contour analysis screen

Contour and roughness layout

Mitutoyo

Formtracer Extreme SV-C4500CNC

Series 525 - Surface and Contour Measuring Instrument

High accurate fully CNC surface and contour measuring instrument.

The Formtracer Extreme SV-C4500CNC offers you the following benefits:
- Powerful as two separate, fully CNC instruments.
- Measurement of long distances in Z2-axis for models without α- axis.
- Each axis has a drive speed up to 200 mm/s.
- Dual stylus system for upward and downward contour measurement at doubled sided contours.
- It´s variable contour measuring force is controlled by software FORMTRACEPAK.
- The contour drive unit is equipped with an arc encoder detector giving excellent accuracy and resolution in Z1-axis.
- Perfectly made for increased throughput of multiple profile and workpiece measurement tasks.
- The detector unit incorporates an anti-collision safety device, causing it to stop automatically if its main body collides with a workpiece or jig.

Specifications

Traverse	Z2= 300 mm / 500 mm
Measuring range	X= 200 mm Y= 200 mm **Contour:** Z1= 60 mm Z2= 300 / 500 mm **Roughness:** Z1= 800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0-50 mm/s
Accuracy	X= (0,8 +4L/200) µm [L: Drive length (mm)] Z1= (0,8 + I2HI/100) µm [H: Measurement height from the horizontal position (mm)] Model without α-axis: Z2= (1,5 + 10HI1000) µm
Inclining range	-45° (CCW) to +10° (CW)
Measuring force	0,75 mN
Software	**FORMTRACEPAK** • Allows control of all axis, motor-driven Y-axis table and rotary table for efficient automated measurement. • Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

Refer to CONTOUR AND SURFACE MEASUREMENT brochure

SV-C4500CNC equipped with two powerful exchangeable drive units

Surface roughness drive unit   Contour drive unit

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Formtracer Extreme SV-C4500CNC

Series 525 - Surface and Contour Measuring Instrument

SV-C4500CNC-H

No.	Z2-axis range [mm]	Y-axis table unit	α-axis unit
525-681-1D	500	-	-
525-682-1D	500	-	Installed
525-683-1D	500	Installed	-
525-684-1D	500	Installed	Installed
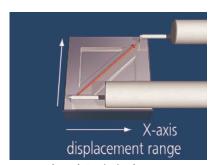
SV-C4500CNC-S

No.	Z2-axis range [mm]	Y-axis table unit	α-axis unit
525-661-1D	300	-	-
525-662-1D	300	-	Installed
525-663-1D	300	Installed	-
525-664-1D	300	Installed	Installed
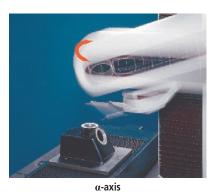
Multiple measurements

Through 2-axis simultaneous control in the X and Y directions

Y-axis

α-axis

Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.

Optional accessories

No.	Description
12AAD975	Theta-1 axis, Rotary Axis
12AAE287	Cabin for S-type used with CNC series, For Z2=300mm
12AAE449	Cabin for H-type used with CNC series, for Z2=500mm
178-037	2D auto-leveling table, for CNC Surftest and Formtracer
178-077	3D leveling table, (for SV-3200 only with 178-096)
178-078	Theta-2 axis, Rotary Axis
178-397-2	Detector, 4mN

Formtracer Extreme SV-C4500CNC HYBRID Type 1

Series 525 - Surface and Contour Measuring Instrument

This measuring system is equipped with a surface roughness detector, a contour detector and a confocal chromatic point sensor (CPS) employing axial chromatic aberration. It performs non-contact contour and roughness measurement on parts with steeply inclined surfaces and soft materials.

The Formtracer Extreme SV-C4500CNC Hybrid Type 1 offers you the following benefits:
- Powerful as three separate fully CNC instruments.
- High accurate fully CNC surface and contour measuring instrument.
- Non-contact and contact measurement combined in one instrument.
- Two machine types with different CPS sensors available, depending on measuring range and resolution.
- Drive speed of up to 200 mm/s in all axes.
- Vibration isolator as standard.

Specifications

Traverse	Z2 = 500 mm
Measuring range	X= 200 mm Y= 200 mm **Contour:** Z1= 60 mm Z2= 300 / 500 mm **Roughness:** Z1= 800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Accuracy	X= (0,8 +4L/200) µm [L: Drive length (mm)] Z1= (0,8 + I2HI/100) µm [H: Measurement height from the horizontal position (mm)] Model without α-axis: Z2= (1,5 + 10HI1000) µm
Software	**FORMTRACEPAK** • Allows control of all axis, motor-driven Y-axis table and rotary table for efficient automated measurement. • Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

Additional Specifications

Non-contact detector	
Measuring range	CPS0517 = 100 µm CPS2525 = 1200 µm
Working distance	CPS0517 = 12 mm CPS2525 = 21 mm
Resolution	CPS0517 = 5 nm CPS2525 = 25 nm

Surface roughness drive unit

Contour drive unit

CPS sensor drive unit

No.	Model	Roughness	Contour	Non-contact
525-686-1D	Type 1A	0,75 mN	Dual contour stylus	CPS2525
525-687-1D	Type 1B	0,75 mN	Dual contour stylus	CPS0517

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Formtracer Extreme CS-5000CNC and CS-H5000CNC

Series 525 - CNC Surface and Contour Measuring Instruments

This is the highest-accuracy stylus type CNC surface roughness and contour measuring instrument.

The Formtracer Extreme CS-5000CNC / CS-H5000CNC offers you the following benefits:

- It meets the highest demands of accuracy and repeatability.
- You can carry out simultaneous analysis of roughness and contour within one measurement.
- It includes a cabin and a vibration stand as standard to avoid external influences.
- High resolution in X1-axis: 5 nm and Z1-axis: 0,8 nm/1,6 nm.
- The X1 and Z2-axis have maximum drive speeds of 40 mm/s and 200 mm/s respectively.

CS-H5000CNC

Specifications

Traverse	Z2 = 300 mm / 500 mm
Measuring range	X = 200 mm Z1 = 12 mm [standard lenght stylus] Z1 = 24 mm [double lenght stylus]
Measuring speed	Roughness measurement: 0,02 - 0,2 mm/s Contour measurement: 0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode 0 - 50 mm/s
Accuracy	**CS-5000CNC:** X = (0,3+0.002L) µm Z1 = (0,3+I0,02HI) µm **CS-H5000CNC:** X = (0,16+0,001L) µm Z1 = (0,07+I0,02HI) µm [L : Drive length (mm)] [H : Measurement height from the horizontal position (mm)]
Traverse straightness	**CS-5000CNC:** X = (0,1+0,0015L) µm [standard stylus] X = (0,2+0,0015L) µm [double length stylus] **CS-H5000CNC:** X = (0,05+0,0003L) µm [standard stylus] X = (0,1+0,0015L) µm [double length stylus]
Resolution	X = 0,005 µm Z1 = 0,0008 µm [standard stylus] Z1 = 0,0016 µm [double length stylus]
Software	**FORMTRACEPAK**
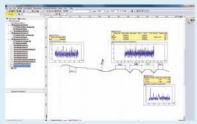
Refer to CONTOUR AND SURFACE MEASUREMENT brochure

Formtracer Extreme CS-5000CNC and CS-H5000CNC

Series 525 - CNC Surface and Contour Measuring Instruments

Specifications and Styli

Specifications

Software | **FORMTRACEPAK**
- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.

Contour and roughness analysis

Optional:
Aspherical lens analysis program
ASLPAK
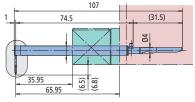
CS-5000CNC
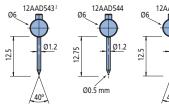
Model	CS-5000CNC S	CS-5000CNC S + Y-axis	CS-5000CNC H	CS-5000CNC H + Y-axis
No.	525-727-12	525-729-12	525-747-12	525-749-12
Z2-axis range [mm]	300	300	500	500
Y-axis table unit	-	Installed	-	Installed
α-axis unit	Installed	Installed	Installed	Installed

CS-H5000CNC
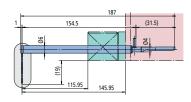
Model	CS-H5000CNC H	CS-H5000CNC H + Y-axis	CS-H5000CNC S	CS-H5000CNC S + Y-axis
No.	525-706-12	525-707-12	525-776-12	525-777-12
Z2-axis range [mm]	500	500	300	300
Y-axis table unit	-	Installed	-	Installed
α-axis unit	-	-	-	-
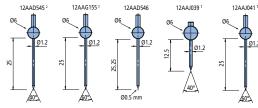
Standard
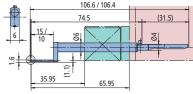
Double length
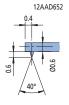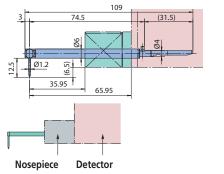
For small holes

Eccentric

Nosepiece **Detector**
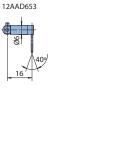
1 = only for CS-H5000CNC
2 = only for CS-5000CNC

503

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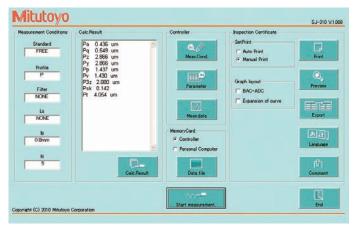
Optional Software USB Communication Tool
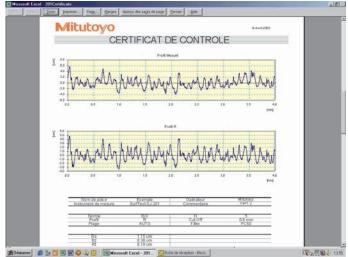
Series 178 - Control Software for SJ series, SV-2100

This is a control software for Surftest SJ-210 / SJ-310 / SJ-410 / SJ-500 and SV-2100 which offers you the following benefits:

- It is available as a free download on www.mitutoyo.eu (registration is required).
- Output software is based on Microsoft® Excel® for controlling the devices, reproducing and storing measurement data.
- Measurement device control.
- It provides definition of measurement variables.
- Graphic representation of the profile.
- Storage of measurement records.
- Documentation of measurements result.
- A USB connecting cable is necessary.

Optional accessories

No.	Description
12AAD510	USB cable for SJ-310 / SJ-410 series
12AAH490	USB Cable for SJ-500 / SV-2100
63AAA211	USB communication cable for SJ-210, Length 1800mm
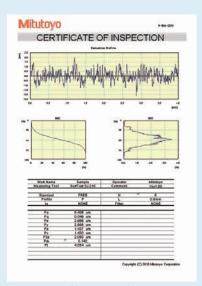
Input mask for Surftest SJ series

Output record from Microsoft® Excel® in 18 languages as standard.

Output record from Microsoft® Excel®

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Optional Styli
for Surftest and Formtracer SV-C series

Detectors

12AAG202 Extension rod 50 mm

12AAG203 Extension rod 100 mm
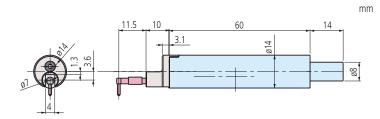
mm
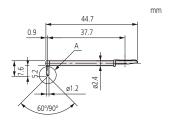
Order No	Measuring force		Inclusive stylus
178-396-2	**0,75 mN**	R2 µm, 60°	**12AAC731**
178-397-2	**4 mN**	R5 µm, 90°	**12AAB403**
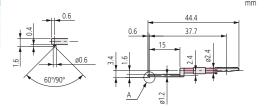
No.	Radius	Angle
12AAE882	1 µm	60°
12AAE924	1 µm	90°
12AAC731	2 µm	60°
12AAB403	5 µm	90°
12AAB415	10 µm	90°
12AAE883	250 µm	60°

mm
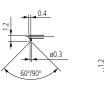
Standard
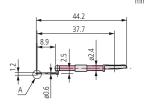
No.	Radius	Angle
12AAC732	2 µm	60°
12AAB404	5 µm	90°
12AAB416	10 µm	90°

mm

For small hole

No.	Radius	Angle
12AAC733	2 µm	60°
12AAB405	5 µm	90°
12AAB417	10 µm	90°

mm
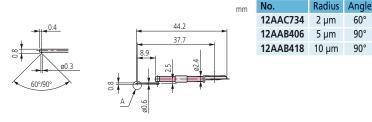
For extra-small hole

No.	Radius	Angle
12AAJ662	250 µm	-
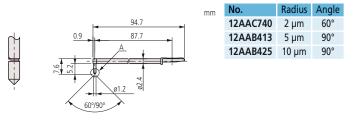
mm

For ultra-small hole

505

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Optional Styli
for Surftest and Formtracer SV-C series

No.	Radius	Angle
12AAC734	2 µm	60°
12AAB406	5 µm	90°
12AAB418	10 µm	90°

For ultra-small hole

No.	Radius	Angle
12AAC740	2 µm	60°
12AAB413	5 µm	90°
12AAB425	10 µm	90°

For deep hole [double-length]

No.	Radius	Angle
12AAE886	250 µm	60°
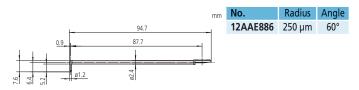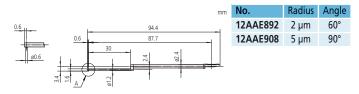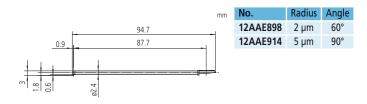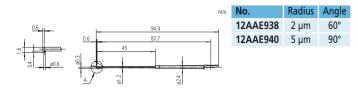
For rolling circle waviness [double-length]

No.	Radius	Angle
12AAE892	2 µm	60°
12AAE908	5 µm	90°

For small deep hole [double-length]

No.	Radius	Angle
12AAE898	2 µm	60°
12AAE914	5 µm	90°

For deep hole [double-length]

No.	Radius	Angle
12AAE938	2 µm	60°
12AAE940	5 µm	90°
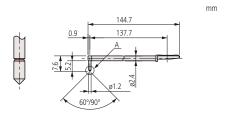
For small slotted hole [double-length]

Optional Styli
for Surftest and Formtracer SV-C series

No.	Radius	Angle
12AAC741	2 µm	60°
12AAB414	5 µm	90°
12AAB426	10 µm	90°

mm
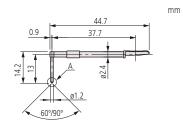
For deep hole [triple-length]

No.	Radius	Angle
12AAC735	2 µm	60°
12AAB409	5 µm	90°
12AAB421	10 µm	90°

mm
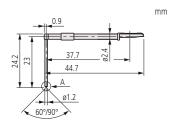
For deep groove 10 mm

No.	Radius	Angle
12AAC736	2 µm	60°
12AAB408	5 µm	90°
12AAB420	10 µm	90°

mm

For deep groove 20 mm

No.	Radius	Angle
12AAE893	2 µm	60°
12AAE909	5 µm	90°

mm

For deep groove 20 mm [double-length]

No.	Radius	Angle
12AAC737	2 µm	60°
12AAB407	5 µm	90°
12AAB419	10 µm	90°
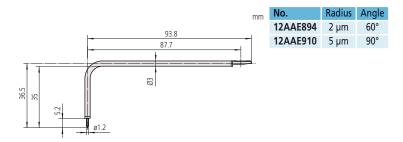
mm

For deep groove 30 mm

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Optional Styli
for Surftest and Formtracer SV-C series

No.	Radius	Angle
12AAE894	2 µm	60°
12AAE910	5 µm	90°

mm
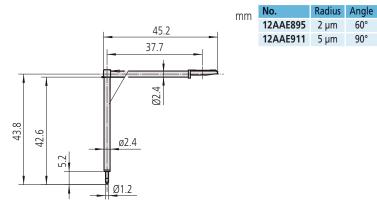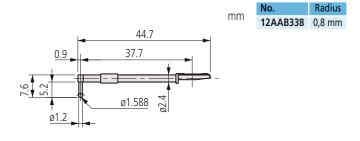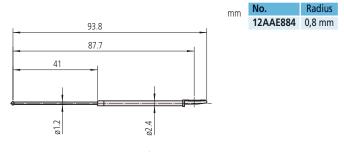
For deep groove 30 mm [double-length]

No.	Radius	Angle
12AAE895	2 µm	60°
12AAE911	5 µm	90°

mm

For deep groove 40 mm

No.	Radius
12AAB338	0,8 mm

mm
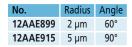
**For rolling circle waviness surface roughness
(Roughness specimen 178-611 required)**

No.	Radius
12AAE884	0,8 mm

mm
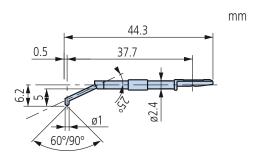
**For rolling circle waviness surface roughness
[double-length] (178-611 required)**

Mitutoyo

Optional Styli
for Surftest and Formtracer SV-C series

No.	Radius	Angle
12AAE899	2 µm	60°
12AAE915	5 µm	90°
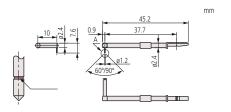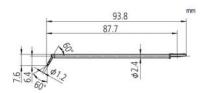
For hole bottom

No.	Radius	Angle
12AAC739	2 µm	60°
12AAB412	5 µm	90°
12AAB424	10 µm	90°
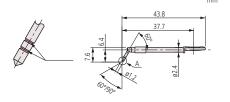
For eccentric arm

No.	Radius	Angle
12AAM601	2 µm	60°
12AAM603	5 µm	60°
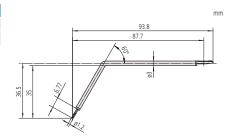
No.	Radius	Angle
12AAB339	2 µm	60°
12AAB410	5 µm	90°
12AAB422	10 µm	90°

For gear tooth

No.	Radius	Angle
12AAE896	2 µm	60°
12AAE912	5 µm	90°

For gear tooth [double-length]
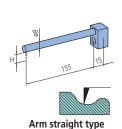
No.	Radius	Angle
12AAC738	2 µm	60°
12AAB411	5 µm	90°
12AAB423	10 µm	90°

For knife-edge

Mitutoyo
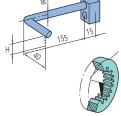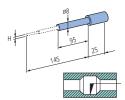
Optional Styli and Arms
for Contracer and Formtracer SV-C Series

Arm straight type
CV-2100

Arm eccentric type
CV-2100

Arm for small-hole stylus
CV-2100

Applicable arms for CV-2100

No.	Arm	Arm No.	Compatible stylus height (H) [mm]
935110	Small hole	AB-11	0,4 / 1 / 2,5
935111	Straight type	AB-51	6
935112	Straight type	AB-61	12
935113	Straight type	AB-71	20
935114	Straight type	AB-81	30
935115	Straight type	AB-91	42
935116	Eccentric type	AB-52	6
935117	Eccentric type	AB-62	12
935118	Eccentric type	AB-72	20
935119	Eccentric type	AB-82	30
935120	Eccentric type	AB-92	42

Applicable arms for CV-3200 / CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC

No.	Arm	Arm No.	Compatible stylus height (H) [mm]
12AAQ762	Eccentric arm	AB-37	SPH-5*, 6*, 7*, 8*, 9*
12AAM101	Straight type	AB-31	SPH-5*, 6*, 7*, 8*, 9*
12AAM103	Small hole	AB-33	SPH-41, SPH-42, SPH-43

Applicable styli for CV-2100
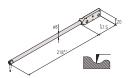
No.	Stylus	Stylus No.	Stylus height (H) [mm]
932693	Small hole, carbide-tipped one-sided cut	SP-11	0,4
932694	Small hole, carbide-tipped one-sided cut	SP-12	1
932695	Small hole, carbide-tipped one-sided cut	SP-13	2,5
12AAE873	Small hole, carbide-tipped cone	SP-31	0,4
12AAE874	Small hole, carbide-tipped cone	SP-32	1
12AAE875	Small hole, carbide-tipped cone	SP-33	2,5

Applicable styli for CV-3200 / CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC
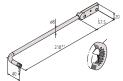
No.	Stylus	Stylus No.	Stylus height (H) [mm]
12AAM104	Small hole, carbide tipped one sided cut	SPH-41	2
12AAM105	Small hole, carbide tipped one sided cut	SPH-42	4
12AAM106	Small hole, carbide tipped one sided cut	SPH-43	6,5

Arm and stylus set
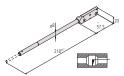
No.	Applicable models	Included arms	Included styli	Included arm stylus
12AAR587	CV-3200, CV-4500, SV-C3200, SV-C4500, SV-C4500CNC	AB-33, AB-37	SPH-41, -43, -51, -72, -76	
12AAR588	CV-4500, SV-C4500, SV-C4500CNC	AB-33, AB-37	SPH-41, -43, -51, -72, -76, SPHW-66, -76	SPHW-32
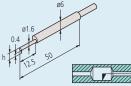
Arm straight type
CV-3200/CV-4500
SV-C3200/SV-C4500
SV-C4500CNC
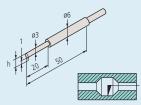
Arm eccentric type
CV-3200/CV4500
SV-C3200/SV-C4500
SV-C4500CNC
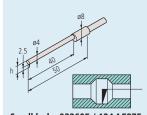
Arm for small-hole stylus
CV-3200/CV4500
SV-C3200/SV-C4500
SV-C4500CNC
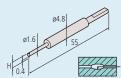
Small hole: 932693 / 12AAE873
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 μm / 25 μm
Tip material: Carbide / Carbide
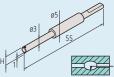
Small hole: 932694 / 12AAE874
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 μm / 25 μm
Tip material: Carbide / Carbide
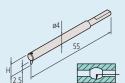
Small hole: 932695 / 12AAE875
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 μm / 25 μm
Tip material: Carbide / Carbide

Small hole: 12AAM104
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 μm
Tip material: Carbide

Small hole: 12AAM105
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 μm
Tip material: Carbide

Small hole: 12AAM106
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 μm
Tip material: Carbide

Optional Styli and Arms
for Contracer and Formtracer SV-C Series

Styli

Single bevel
Tip angle: 12°
Tip radius: 25 µm
Tip material: Carbide

Cross ground
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide

Cone
Tip angle: 30°/50°
Tip radius: 25 µm
Tip material: Carbide / Sapphire / Diamond
(355129: 50°, Diamond)
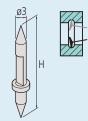
Cone
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide

Knife edge
Tip angle: 20°
Edge width: 3 mm
Tip radius: 25 µm
Tip material: Carbide

Ball
Ball: ø1 mm
Tip material: Carbide

Both sides conical stylus
Tip angle: 30°
Tip radius: 25 µm
Tip material: Carbide
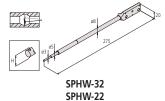
Applicable styli for
CV-2100 / CV-3200/ CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC

No.	Stylus	Stylus No.	Stylus height (H) [mm]
354882	Single bevel, carbide tipped	SPH-51	6
354883	Single bevel, carbide tipped	SPH-61	12
354884	Single bevel, carbide tipped	SPH-71	20
354885	Single bevel, carbide tipped	SPH-81	30
354886	Single bevel, carbide tipped	SPH-91	42
354887	Cross ground, carbide tipped	SPH-52	6
354888	Cross ground, carbide tipped	SPH-62	12
354889	Cross ground, carbide tipped	SPH-72	20
354890	Cross ground, carbide tipped	SPH-82	30
354891	Cross ground, carbide tipped	SPH-92	42
12AAE865	Cone, carbide-tipped angle 20°	SPH-57	6
12AAE866	Cone, carbide-tipped angle 20°	SPH-67	12
12AAE867	Cone, carbide-tipped angle 20°	SPH-77	20
12AAE868	Cone, carbide-tipped angle 20°	SPH-87	30
12AAE869	Cone, carbide-tipped angle 20°	SPH-97	42
354892	Cone, sapphire-tipped angle 30°	SPH-53	6
354893	Cone, sapphire-tipped angle 30°	SPH-63	12
354894	Cone, sapphire-tipped angle 30°	SPH-73	20
355129	Cone, diamond-tipped angle 50°	SPH-79	20
354895	Cone, sapphire-tipped angle 30°	SPH-83	30
354896	Cone, sapphire-tipped angle 30°	SPH-93	42
12AAA566	Cone, carbide-tipped angle 30°	SPH-56	6
12AAA567	Cone, carbide-tipped angle 30°	SPH-66	12
12AAA568	Cone, carbide-tipped angle 30°	SPH-76	20
12AAA569	Cone, carbide-tipped angle 30°	SPH-86	30
12AAA570	Cone, carbide-tipped angle 30°	SPH-96	42
354897	Knife edge, carbide tipped	SPH-54	6
354898	Knife edge, carbide tipped	SPH-64	12
354899	Knife edge, carbide tipped	SPH-74	20
354900	Knife edge, carbide tipped	SPH-84	30
354901	Knife edge, carbide tipped	SPH-94	42
354902	Ball, carbide tipped	SPH-55	6
354903	Ball, carbide tipped	SPH-65	12
354904	Ball, carbide tipped	SPH-75	20
354905	Ball, carbide tipped	SPH-85	30
354906	Ball, carbide tipped	SPH-95	42

Applicable styli for only CV-4500 /SV-C4500 / SV-C4500CNC

No.	Stylus	Stylus No.	Stylus height (H) [mm]
12AAT469	Both sides small hole arm stylus 20°	SPHW-21	2,4
12AAT470	Both sides small hole arm stylus 20°	SPHW-22	5
12AAM095	Both sides conical stylus	SPHW-56	20
12AAM096	Both sides conical stylus	SPHW-66	32
12AAM097	Both sides conical stylus	SPHW-76	48
12AAM108	Both sides small hole arm stylus	SPHW-31	2,4
12AAM109	Both sides small hole arm stylus	SPHW-32	5
12AAM110	Both sides small hole arm stylus	SPHW-33	9

SPHW-31
SPHW-21

SPHW-32
SPHW-22

SPHW-33

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Optional Accessories for Surftest, Contracer and Formtracer

For SV series, SV-C series, CV series, CS series and CNC models

Automatic-leveling table : 178-087 (for SV, CV, SV-C, CS)
Automatic-leveling table : 178-037 (for CNC models)
This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this troublesome operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.

No.	Inclination adjustment angle	Maximum load [kg]	Effective table dimensions [mm]
178-087	± 2°	7	130 x 112

Automatic-leveling table : 178-087 (for SV, CV, SV-C, CS)
Automatic-leveling table : 178-037 (for CNC Models)
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No.	Inclination adjustment angle	Maximum load [kg]	Effective table dimensions [mm]
178-037	± 2°	7	130 x 112

178-087

Using 178-087

Micro-chuck
This chuck is suitable for clamping extra-small diameter workpieces (ø1.5 mm or less), which cannot be retained with the centering chuck.

No.	Dimensions [mm]	Retention range [mm]
211-031	ø118 x 48,5	OD: Ø 0,1 - Ø 1,5

211-031

Quick chuck
This chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

No.	Dimensions [mm]	Retention range [mm]
211-032	ø118 x 41	Inner latch : OD ø1 - ø36 Inner latch : ID ø16 - ø69 Outer latch : OD ø25 - ø79

211-032

Y-axis table
for SV-3200, SV-C, CS and CV models (not CNC models)
Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface. It allows semi-automatic measurement with a semi-automatic with non CNC models by using these items.

No.	Travel range [mm]	Resolution	Positioning accuracy [µm]	Maximum load [kg]	Drive speed
178-097	200	0,05	±3	50	Max. 80 mm/s

178-097

θ1-axis:[1]
For efficient measurement in the axial / transverse directions. When measuring a cylindrical workpiece, automatic alignment can be performed in combination with the Y-axis table.
[1] = **12AAE630** mounting plate is required when directly installing on the base of the machine.
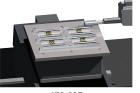
No.	Resolution	Rotational speed	Displacement	Maximum load [kg]
12AAD975	0,004°	Max. 10°/s	360°	12

12AAD975

θ2-axis:[1]
For efficent measurement of multiple points on a cylindrical workpiece and automate front/rear-side measurement.
[1] = **12AAE718** mounting plate is required when directly installing on the base of the machine.
[1] = **12AAE705** attachment plate is required when installing on θ1-axis table.
[1] = **12AAE707** mounting plate is required when directly installing on Y-axis table with automatic leveling table.

No.	Resolution	Rotational speed	Displacement	Maximum load [kg]
178-078	0,0072°	Max. 18°/s	360°	4

178-078

178-097
using Y-axis

12AAD975
using θ1-axis

178-078
using θ2-axis
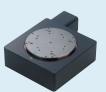
Optional Accessories for Surftest, Contracer and Formtracer

12AAG175

Calibration stage

No.	Description
12AAG175	For mounting a roughness specimen or step gauge during calibration

Cross-travel table

No.	Table top [mm]	XY travel [mm]
218-001	280 x 180	100 x 50
218-041	280 x 152	50 x 25

218-001   **218-041**

Digital three-axis adjustment table

No.	Description
178-047	This table helps to 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.

178-047

Digital XY leveling table

No.	Leveling range	Table top [mm]	XY travel [mm]
178-042-1	±1,5°	130 x 100	± 12,5

178-042-1

Precision V-Block

No.	Description
998291	Workpiece diameter : 1 mm to 160 mm Can be mounted on a leveling table

998291

Precision vise

No.	Description
178-019	Max. workpiece size : 36 mm Can be mounted on a leveling table

178-019

Rotary vise

No.	Description
218-003	Two-slide jaw type Max. workpiece size : ø60 mm Minimum reading : 1°

218-003

Vibration isolator

No.	Packing size	Description
178-119	1000 x 1340 x 880 mm	For SV-2100/3200 series (wide base) For CV-3200/4500 series (wide base) For SV-C3200/4500 series (wide base)
12AAK110.	830 x 800 x 700 mm	For SV-2100/3200 series (standard base) For CV-3200/4500 series (standard base) For SV-C3200/4500 series (standard base)
178-115	600 x 1050 x 260 mm	Desktop type For SV-2100/3200 series (wide base) For CV-3200/4500 series (wide base) For SV-C3200/4500 series (wide base)

XY leveling table
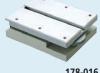
No.	Leveling range	Table top [mm]	XY travel [mm]
178-043-1	±1,5°	130 x 100	± 12,5
178-016	±1,5°	130 x 100	

178-043-1   **178-016**

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eco-fix Fixtures Form

eco-fix Kit Form S

Adapter plate Ø150 mm usable with:

- Roundtest RA-10
- Roundtest RA-120
- Roundtest RA-120P
- Roundtest RA-1600
- THETA 1 for CV, SV, SV-C and CS types

No.
K551133

eco-fix Kit Form L

Adapter plate Ø200 mm usable with:

- Roundtest RA-2200
- Roundtest RA-H5200
- Roundtest RA-2200CNC
- Roundtest RA-H5200CNC
- THETA 1 for CV, SV, SV-C and CS types

No.
K551134

Roundtest RA-10

Series 211 - Form Measuring Instrument

This is a compact and affordable form measuring instrument.

The Roundtest RA-10 offers you the following benefits:
- It combines outstanding cost and performance with full measurement capabilities.
- The machine has a compact body with integrated electronics and printer, making it ideal for installation in space-restricted locations.
- You can easily view measurement results and recorded profiles on the large coloured LCD panel display.
- Despite being a low-priced model, the turntable with air bearings gives you rotational accuracy as high as (0,04+0,0006H) μm, assuring a precision that compares well with that of higher priced models.
- The control panel has large keys and an intuitive layout for easy operation.
- One-key calling function.
- One-key zero-set function.
- Support of 16 languages.
- It complies with EN ISO standard like 12181-1, 12181-2, 12781-1 and 12781-2.
- USB Communication Program – Microsoft® Excel ® based – to import results and create, save and print out inspection certificates on PC.

Specifications

Range	±1000 μm

Turntable

Rotational accuracy	**Radial:** (0,04+0,0006H) μm H: Measuring height from turntable surface (mm) **Axial:** (0,04+0,0006X) μm X: Radial distance from center (mm)
Max. probing Ø	100 mm
Max. workpiece Ø	320 mm
Max. turntable loading	10 kg

Vertical column

Vertical travel	117 mm
Max. probing height	152 mm

Display unit

Data analysis items	Roundness, Coaxiality, Concentricity, Flatness, Runout radial
Printer	Built-in thermal line printer

Software
USB Communication Program
as a free download on www.mitutoyo.eu
(registration required)

Refer to FORM MEASUREMENT brochure

RA-10 with optional collet

Z-axis scale unit

X-axis stop

Mitutoyo

Roundtest RA-10
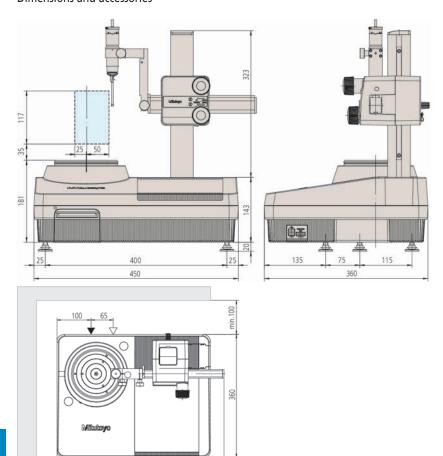
Series 211 - Form Measuring Instrument

Dimensions and accessories

211-031

211-032

211-051

211-052

211-053

211-054

211-055

12AAH425

211-013

No.	Model	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-541D	RA-10	320	100	10

Specifications

Max. turntable loading	10 kg

Optional accessories

No.	Description
12AAH318	Z-axis scale unit
12AAH320	X-axis stopper
12AAH402	Collet (Ø 0,5-1,0mm)*
12AAH403	Collet (Ø 1,0-1,5mm)*
12AAH404	Collet (Ø1,5-2,0mm)*
12AAH405	Collet (Ø 2,0-2,5mm)*
12AAH406	Collet (Ø2,5-3,0mm)*
12AAH407	Collet (Ø3,0-3,5mm)*
12AAH408	Collet (Ø3,5-4,0mm)*
12AAH409	Collet (Ø4,5-5,0mm)*
12AAH410	Collet (Ø5,0-6,0mm)*
12AAH411	Collet (Ø6,0-7,0mm)*
12AAH412	Collet (Ø 7,0-8,0mm)*
12AAH413	Collet (Ø8,0-9,0mm)*
12AAH414	Collet (Ø 9,0-10,0mm)*
12AAH420	Spacer for reference hemisphere
12AAH425	Alignment table with D.A.T (mm)
211-013	Micro vibration isolator
211-016	Reference hemisphere
211-031	Micro chuck, OD: 0,1-1,5mm
211-032	Quick chuck, OD: 1-79mm, ID: 16-69 mm
211-045	Magnification calibration gauge, for Roundtest
211-051	Collet chuck holder (OD: 0,5-10mm)*
211-052	Quick chuck
211-053	V-block A (Screw clamp)
211-054	V-block B (spring clamp)
356038	Auxiliary stage for low height workpiece, for Roundtest
997090	Gauge block set for calibration, for Roundtest

* Individual collet for collet chuck holder should be ordered separately.

Consumable spares

No.	Description
12AAH181	Printer paper (10 rolls)

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Roundtest RA-120 and RA-120P

Series 211 - Form Measuring Instrument

These are compact, affordable and simple-to-use instruments for measuring roundform geometry.

The Roundtest RA-120 and RA-120P offer you the following benefits:
- The turntable accuracy of (0,04+0,0006H) µm provides high level form analysis.

RA-120
- The RA-120 has a compact body with integrated electronics and printer, making it ideal for installation in space-restricted locations.
- You can easily view measurement results and recorded profiles on the large coloured LCD panel display.
- One-key operations.
- Support of 16 languages.
- It complies with EN ISO standard like 12181-1, 12181-2, 12781-1 and 12781-2
- USB Communication Program – Microsoft® Excel ® based – to import results and create, save and print out inspection certificates on PC.

RA-120P
- The RA-120P is a PC based model with all operations controlled via powerful ROUNDPAK software.
- Software ROUNDPAK gives you excellent possibilities for single measurement and part programming.

RA-120

RA-120P

Specifications

Turntable

Rotational accuracy	**Radial:** (0,04+0,0006H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,04+0,0006X) µm X: Radial distance from center (mm)
Max. probing Ø	280 mm 380 mm in reverse position
Max. workpiece Ø	440 mm
Max. turntable loading	25 kg
Centering range	±3 mm
Leveling range	±1°

Vertical column

Vertical travel	280 mm
Max. probing height	280 mm above turntable surface 480 mm in reverse position
Max. probing depth	100 mm (minimum ID: 30 mm)

Display unit

Data analysis items	Roundness, Coaxiality, Flatness, Runout (radial), Runout (axial), Thickness deviation, Parallelism, Perpendicularity
Printer	Built-in thermal line printer (RA-120)
Software	**ROUNDPAK** (only RA-120P)

**Software
USB Communication Program
as a free download on www.mitutoyo.eu
(registration required)
(only RA-120)**

Refer to ROUNDTEST RA-120 brochure

Scan QR Code with your mobile device to watch the product lines video on YouTube

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Roundtest RA-120 and RA-120P

Series 211 - Form Measuring Instrument

This is a compact roundness tester with D.A.T. (Digital Adjustment Table) function.

The D.A.T. gives you the following benefits:
- The turntable displays centering and leveling adjustments digitally, making this challenging task easy enough for even an untrained operator to perform, through these four simple steps:

1. Preliminary measurement of two cross sections on the workpiece.
2. The centering and leveling adjustment values are displayed.
3. The digital micrometer heads on the rotary table are adjusted to match the values displayed.
4. Centering and leveling is complete. [Centering range : ±3 mm - Leveling range : ±1°]

No.	Model	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-542D	RA-120 with D.A.T. function	440	280	25
211-544D	RA-120 with mechanical turntable	440	280	25
211-545D	RA-120P with D.A.T. function	440	280	25
211-547D	RA-120P with mechanical turntable	440	280	25

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.

Optional accessories
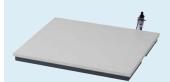
No.	Description
12AAH320	X-axis stopper
211-013	Micro vibration isolator
211-014	Three-jaw chuck, OD: 2-78mm, ID: 25-68mm
211-016	Reference hemisphere
211-031	Micro chuck, OD: 0,1-1,5mm
211-032	Quick chuck, OD: 1-79mm, ID: 16-69 mm
211-045	Magnification calibration gauge, for Roundtest
211-061	Collect chuck holder
356038	Auxiliary stage for low height workpiece, for Roundtest
997090	Gauge block set for calibration, for Roundtest

Consumable spares

No.	Description
12AAH181	Printer paper (10 rolls)

211-016

211-013

Z-axis scale unit (optional)   X-axis stop

Scan QR Code with your mobile device and watch our product videos on YouTube

Roundtest RA-1600

Series 211 - Form Measuring System
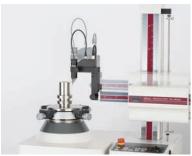
This is a PC-compliant form measuring system which allows you to measure roundform geometry like cylindricity.

The Roundtest RA-1600 offers the following benefits:
- It is equipped with a high accurate turntable accuracy of (0,02+0,0006H) μm.
- You can carry out simple & accurate centering and leveling of the workpiece with D.A.T. (Digital Adjustment Table).
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A remote control box is including allowing you easy operation.
- There is also an auto follow function for easy and quick pre-centering of the workpiece.

Specifications

Turntable

Rotational accuracy	**Radial:** (0,02+0,0006H) μm H: Measuring height from turntable surface (mm) **Axial:** (0,02+0,0006X) μm X: Radial distance from center (mm)
Rotational speed	4, 6, 10 rpm
Max. probing Ø	280 mm
Max. workpiece Ø	560 mm
Max. turntable loading	25 kg
Centering range	±3 mm
Leveling range	±1°

Vertical column

Max. probing height	300 mm above turntable surface
Max. probing depth	91 mm (minimum ID : ø32 mm) 50 mm (minimum ID : ø7 mm)
Straightness	0,2 μm / 100 mm 0,3 μm / 300 mm
Parallelism with turntable axis	1,5 μm / 300 mm
Software	**ROUNDPAK**

Measuring screen

Result screen

ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions.

RA-1600 (+desktop vibration isolator)

Spiral Measurement/Analysis (RA-1600)

Provided with a spiral measurement function that combines turntable rotation and rectilinear motion allowing cylindricity, coaxiality and other form characteristics to be measured in continuous data stream mode.

Measurement through X - axis tracking
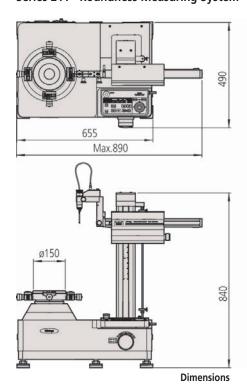
Measurement while tracing is possible through a built-in linear scale in the X - axis.

Mitutoyo
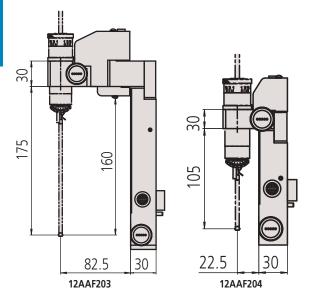
Roundtest RA-1600

Series 211 - Roundness Measuring System

Dimensions

No.	Model	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-723D	RA-1600	560	280	25

12AAF203　　　**12AAF204**

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.

Optional accessories

No.	Description
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAK110	Vibration isolator, for Surftest SV, Contracer, Formtracer, Roundtest
12AAK120	Monitor arm, for vibration isolator 12AAK120
12AAL019	Side table
12AAL090	Sliding detector holder
211-014	Three-jaw chuck, OD: 2-78mm, ID: 25-68mm
211-031	Micro chuck, OD: 0,1-1,5mm
211-032	Quick chuck, OD: 1-79mm, ID: 16-69 mm
211-045	Magnification calibration gauge, for Roundtest
211-061	Collect chuck holder
356038	Auxiliary stage for low height workpiece, for Roundtest
997090	Gauge block set for calibration, for Roundtest
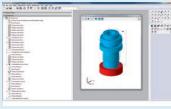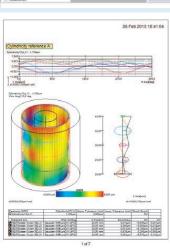
Refer to ROUNDTEST RA-1600 brochure

Roundtest RA-2200

Series 211 - Form Measuring Instrument

This is a highly accurate form measuring system which allows you to measure roundform geometry like cylindricity.

The Roundtest RA-2200 offers the following benefits:
- It has fully motorised axes movement.
- Its extremely high turntable accuracy of (0,02+0,00035H) µm gives you excellent form analysis.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A huge number of styli provides you with maximum flexibility.
- There is an auto follow function for easy and quick pre-centering of the workpiece.

There is a wide variety of models available to suit any application.
RA-2200DS/DH: These models have a navigation function supplied as standard, to quickly and simply guides you through the centering and leveling task. The models are equipped with the D.A.T. (Digital Adjustment Table).

RA-2200AS/AH: The models have an automatic centering and leveling turntable supplied as standard , freeing you from the centering and leveling task. The models are equipped with the A.A.T. (Automatic Adjustment Table).

Specifications

Turntable

Rotational accuracy	**Radial:** (0,02+0,00035H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,02+0,00035X) µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing Ø	300 mm
Max. workpiece Ø	580 mm
Max. turntable loading	30 kg
Leveling range	±1°
Centering range	**DS / DH:** ±5 mm **AS / AH:** ±3 mm

Vertical column

Max. probing height	**AS / DS :** 300 mm **AH / DH:** 500 mm above turntable surface
Max. probing depth	85 mm (minimum ID : ø32 mm) 50 mm (minimum ID : ø7 mm)
Straightness	**AS / DS :** 0,1 µm / 100 mm **AS / DS :** 0,15 µm / 300 mm **AH / DH:** 0,25 µm / 500 mm
Parallelism with rotation center	**AS / DS :** 0,7 µm / 300 mm **AH / DH:** 1,2 µm / 500 mm

Horizontal axis

Straightness	0,7 µm / 150 mm
Perpendicularity to rotation center	1 µm / 150 mm
Software	**ROUNDPAK** FORMTRACEPAK-AP (optional for roughness detection unit)

ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions.

RA-2200AS

Automatic measurement

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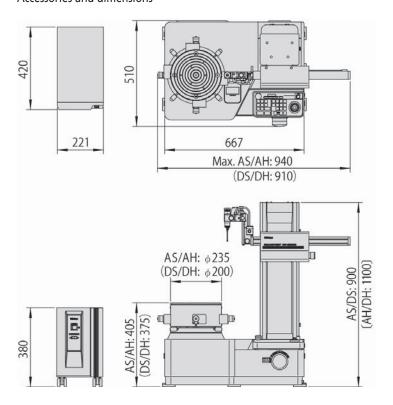
Roundtest RA-2200

Series 211 - Roundness/Cylindricity Measuring System

Accessories and dimensions

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.

Optional accessories

No.	Description
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAF353	Roughness detection unit
12AAK110	Vibration isolator, for Surftest SV, Contracer, Formtracer, Roundtest
12AAK120	Monitor arm, for vibration isolator 12AAK120
12AAL019	Side table
211-014	Three-jaw chuck, OD: 2-78mm, ID: 25-68mm
211-031	Micro chuck, OD: 0,1-1,5mm
211-032	Quick chuck, OD: 1-79mm, ID: 16-69 mm
211-045	Magnification calibration gauge, for Roundtest
356038	Auxiliary stage for low height workpiece, for Roundtest

Refer to ROUNDTEST RA-2200 brochure

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-511D	RA-2200AS	AAT	300	580	300	30
211-512D	RA-2200AH	AAT	500	580	300	30
211-513D	RA-2200DS	DAT	300	580	300	30
211-515D	RA-2200DH	DAT	500	580	300	30

1* AAT : Automatic Adjustment Table
 DAT : Digital Adjustment Table

Mitutoyo

Roundtest RA-H5200

Series 211 - High-precision Form Measuring Instrument

This is a highly accurate, precision form measuring system developed to give you the highest accuracy as well as high flexibility and analytical capability.

The Roundtest RA-H5200 offers the following benefits:
- Its integrated vibration isolator helps you to measure within the best conditions.
- It has a high measuring range and loading mass.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A.A.T. (Automatic Adjustment Table) gives you fully automatic centering and leveling.
- There is an auto follow function for easy and quick pre-centering of the workpiece.

Specifications

Turntable

Rotational accuracy	**Radial:** (0,02+0,00035H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,02+0,00035X) µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing Ø	400 mm
Max. workpiece Ø	680 mm
Max. turntable loading	80 kg without auto centering 65 kg
Centering range	±5 mm
Leveling range	±1°

Vertical column

Max. probing height	**AS :** 350 mm **AH:** 550 mm above turntable surface
Max. probing depth	85 mm (minimum ID : ø32 mm) 50 mm (minimum ID : ø7 mm)
Straightness	**AS / AH :** 0,05 µm / 100 mm **AS :** 0,14 µm / 350 mm **AH :** 0,2 µm / 550 mm
Parallelism with rotation center	**AS :** 0,2 µm / 350 mm **AH :** 0,32 µm / 550 mm

Horizontal axis

Straightness	0,4 µm / 200 mm
Perpendicularity to rotation center	0,5 µm / 200 mm
Software	**ROUNDPAK** FORMTRACEPAK-AP (optional for roughness detection unit)

ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions.

Highly accurate, automatic centering/leveling turntable
The performance of this turntable has been achieved through exceptional manufacturing accuracy of the critical components, in addition to a high-accuracy air-bearing that provides superior rigidity. The resulting rotational accuracy, the heart of a Roundtest measuring system, is world-class at 0,02+0,00035H µm.

Sliding detector-unit holder provided as a standard feature
The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm. Sliding distance : 112 mm.

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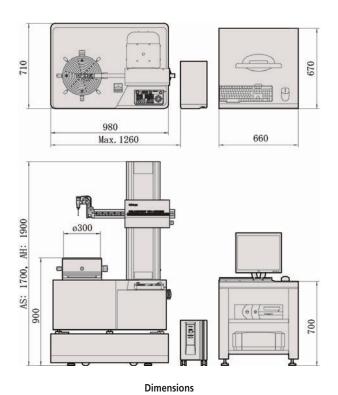
Roundtest RA-H5200
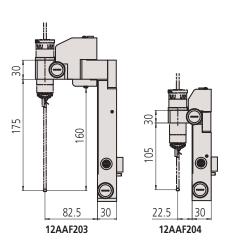
Series 211

Dimensions and accessories

Dimensions

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.

Optional accessories

No.	Description
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAF205	Triple length holder for exta-deep holes
12AAF353	Roughness detection unit
12AAL019	Side table
211-014	Three-jaw chuck, OD: 2-78mm, ID: 25-68mm
211-031	Micro chuck, OD: 0,1-1,5mm
211-032	Quick chuck, OD: 1-79mm, ID: 16-69 mm
211-045	Magnification calibration gauge, for Roundtest

211-014

211-031

211-032

211-045

Refer to ROUNDTEST RA-H5200 brochure

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-531D	RA-H5200AS	AAT	350	680	400	65
211-532D	RA-H5200AH	AAT	550	680	400	65

1* AAT : Automatic Adjustment Table

mm

12AAF203

12AAF204

12AAF205

Mitutoyo

Roundtest Extreme RA-2200CNC

Series 211 - High-precision Form Measuring Instrument

This is a fully automatic CNC form measuring instrument that gives highly accurate results.

The Roundtest Extreme RA-2200CNC offers you the following benefits:
- It has a CNC controlled measuring system with orientation steps of 1°.
- The extremely high turntable accuracy of (0,02+0,00035H) µm gives you highly accurate form analysis.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- An automatic centering and leveling turntable A.A.T. (Automatic Adjustment Table) is supplied as standard, freeing you from the centering and leveling task.

Specifications

Turntable

Rotational accuracy	**Radial:** (0,02+0,00035H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,02+0,00035X) µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing Ø	256 mm
Max. workpiece Ø	580 mm
Max. turntable loading	30 kg
Centering range	±3 mm
Leveling range	±1°

Vertical column

Max. probing height	**AS :** 300 mm **AH:** 500 mm above turntable surface
Max. probing depth	104 mm (minimum ID : ø32 mm) 26 mm (minimum ID : ø12,7 mm)
Straightness	**AS / AH :** 0,1 µm / 100 mm **AS :** 0,15 µm / 300 mm **AH :** 0,25 µm / 500 mm
Parallelism with rotation center	**AS :** 0,7 µm / 300 mm **AH :** 1,2 µm / 500 mm

Horizontal axis

Straightness	0,7 µm / 150 mm
Perpendicularity to rotation center	1 µm / 150 mm
Software	**ROUNDPAK** FORMTRACEPAK-AP (optional for roughness detection unit)

Optional accessories

No.	Description
12AAG419	Roughness detection unit CNC, 0,75mN
12AAK110	Vibration isolator, for Surftest SV, Contracer, Formtracer, Roundtest
12AAK120	Monitor arm, for vibration isolator 12AAK120
12AAL019	Side table

ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions.

Refer to ROUNDTEST RA-2200 brochure

RA-2200 CNC
+ optional vibration isolator [12AAK110]
and side table [12AAL019]

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. work-piece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-517D	RA-2200CNC AS	AAT	300	580	256	30
211-518D	RA-2200CNC AH	AAT	500	580	256	30

1* AAT : Automatic Adjustment Table

Mitutoyo

Roundtest Extreme RA-H5200CNC

Series 211 - High-precision Roundness/Cylindricity Measuring System
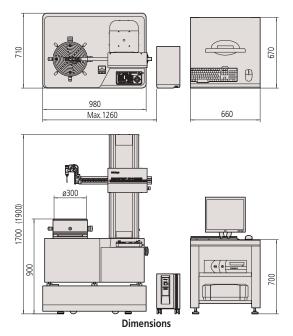
This is a CNC form measuring instrument that combines high accuracy with automatic CNC measurements.

The Roundtest Extreme RA-H5200CNC offers you the following benefits:
- An integrated vibration isolator helps you to measure within best conditions.
- It will greatly improve your productivity and efficiency.
- You can take highly accurate, fast and operator-free measurements.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- An automatic centering and leveling turntable A.A.T. (Automatic Adjustment Table) is supplied as standard, freeing you from the centering and leveling task.

RA-H5200CNC + side table [12AAL019]

Dimensions

Specifications

Turntable

Rotational accuracy	**Radial:** (0,02+0,00035H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,02+0,00035X) µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm Auto centering: 20 rpm
Max. probing Ø	356 mm
Max. workpiece Ø	680 mm
Max. turntable loading	80 kg without auto centering 65 kg
Centering range	±5 mm
Leveling range	±1°

Vertical column

Max. probing height	**AS :** 350 mm **AH:** 550 mm above turntable surface
Max. probing depth	104 mm (minimum ID : ø32 mm) 26 mm (minimum ID : ø12,7 mm)
Parallelism with rotation center	**AS :** 0,2 µm / 350 mm **AH :** 0,32 µm / 550 mm

Horizontal axis

Straightness	0,4 µm / 200 mm
Perpendicularity to rotation center	0,5 µm / 200 mm
Software	**ROUNDPAK** FORMTRACEPAK-AP (optional for roughness detection unit)

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.

Optional accessories

No.	Description
12AAG419	Roughness detection unit CNC, 0,75mN
12AAL019	Side table

ROUNDPAK
Simple to operate even with a full set of parameters

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ø [mm]	Max. probing Ø [mm]
211-533D	RA-H5200CNC AS	AAT	350	680	356
211-534D	RA-H5200CNC AH	AAT	550	680	356

1* AAT : Automatic Adjustment Table

Mitutoyo

Roundtest Extreme RA-6000CNC

Series 211 – Large size Form Measuring Instrument

This is a fully automatic CNC form measuring instrument for heavy and accurate workpieces.

The Roundtest Extreme RA-6000CNC bears the following benefits:
- Huge measuring range of 1050 mm in height for long workpieces
- Wide probing range enables measurements of form parameters of huge-diameter workpieces
- Maximum loading capacity of 350 kg for heavy and big size workpieces
- Highly-accurate measurements of large workpieces
- Fully automatic measurement provides fast and accurate processing
- ROUNDPAK software also comprises easy-to use part programing and single measurement functions
- A highly accurate automatic centering and leveling turntable A.A.T. (Automatic Adjustment Table) is supplied as standard, rendering manual centering and leveling redundant

Specifications

Turntable

Rotational accuracy	**Radial:** (0,05+0,0006H) µm H: Measuring height from turntable surface (mm) **Axial:** (0,05+0,0006X) µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6 rpm
Max. turntable loading	350 kg
Centering range	±5 mm
Leveling range	±1°

Vertical column

Max. probing height	1050 mm

ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions

RA-6000CNC

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-591D	RA-6000CNC	AAT	1050	900	880	350

1* AAT : Automatic Adjustment Table

Mitutoyo

Optional Styli for Roundtest

Interchangeable styli for RA-10, RA-120, RA-120P, RA-1600, RA-2200, RA-H5200

12AAL021 - Standard ø 1,6 mm tungsten carbide	**12AAL022 - Notch** ø 3 mm tungsten carbide	**12AAL023 - Deep groove** R 0,25 mm sapphire
12AAL024 - Corner R 0,25 mm sapphire	**12AAL025 - Cutter mark** R 15 mm tungsten carbide	**12AAL026 - Small hole** ø 0,8 mm tungsten carbide
12AAL027 - Small hole ø 1 mm tungsten carbide	**12AAL028 - Small hole** ø 1,6 mm tungsten carbide	**12AAL029 - Extra small hole** ø 0,5 mm tungsten carbide
12AAL030 - ø 1,6 mm ball ø 1,6 mm tungsten carbide	**12AAL031 - Disc** ø 12 mm	**12AAL032 - Crank** ø 0,5 mm tungsten carbide
12AAL033 - Crank ø 1 mm tungsten carbide	**12AAL034 - Flat surface** Tungsten carbide	**12AAL035 - 2X-long standard** ø 1,6 mm tungsten carbide
12AAL036 - 2X-long notch ø 3 mm tungsten carbide	**12AAL037 - 2X-long deep groove** R 0,25 mm sapphire	**12AAL038 - 2X-long corner** R 0,25 mm sapphire
12AAL039 - 2X-long type cutter mark R 15 mm tungsten carbide	**12AAL040 - 2X-long small hole** ø 1 mm tungsten carbide	**12AAL041 - 3X-long standard** ø 1,6 mm tungsten carbide
12AAL042 - 3X-long deep groove R 0,25 mm sapphire	**12AAL043 - Stylus shank** for mounting M2 - CMM stylus	**12AAL044 - Stylus shank groove** for mounting M2 - CMM stylus
12AAL045 - Stylus shank 2X groove for mounting M2 - CMM stylus		

Standard accessories
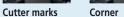
No.	Description
12AAL021	Standard stylus

Optional accessories

No.	Description
12AAL022	Stylus for notches, Ø3 mm, tungsten carbide
12AAL023	Stylus for deep groove, R 0,25 mm, Sapphire
12AAL024	Stylus for corner, R 0,25 mm, Sapphire
12AAL025	Stylus for cutter marks, R 15 mm, tungsten carbide
12AAL026	Stylus for small holes, Ø0,8 mm, tungsten carbide
12AAL027	Stylus for small holes, Ø1 mm, tungsten carbide
12AAL028	Stylus for small holes, Ø1,6 mm, tungsten carbide
12AAL029	Stylus for extra small hole, Ø0,5 mm, tungsten carbide
12AAL030	Stylus ball type, Ø1,6 mm, tungsten carbide
12AAL031	Stylus disc type, Ø12 mm
12AAL032	Stylus for cranks, Ø0,5 mm, tungsten carbide
12AAL033	Stylus for cranks, Ø1 mm, tungsten carbide
12AAL034	Stylus for flat surface, tungsten carbide
12AAL035	Stylus 2X-long standard type, Ø1,6 mm, tungsten carbide[*1]
12AAL036	Stylus 2X-long type for notches, Ø3 mm, tungsten carbide[*1]
12AAL037	Stylus 2X-long type for deep grooves, R 0,25 mm, Sapphire[*1]
12AAL038	Stylus 2X-long type for corners, R 0,25 mm, Sapphire[*1]
12AAL039	Stylus 2X-long type for cutter marks, R 15 mm, tungsten carbide[*1]
12AAL040	Stylus 2X-long type for small hole, Ø1 mm, tungsten carbide[*1]
12AAL041	Stylus 3X-long standard type, Ø1,6 mm, tungsten carbide[*2]
12AAL042	Stylus 3X-long type for deep grooves, R 0,25 mm, Sapphire[*2]
12AAL043	Stylus shank, for mounting M2-CMM stylus
12AAL044	Stylus shank for grooves, for mounting M2-CMM stylus
12AAL045	Stylus shank 2X-long type for grooves, for mounting M2-CMM stylus[*1]

*1 Not available for RA-10, RA-120, RA-120P
*2 Measuring is only possible in the vertical direction

Notches   **Flat surface**

Cutter marks   **Corner**   **Small hole**

Optional Styli for Roundtest

Standard accessories

No.	Description
12AAE301	Stylus standard type for CNC, Ø1,6 mm, tungsten carbide
12AAE302	Stylus for flat surfaces for CNC, Ø1,6 mm, tungsten carbide

Optional accessories

No.	Description
12AAE303	Ball stylus for CNC, Ø1,6 mm, tungsten carbide
12AAE304	Ball stylus for CNC, Ø0,8 mm, tungsten carbide
12AAE305	Ball stylus for CNC, Ø0,5 mm, tungsten carbide
12AAE306	Stylus for deep holes, Ø1,6 mm, tungsten carbide
12AAE307	Stylus for deep holes, Ø1,6 mm, tungsten carbide
12AAE308	Stylus for deep grooves, Ø1,6 mm, tungsten carbide
12AAE309	Stylus for notches, Ø3,0 mm, tungsten carbide
12AAE310	Stylus for grooves, Ø1,6 mm, tungsten carbide

Interchangeable styli for RA-2200CNC, RA-H5200CNC, RA-6000CNC

12AAE301 - Standard
ø 1,6 mm tungsten carbide

12AAE302 - Flat surface
ø 1,6 mm tungsten carbide

12AAE303 - ø 1,6 mm ball
ø 1,6 mm tungsten carbide

12AAE304 - ø 0,8 mm ball
ø 0,8 mm tungsten carbide

12AAE305 - ø 0,5 mm ball
ø 0,5 mm tungsten carbide

12AAE306 - Deep hole
ø 1,6 mm tungsten carbide

12AAE307 - Deep hole
ø 1,6 mm tungsten carbide

12AAE308 - Deep groove
ø 1,6 mm tungsten carbide

12AAE309 - Notch
ø 3 mm tungsten carbide

12AAE310 - Groove
ø 1,6 mm tungsten carbide

Mitutoyo

Optional Accessories for Roundtest

Optional accessories for Roundtest and Roundtest Extreme

Auxiliary stage for a low-height workpiece

No.	Description
356038	Used for measuring a workpiece whose diameter is 40 mm or less and whose height is 20 mm or less

356038

Chuck - Quick chuck
This chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

No.	Holding capacity [mm]	External dimensions [mm]
211-032.	Internal jaw: ID = ø 16 - 69 External jaw: OD = ø 1 - 79	ø118 x 41

211-032

211-031

Chuck - Quick chuck
This Chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

No.	Holding capacity [mm]	External dimensions [mm]
211-031.	Internal jaw: ø 0,1 - 1,5	ø 118 x 48,5

Chuck - Three jaw chuck (key operated)

No.	Holding capacity [mm]	External dimensions [mm]
211-014	Internal jaw: ID = ø 25 - 68 Internal jaw: OD = ø 2 - 35 External jaw: OD = ø 35 - 78	ø157 x 70,6

211-014

Cylindric square

No.	Cylindricity [µm]	Perpendicularity [µm]	Straightness [µm]
350850	2	3	1

350850

997090

Gauge block set for calibration

No.	Description
997090	Standard accessory for RA-2200, RA-2200CNC Standard accessory for RA-H5200 and RA-H5200CNC

Magnification checking gauge

No.	Graduation [µm]
211-045	0,2

211-045

Origin point gauge

No.	Description
998382	Standard accessory for RA-1600, RA-2200 and RA-H5200

998382

Vibrator isolator and accessories

No.	External dimensions [mm]	Vibration isolation method	Description
178-025	(WxDxH) 750 x 550 x 59	Air suspension Diaphragm isolation system	For RA-2200 and RA-2200CNC
178-024	640 x 470 x 660		Stand for RA-2200 and RA-2200CNC
12AAL019	660 x 670 x 700		Side table
12AAK110	830 x 800 x 700		Vibration isolator
12AAK120			Monitor arm

178-025

12AAK110 + 12AAK120   12AAK110 + 12AAL019

Micro-Vickers Hardness HM-Series
Page 532

Vickers Hardness HV-Series
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Rockwell, Rockwell Superficial, Brinell
Page 542

Portable Hardness Tester
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Reference Material Blocks
Page 551

Micro-Vickers Hardness Testing Machines
HM-210/220

Series 810

This is a high performance hardness testing machine that uses advanced technology and is ideal for quality control.
The manual line up of the HM-200 Series has the following benefits:

- 144 mm (5,7 inch) colored touchsreen display (Type A) with higher visibility, easy to operate user interface
- Digimatic output for report creation.
- USB stick data export
- Electromagnetic test force generation system for higher accuracy.
- A high performance optical system provides a high quality image of the indentation load.
- A long working distance greatly reduces the possibility of collision.
- A range of six different objectives: 2x, 5x, 10X, 20X, 50X and 100X for measuring the indentation images.
- LED lighting gives you an observation image in natural colour, with better contrast, as well as longer operation.
- You can set different kinds of conditions on a touch panel, and display test results for easy operation.
- Vickers, Knoop and KC fracture toughness measurement.
- Test force ranges from 0,05g to 2kg.

Touchscreen type   **Software type**

Specifications

Indenter / Objective turret	Motor driven and manual operation
Data output Standard	RS-232C, Digimatic, USB 2 interface ISO 6507-2, JIS B 7725
XY stage [mm]	**Travel range system A + B**: 25 x 25 / 50 x 50 manual **Travel range system C + D :** 50 x 50 / 100 x 100 motorized
Arbitrary test force	1 type [Default: 245,2mN (25gf)]
Control panel	Built-in touch panel, 5,7" Color LCD (HM-210A/220A for System A), Control software (PC for System B/C/D)
External dimensions Main unit mass	System A: 315(W)×671(D) ×595(H)mm/38,5kg System B/C/D: 315(W)×586(D)×741(H)mm/37,4kg
Functions	Calculation of Vickers / Knoop*2 hardness, and ceramic fracture toughness based on IF method (JIS R1.697), 3 display format (standard, list, simple), GO/NG judgment, test condition guide, curve and user correction, hardness corresponding value, statistics calculation
Objective lens unit	Up to 4 pcs. mountable (one mounted 50X as standard)
Output	Digimatic, serial, USB2 series A (for memory)*1, USB2 B Type (for system communication)
Resolution of diagonal length of an indentation	Objective lens less than 50X: 0,1μm (Objective lens more than 50X: 0,01μm)
Specimen dimensions	System A/B: height 133mm, depth 160mm (when using manual XY stage 25X25) System C: height 112mm, depth 160mm, System D: height 72mm, depth 160mm
Test force control	Electromagnetic generation of force (force motor) and automatic control (load, duration, unload)
Turret drive	Motor-driven and manual operation

Power turret with 2 indenter mounts and 4 objective mounts

Hardness Testing Machines brochure on request

For a list of optional accessories, refer to the following page.
Hardness test blocks can be found in the Hardness Testing Machines brochure.

HM-210 Testforce range

No.	Test force									
HM-210	V.S.*	HV0,01	HV0,02	HV0,03	HV0,05	HV0,1	HV0,2	HV0,3	HV0,5	HV1
	mN	98,07	196,1	294,2	490,3	980,7	1.961	2.942	4.903	9.807
	(gf)	10	20	30	50	100	200	300	500	1.000
	*V.S. = Vickers scale									

HM-220 Testforce range

No.	Test force									
HM-220	V.S.*	HV0,00005	HV0,0001	HV0,0002	HV0,0003	HV0,0005	HV0,001	HV0,002	HV0,003	HV0,005	HV0,01
	mN	0,4903	0,9807	1.961	2.942	4,903	9,807	19,61	29,42	49,03	98,07
	(gf)	(0,05)	(0,1)	(0,2)	(0,3)	(0,5)	1	2	3	5	10
	V.S.*	HV0,02	HV0,03	HV0,05	HV0,1	HV0,2	HV0,3	HV0,5	HV1	HV2	
	mN	196,1	294,2	490,3	980,7	1.961	2.942	4.903	9.807	19.610	
	(gf)	20	30	50	100	200	300	500	1.000	2.000	
	*V.S. = Vickers Scale										

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Micro-Vickers Hardness Testing Machines HM-210/220

Manual or complete automatic testing

Optional accessories

No.	Description
63ETB601	500HV0,1 HTB Vickers ASTM E-92, with DAkkS certificate 30x30x6mm steel
63ETB606	750HV0,1 HTB Vickers ASTM E-92, with DAkkS certificate 30x30x6mm steel
63ETB635	500HV0,3 HTB Vickers ISO 6507-3, with DAkkS certificate 30x30x6mm steel
63ETB640	750HV0,3 HTB Vickers ISO 6507-3, with DAkkS certificate 30x30x6mm steel
63ETB670	500HV1 HTB Vickers ISO 6507-3, with DAkkS certificate 30x30x6mm steel
63ETB675	750HV1 HTB Vickers ISO 6507-3, with DAkkS certificate 30x30x6mm steel
810-017	Special vise, (opening width 100mm)
810-013	Sheet specimen table
810-014	Thin specimen table, (horizontal type)
810-015	Thin specimen table, (vertical type)
810-019	Tilting specimen table
810-020	Adjustable specimen holder, Ø15-30mm
810-018	Rotary table, 360°
810-084	Rotatable adjustable specimen table, Ø15-30mm / 360°
810-085	Sheet specimen table
810-095	Rotary tilting specimen table, vise Ø15-50mm
375-056	Calibration Micro Scale
810-650-1	Resin mold specimen table, Ø25.4 mm
810-650-2	Resin mold specimen table, Ø30 mm
810-650-3	Resin mold specimen table, Ø31.75 mm
810-650-4	Resin mold specimen table, Ø38.1 mm
810-650-5	Specimen holder f. resin molded specimen, 1 specimen Ø40 mm
02ATE760	Table, QV-E/QS
810-641	Vibration Isolator, (for testing machine)

Code number	Description
63AAA356	HDMI camera
11AAC729	C-mount
NEC EA241WM	24" monitor

System A

HM-210A/HM-220A

Features:
- **Touch-panel operation**
- **Measurement of indentation dimensions using a measuring microscope**
- **Positioning using a manual XY stage**

System C

HM-210C/HM-220C

Features:
- **Operated using AVPAK-20**
- **Automatic indentation reading**
- **Automatic positioning with motorized XY stage**

Vickers HDMI camera system
(To be used with manual Vickers testing machines)
The 1/3" 1.2 Mpixel HDMI camera and a 24"standard monitor enables observation and measurement of indentations at high magnification, thereby reducing operator error. Additionally, images can be stored on the included 16GB SD card. No PC needed due to built in processor. Scope of delivery includes HDMI cable and wireless mouse. Please order 63AAA356, 11AAC729 and NEC EA21N for complete set.

System B

HM-210B/HM-220B
Automatic measurement by AVPAK-20 eliminates operator measurement errors.

Features:
- **Operation using AVPAK-20**
- **Automatic measurement of indentations**
- **Positioning using a manual XY stage**
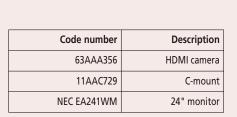
System D

HM-210D/HM-220D
Top-end model with autofocus

Features:
- **Operated using AVPAK-20**
- **Automatic identation reading**
- **Automatic positioning with motorized XY stage**
- **Autofocusing**

AVPAK-20 software 11AAC666 for automatic hardness testing systems.
Software that supports control, testing and report creation related to hardness testing. Supports parameter setting and automatic measurement.

High-functionality PC and TFT monitor Compatible with Windows® 10 Professional. Supports a wide-screen TFT and provides improved operability.
***depending the version**

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Micro-Vickers Hardness Testing Machines HM-210/220

Configuration

Up to three additional objective lenses can be added

TOUCH SCREEN MODELS — SYSTEM A

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HM-210 SYSTEM A — Main unit standard test force	810-401D	Video camera unit	810-454D	
Manual XY stage 25 x 25mm	810-420	Objective lens 2X	11AAC104	
		Objective lens 5X	11AAC105	
HM-210 SYSTEM A — Main unit standard test force	810-401D	Objective lens 10X	11AAC106	
Manual XY stage 50 x 50mm	810-423	Objective lens 20X	11AAC107	
		Objective lens 100X	11AAC108	
		Indenter shaft unit	11AAC109	with 19BAA061 Knoop indenter
HM-220 SYSTEM A — Main unit low test force	810-406D	Video camera unit	810-454D	
Manual XY stage 25 x 25mm	810-420	Objective lens 2X	11AAC104	
		Objective lens 5X	11AAC105	
HM-220 SYSTEM A — Main unit low test force	810-406D	Objective lens 10X	11AAC106	
Manual XY stage 50 x 50mm	810-423	Objective lens 20X	11AAC107	
		Objective lens 100X	11AAC108	
		Indenter shaft unit	11AAC110	with 19BAA062 Knoop indenter

SOFTWARE MODELS — SYSTEM B

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HM-210 SYSTEM B — Main unit standard test force	810-404D	Objective lens 2X	11AAC104	
Manual XY stage 25 x 25mm	810-420	Objective lens 5X	11AAC105	
AVPAK-20*	11AAC666	Objective lens 10X	11AAC106	
		Objective lens 20X	11AAC107	
HM-210 SYSTEM B — Main unit standard test force	810-404D	Objective lens 100X	11AAC108	
Manual XY stage 50 x 50mm	810-423	Indenter shaft unit	11AAC109	with 19BAA061 Knoop indenter
AVPAK-20*	11AAC666	Measuring microscope	11AAC129	
HM-220 SYSTEM B — Main unit low test force	810-409D	Objective lens 2X	11AAC104	
Manual XY stage 25 x 25mm	810-420	Objective lens 5X	11AAC105	
AVPAK-20*	11AAC666	Objective lens 10X	11AAC106	
		Objective lens 20X	11AAC107	
HM-220 SYSTEM B — Main unit low test force	810-409D	Objective lens 100X	11AAC108	
Manual XY stage 50 x 50mm	810-423	Indenter shaft unit	11AAC110	with 19BAA062 Knoop indenter
AVPAK-20*	11AAC666	Measuring microscope	11AAC129	

SOFTWARE MODELS — SYSTEM C

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HM-210 SYSTEM C — Main unit standard test force	810-404D	Objective lens 2X	11AAC104	
Motorized XY stage 50 x 50mm	810-461D	Objective lens 5X	11AAC105	
AVPAK-20*	11AAC666	Objective lens 10X	11AAC106	
		Objective lens 20X	11AAC107	
HM-210 SYSTEM C — Main unit standard test force	810-404D	Objective lens 100X	11AAC108	
Motorized XY stage 100 x 100mm	810-462D	Indenter shaft unit	11AAC109	with 19BAA061 Knoop indenter
AVPAK-20*	11AAC666	Measuring microscope	11AAC129	
HM-220 SYSTEM C — Main unit low test force	810-409D	Objective lens 2X	11AAC104	
Motorized XY stage 50 x 50mm	810-461D	Objective lens 5X	11AAC105	
AVPAK-20*	11AAC666	Objective lens 10X	11AAC106	
		Objective lens 20X	11AAC107	
HM-220 SYSTEM C — Main unit low test force	810-409D	Objective lens 100X	11AAC108	
Motorized XY stage 100 x 100mm	810-462D	Indenter shaft unit	11AAC110	with 19BAA062 Knoop indenter
AVPAK-20*	11AAC666	Measuring microscope	11AAC129	

SOFTWARE MODELS — SYSTEM D

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HM-210 SYSTEM D — Main unit standard test force	810-404D	Objective lens 2X	11AAC104	
Motorized XY stage 50 x 50mm	810-461D	Objective lens 5X	11AAC105	
Auto Focus stage unit	810-465	Objective lens 10X	11AAC106	
AVPAK-20*	11AAC666	Objective lens 20X	11AAC107	
		Objective lens 100X	11AAC108	
HM-210 SYSTEM D — Main unit standard test force	810-404D	Indenter shaft unit	11AAC109	with 19BAA061 Knoop indenter
Motorized XY stage 100 x 100mm	810-462D	Measuring microscope	11AAC129	
Auto Focus stage unit	810-465			
AVPAK-20*	11AAC666			
HM-220 SYSTEM D — Main unit low test force	810-409D	Objective lens 2X	11AAC104	
Motorized XY stage 50 x 50mm	810-461D	Objective lens 5X	11AAC105	
Auto Focus stage unit	810-465	Objective lens 10X	11AAC106	
AVPAK-20*	11AAC666	Objective lens 20X	11AAC107	
		Objective lens 100X	11AAC108	
HM-220 SYSTEM D — Main unit low test force	810-409D	Indenter shaft unit	11AAC110	with 19BAA062 Knoop indenter
Motorized XY stage 100 x 100mm	810-462D	Measuring microscope	11AAC129	
Auto Focus stage unit	810-465			
AVPAK-20*	11AAC666			

* The above set does not include PC.

For all systems: 50 x objective as standard.

Observation image of the indentation (50X)
Stray light reduction around the indentation

Wide range of lenses available for different magnifications

Objectives	Vickers-Scale		
	HV 0,00005 - 0,02	HV 0,2 - 1	HV 1-2
2x	Use this objectives only for probe overview		
5x	Use this objectives only for probe overview		
10x			
20x			
50x			
100x			
10x objective for easy focus			
Use this table for first orientation			

Micro-Vickers Hardness Testing Machines
HM-210/220

Configuration

A   B   C   D

Single indenter configuration HM-200 A-Type sets

Contains:	810-401D-ASET HM-210A
810-401D	Manual main unit HM-210
11AAC106	10x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Contains:	810-406D-ASET HM-220A
810-406D	Manual main unit HM-220
11AAC106	10x Objective lens
11AAC108	100x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Single indenter configuration HM-200 B-Type sets

Contains:	810-404D-BSET1 HM-210B
810-404D	System main unit HM-210
11AAC106	10x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Contains:	810-409D-BSET1 HM-220B
810-409D	System main unit HM-220
11AAC106	10x Objective lens
11AAC108	100x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Double indenter configuration HM-200 B-Type sets

Contains:	810-404D-BSET2 HM-210B
810-404D	System main unit HM-210
11AAC109	Second indenter shaft unit for Knoop test
11AAC106	10x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Contains:	810-409D-BSET2 HM-220B
810-409D	System main unit HM-220
11AAC110	Second indenter shaft unit for Knoop test
11AAC106	10x Objective lens
11AAC108	100x Objective lens
Standard lens	50x Objective lens
810-420	Manual XY stage 25x25mm

810-016 vise not included

Single indenter configuration HM-200 C-Type sets

Contains:	810-404D-CSET HM-210C
810-404D	System main unit HM-210
11AAC104	2x Objective lens
11AAC106	10x Objective lens
Standard lens	50x Objective lens
810-462D	Motorized XY stage 100x100mm

810-016 vise not included

Contains:	810-409D-CSET HM-220C
810-409D	System main unit HM-220
11AAC104	2x Objective lens
11AAC106	10x Objective lens
11AAC108	100x Objective lens
Standard lens	50x Objective lens
810-462D	Motorized XY stage 100x100mm

810-016 vise not included

Single indenter configuration HM-200 D-Type sets

Contains:	810-404D-DSET HM-210D
810-404D	System main unit HM-210
11AAC104	2x Objective lens
11AAC106	10x Objective lens
Standard lens	50x Objective lens
810-462D	Motorized XY stage 100x100mm
810-465	Autofocus unit

Contains:	810-409D-DSET HM-220D
810-409D	System main unit HM-220
11AAC104	2x Objective lens
11AAC106	10x Objective lens
11AAC108	100x Objective lens
Standard lens	50x Objective lens
810-462D	Motorized XY stage 100x100mm
810-465	Autofocus unit

810-016 vise not included

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Vickers Hardness Testing Machine HV-110/120

Series 810

The manual line up of the HV-100 Series has the following benefits:
- 144 mm (5,7 inch) colored touchsreen display (Type A) with higher visibility, easy to operate user interface
- Digimatic output for report creation.
- USB stick data export
- Electronic test force change.
- Max. specimen height up to 210mm
- LED illumination for best image.
- High number of accessories
- Vickers, Knoop, Brinell and KC fracture toughness measurement.
- Supports Brinelltest up to 62,5KG with an optional test force weight.

Manual type A   **Software type D**

HV-110 Testing force range

No.	Test force							
	V.S.*	HV1	HV2	HV3	HV5	HV10	HV20	HV30	HV50
HV-110	N	9,807	19,61	29,42	49,03	98,07	196,1	294,2	490,3
	(kgf)	1	2	3	5	10	20	30	50
	*V.S. = Vickers Scale								

HV-120 Testing force range

No.	Test force							
	V.S.*	HV0,3	HV0,5	HV1	HV2,5	HV5	HV10	HV20	HV30
HV-120	N	2,942	4,903	9,807	24,51	49,03	98,07	196,1	294,2
	(kgf)	0,3	0,5	1	2,5	5	10	20	30
	*V.S. = Vickers Scale								

Scan QR Code with your mobile device and watch our product videos on YouTube

Specifications

External dimensions [mm]	System A: 307(W)×696(D) ×786(H)mm System B/C/D: 307(W) ×627(D)×875(H)mm
Objective lens	Up to 3 pcs. mountable (one standard lens 10X mounted as standard)
Load control	Automatic (load, dwell, unload)
Force dwell time	5-999 sec (selectable)
Optical system	Infinity corrected optical system
Illumination unit	LED light
Standard	JIS B 7725, ISO 6507-2
Data output	RS-232C, Digimatic, USB 2. 0 interface
Indenter approach speed	60 µm/s, 150 µm/s selectable
Working distance	50X = 2,5 mm (other objectives available)
Mass	43 kg
Control panel	Built-in touch panel, 5,7" Color LCD (HM-110A/120A for System A), Control software (PC for System B/C/D)
Functions	Calculation of Vickers / Knoop*2 / Brinell*3 hardness, and ceramic fracture toughness based on IF method (JIS R1.697), 3 display format (standard, list, simple), GO/NG judgment, test condition guide, curve and user correction, hardness corresponding value, statistics calculation
Main unit mass	HV-110: Approx. 60kg, HV-120: Approx. 58kg
Output	Digimatic, serial, USB2 series A (for memory)*1, USB2 B Type (for system communication)
Resolution of diagonal length of an indentation	Objective lens less than 50X: 0,1µm (Objective lens more than 50X: 0,01µm)
Specimen dimensions	System A: height 210mm, depth 170mm (when using flat anvil) System B: height 181mm, depth 170mm (when using manual XY stage 50X50mm) System C: height 172mm, depth 170mm, System D: height 132mm, depth 170mm
Test force control	Lever method and automatic control (load, duration, unload)
Turret drive	Motor driven and manual operation

Hardness Testing Machines brochure on request

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Vickers Hardness Testing Machine HV-110/120

Manual or complete automatic testing

Optional accessories

No.	Description
63DIA011	Diamond Indenter Vickers HV 0,2, DIN EN ISO 6507-2 with DAkkS certificate, HV-100 Series, HV-112, HV-114, AVK Series
63ETB775	750HV1 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB749	500HV10 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB754	750HV10 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB875	500HV20 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB880	750HV20 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB897	500HV30 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
63ETB902	750HV30 HTB Vickers ISO 6507-3, with DAkkS certificate 60x60x16mm steel
810-038	Round table, Ø250 mm
810-040	V-anvil, groove length 40 mm, Ø15 mm-Ø60 mm
810-041	V-anvil, groove length 40 mm, Ø3 mm-Ø9 mm
810-423	Manual XY stage w. digital micrometers, 50x50mm HM-200 and HV-100 Series
11AAC702	Vickers hardness testing machines, Steel stand for HV-100 Series machine
11AAC719	Vickers hardness testing machines, Vibration isolator stand HV-100 Series
810-644	Adittional rack for 11AAC719

Vickers HDMI camera system

Code number	Description
63AAA356	HDMI camera
11AAC729	C-mount
NEC EA241WM	24" monitor
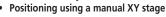
System A

HV-110A/HV-120A

Features:
- **144 mm** (5.7 inch) color LCD display
- 3 types of display styles settable
- Equipped measuring microscope allows diagonal length measurement by visual observation
- Positioning using a manual XY stage

System B

HV-110B/HV-120B

Features:
- Operation using highly functional AVPAK-20 software
- Light intensity of LED illumination adjusted with aperture or AVPAK-20
- Positioning using a manual XY stage

System C

HV-110C/HV-120C

Features:
- Operation using highly functional AVPAK-20 software
- Light intensity of the LED illumination adjusted with aperture diaphragm or through AVPAK-20
- Automatic indentation reading
- Automatic positioning using motorized XY stage

System D

HV-110D/HV-120D

Features:
- Operation using highly functional AVPAK-20 software
- Light intensity of the LED illumination adjusted with aperture diaphragm or through AVPAK-20
- Automatic positioning with motorized XY stage
- Auto focussing

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Vickers Hardness Testing Machine HV-110/120

Configuration

Two additional objective lenses can be selected

TOUCH SCREEN MODELS — SYSTEM A

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HV-110 SYSTEM A				
Main unit standard test force	810-440D	Video camera unit	810-454D	
Manual XY stage 50 x 50mm	810-423	Objective lens 2X	11AAC712	
		Objective lens 5X	11AAC713	
		Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	
HV-120 SYSTEM A				
Main unit low test force	810-445D	Video camera unit	810-454D	
Manual XY stage 50X50 mm	810-423	Objective lens 2X	11AAC712	
		Objective lens 5X	11AAC713	
		Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	

SOFTWARE MODELS — SYSTEM B

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HV-110 SYSTEM B				
Main unit standard test force	810-443D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Manual XY stage 50 x 50mm	810-423	Objective lens 2X	11AAC712	
AVPAK-20*	11AAC666	Objective lens 5X	11AAC713	
		Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	
HV-120 SYSTEM B				
Main unit low test force	810-448D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Manual XY stage 50 x 50mm	810-423	Objective lens 2X	11AAC712	
AVPAK-20*	11AAC666	Objective lens 5X	11AAC713	
		Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	

SOFTWARE MODELS — SYSTEM C

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HV-110 SYSTEM C				
Main unit standard test force	810-443D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Motorized XY stage 50 x 50mm	810-451	Objective lens 2X	11AAC712	
AVPAK-20*	11AAC666	Objective lens 5X	11AAC713	
HV-110 SYSTEM C		Objective lens 20X	11AAC714	
Main unit standard test force	810-433D	Objective lens 50X	11AAC715	
Motorized XY stage 100 x 100mm	810-452D			
AVPAK-20*	11AAC666			
HV-120 SYSTEM C				
Main unit low test force	810-448D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Motorized XY stage 50 x 50mm	810-451D	Objective lens 2X	11AAC712	
AVPAK-20*	11AAC666	Objective lens 5X	11AAC713	
HV-120 SYSTEM C		Objective lens 20X	11AAC714	
Main unit standard test force	810-433D	Objective lens 50X	11AAC715	
Motorized XY stage 100 x 100mm	810-452D			
AVPAK-20*	11AAC666			

SOFTWARE MODELS — SYSTEM D

Minimum system configuration		In addition selectable FACTORY OPTIONS		Remarks
HV-110 SYSTEM D				
Main unit standard test force	810-443D	Video camera unit	810-454D	
Motorized XY stage 50 x 50mm	810-451D	Objective lens 2X	11AAC712	
Auto Focus stage unit	810-465	Objective lens 5X	11AAC713	
AVPAK-20*	11AAC666	Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	
HV-110 SYSTEM D				
Main unit standard test force	810-443D	Objective lens 100X	11AAC716	
Motorized XY stage 100 x 100mm	810-452D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Auto Focus stage unit	810-465			
AVPAK-20*	11AAC666			
HV-120 SYSTEM D				
Main unit low test force	810-448D	Video camera unit	810-454D	
Motorized XY stage 50 x 50mm	810-451D	Objective lens 2X	11AAC712	
Auto Focus stage unit	810-465	Objective lens 5X	11AAC713	
AVPAK-20*	11AAC666	Objective lens 20X	11AAC714	
		Objective lens 50X	11AAC715	
HV-120 SYSTEM D		Objective lens 100X	11AAC716	
Main unit low test force	810-448D	Measuring microscope	11AAC718	Cannot be used simultaneously with the vision unit
Motorized XY stage 100 x 100mm	810-452D			
Auto Focus stage unit	810-465			
AVPAK-20*	11AAC666			

* The above set does not include PC.

For all systems: 10 x objective as standard.
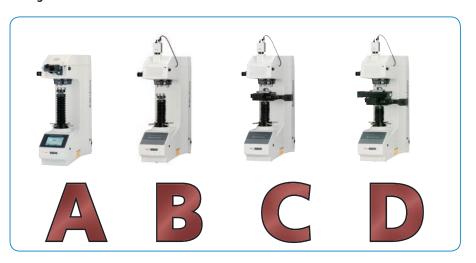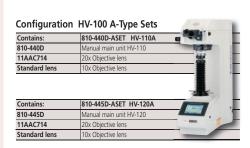
Micro-Vickers and Vickers Set
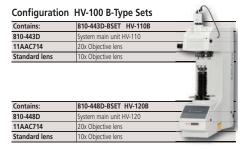
All items listed below the set code number are included in the scope of delivery.

Configuration

A B C D

Configuration HV-100 A-Type Sets

Contains:	810-440D-ASET HV-110A
810-440D	Manual main unit HV-110
11AAC714	20x Objective lens
Standard lens	10x Objective lens

Contains:	810-445D-ASET HV-120A
810-445D	Manual main unit HV-120
11AAC714	20x Objective lens
Standard lens	10x Objective lens

Configuration HV-100 B-Type Sets

Contains:	810-443D-BSET HV-110B
810-443D	System main unit HV-110
11AAC714	20x Objective lens
Standard lens	10x Objective lens

Contains:	810-448D-BSET HV-120B
810-448D	System main unit HV-120
11AAC714	20x Objective lens
Standard lens	10x Objective lens

Configuration HV-100 C-Type Sets

Contains:	810-443D-CSET HV-110C
810-443D	System main unit HV-110
11AAC712	2x Objective lens
11AAC714	20x Objective lens
Standard lens	10x Objective lens
810-462D	Motorized XY stage 100x100mm

810-016 vise not included

Contains:	810-448D-CSET HV-120C
810-448D	System main unit HV-120
11AAC712	2x Objective lens
11AAC714	20x Objective lens
Standard lens	10x Objective lens
810-462D	Motorized XY stage 100x100mm

810-016 vise not included

Configuration HV-100 D-Type Sets

Contains:	810-443D-DSET HV-110D
810-443D	System main unit HV-110
11AAC712	2x Objective lens
11AAC714	20x Objective lens
Standard lens	10x Objective lens
810-462D	Motorized XY stage 100x100mm
810-465	Autofocus unit

810-016 vise not included

Contains:	810-448D-DSET HV-120D
810-448D	System main unit HV-120
11AAC712	2x Objective lens
11AAC714	20x Objective lens
Standard lens	10x Objective lens
810-462D	Motorized XY stage 100x100mm
810-465	Autofocus unit

810-016 vise not included

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Vickers Hardness Testing Software

Software AVPAK-20 for System B,C and D No. 11AAC666

Software to control test sequence, evaluate hardness and make report
Supports Windows® 10, 64 bit operating system
.
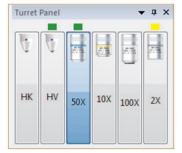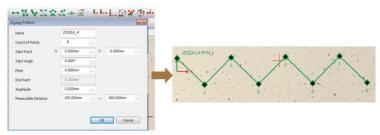
Automatic and manual video line measurement of indentation diagonals

Turret control function with color indicator
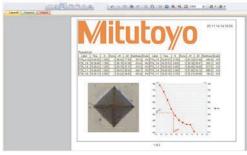
Test pattern function
Operator friendly presets of test patterns (line, zigzag, grid or circle/ arc) with adjustable indentation spacings. Additionally patterns can be combined or test points can be set freely as a teach in pattern.

Coordinate alignment function
Several test pattern alignment methods (1-point, 2-points, 3-points, arc, and centre of circle, bisector, midpoint) are available to place the pattern in the correct position. The automatic contour recognition allows to place indentations in accordance with the obtained contour or a specified excerpt from the contour. Therefore lines, patterns or a matrix of indentations can be placed accordingly.

Analysis and report function
Provides to display several types of graph (carburise transition, carburize distribution, X-R control chart) and layouts. It is possible to edit these graphs on the report. Tracebility comments, indentation images and tables of test data can be inserted as well.

Overview image generation

Stage control function

Functions

Stitching
Generates specimen overview images by stitching several images together. Indentation patterns can be placed on the overview image precisely and easily. (motorized XY stage is required)

Automatic indentation measurement
Automatically measure the indentation's diagonal lengths according EN ISO 6507-1

Illumination control
Set the illumination level manually or automatically according to the specimen surface. Additionally display the saturation on the camera image

Stage control function
Control the motorized XY stage unit (for C- and D-Types) and the autofocus stage unit (type D) by the virtual joystick on the AVPAK-20 window. (Hardware joystick box is always included in the motorized XY stage's scope of delivery) Insert XY positioning steps in your part program and store 5 settable postions.

Turret control function
Choose and change the Objective lens on the turret panel. Green colour marks indicate the indenter and objective lenses that are set for measurement in the software. The objective lens set for overview image stitching is marked in yellow.

Automatic execution function
Record any kind of operation, store and rerun as part programs.
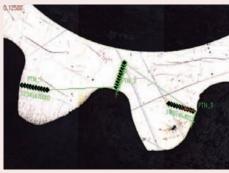
Vickers Hardness Testing Software

Software AVPAK-20 for System B, C and D

Graphic view (of stored images)
For displaying the specimen overview images and checking the pattern positioning The digital zoom function can be used to easily magnify and check the indentation site.

FUNCTIONS

Layout view
Indentation images, graphs, tables, etc., can be laid out freely to create the report in need.

Stitching
Takes images of an entire rectangular field from the moving stage then combines the images. Use stitching for a complete overview of sample.
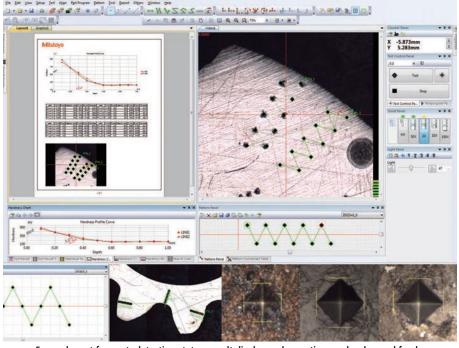
Auto trace
Automatically traces the shape of the sample. Take images as the stage moves along the outer contours of the specimen, then combines the images.

Navigation function for the manual XY stage
(System B)
When the test position is to be moved during multipoint testing (CHD etc.), this function guides the positioning of the manual XY fine adjustment stage to the next position by pop up on screen menu. User positioning errors are reduced drastically

Screen layout for control, testing status, result display and reporting can be changed freely.

Handling of multiple specimens
Part program and Part Manager function support testing of multiple and irregular specimens.

Multi-specimen testing
Executes different part programs for each irregular specimen.

Parts Manager:
Executes a common part program for specimens having the same shape. parts can be arranged in grid positions.

Pattern creation:
This tool supports the creation of test patterns such as straight lines, zigzag lines and teaching patterns.

Pattern pasting :
This tool supports the pasting of created test patterns by applying a coordinate system. It adjusts the origin, direction, etc. of the before created pattern. Works coordinate systems for complex applications can be generated.

Rockwell HR-100/200/300/400

Series 963

These are five economical Rockwell hardness testing machines to suit practically every application you need.
The Rockwell HR-100/200/300/400 offers you the following benefits:
- The newly designed frame provides maximum clearance for positioning the work piece, all you need is a flat table for mounting these testing machines.
- They are very simple to operate: the analogue types HR-110/HR-210 use an automatic presetting dial gauge.
- HR-110MR does not require a power source, and is considered to be environmentally friendly.
- Digital models HR-430MR/MS use automatic steering wheel braking and load sequencing for easy handling.
- Digital models HR-320MS and HR-430MR/MS can use our Digimatic Mini-processor (DP-1VR) for printing results, and you can use an input tool (USB-ITN-E) to connect to a PC for data transfer, analysis and storage.
- You can perform Brinell hardness tests by using the following optional accessories:
  a Brinell indenter, a weight set and a measurement microscope.

Analog

Model	HR-110MR	HR-210MR
No.	963-210-20	963-220D
Preliminary test force (N)	98,07	98,07
Test force Superficial (N)	-	-
Test force Rockwell (N)	588,4; 980,7; 1471	588,4; 980,7; 1471
Display	Analog	Analog
Preliminary test force setting	-	-
Resolution	0,5 HR graduation	0,5 HR graduation
Test force selection	Weight exchange	Weight exchange
Test force application	Manual	Semi-automatic
Test force duration	Manual	Fixed 3-5-5 sec. or manual

Digital

Model	HR-320MS	HR-430MR	HR-430MS
No.	963-231D	963-240D	963-241D
Preliminary test force (N)	29,42; 98,07	98,07	29,42; 98,07
Test force Superficial (N)	147,1; 294,2; 441,3	-	147,1; 294,2; 441,3
Test force Rockwell (N)	588,4; 980,7; 1471	588,4; 980,7; 1471	588,4; 980,7; 1471
Display	Digital	Digital	Digital
Preliminary test force setting	-	Dial switching	Dial switching
Resolution	0,1 HR indication	0,1 HR indication	0,1 HR indication
Test force selection	Weight exchange	Dial switching	Dial switching
Test force application	Semi-Automatic	Automatic	Automatic
Test force duration	Fixed 3-5-5 sec. or manual	1-99 sec or manual	1-99 sec or manual
Data output	Digimatic (SPC), RS-232C	Digimatic (SPC), RS-232C	Digimatic (SPC), RS-232C

Specifications

Standard	ISO 6508-2; ASTM E18; JIS B 7726;
Height	Max. 180 mm (100 if cover is attached) mm
Measuring depth	Max. 165 mm (from the center of the endenter axis)
Functions	HR-320MS, HR-430MR, HR-430MS : GO/NG, Compensation fubction, Hardness conversion

Optional accessories

No.	Description
56AAK286B	Brinell weight set, HR-110MR HR-210MR 3pcs.
56AAK287B	Brinell weight set, HR-320MS 4pcs.
56AAK288B	Brinell weight set, HR-430MR 3pcs.
56AAK289B	Brinell weight set, HR-430MS 4pcs.
810-037	Round table, Ø180 mm
810-038	Round table, Ø250 mm
19BAA161D	Portable Microscope, 20x for Brinell measurement
Anvils	
810-030	Diamond spot anvil, for Rockwell Superficial scales Ø3.5 mm
810-027	Hardness testing machines, Adjustable support for long workpieces
810-029	V-anvil, groove length 400 mm, Ø50 mm- Ø100 mm
810-026	Fine feed adjustment stage, for Jominy test(end quench test)specimen
810-028	Hardness testing machines, Height adjustable jack rest
810-040	V-anvil, groove length 40 mm, Ø15 mm- Ø60 mm
810-043	Spot Anvil, Spot Ø12 mm
810-041	V-anvil, groove length 40 mm, Ø3 mm- Ø9 mm
810-044	Stepped spot Anvil, Spot Ø5.5 mm, step height 13 mm
810-042	Stepped V-anvil, step height 13 mm, groove length 10 mm, Ø4mm- Ø16 mm
810-048	Steel table, for Rockwell hardness testing machines
Computer accessories (not HR-110, HR-210)	
06AFM380E	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Round 6-Pin Type
937387	Digimatic Cable, Round 6-Pin Type, 1m
965013	Digimatic Cable, Round 6-Pin Type, 2m
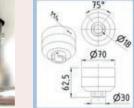
For identers and Hardness test blocks see chapter Hardness Test Blocks

Rockwell HR-100/200/300/400

K543817
Workpiece clamping device for:
HR-110MR
HR-210MR
HR-430MR

HR-110MR and HR-210MR dial gauge
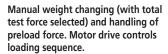
HR-110MR
Rockwell hardness testing machine

An environmentally friendly energy-saving model.
The basic operation is all manual, including weight-changing (total test force selection).

HR-210MR
Rockwell hardness testing machine

Manual weight changing (with total test force selected) and handling of preload force. Motor drive controls loading sequence.

HR-320MS

Dual type (Rockwell / Rockwell Superficial) hardness testing machine:

Manually handles test force and preload force selection.
Motor drive controls loading sequence.

HR-430MR
Rockwell hardness testing machine:

Economy type, but supports dial switching, power steering and support of all test standards and is equipped with automatic brake handle auto start feature.
Motor drive controls loading sequence.

HR-430MS

Dual type (Rockwell / Rockwell Superficial) hardness testing machine:

Economy type, but supports dial switching, power steering and support of all test standards and is equipped with automatic brake handle auto start feature.
Motor drive controls loading sequence.

SPC Digimatic and RS-232C interface

HR-300-400 digital display

HR-400 Automatic preliminary test force brake

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Rockwell HR-100/200/300/400

Series 963

Additional product description and accessories for HR-100/200/300/400 Series

810-038
Round table OD Ø250 mm

For large probes
like profiles

810-037
Round table OD Ø180 mm

For large probes
like profiles

810-040
V-anvil (large)
(OD Ø40 mm, groove width 30 mm)
For shaft material (max Ø60 mm)

810-043
Spot anvil

(OD Ø12 mm)

810-041
V-anvil (small)
(OD Ø 40 mm, groove width 6 mm)
For shaft material (max. Ø8.4 mm)

810-044
Spot anvil
(OD Ø5.5 mm)
For plate material

810-027
Variable rest

Test of long object probes (used together with anvil)

810-029
**Special V-anvil (Length 400 mm,
groove width 50 mm)**

For shaft material
(max. Ø100 mm)

810-026
**Micromovement table for
Jominy test**

JIS G 0561
Steel hardenability test

810-030
Diamond spot anvil
(OD Ø10 mm)
For plate material
Exclusive use for Rockwell superficial hardness test

810-042
Small V-anvil
(OD Ø10 mm)
For shaft material (max. Ø16 mm)

810-028
Jack rest

Testing of long object probes
(used together with anvil
or round table)

810-048
**Mount for testing
machine**

300
700
400
554

264-504-5
Digimatic miniprocessor DP-1VR
Connecting cable not included (sold separately),
please order separately. Connecting cable (1 m),
part No. 937387

06AFM380E
**USB input tool
Direct USB-ITN**

Easy data input to PC

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Rockwell, Rockwell Superficial, Brinell Hardness Tester HR-530

Series 810

The HR-530 series offers five different hardness testing methods: Rockwell, Rockwell Superficial, Brinell, Brinell Depth Measurement and Plastic Testing in a single unit.

This makes it a versatile tool ready to tackle tasks in production, goods inwards inspection and quality control in general.

- A real time unique electronic test force control system is built into the compact body along with an electronic force gage. The test force control prevents the system from applying too much test force at the point of reaching total testforce.
- Real time force control provides accurate test force generation and stable time cycle sequences conform to ISO standards.
- The serial measurement mode enables fast execution of a high numbers of tests on identical workpieces.
- A magnet brake system stops the spindle movement immediately at sensing of workpiece contact. This enables the HR-530 to perform semi automatic test sequences, eliminating the user influence.
- The lever indenter arm design enables not only interior and exterior measurements but also an excellent specimen surface overview. The functionality is furthermore enhanced by an LED workroom illumination.
- The unique lever arm design allows testing at inside positions without cutting the specimen. The minimum diameter that can be entered by the lever arm with the standard diamond indenter supplied with the machine is 35 mm.
- The optional short type diamond indenter (Part No. 63DIA007) additionally enables inside testing from Ø22 mm.
- HR-530L long type with an optional max. specimen height of 395 mm.

Specifications

Functions	• Conversion function [HV, HK, HR (Rockwell hardness A, B, C, D, F, G / Rockwell Superficial 15T, 30T, 45T, 15N, 30N, 45N), HS, HB, tensile strength] • GO/NG judgment function Serial test function (for specimens of the same thickness) • Cylindrical correction, spherical correction, offset correction, multi-point correction functions • Statistical calculation function • Graph generation function (X-R control charts)
Preliminary test force	29,42; 98,07 N
Power supply	AC100V, 120V, 220V, 240V Auto-selection
Statistic function	Maximum value, minimum value, mean value, standard deviation, upper limit, lower limit, GO count, range, NG count
Test force setting	By software setting
Table lifting	Manual (automatic breaking and load sequencing)
Standard	ISO 6508; JIS 7726; ISO 6506, JIS 7726; ISO 2039-2, ASTM D785, JIS K 7202; VDI/VDE 2616-1
Load control	Automatic (load/hold/unload)
Max. specimen depth	150 mm
Brinell Scale [N]	61,29; 98,07; 153,2; 245,2; 294,2; 306,5; 612,9; 980,7; 1226; 1839 N
Data output	RS-232C Digimatic, USB2
Force dwell time	1-120s (Selectable in units of 1s)

Standard accessories

No.	Description
19BAA073	Rockwell diamond indenter, HRC HRA
11AAD465	Rockwell carbide ball indenter ø1,5875mm, for Rockwell test method, Marked with Serial No., w/o certificate
810-039	Flat anvil, Ø64 mm
810-042	Stepped V-anvil, step height 13 mm, groove length 10 mm, Ø4mm- Ø16 mm
383876	Cover, Vinyl cover for PJ-3010F projector

HR-530 (No. 810-236)

Maximum workpiece size:
Height 250 mm
Depth 150 mm

HR-530L (No. 810-336)

Maximum workpiece size:
Height 395 mm
Depth 150 mm

545

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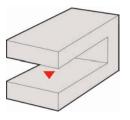
Rockwell, Rockwell Superficial, Brinell Hardness Tester HR-530
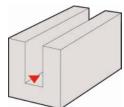
Metric — HR-530

No.	Rockwell Scale Diamond	Rockwell Scale Ball 1,5875 mm	Rockwell Scale Ball 3,175 mm	Rockwell Scale Ball 6,35 mm	Rockwell Scale Ball 12,7 mm	Rockwell Superficial Scale Diamond	Rockwell Superficial Scale Ball 1,5875 mm	Rockwell Superficial Scale Ball 3,175 mm	Rockwell Superficial Scale Ball 6,35 mm	Rockwell Superficial Scale Ball 12,7 mm	Rockwell Plastic Test Scales Ball 3,175 mm
810-236	HRA; HRD; HRC	HRF; HRB; HRG	HRH; HRE; HRK	HRL; HRM; HRP	HRR; HRS; HRV	HR15N; HR39N; HR45N	HR15T; HR20T; HR45T	HR15W; HR30W; HR45W	HR15X; HR30X; HR54X	HR15Y; HR30Y; HR45Y	HRE; HRK
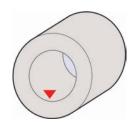
No.	Rockwell Plastic Test Scales Ball 6,35 mm	Rockwell Plastic Test Scales Ball 12,7 mm	Rockwell α Test Ball 12,5 mm	Max. specimen height	Brinell Scales indentation only Ball 1,0 mm	Brinell Scales indentation only Ball 2,5 mm	Brinell Scales indentation only Ball 5,0 mm	Brinell Scales indentation only Ball 10,0 mm	Brinell depth measurement Ball 2,5 mm
810-236	HRL; HRM	HRR	(HRR)	250 mm	HBW 1/10; HBW 1/30	HBW 2,5/6,25; HBW2,5/31,25; HBW 2,5/62,5; HBW 2,5/187,5	HBW 5/25; HBW 5/62,5; HBW 5/125	HBW 10/100	HBD 2,5/62,5; HBD 2,5/187,5

Metric — HR-530L

No.	Rockwell Scale Diamond	Rockwell Scale Ball 1,5875 mm	Rockwell Scale Ball 3,175 mm	Rockwell Scale Ball 6,35 mm	Rockwell Scale Ball 12,7 mm	Rockwell Superficial Scale Diamond	Rockwell Superficial Scale Ball 1,5875 mm	Rockwell Superficial Scale Ball 3,175 mm	Rockwell Superficial Scale Ball 6,35 mm	Rockwell Superficial Scale Ball 12,7 mm	Rockwell Plastic Test Scales Ball 3,175 mm
810-336	HRA; HRD; HRC	HRF; HRB; HRG	HRH; HRE; HRK	HRL; HRM; HRP	HRR; HRS; HRV	HR15N; HR39N; HR45N	HR15T; HR20T; HR45T	HR15W; HR30W; HR45W	HR15X; HR30X; HR54X	HR15Y; HR30Y; HR45Y	HRE; HRK

No.	Rockwell Plastic Test Scales Ball 6,35 mm	Rockwell Plastic Test Scales Ball 12,7 mm	Rockwell α Test Ball 12,5 mm	Max. specimen height	Brinell Scales indentation only Ball 1,0 mm	Brinell Scales indentation only Ball 2,5 mm	Brinell Scales indentation only Ball 5,0 mm	Brinell Scales indentation only Ball 10,0 mm	Brinell depth measurement Ball 2,5 mm
810-336	HRL; HRM	HRR	(HRR)	395 mm	HBW 1/10; HBW 1/30	HBW 2,5/6,25; HBW2,5/31,25; HBW 2,5/62,5; HBW 2,5/187,5	HBW 5/25; HBW 5/62,5; HBW 5/125	HBW 10/100	HBD 2,5/62,5; HBD 2,5/187,5

Optional accessories

No.	Description
810-038	Round table, Ø250 mm
810-027	Hardness testing machines, Adjustable support for long workpieces
810-037	Round table, Ø180 mm
810-029	V-anvil, groove length 400 mm, Ø50 mm- Ø100 mm
810-040	V-anvil, groove length 40 mm, Ø15 mm- Ø60 mm
810-041	V-anvil, groove length 40 mm, Ø3 mm- Ø9 mm
810-043	Spot Anvil, Spot Ø12 mm
810-030	Diamond spot anvil, for Rockwell Superficial scales Ø3.5 mm
810-044	Stepped spot Anvil, Spot Ø5.5 mm, step height 13 mm
810-042	Stepped V-anvil, step height 13 mm, groove length 10 mm, Ø4mm- Ø16 mm
810-028	Hardness testing machines, Height adjustable jack rest
810-643	Vibration damping stand
11AAD186	Steel table for HR-530, Rockwell hardness testing machines
264-505D	Statistic Processing Printer DP-1VA, Data Printer and Logger CEE Type
06AFM380D	USB Input Tool Direct (Digimatic USB), Digi/Digi2, Flat 10-Pin Type
11AAD537	Foot switch with aluminum housing, Hardness testing machines
11AAD745	Printer cable DP-414 HR-530, Rockwell Hardness testing machines
02ZAA020	AC Cable
02ZAA030	Mains Power Lead (2m), (IEC/CEE22 Cord set)

Additional accessories are available for Brinell hardness testing. Refer to the Hardness Testing Machines brochure.

Mitutoyo

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Impact Type Hardness Testing Unit
HARDMATIC HH-411

Series 810

This is a lightweight, digital-reading portable hardness testing instrument for metal workpieces. The Hardmatic HH-411 offers you the following benefits:
- It operates on the rebound hardness principle (standardised according to ASTM A 956).
- Measurement is conducted with hardness value L (Leeb-value) but you can convert to any desired hardness scale.
- The display automatically shows GO/±NO GO with the tolerance function set and selected.
- It has a memory function for 1800 measured values, and automatic measuring direction angle-compensation.
- Expak software gives you simple data collection 11AAC238

Sample application

Specifications

Impact device	Impact hammer with integrated carbide-ball tip, D scale (ASTM A 956)
Functions	Auto angle compensation, Offset, OK/NG judgement, Hardness scale conversion, Data storage (1.800 data entries), Statistical analysis (Average value, Max. value, Min. value, Dispersion), Auto sleep function, Impact counter display function
Power supply	Battery LR6 (2 pcs.) or AC adapter (optional)
Data output	RS-232C, SPC

Standard accessories

No.	Description
19BAA457	Replacement carbide ball, HH-411
19BAA460	Detector Cable f. UD-41X
19BAA258	Cleaning brush, HH-411

Optional accessories

No.	Description
19BAA458	Impact hammer, DL impact device
06AEG302D	AC-Adapter, 9V 500mA, CEE Type
11AAC238	EXPAK-08 data processing program, HH-411
19BAA238	Leeb rebound hardness testing device, RS232C cable HH-411
Computer accessories	
937387	Digimatic Cable, Round 6-Pin Type, 1m
Indenters	
810-288-10	Leeb impact device, HLDC impact device UD-412
810-289-10	Leeb impact device, HLD+15 impact device UD-413
810-290-10	Leeb impact device, HLDL impact device UD-414
Support rings for D/DC type impact devices	
19BAA248	Support ring cylindrical specimen, R10-20 HH-411
19BAA249	Support ring hollow cylindrical specim., R14-20 HH-411
19BAA250	Support ring spherical specimen, R10-27.5 HH-411
19BAA251	Support ring hollow spherical specim., R13.5-20 HH-411 (D/DC impact devices)

Model	HH-411
No.	810-298-10
Accuracy	±12 HL (800 HL +/- 1.5%)
Display unit	7-segment LCD
Hardness Display range	Leeb hardness: 1 to 999HL
Vickers Brinell Rockwell C Rockwell B Shore Tensile strength	**Conversion range / Increment** 43-950HV / 1 HV 20-894 HB / 1 HB 19,3-68,2 HRC / 0,1 HRC 13,5-101,7 HRB / 0,1 HRB 13,2-99,3 HS / 0,1 HS 499-1.996 MPa / 1 MPa
Specimen Thickness Specimen Mass	Min. 5 mm 5 kg or more
Dimensions Measuring/Display unit	ø28 x 175 mm / 70 x 110 x 35 mm
Specimen requirements	Min. specimen thickness of 5mm or more and mass of 5kg or more (However, a specimen of mass of 0.1 to 5kg is measurable by securing to a massive base) Testing point: 5mm or more from edge of specimen, 3mm or more between testing points Specimen surface roughness: Ra of 2µm or less
Resolution	1-999 HL
Mass	320 g

UD-412 Impact device HLDC scale
Use for inner walls of cylinders. The grip is short to allow positioning within a cylinder.

UD-413 Impact device HLD+15 scale
Use for concave workpieces such as gear teeth, grooves, etc.

UD-414 impact device HLDL scale
Use for gear teeth, welded corners, etc.

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Digital and Analogue Durometers
HARDMATIC HH-300

Series 811 - Shore A

These compact digital/dial durometers in the Shore A scale can test a range of different materials and offer you the following benefits:
- You can use them for testing the hardness of the materials including soft rubber, elastomers, natural rubber, casting resin, neoprene, polyesters, soft PVC, leather, etc.

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
64AAA964	Reference material Shore, HH-300 Series Shore A 3pcs.
811-013	Testing stand, HH-300 Series Shore A compact types
811-019	Testing stand, HH-300 Series Shore A long types
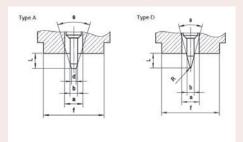
Shore A

Model	HH-331	HH-332	HH-335	HH-336	HH-335-01	HH-336-01
No.	811-331-10	811-332-10	811-335-10	811-336-10	811-335-11	811-336-11
Shore Scale	Shore A	Shore A	Shore A	Shore A	Shore A	Shore A
Indenter b	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm
Indenter d	ø 0,79 mm	ø 0,79 mm	ø 0,79 mm	ø ,079 mm	ø 0,79 mm	ø 0,79 mm
Indenter r	-	-	-	-	-	-
θ	35°	35°	35°	35°	35°	35°
Pressure foot a	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm
Pressure foot f	ø 18 mm	ø 18 mm	44 x 18 mm	44 x 18 mm	ø 18 mm	ø 18 mm
Indenter protrusion	2,5 mm	2,5 mm	2,5 mm	2,5 mm	2,5 mm	2,5 mm
Spring force WE, WA, WD	WA=550+75 HA [mN]	WA=550+75 HA [mN]	WA=550+75 HA [mN]	WA=550+75 HA [mN]	WA=550+75 HA [mN]	WA=550+75 HA [mN]
Display	Analog Dial	Digital	Analog Dial	Digital	Analog Dial	Digital
Dimensions (WxDxH)	188 x 68 x 35 mm	193 x 60 x 29,5	146 x 68 x 34 mm	151 x 60 x 28,5 mm	146 x 68 x 34 mm	151 x 60 x 28,5 mm
Mass	0,32 kg	0,31 kg	0,3 kg	0,29 kg	0,27 kg	0,26 kg

Indenter geometry Shore A and D

Testing stand
- Workstage dimension: Ø90 mm
- Max. specimen height: 90mm
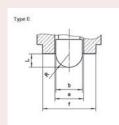
811-335-11

811-336-11

811-331-10

811-332-10

64AAA964 Shore A

Mitutoyo

Digital and Analogue Durometers
HARDMATIC HH-300

Series 811 - Shore E

These compact digital/dial durometers in the Shore E scale can test a range of different materials and offer you the following benefits:
- You can use them for testing the hardness of the materials including soft rubber, elastomers, natural rubber, casting resin, neoprene, polyesters, soft PVC, leather, etc.

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
811-013	Testing stand, HH-300 Series Shore A compact types

Type E

Indenter geometry Shore E

Shore E

Model	HH-329	HH-330
No.	811-329-10	811-330-10
Shore Scale	Shore E	Shore E
Indenter b	ø 5 mm	ø 5 mm
Indenter r	ø 2,5 mm	ø 2,5 mm
Pressure foot a	ø 5,4 mm	ø 5,4 mm
Pressure foot f	44 x 18 mm	44 x 18 mm
Indenter protrusion	2,5 mm	2,5 mm
Spring force WE, WA, WD	WE=550+75 HE [mN]	WE=550+75 HE [mN]
Display	Analog	Digital
Dimensions (WxDxH)	146 x 68 x 34 mm	147 x 59 x 40 mm
Mass	0,3 kg	0,29 kg

Testing stand
- Workstage dimension: Ø90 mm
- Max. specimen height: 90mm

811-329-10

811-330-10

549

Mitutoyo

Digital and Analogue Durometers
HARDMATIC HH-300

Series 811 - Shore D

These compact digital/dial durometers in the Shore D scale can test a range of different materials and offer you the following benefits:
- You can use them for testing the hardness of the materials including hard rubber, hard plastics, acrylic glass, Polystyrene, rigid thermoplastics, vinyl, cellulose acetate, etc.

Optional accessories

No.	Description
905338	Digimatic Cable, Flat Straight Type, 1m
64AAA590	Reference material Shore, HH-300 Series Shore D 3pcs.
811-012	Testing stand, HH-300 Series Shore D all types

Shore D
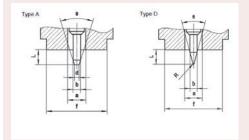
Model	HH-333	HH-334	HH-337	HH.338	HH-337-01	HH-338-01
No.	811-333-10	811-334-10	811-337-10	811-338-10	811-337-11	811-338-11
Shore Scale	Shore D	Shore D	Shore D	Shore D	Shore D	Shore D
Indenter b	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm	ø 1,25 mm
Indenter d	-	-	-	-	-	-
Indenter r	R 0,1 mm	R 0,1 mm	R 0,1 mm	R 0,1 mm	R 0,1 mm	R 0,1 mm
θ	30°	30°	30°	30°	30°	30°
Pressure foot a	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm	ø 3 mm
Pressure foot f	ø 18 mm	ø 18 mm	44 x 18 mm	44 x 18 mm	ø 18 mm	ø 18 mm
Indenter protrusion	2,5 mm	2,5 mm	2,5 mm	2,5 mm	2,5 mm	2,5 mm
Spring force WE, WA, WD	WD=444,5HD [mN]	WD=444,5HD [mN]	WD=444,5HD [mN]	WD=444,5HD [mN]	WD=444,5HD [mN]	WD=444,5HD [mN]
Display	Analog Dial	Digital	Analog Dial	Digital	Analog Dial	Digital
Dimensions (WxDxH)	188 x 68 x 35 mm	193 x 60 x 29,5 mm	146 x 68 x 34 mm	151 x 60 x 28,5 mm	146 x 68 x 34 mm	151 x 60 x 28,5 mm
Mass	0,32 kg	0,31 kg	0,3 kg	0,29 kg	0,27 kg	0,26 kg

Indenter geometry Shore A and D

811-337-11

811-338-11

811-333-10

811-334-10

64AAA590 Shore D

Hardness Test Blocks / Indenters

Hardness Test Blocks / Indenters

Hardness reference materials in quality control:
The boost for your process safety!

The daily verification, performed by the user, is described in the according hardness testing standards and significantly contributes to quality management processes.
In the daily verification process, all parameters of the hardness test system that build up to the hardness value, are examined by indentations on the hardness reference material.
This periodical inspection of the machine by means of hardness reference materials should be carried out immediately before the daily start of the test schedule.
If the device is used only once a week, the check should only be done on that day.
In three-shift operation, a check at the beginning of each shift is recommended.

An according documentation enhances the process safety, as value shifts due to damage or malfunction can be detected easily.
A comprehensive direct and indirect verification should be performed once a year as part of a calibration. The direct examination includes test force, measuring system, test cycle and indenter.
Indirect testing using hardness reference material blocks, indicate the correct interaction of all the parameters that were checked in the direct verification of the testing machine.
In addition, the repeatability of results of the hardness testing machine can also be checked with the hardness test blocks.
Mitutoyo offers a comprehensive range of hardness reference materials (hardness test blocks) to suit your quality management procedure perfectly.

Mitutoyo reference materials:
- High-end quality Made in Germany
- Independent DAkkS calibration according to DIN EN ISO and/or ASTM in an accredited laboratory
- Multiple calibrations (up to 3 scales on one test block and surface grid on request
- Large square or rectangular surface with large space advantage over triangular or round test blocks
- Short delivery time
- MPE "Maximum Permitted Error" of the hardness testing system engraved – all relevant information at a glance

Please check out our comprehensive range of hardness test blocks in our test block leaflet PRE1477

Large square or rectangular surface with large space advantage over triangular or round test blocks

The boxes keep the valuable test blocks safe and store the calibration certificate

Mitutoyo

Hardness Test Blocks / Indenters

Indenters

No.	Name	Standard	Machine type	Comment
19BAA162	Carbide Ball Brinel Ø5,0mm	w/o calibration certificate	all Mitutoyo Rockwell machines, HV-100 Series	without certificate
19BAA163	Carbide Ball Brinell Ø10,0mm	w/o calibration certificate	all Mitutoyo Rockwell machines, HV-100 Series	without certificate
19BAA281	Carbide Ball Brinell Ø1,0mm	w/o calibration certificate	all Mitutoyo Rockwell machines, HV-100 Series	without certificate
19BAA283	Carbide Ball Brinell Ø2,5mm	w/o calibration certificate	all Mitutoyo Rockwell machines, HV-100 Series	without certificate
19BAA507	Carbide Ball Rockwell Ø1,5875mm	w/o calibration certificate	all Mitutoyo Rockwell machines	without certificate
19BAA508	Carbide Ball Rockwell Ø3,175mm	w/o calibration certificate	all Mitutoyo Rockwell machines	without certificate
19BAA509	Carbide Ball Rockwell Ø6,35mm	w/o calibration certificate	all Mitutoyo Rockwell machines	without certificate
19BAA510	Carbide Ball Rockwell Ø12,7mm	w/o calibration certificate	all Mitutoyo Rockwell machines	without certificate
63BAL001	Carbide Ball Brinell Ø1,0mm	ISO 6506-2	all Mitutoyo Rockwell machines, HV-100 Series	with DAkkS certificate
63BAL002	Carbide Ball Brinell Ø2,5mm	ISO 6506-2	all Mitutoyo Rockwell machines, HV-100 Series	with DAkkS certificate
63BAL003	Carbide Ball Brinel Ø5,0mm	ISO 6506-2	all Mitutoyo Rockwell machines, HV-100 Series	with DAkkS certificate
63BAL004	Carbide Ball Brinell Ø10,0mm	ISO 6506-2	all Mitutoyo Rockwell machines, HV-100 Series	with DAkkS certificate
63BAL005	Carbide Ball Rockwell Ø1,5875mm	ISO 6508-2	all Mitutoyo Rockwell machines	with DAkkS certificate
63BAL006	Carbide Ball Rockwell Ø3,175mm	ISO 6508-2	all Mitutoyo Rockwell machines	with DAkkS certificate
63BAL007	Carbide Ball Rockwell Ø6,35mm	ISO 6508-2	all Mitutoyo Rockwell machines	with DAkkS certificate
63BAL008	Carbide Ball Rockwell Ø12,7mm	ISO 6508-2	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA001	Diamond Indenter Rockwell ISO 6508-2 HRA HRC HRD HRN	ISO 6508-2 Function test Table 4	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA002	Diamond Ind. Rockwel ISO 6508-2	ISO 6508-2 without Function test	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA004	Diamond Indenter Rockwell ASTM E-18	ASTM E-18 Function test	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA006	10HRC Diamond Indenter Rockwell ISO 6508-2	ISO 6508-2 Function test Table 5	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA007	HR-500 Diamond Indenter Rockwell ISO6508-2	ISO 6508-2 without Function test	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA008	Diamond Indenter Rockwell ISO6508-2 long Form	ISO 6506-2 Function test Table 5	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA009	Diamond Indenter Rockwell ISO6508-2 slim Form	ISO 6508-2 Function test Table 5	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA011	Diamond Indenter Vickers HV 0,2	ISO 6507-2	HV-100 Series, HV-112, HV-114, AVK Series	with DAkkS certificate
63DIA012	Diamond Indenter Vickers HV 5	ISO 6507-2	HV-100 Series, HV-112, HV-114, AVK Series	with DAkkS certificate
63DIA013	Diamond Indenter Knoop HK 0,01	ISO 4545-2	HM-100 Series, HM-200 Series, MVK-Series	with DAkkS certificate
63DIA014	Diamond Indenter Knoop HK 0,2	ISO 4545-2	HV-100 Series, HV-112, HV-114, AVK Series	with DAkkS certificate
63DIA015	Diamond Indenter Vickers HV0,01	ISO 6507-2	HM-100 Series, HM-200 Series, MVK-Series	with DAkkS certificate
63DIA016	Diamond Indenter Vickers HV0,2	ISO 6507-2	HM-100 Series, HM-200 Series, MVK-Series	with DAkkS certificate
63DIA021	Diamond Indenter Rockwell ISO 6508-2 HRA HRC HRD	ISO 6508-2 Function test Table 5	all Mitutoyo Rockwell machines	with DAkkS certificate
63DIA022	Diamond Indenter Rockwell Superficial ISO 6508-2 HRN	ISO 6508-2 Function test Table 6	all Mitutoyo Rockwell machines	with DAkkS certificate

Rockwell indenters
Additionally to the geometrical specification for the calibration of Rockwell diamond indenters, a „function test" is described in the relevant standards ISO 6508-2 and ASTM E-18. The intention is to verify the applicability of the indenter in regard of various indentation depth levels under different test forces.

Vickers indenters
The grinding process for Vickers diamond indenters leaves a junction line at the point, where the faces of the diamond join together, rather than having a perfect tip. ISO and ASTM standards define the maximum length of the junction line in dependence to the test force that is being used. Due to the obtained length, the indenter is classified for the use in different testforce ranges.

CMM Software
Page 554

Manual CMMs
Page 558
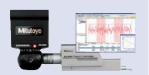
Small- and Medium Size CMMs
Page 559

Large Size CMMs
Page 567

In-Line and Shopfloor CMMs
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Measuring Heads, Probes and Styli
Page 572

Fixtures and Enclosures
Page 581

CMM Software
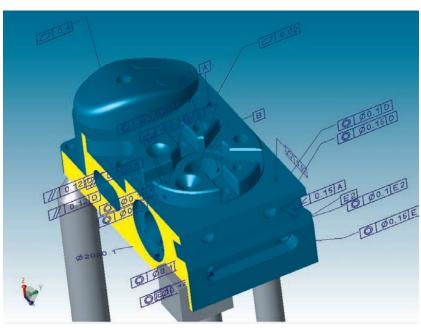
MiCAT Planner
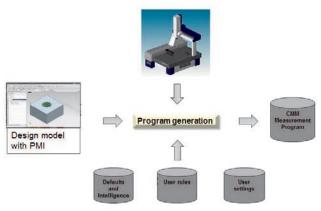
The new CMM software generation for an efficient, safe and automatic CMM programming. MiCAT Planner drastically reduces the programming time and thus will make your work much more efficient! Programs will now be made within minutes where it took hours or even days before. MiCAT planner is using PMI (Product Manufacturing Information) tolerance information inside the CAD file and creates the complete part program by considering your individual measurement strategy and your specific CMM. This guarantees a collision-free program in the shortest possible time.

- Reduces programming time significantly
- Collision-free and optimized programs
- Increased availability of the measuring machine
- Flexibility in choosing the measuring machine
- Unified measurement strategies increase data quality
- Speeds up instruction of staff

Step 1: Load the CAD model.
• Various CAD transaltors available: stp, Catia V4/V5, Creo, NX, Parasolid, SolidEdge, SolidWorks, Inventor
• Add missing tolerance information
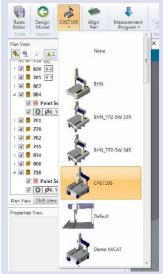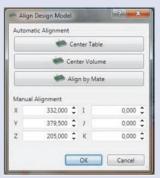
Workflow by MiCAT Planner
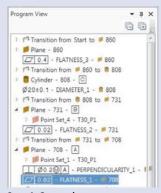
See how fast programs are generated with MiCAT Planner

Step 2: Select the CMM

Step 3: Align CAD model

Step 4: Create the part program

Step 5: Transfer to MCOSMOS

Mitutoyo

CMM Software

MCOSMOS - The Modular Software for all Kinds of Measurement

The heart of your CMM: to organize, execute, calculate and report.

- Organize your measurement programs on the network
- Add commands and instructions to guide the operator
- Create individual reports meeting your customer's needs
- Archive your results in formats like PDF, XLS, HTML and many other
- SPC with MeasurLink or export data to CAQ systems
- Export detected geometrical elements to CAD systems
- Revision Management for authorized usage of validated part programs **as standard**
- Meet the requirements of **FDA Title 21 CFR Part 11** without extra costs

The following packages are also available for Offline programming.
The so called "**Offline MCOSMOS**" packages allow you to create part programs whilst the CMM is proofing your product quality.

PartManager

GEOPAK
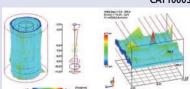
CAT1000P

CAT1000S

ROUNDPAK-CMM

For details, please ask for the MCOSMOS brochure.

Software package	MCOSMOS Manual	MCOSMOS-1 Basic package	MCOSMOS-2 CAD package	MCOSMOS-3 Full package
Part Manager • System configuration • Part program handling • Data management • Create report templates	●	●	●	●
GEOPAK • On/Off-line • For prismatic elements • Operator guidance • Parametric programs	●	●	●	●
CAT1000P • CAD programming • For prismatic elements • Collision control • Incl. simulation			●	●
CAT1000S • CAD programming • Free-form inspection • Surface + edge points • Grahical Reports			●	●
SCANPAK • For 2D contours • Evaluate + manipulate • Graphical Reports • Data exchange to CAD + NC				●

Additional software packages meeting your needs:

MeasurLink:
SPC software with certified AQDEF interface. Allows you to collect data from different vendors and devices. Its database offers collecting and analyzing data from all over the world, analyse your process and create individual reports.

GEARPAK:
Turn your CMM into a gear measurement device! Extend your capabilities, measure gears, worm gears, helical gears. Just input the gear parameters - the rest will be done by GEARPAK: measurement strategy, path generation, probe changes, and of course the measurement report of your gear.

ROUNDPAK-CMM
Special evaluation tool for scanning measurements typically known from form measurement instruments. Topographic views and evaluation of form and position deviations.

Mitutoyo

CMM Software
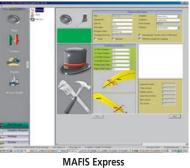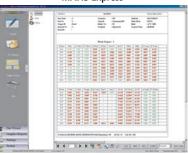
MAFIS Express - Rapid Air Foil Inspection Software

Mitutoyo introduces the fastest way for inspecting blades and blisks: MAFIS Express.

- Increases your throughput by time savings up to 90%
- Intuitive programming and easy handling
- For many kinds of airfoils like blades, blisks, gas turbines
- Easy Off-line programming on the CAD model
- Individual setting of the inspection routine: measure all or just some dedicated intersections
- Support of standards set by Rolls-Royce®, P&W, Siemens®, GE®, Honeywell®, SNECMA, Turbomeca® and others
- Ideal with the Revo® or SP25M probe heads

MAFIS Express
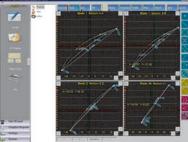
Setting intersections on the CAD model
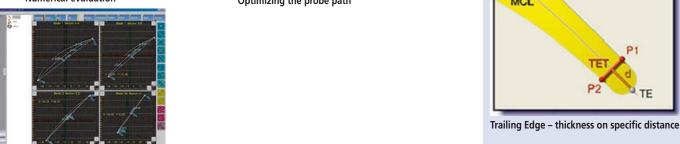
Numerical evaluation

Optimizing the probe path
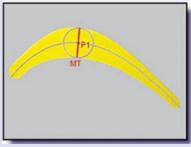
Graphical evaluation
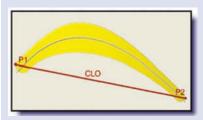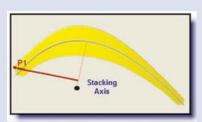
Take a look how quick air foils are inspected by MAFIS Express
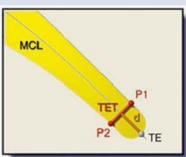
Maximum thickness
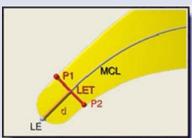
Overall Chord Length

Stacking Axis

Trailing Edge – thickness on specific distance

Leading Edge – thickness on specific distance

CMM Software

Point Cloud Processing Software for Coordinate Measuring Machines MSURF

Screen sample from MSURF-S/I

MSURF-S

Calculates point cloud data measured by CNC CMM with SurfaceMeasure. It generates scanning paths by defining the scanning start position, length, and width.

- Scanning paths can be created by simply defining three items : the scanning starting point, the scanning length, and the scanning width
- Scanning paths can be stored as measurement macros
- Point cloud data obtained from scanning can be exported in text or STL format
- MSURF-S can be started from MCOSMOS

Auto-change rack

MSURF-I

Conducts analysis or comparison verification of measured point cloud data in reference to nominal data (supporting CAD data import).
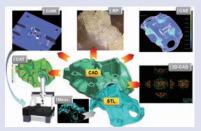
- Importing CAD data
- Feature-by-feature comparison
- Comparison of cross-sectional shapes

Error color-coded map

MSURF Planner

is software to automatically create measurement macros (surface form, feature form) for the line laser probe from 3D CAD data.
Optimized data (travel path, number of probe head revolutions, etc.) of a measurement path will contribute to improvements in productivity.
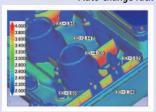
- Automatic scanning path programming.
- Automatic path generation for surface or feature extraction
- Mirroring function
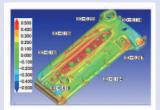
Surface curvature evaluation

SurfaceMeasure 606T
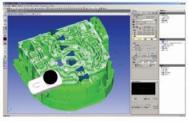
MSURF-G

Off-line version for part program generation
- Semi-automatic function for creating measurement paths with optimum probe orientation
- Detection of collision between the probe and the workpiece model
- Generation of simulated data for the point cloud expected to be obtained through scanning
- Displaying measurement movements (scanner movements) in animation

Screen sample from MSURF-G

Screen sample from MSURF-G

All products to be sold to commercial customers. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon. For suggested retail prices, please refer to the separate price list.

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Mitutoyo

CRYSTA-PLUS M Series

Series 196 - Manual CMM

Welcome to the world of 3D coordinate measuring technology!
This is Mitutoyo's manual floating bridge type coordinate measuring machines designed to give you very high accuracy in a wide range of applications. CRYSTA-PLUS M is the intelligent alternative to the complex, cost-intensive measuring equipment with conventional multi-point measuring devices. These CMM's will introduce you into the world of 3D measurement and will demonstrates its strengths wherever the measuring tasks are constantly changing, different work pieces are involved, and random measurements are needed

The Crysta-Plus M offers you the following benefits:

• High-precision, self-adjusting air bearings on all axes
• Lightweight moving components give you very smooth operation
• Force reducing grip
• Continuous fine feed over the entire measuring range
• Dust protected glass scales
• With powerful Mitutoyo MCOSMOS software
• Temperature compensation (optional)
• Permissible ambient temperature from 15°C to 30°C
• Optional LED illumination for better view

Crysta-Plus M574

Crysta-Plus M7106

Crysta-Plus M Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
196-683	443	400 x 400 x 300	180	480	410
196-684D	443	400 x 400 x 300	180	480	410
196-591	544	500 x 400 x 400	180	590	512
196-592	544	500 x 400 x 400	180	590	512
196-596	574	500 x 700 x 400	180	590	646
196-597	574	500 x 700 x 400	180	590	646
196-342	776	700 x 700 x 600	500	800	1560
196-352	7106	700 x 1000 x 600	800	800	1800
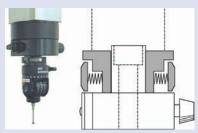
MCOSMOS

Specifications

Digital step	0,5 µm
Accuracy	E0, MPE from: (3+0,4L/100) µm
Guide system	Air bearing
Axis clamp	One-touch air clamp
Fine feed	Entire range

One-touch air clamp and fine feed for rapid and easy positioning

Ergonomically designed guide grip on Z-axis for reliable measurement (only for Crysta-Plus M776 and M7106)

Accuracy is specified for the following environmental conditions for the CMM

Temperature range		19°C - 21°C	**15°C - 30°C***
Temperature change	Per hour	-	**2 K**
	Per 24 hours	-	**5 K**
Temperature gradient	Vertical	0.5 K/m	**1 K/m**
	Horizontal	0.5 K/m	**1 K/m**

*The values shown in bold in the table above apply when using the temperature compensation system (optional):

CRYSTA-Plus M brochure on request

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task.

CRYSTA-APEX S 500, 700 & 900 Series

Series 191 - Standard CNC CMM

Measuring equipment performance is being challenged as never before. Manufactured products are continuously improving in terms of increased lifetime and decreased energy consumption, often achieved through the application of tighter tolerances, and the ubiquitous Coordinate Measuring Machine now meets these challenges.

In the CRYSTA-Apex S series, Mitutoyo offers you an advanced CMM capable of making very accurate measurements at high speed. It's also a future-proof investment since probe systems and software can easily be changed, or added to the system, whenever required.

This series contains a complete range going from small, medium and big size CNC CMM.

- Lightweight materials and an innovative machine structure deliver high motion stability, accuracy and affordability.
- The temperature compensation function (16°C to 26°C) allows you to take accurate measurements even on the shop floor.
- Compatible vision and scanning probe technologies give you flexible and effective measurement capabilities.
- Multi-sensors capability

Specifications

Digital step	0,1 μm
Accuracy	E0, MPE from: (1,7+0,3L/100) μm
Max. drive speed	519 mm/s (3-axis)

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	2°C	2°C
	Per 24 hours	2°C	5°C
Temperature gradient	Vertical	1 K/m	1 K/m
	Horizontal	1 K/m	1 K/m

Joystick controller
Features:
-1 Lever (selectable)
-2 Levers (selectable)

Mitutoyo eco-fix fixture kits:
- flexible & quick setup
- time & cost saving
- easy adaption of product changes

CRYSTA-Apex S brochure on request

Scan QR Code with your mobile device and watch our product videos on YouTube

StyliCleaner always Reliable and Clean Stylus

CRYSTA-Apex S9106

CRYSTA-Apex S Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-244-10	544	500 x 400 x 400	180	545	515
191-248-10	574	500 x 700 x 400	180	545	625
191-252-10	776	700 x 700 x 600	800	800	1675
191-254-10	7106	700 x 1000 x 600	1000	800	1951
191-292-10	9106	900 x 1000 x 600	1200	800	2231
191-292H-10	9108	900 x 1000 x 800	1200	1000	2261
191-294-10	9166	900 x 1600 x 600	1500	800	2868
191-294H-10	9168	900 x 1600 x 800	1500	1000	2898
191-296-10	9206	900 x 2000 x 600	1800	800	3912
191-296H-10	9208	900 x 2000 x 800	1800	1000	3942

![Mitutoyo]

CRYSTA-APEX S 1200 Series

Series 191 - Standard CNC CMM

The CRYSTA-APEX S Series is a high performance, cost effective coordinate measuring machine, designed and constructed according to Mitutoyo's extensive experience in CNC CMM technology. It offers you the following benefits:

- Lightweight materials and an innovative machine structure deliver high motion stability, accuracy and affordability.
- The temperature compensation function (16°C to 26°C) allows you to take accurate measurements even on the shop floor.
- Compatible vision and scanning probe technologies give you flexible and effective measurement capabilities.
- Multi-sensors capability

CRYSTA-Apex S 122010

CRYSTA-Apex S Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-392-10	121210	1200 x 1200 x 1000	2000	1000	4050
191-394-10	122010	1200 x 2000 x 1000	2500	1000	6150
191-396-10	123010	1200 x 3000 x 1000	3000	1000	9110

Specifications

Digital step	0,1 μm
Accuracy	E0, MPE from: (2,3+0,3L/100) μm
Max. drive speed	693 mm/s
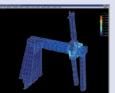
Temperature compensation system (temperature sensors)

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	2°C	2°C
	Per 24 hours	2°C	5°C
Temperature gradient	Vertical	1 K/m	1 K/m
	Horizontal	1 K/m	1 K/m

The machine structure has been optimized using FEM (Finite-element Method) and modal analysis

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

Refer to the CRYSTA-Apex S brochure

StyliCleaner always Reliable and Clean Stylus

CRYSTA-APEX S 1600 & 2000 Series

Specifications

Digital step	0,1 µm
Accuracy	E0, MPE from: (3,3+0,45L/100) µm
Max. drive speed	693 mm/s

Joystick controller

The machine structure has been optimized using FEM (Finite-element Method) and modal analysis

Refer to the CRYSTA-Apex S brochure

StyliCleaner always Reliable and Clean Stylus

Series 191 - Standard CNC CMM

The CRYSTA-APEX S 1600 & 2000 series offers you up to 12,8m³ measuring volume and still keeps an excellent 4,5 µm accuracy or better.
This series is developed for supporting quality evaluation of volumetric parts.
This high performance, cost effective coordinate measuring machine, designed and constructed according to Mitutoyo's extensive experience in CNC CMM technology.
Ready for touch trigger probe, scanning probe, optical probe and laser scanner probe.

- Proven bridge type construction
- High rigidity air-bearing guiding on every axis
- High accuracy
- High speed and acceleration
- Temperature compensation from 16° to 24°C
- Glass scale with high resolution 0,1 µm
- Multi-sensors capability
- Multi-Function Joystick Box including two levers and speed adjustment
- Optional with anti-vibration table

CRYSTA-Apex S 163012

CRYSTA-Apex S Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-286-10EU	162012	1600 x 2000 x 1200	3000	1400	9300
191-266-10EU	163012	1600 x 3000 x 1200	3500	1400	10600
191-276-10EU	164012	1600 x 4000 x 1200	4500	1400	14800
191-286H-10EU	162016	1600 x 2000 x 1600	3000	1800	9350
191-266H-10EU	163016	1600 x 3000 x 1600	3500	1800	10650
191-276H-10EU	164016	1600 x 4000 x 1600	4500	1800	14850
191-366H-10EU	203016	2000 x 3000 x 1600	4000	1800	14100
191-376H-10EU	204016	2000 x 4000 x 1600	5000	1800	19400

All products to be sold to commercial customers. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon. For suggested retail prices, please refer to the separate price list.

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STRATO-APEX 500, 700 & 900 Series

Series 355 - High accuracy CNC CMM

The challenges for measurement equipment are rising. Products are continuously improving as a result the lifetime of products is increasing while their energy consumption is reduced. Additionally, the throughput of production is driven up. All these facts must be taken into account for your measuring equipment. With the STRATO-Apex CMM, Mitutoyo offers you the opportunity to match both: precision and velocity.

This high accuracy CNC coordinate measuring machine that allows you to get accurate results at lightning speed.

The STRATO-APEX Series offers you the following benefits:

•High measurement accuracy and high-speed motion
•High-performance scanning
•Ultra high precision scales on each axis
•Anti-vibration system reduces the impact of nearby vibration sources (optional for 574)
•Multi-sensors capability

STRATO-Apex 9106

STRATO-Apex Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
355-522-10	574	500 x 700 x 400	180	560	1530
355-502-10	776	700 x 700 x 600	500	770	1895
355-507-10	7106	700 x 1000 x 600	800	770	2180
355-512-10	9106	900 x 1000 x 600	800	770	2410
355-517-10	9166	900 x 1600 x 600	1200	770	3085

Specifications

Digital step	500: 0,05 μm 700/900: 0,02 μm
Accuracy	E0, MPE from: (0,7+0,25L/100) μm
Max. drive speed	519 mm/s

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range	Series 500: 18°C -22°C Series 700/900: 19°C -21°C	
Temperature change	Per hour	1°C
	Per 24 hours	2°C
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

Mitutoyo eco-fix fixture kits:
- flexible & quick setup
- time & cost saving
- easy adaption of product changes

Refer to the STRATO-Apex brochure

StyliCleaner always Reliable and Clean Stylus

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STRATO-APEX 1600 Series

Series 355 - High accuracy CNC CMM

High precision large size bridge type CNC CMM, designed to provide top scanning performance with high accuracy, ready for touch trigger probe, scanning probe, optical probe, laser scanner probe.

- Improve structural rigidity bridge type construction with compensation technology
- High accuracy
- High speed and acceleration
- Temperature compensation from 18° to 22°C
- High precision glass scale with resolution 0,05 µm
- Integrated vibration-damping units with auto-levelling air springs
- Granite working table with M8 threads
- Multi-Function Joystick Box including two levers and a speed adjustment

Specifications

Digital step	0,05 µm
Accuracy	E0, MPE from: (2,5+0,4L/100) µm
Max. drive speed	606 mm/s
3D Acceleration	1350 mm/s^2

Accuracy is specified for the following environmental conditions for the CMM:*

Temperature range		18°C - 22°C
Temperature change	Per hour	1 K
	Per 24 hours	2 K
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task.

Refer to the STRATO-Apex brochure

StyliCleaner always Reliable and Clean Stylus

STRATO-Apex Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
355-532-10	162012	1600 x 2000 x 1200	3500	1350	11150
355-534-10	162016	1600 x 2000 x 1600	3500	1750	11200
355-536-10	163012	1600 x 3000 x 1200	4000	1350	15300
355-538-10	163016	1600 x 3000 x 1600	4000	1750	15350

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LEGEX Series

Series 356 - Ultra-High Precision Premium CNC CMM

The LEGEX Series is an ultra-high precision CNC coordinate measuring machine with the world's highest level of accuracy. This is made possible by rigorous analysis of all possible error producing factors and the elimination or minimization of their effects. The fixed bridge structure and precision air bearings running on highly rigged guideways ensure superior motion stability and ultra-high geometrical accuracy. Due the "Center of gravity" placed drive systems of the sliders we reached the best possible dynamic performance. In addition, other various technologies have been utilized in the structure of the drive unit, measuring against vibration etc. to provide ultra-high accuracy. Using FEM structure analysis simulations, guarantee geometric motion accuracy that has minimal errors from fluctuations in the load and other variables. In addition, other various technologies have been utilized in the structure of the drive unit, measuring against vibration etc. to provide ultra-high accuracy. The construction is designed for thermal stability, low expansion crystallized glass scales and temperature compensation, results in an accuracy temperature range of 18 °C to 22°C. This will be helping you reduce measurement environment maintenance costs.The high standard of the design and technology will give you an ultra-high accurate Coordinate Measuring Machine.
The LEGEX Series offers you the following benefits:

•Rigorous analysis of all possible error-producing factors, and elimination or minimization of their effects, delivers unsurpassed accuracy of 0,28μm
•Ultra-high accuracy crystallized-glass scale with the ultra-low expansion coefficient of 0,01x10-6/K is used on each axis
•The fixed bridge structure and precision air bearings, running on highly rigid guideways, give you superior motion stability and ultra-high geometrical accuracy
•You can use many different types of optional probe systems, including touch-trigger probes, laser scanning probes, and a vision measuring probe.

Legex 9106

LEGEX Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
356-403-10	574	500 x 700 x 450	250	700	3500
356-413-10	774	700 x 700 x 450	500	700	5000
356-423-10	776	700 x 700 x 600	500	850	5100
356-433-10	9106	900 x 1000 x 600	800	850	6500

Specifications

Digital step	0,01 μm
Accuracy	E0, MPE from: (0,28+0,1L/100) μm
Max. drive speed	200 mm/s

Accuracy is specified for the following environmental conditions for the CMM*

Temperature range		20±1°C
Temperature change	Per hour	0,5 K
	Per 24 hours	1 K/m
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

CMM calibration using a virtually zero thermal expansion glass gauge

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task.

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CRYSTA-Apex EX 500T/700T/900T Series

Series 191 - Standard CNC CMM equipt with PH20

The EX T series CNC CMM are equipped with a PH20 probe head that will provide you 5-axis touch-trigger operation for significantly higher productivity.

5-Axis operation reduces the time required for probe rotational movements and allows more flexible positioning. This also ensures easy acces to complex workpieces and saves time during both programming and measurement.

In addition to 3-axis point measurement similar to conventional CMM's the PH20 supports "Head Touch" operation for rapid measurement using the two rotational axis of the probe head only, without any movement required along the CMM axes.

Specifications

Digital step	0,1 µm
Accuracy	E0, MPE from: (1,7+0,3L/100) µm
Max. drive speed	519 mm/s (3-axis)

Mitutoyo eco-fix fixture kits:
- flexible & quick setup
- time & cost saving
- easy adaption of product changes

CRYSTA-Apex S brochure on request

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CRYSTA-Apex EX 544T

CRYSTA-Apex S Models:

No.	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-244-30	500 x 400 x 400	180	545	515
191-248-30	500 x 700 x 400	180	545	625
191-252-30	700 x 700 x 600	800	800	1675
191-254-30	700 x 1000 x 600	1000	800	1951
191-292-30	900 x 1000 x 600	1200	800	2231
191-294-30	900 x 1600 x 600	1200	1000	2261
191-296-30	900 x 2000 x 600	1500	800	2868

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CRYSTA-Apex EX 1200R Series

Series 191 - Standard CNC CMM

• CRYSTA-Apex EX 1200R series products are advanced CNC CMMs equipped with the REVO probe head and a choice of probes to create a range of standard 5-axis measuring machines.

• 5-axis operation reduces the time required for probe repositioning movements and allows more flexible positioning. This also facilitates access to complex workpieces and saves time during both programming and measurement.

• Allows ultra high-speed 5-axis scanning (max. 500 mm/s), far surpassing conventional 3-axis control. Support for high-speed sampling of up to 4 points per second allows acquisition of densely spaced measurement points, even during fast scanning.

• Internal implementation of laser sensing technology ensures high-accuracy measurement, even with long styli (up to 500 mm*1).

*1
Distance from probe rotation center to stylus tip

Specifications

Digital step	0,1 µm
Accuracy	E0, MPE from: (2,9+4L/1.000) µm
Max. drive speed	300 mm/s

Refer to the CRYSTA-Apex S brochure

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CRYSTA-Apex EX 123010R
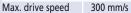
CRYSTA-Apex EX 1.200R Series:

No.	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-392V-10	1200 x 1200 x 1000	2000	1160	4050
191-394V-10	1200 x 2000 x 1000	2500	1160	6150
191-396V-10	1200 x 3000 x 1000	3000	1160	9110

FALCIO-APEX Gantry Series

Series 355 - High accuracy Large CNC CMM

High precision gantry type CNC CMM, designed to provide top scanning performance for your largest workpieces, ready for touch trigger probe, scanning probe, optical probe, laser scanner probe. Used for measurements on big molds, parts of windmills, airplanes, ships etc. Anchored to the floor foundations, this CMM allows almost unlimited loading mass since the workpiece is not placed on the machine structure.These CMMs are also compatible with multisensory applications.

- Improve structural rigidity gantry type construction with compensation technology
- High accuracy
- High speed and acceleration
- High speed and acceleration
- Temperature compensation from 18° to 22°C
- High precision glass scale with resolution 0,1 µm
- Multi-Function Joystick Box including two levers and a speed adjustment
- **Available in many different sizes from 2000 x 3000 x 1600 mm to 3000 x 5000 x 2000 mm.**

Specifications

Digital step	0,1 µm
Accuracy	E0, MPE from: (3,5+0,45L/100) µm
Max. drive speed	520 mm/s

Accuracy is specified for the following environmental conditions for the CMM:*

Temperature range		18°C - 22°C
Temperature change	Per hour	1 K
	Per 24 hours	2 K
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

Scanning with probe SP80 and 100 mm styli.

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Foundation
This type series always requires a special foundation. Please contact your local Mitutoyo partner for further details.

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FALCIO-Apex 305020 G measuring a gear for a wind turbine engine

No.	Range [mm]	Mass [kg]
FALCIO-Apex 203015 G	2000 x 3000 x 1500	12000
FALCIO-Apex 305020 G	3000 x 5000 x 2000	16000

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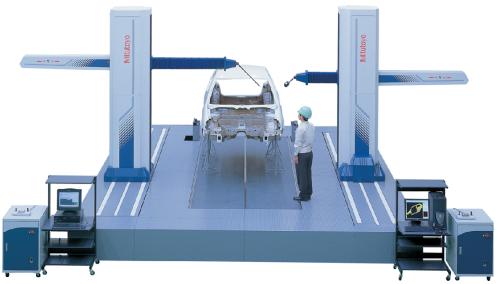
CARB-Strato Series / CARB-Apex Series

Series 360 - Car Body Measuring System

A large, horizontal-type arm CNC CMM for measuring car bodies or similar components. Single/dual-head types are available ; the dual-head type measures by controlling two heads simultaneously, one from each side.

MAIN FEATURES CARBstrato : large, high precision, dual-head type.
MAIN FEATURES CARBapex : large, single-head type, affordable.

Specifications

Digital step	0,1 µm
Range X-axis	4000-8000 mm
Scale	High accuracy linear encoder
Guide system	X-axis : linear guide ; YZ-axis : air bearing
Max. drive speed	866 mm/sec (CARBstrato) 519 mm/sec (CARBapex)
3D Acceleration	0,2G (CARBstrato) 0,1G (CARBapex)

CARBstrato / CARBapex Series brochure on request

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Foundation
This type series always requires a special foundation. Please contact your local Mitutoyo partner for further details.

CARBstrato

No.	Accuracy[1]$E_{0,MPE}$
CARBstrato	(18+20L/1000)µm
CARBapex	(25+28L/1000)µm

[1] According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus ø 4x50 mm. L= measured length (mm).

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

CARBapex

Mitutoyo

MACH KO-GA-ME Series

Specifications

Digital step	0,02 µm
Accuracy	E0, MPE from: (2,4+0,57L/100) µm
Max. drive speed	340 mm/s
3D Acceleration	6750 mm/s^2

MACH Ko-ga-me 12128-3V with optional stand

Mitutoyo eco-fix fixture kits:
- flexible & quick setup
- time & cost saving
- easy adaption of product changes

Refer to the INLINE Measuring systems brochure

Take a look how MACH Ko-ga-me can boost your productivity
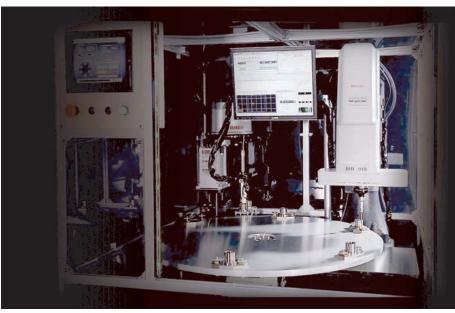
Series 357 - Agile Measurement System

The MACH KO-GA-ME is a unique and compact CMM ready for automated measurements. Looking for the fast, extremely compact, lightweight and easy to mount metrology solution? The MACH KO-GA-ME, essential a compact CMM, is your perfect solution for automated cells. The guaranteed accuracy temperature of 10 °C up to 35 °C provides flexibility and performance also for your production environments.

Mounted on any rigid frame, including machine tools, the KO-GA-ME will give you CMM capabilities without the space requirements of a full-sized machine.

The MACH Series offers you the following benefits:

• High-speed measurements
• Designed for production environments
• Highly reliable
• Extremely small footprints
• Perfect for automated cells and stand-alone solutions
• Ideal for single feature inspection and usable with scanning and point to point probes
• Measuring range up to 120 mm
• Resolution of 0,02 µm
• MeasurLink SPC software (optional)

In-line Application example with MACH Ko-ga-me

MACH Ko-ga-me Models:

No.	Model	Range [mm]	Mass [kg]
357-165	12128-3V	120 x 120 x 80	36

MACH-3A 653

Series 360 - High-Speed In-Line CMM

The MACH-3A 653 is a horizontal spindle type with index table coordinate measuring machine and is designed for fast and precise inline measurement. It grants outstanding throughput will allow you to boost up your measuring process. His small foot print and protection against rough production environments makes him suitable for workshop and inline production measurements.
The MACH Series offers you the following benefits:

- Super High speed and acceleration
- Drastic reduction of the measurement cycle compared with any conventional CMM
- All in One Compact design to minimize the foot print in the workshop and to improve the dust resistance
- Work piece handling and routing in the same posture as for other horizontal spindle machining centres
- Control unit and PC are installed in the dust-tight rack with heat exchanger.
- Ease-of-maintenance construction and air-free operation using high accuracy linear ball bearing
- Temperature compensation from 5°C to 40°C
- Glass scale with high resolution 0,1 µm
- Safety joystick box with deadman switch and speed adjustment
- Optional with index table for higher flexibility

No.	Model	Range [mm]
360-415-10	MACH-3A 653	600 x 500 x 280

Specifications

Digital step	0,1 µm
Accuracy	E0, MPE from: (2,2+0,35L/100) µm
Max. drive speed	1212 mm/s
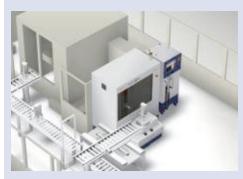
Accuracy is specified for the following environmental conditions for the CMM

Temperature range		5°C - 40°C
Temperature change	per hour	2 K
	per 24 hours	10 K
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Refer to the INLINE Measuring systems brochure

Take a look how MACH-3A 653 can boost your productivity

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MACH-V 9106

Series 360 - In-line type CNC CMM

Accuracy is specified for the following environmental conditions for the CMM*

Temperature range		5°C - 35°C
Temperature change	per hour	2 K
	per 24 hours	10 K
Temperature gradient	Vertical	1 K/m
	Horizontal	1 K/m

The MACH-V 9106 is a vertical spindle type coordinate measuring machine and is designed for fast and precise inline measurement. It grants outstanding throughput will allow you to boost up your measuring process.

His design is so chosen that work pieces can be conveyed through the CMM either in front/back or left/right. This makes it a very flexible system to integrate. Also it can provide pre/post machining feedback to your machine tools for process tuning.

- Higher speed and accuracy with barycentric drive
- Improved dust resistance by installing all drive system and scale units in the dust-tight enclosure on the machine top
- Control unit and PC are installed in the dust-tight rack
- Space-saving design helps installation in a production line
- Flexible loading options due open access to the measuring area
- Ease-of-maintenance construction and air-free operation using high accuracy linear ball bearing
- Temperature compensation from 5° to 35°C
- Glass scale with high resolution 0,1 µm.

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Mitutoyo eco-fix fixture kits:
- flexible & quick setup
- time & cost saving
- easy adaption of product changes

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MACH-V 9106

No.	Model	Range [mm]
360-224-10EU	MACH-V9106	900 x 1000 x 600

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Mitutoyo

CMM Probes

SURFTEST Probe

Surface Roughness Measurement directly on the CMM!

This latest Mitutoyo probe head closes the gap between typical dimensional CMM measurements and surface roughness inspection. Instead of having to take the workpiece to another measuring instrument or using additional portable systems, the SURFTEST Probe adds roughness measurement capability to your CMM and so avoids all the cost and inconvenience of additional systems. It brings the proven technology of the SJ-310 series to the CMM with all its highly capable range of detectors developed for handling specialist applications such as roughness measurement on gears, inside small holes or deep grooves, in addition to simple flat surface measuring tasks.

- Proven technology from Mitutoyo's SJ-310 Surftest
- Chose from five types of detector for variant applications
- High accuracy – no CMM movement during measurement
- One CNC measurement cycle produces all results
- Graphical and numerical output
- One Measurement report for all GD&T requirements

SURFTEST Probe

Optional detectors

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Specifications

| Laser Class | Class 2 [EN/IFC 60825-1(2014)] Class 2 [JIS C 6802: 2014] Laser Type: Red-light semiconductor SurfaceMeasure 201FS Laser Type: Semiconductor |

SurfaceMeasure

Ultra-high speed data collection
SurfaceMeasure is a laser probe that collects coordinate values of the surface of the workpiece by moving and irradiating laser light over the workpiece.
* When using SurfaceMeasure 606/610/1010

Advantages of non-contact type
Non-contact measurement enables measurement of materials that can be easily-deformed by contact measurement, including resin or thin, elastic parts.

Powder-less measurement
Automatic configuration of the camera sensitivity and the laser intensity settings according to the environment and materials enable establishing a simple and comfortable laser-scanning environment since measurement is now powder and spray free.

Evaluation cases
The collected point cloud data can be used by various optional software in a wide range of applications, such as editing, plane creation, comparison using CAD data and more.

Measurement of color sample plate

Measurement of glossy parts

No.	Model	Max. scan width	Max. scan depth	Scanning error	Max. Acquisition rate	Line Laser	Point Laser
02AQH100	SM 606	60 mm	60 mm	12 µm	75000 points/sec	Wave length: 660 nm Power output: 4mW	Wave length: 635 nm Power output: 1mW
02AQH200	SM 606T	3x65 mm	65 mm	17 µm	3x25000 points/sec	Wave length: 660 nm Power output: 4mW	Wave length: 635 nm Power output: 1mW
02AQH250	SM 610	60 mm	100 mm	15 µm	75000 points/sec	Wave length: 660 nm Power output: 4mW	Wave length: 635 nm Power output: 1mW
02AQH280	SM 1010	100 mm	100 mm	18 µm	75000 points/sec	Wave length: 660 nm Power output: 4mW	Wave length: 635 nm Power output: 1mW
02AQH290	SM 403	40 mm	30 mm	8 µm	60000 points/sec	Wave length: 660 nm Power output: 4mW	Wave length: 635 nm Power output: 1mW
02AQJ500	SM 201FS	23 mm	15 mm	1,8 µm	25000 points/sec	Wave length: 670 nm Power output: 1mW	

The flying spot type is capable of scanning difficult parts, such as this impeller, precisely and achieves highest scanning accuracy in the class.

CMM Probes

SM 606T

SM 201FS

SM 403/606/610/1010

QVP (Quick Vision Probe)

QVP

Mitutoyo's Vision Probe System for CMMs

The Quick Vision Probe will make from your CMM an VMM (VisionMM). Put in an probe change rack you can use it together with other probes. Were traditional probes can not be used, very small holes and flexible parts, the QVP can do this Job.

- Fast optical measurements – the perfect choice for small features and soft materials
- Ideal in combination with tactile probes
- Prepared for automatic probe change
- Four objective lenses offer different optical magnification
- From 0,375 x to 3,75 x
- White LED ring light
- White LED coaxial light

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Mitutoyo

CMM Probes

MPP-310Q

Ultra-High accuracy and low measuring force Scanning Probe

This ultra-high precision scanning probe incorporates built-in XYZ scales for highest accuracy performance.
The compact size of this probe is ideal for low measuring force and
high speed scanning.
Data collection can be performed by scanning measurement, ultrahigh
precision point measurement and center alignment measurement.
Special developed for our Ultra-High accuracy CMM

- High resolution of 0,01 µm
- Measuring range ±1 mm
- Extremely low measuring forces of 0,03 N
- Styli length up to 200 mm
- Air bearing for smooth measurements
- Axis clamping for scanning on slanted or arched surfaces

MPP-310Q

PH20

Rapid tactile measurements at any probe angle
- Head touch for improved repeatability
- Feature-based calibration for improved accuracy
- Probe change with TP20 moduls
- Allowing subsequent measurement at any head angle
- Full support in MCOSMOS

PH20

CMM Probes
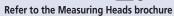
Revo

5-axis measurement technology
- Rapid scanning at any angle
- dynamic 2-axis head provides most of the stylus motion
- High accuracy and repeatability
- Scanning with 5-axes of simultaneous motion allows unparalleled measurement flexibility
- 'Head-touches' take measurement points faster, with improved accuracy and repeatability
- 5-axis motion eliminates time spent indexing the head

Revo

Refer to the Measuring Heads brochure

5-axis scanning options with CRYSTA-Apex and Revo

Mitutoyo

CMM Probes

Scanning probe systems

Scanning probes can acquire several hundred surface points each second, enabling measurement of form as well as size and position.
Scanning probes can also be used to acquire discrete points in a similar way to touch-trigger probes.
A range of solutions is available, suitable for all sizes and configurations of CMM.

SP80
is a quill-mounted scanning probe that uses digital scale and readhead technology, to provide exceptional scanning performance, even with long styli.

SP25M
At just 25 mm in diameter, the SP25M is small and light, making it ideally suited to mounting on articulating heads. It is also sufficiently compact to suit small CMM's

SP600M
Renishaw's SP600 analogue scanning
probe offers high-performance inspection, digitizing and profile scanning capability for a wide range of CMM's.

Touch-trigger probe systems

TP7M
High accuracy type

TP200
Compact and high accuracy (stylus change type)

SCR200
Rack

**Micro Touch Probe
UMAP-CMM**

TP20
Compact type

MCR20
Rack

MH20i / MH20
Manual Probes

Probe heads

PH10M
Motor drive index type

MIH
Manual index type

PH1
Simple manual type

CMM Probes brochure on demand

Styli Kits

Mitutoyo offers you over 600 styli plus highly specialised equipment within a wide range of selected materials like steel, aluminium, ceramics, ruby, zirconium oxide or silicon nitride.

Styli Kit M2 Addition

No.	Contents	Description	Length [mm]
K651382	1x Part No. K651058	5-way stylus holder M2	7,5
	1x Part No. K651040	Extension steel M2	30
	1x Part No. K651039	Extension steel M2	20
	4x Part No. K651038	Extension steel M2	10
	1x Part No. K651022	Stylus steel-ruby M2	20
	1x Part No. K651021	Stylus steel-ruby M2	20
	5x Part No. K651019	Stylus steel-ruby M2	20
	1x Part No. K651012	Stylus steel-ruby M2	10
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M2 Addition

Styli Kit M2 Basic 1

No.	Contents	Description	Length [mm]
K651377	1x Part No. K651012	Stylus steel-ruby M2	10
	1x Part No. K651014	Stylus steel-ruby M2	10
	1x Part No. K651019	Stylus steel-ruby M2	20
	1x Part No. K651016	Stylus steel-ruby M2	10
	1x Part No. K651021	Stylus steel-ruby M2	20
	1x Part No. K651022	Stylus steel-ruby M2	20
	1x Part No. K651031	Cylinder stylus steel M2	13
	1x Part No. K651062	Adaptor M2	7
	1x Part No. K651054	5-way stylus M2	30
	1x Part No. K651083	Disk stylus steel M2	7,5
	1x Part No. K651085	Disk stylus steel - ruby M2	10
	1x Part No. K651038	Extension steel M2	10
	1x Part No. K651039	Extension steel M2	20
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M2 Basic 1

Styli Kit M2 Basic 2

No.	Contents	Description	Length [mm]
K651354	1x Part No. K651235	Stylus tungsten carbide-ruby M2	20
	1x Part No. K651249	Stylus tungsten carbide-ruby M2	20
	1x Part No. K651019	stylus steel-ruby M2	20
	1x Part No. K651347	Stylus carbon fiber-ruby M2	50
	1x Part No. K651348	Stylus carbon fiber-ruby M2	50
	1x Part No. K651349	Stylus carbon fiber-ruby M2	50
	1x Part No. K651350	Stylus extension CRP M2	40
	1x Part No. K651351	Stylus extension CRP M2	50
	1x Part No. K651352	Stylus extension CRP M2	70
	1x Part No. K651353	Stylus extension CRP M2	90
	1x Part No. K651058	5-way stylus holder M2	7,5
	1x Part No. K651223	pin spanner ø 1,2 mm	

Styli Kit M2 Basic 2

Styli Kit M2 Expansion

No.	Contents	Description	Length [mm]
K651378	1x Part No. K651236	Stylus tungsten carbide-ruby M2	10
	1x Part No. K651248	Stylus tungsten carbide-ruby M2	20
	2x Part No. K651257	Stylus tungsten carbide-ruby M2	30
	1x Part No. K651233	Stylus tungsten carbide-ruby M2	10
	1x Part No. K651276	Stylus tungsten carbide-ruby M2	10
	1x Part No. K651012	Stylus steel-ruby M2	10
	1x Part No. K651013	Stylus steel-ruby M2	10
	1x Part No. K651014	Stylus steel-ruby M2	10
	1x Part No. K651015	Stylus steel-ruby M2	10
	2x Part No. K651020	Stylus steel-ruby M2	20
	1x Part No. K651032	Cylinder stylus-ruby M2	20
	1x Part No. K651052	4-way stylus-ruby M2	10
	1x Part No. K651098	Tip stylus tungsten carbide M2	10
	1x Part No. K651083	Disk stylus steel M2	7,5
	1x Part No. K651084	Disk stylus steel M2	7,5
	1x Part No. K651041	Extension steel M2	40
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M2 Expansion

Mitutoyo

Styli Kits

Styli Kit M2 Professional

No.	Contents	Description	Length [mm]
K651379	1x Part No. K651236	Stylus tungsten carbide-ruby M2	10
	1x Part No. K651248	Stylus tungsten carbide-ruby M2	20
	1x Part No. K651233	Stylus tungsten carbide-ruby M2	10
	2x Part No. K651276	Stylus tungsten carbide-ruby M2	10
	2x Part No. K651012	Stylus steel-ruby M2	10
	1x Part No. K651013	Stylus steel-ruby M2	10
	3x Part No. K651014	Stylus steel-ruby M2	10
	5x Part No. K651019	Stylus steel-ruby M2	20
	1xPart No. K651015	Stylus steel-ruby M2	10
	2xPart No. K651020	Stylus steel-ruby M2	20
	1x Part No. K651016	Stylus steel-ruby M2	10
	2x Part No. K651021	Stylus steel-ruby M2	20
	3x Part No. K651017	Stylus steel-ruby M2	10
	3x Part No. K651022	Stylus steel-ruby M2	20
	2x Part No. K651018	Stylus steel-ruby M2	10
	2x Part No. K651024	Stylus steel-ruby M2	10
	1x Part No. K651025	Stylus steel-ruby M2	11
	1x Part No. K651030	Cylinder stylus steel M2	11
	1x Part No. K651031	Cylinder stylus steel M2	13
	1x Part No. K651032	Cylinder stylus steel M2	20
	1x Part No. K651062	Adaptor M2	7
	1x Part No. K651052	4-way stylus-ruby M2	10
	1x Part No. K651053	5-way stylus-ruby M2	18
	1xPart No. K651054	5-way stylus-ruby M2	30
	1xPart No. K651097	Tip stylus steel M2	15
	1xPart No. K651098	Tip stylus tungsten carbide M2	10
	1x Part No. K651083	Disk stylus steel M2	7,5
	1x Part No. K651084	Disk stylus steel M2	7,5
	1xPart No. K651085	Disk stylus steel - ruby M2	10
	1xPart No. K651090	Hollow ball ceramic M2	11
	1xPart No. K651058	5-way stylus holder M2	7,5
	4xPart No. K651037	Extension steel M2	5
	2x Part No. K651038	Extension steel M2	10
	2x Part No. K651039	Extension steel M2	20
	2xPart No. K651040	Extension steel M2	30
	2x Part No. K651041	Extension steel M2	40
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M2 Starter

No.	Contents	Description	Length [mm]
K651376	1x Part No. K651012	Stylus steel-ruby M2	10
	1x Part No. K651019	Stylus steel-ruby M2	20
	1x Part No. K651021	Stylus steel-ruby M2	20
	1x Part No. K651022	Stylus steel-ruby M2	20
	1x Part No. K651038	Extension steel M2	10
	1x Part No. K651039	Extension steel M2	20
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M3 CRP 1

No.	Contents	Description	Length [mm]
K651318	1x Part No. K651297	Stylus carbon fiber-ruby M3	21
	1x Part No. K651298	Stylus carbon fiber-ruby M3	21
	1x Part No. K651301	Stylus carbon fiber-SiNi M3	21
	1x Part No. K651299	Stylus carbon fiber-ruby M3	31
	1x Part No. K651300	Stylus carbon fiber-ruby M3	40
	1x Part No. K651303	Stylus carbon fiber-ruby M3	50
	1x Part No. K651223	pin spanner ø 1,2 mm	

Styli Kit M3 CRP 2

No.	Contents	Description	Length [mm]
K651319	1x Part No. K651302	Stylus carbon fiber-ruby M3	21
	1x Part No. K651304	Stylus carbon fiber-ruby M3	21
	1x Part No. K651303	Stylus carbon fiber-ruby M3	50
	1x Part No. K651306	Stylus carbon fiber-ruby M3	50
	1x Part No. K651305	Stylus carbon fiber-ruby M3	75
	1x Part No. K651223	Pin spanner ø 1,2 mm	

Styli Kit M2 Professional

Styli Kit M2 Starter

Styli Kit M3 CRP 1

Styli Kit M3 CRP 2

Styli Kits

Styli Kit M3 Basic

Styli Kit M3 Basic

No.	Contents	Description	Length [mm]
K651381	1x Part No. K651170	Adaptor steel M3	5
	1x Part No. K651146	Stylus steel-ruby M3	21
	5x Part No. K651147	Stylus steel-ruby M3	21
	1x Part No. K651148	Stylus steel-ruby M3	21
	3x Part No. K651151	Stylus steel-ruby M3	31
	1x Part No. K651152	Stylus steel-ruby M3	33,5
	1x Part No. K651169	5-way stylus holder M3	13
	1x Part No. K651180	swivel steel M3	11,5
	1x Part No. K651172	disc stylus M3	33
	1x Part No. K651174	disc stylus M3	7,5
	1x Part No. K651157	extension steel M3	20
	1x Part No. K651159	extension steel M3	35
	2x Part No. K651223	Pin spanner ø 1,2 mm	23
	1x Part No. K650135	hexagonal screwdriver	

Styli Kit M3 CRP 3

Styli Kit M3 CRP 3

No.	Contents	Description	Length [mm]
K651320	1x Part No. K651302	Stylus carbon fiber-ruby M3	21
	1x Part No. K651304	Stylus carbon fiber-ruby M3	21
	1x Part No. K651303	Stylus carbon fiber-ruby M3	50
	1x Part No. K651306	Stylus carbon fiber-ruby M3	75
	1x Part No. K651305	Stylus carbon fiber-ruby M3	100
	1x Part No. K651223	Pin spanner ø 1,2 mm	

Styli Kit M3 Starter

Styli Kit M3 Starter

No.	Contents	Description	Length [mm]
K651380	1x Part No. K651146	Stylus steel-ruby M3	21
	1x Part No. K651147	Stylus steel-ruby M3	21
	1x Part No. K651148	Stylus steel-ruby M3	21
	1x Part No. K651151	Stylus steel-ruby M3	31
	1x Part No. K651152	Stylus steel-ruby M3	33,5
	1x Part No. K651157	extension steel M3	20
	1x Part No. K651159	extension steel M3	35
	2x Part No. K651223	Pin spanner ø 1,2 mm	23

Styli Kit M4

Styli Kit M4

No.	Contents	Description	Length [mm]
K651383	1x Part No. K651184	Stylus ceramic-ruby M4	100
	1x Part No. K651182	Stylus ceramic-ruby M4	50
	1x Part No. K651216	Adaptor ceramic M4/M3	100
	1x Part No. K651215	Adaptor ceramic M4/M3	75
	1x Part No. K651214	Adaptor ceramic M4/M3	50
	1x Part No. K651204	extension ceramic M4	50
	1x Part No. K651203	extension ceramic M4	30
	1x Part No. K651170	Adaptor M3/M2	5
	1x Part No. K651208	Adaptor M4/M3	9
	2x Part No. K650346	Pin spanner	49
	2x Part No. K651223	Pin spanner	23
	1x Part No. K651058	5-way stylus holder M2	7,5
	1x Part No. K651169	5-way stylus holder M3	13
	1x Part No. K651206	5-way stylus holder M4	18
	1x Part No. K651186	Stylus steel-ruby M4	19,5
	4x Part No. K651187	Stylus steel-ruby M4	19
	1x Part No. K651188	Stylus steel-ruby M4	18

Mitutoyo

StyliCleaner always Reliable and Clean Stylus

StyliCleaner

The integrated solution to clean your probe tip

Reliable? Avoid mismeasurement with the StyliCleaner

Put an end to the risk of wrong measuring data caused by a polluted stylus!

Mitutoyo Styli Cleaner The automated solution to remove dust or chip from coordinate measuring machines' styli. The StyliCleaner automatically cleans your probe tip - even during the measurement process. In as little as 30 seconds a combination of compressed air and detergent reliably removes all dirt from the sensor. The StyliCleaner not only sets an end to the hassle of manual cleaning but also to the time-consuming recalibration of all probe angles that follows it. As a result, StyliCleaner dramatically increases the efficiency and reliability of your quality assurance!

Developed by a Mitutoyo application engineer together with one of his customers, only with a prototype, has shown exceptional results from the beginning. Also, other customers did tests and were happily surprised by the results. Especially there were production measurements and SPC were involved. That's why in every Metrology course it is mentioned: Clean the part, the fixture and the styli.

Polluted Styli tip

Cleaned Styli tip

No.	Model	Remarks
63AAA102	SC1	For straight styli only
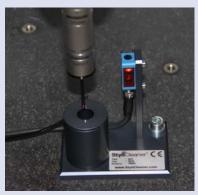
CMM Fixtures

eco-fix CMM fixtures Series

Mitutoyo eco-fix CMM fixtures Series – Experience in Accuracy

Mitutoyo fixture kits series "eco-fix" is a very fast and affordable solution to get workpieces clamped on the measuring machine. In just a few minutes, your fixture is ready for measurement. Therefore, eco-fix is a very attractive alternative to customised jigs.
The modular clamping system for CMM and form measuring machines, eco-fix, allows relaxed working in many ways. For the first time, functions and colours are conjoint in a practice-oriented concept for time-saving economical working and confusion- proof handling.

Clear optical differentiation of elements by colour
• Black: base plate
• Violet: brackets
• Orange: build up components
• Silver: Top pieces for workpiece support

Workpiece set up on eco-fix base plate

Fixtures leaflet PRE 1403

Mitutoyo

CMM Fixtures
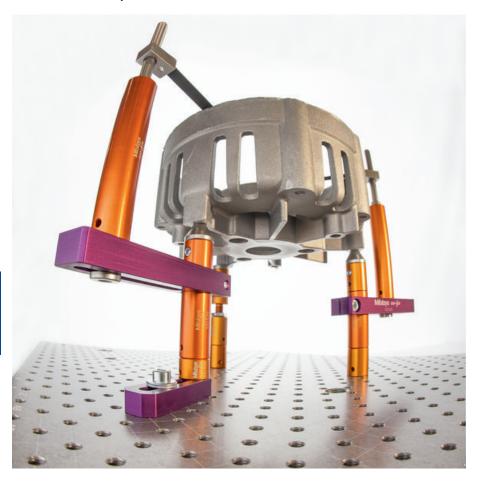
eco-fix CMM fixtures Series

An easy way to document your repeatable fixture set-up for reduced variation:

• Parts numbers featured on all elements for easy identification of components
• Alpha numeric grid pattern on all base plates for simplified positioning and relocation of elements
• Fits all CMM brands
• Build your individual fixture in only 20 minutes!
• Flexible modular systems
• Fast & affordable
• Suitable for various different workpieces or other measuring equipment
• Easy adaption to product changes
• M6 thread pattern
• Purchase one kit for each workpiece

The major advantage of eco-fix is that – in contrast to conventional solutions – no additional joints are required due to the state-of-the-art construction. These are the ideas that count in a daily job routine and make eco-fix noticeably better priced than similar systems – without saving on performance and versatility.
The results are systematic efficiency at compelling profitability and considerably reduced costs at enormous versatility.

CMM Fixtures

Mitutoyo eco-fix pallet receiver system

Receiver pallet and master ball on the granite

The affordable new manual pallet receiver system is perfectly suitable where workpiece through-put shall be boosted although fully automated solutions are not feasible or beyond budget. It significantly speeds up measuring on coordinate measuring machines.

Just a few of the systems strong points:
• Easy, precise and fast repositioning
• Enhances semi-automatic serial CMM measurement
• Significantly higher measurement throughput
• Stowing rack for perfect workshop tidiness.
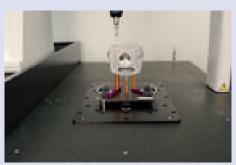
In combination with the well-known eco-fix system, you get the most out of CMM measurement. The pallet system comprises the tried and tested Mitutoyo eco-fix system, a base plate with two handles and three semi- spheres on the bottom. The latter help the measuring staff with quickly and precisely positioning the pallet on the receiver frame fixed to the measuring machine – in just one step. This way, fine-adjusting of the position is a thing of the past.

Base pallet and fixtured workpiece in measurement position

During the measuring process another workpiece can be positioned on a second, identically equipped pallet and placed on the machine as soon as the first workpiece has been measured. This not only guarantees very quick measurement and – as a consequence – a high workpiece throughput but also top process safety.

Mitutoyo offers a rack system that can hold up to six pallets that can be placed close to the CMM. It will hold the Fixtures prepared for the next measurement. For perfect tidiness in the measuring room and stowing away pallets that are currently not in use Mitutoyo offers customized racks system that can hold all of your fixture pallets, even when equipped with fixtures and workpieces That way, you can build up a fixture archive for all your parts with a repetitive measurement schedule.

Start measurement process

Fixtures leaflet PRE 1403

Mitutoyo

CMM Fixtures
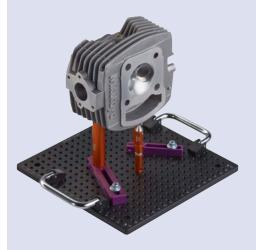
eco-fix kits avalable in many configurations.

Pallet receiver base and handles
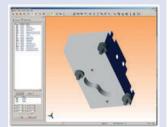
Eco-fix storage rack with fixtured workpieces

Mitutoyo

CMM Fixtures
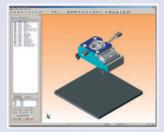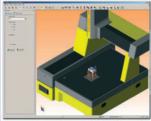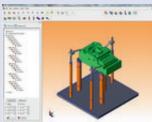
FixtureBuilder Software

The free of charge software FixtureBuilder enables the user to easily plan and set up his CMM fixture in just a few minutes. Repeatable fixturing has never been easier and at a better price performance ratio.

"FixtureBuilder" is a software tool that allows users to create virtual clamping fixtures quickly and easily. Users can choose whether to set the virtual fixture up manually or to allow the software's "AutoMode" to perform the task.

The interactive "AutoMode" operating mode guides the user step by to step to a finalized clamping fixture. Only very few data need to be input, for example the choice of component to be clamped or the position and type of contact and tensioning points. This data is sufficient to enable FixtureBuilder to independently create a complete clamping fixture.

• Fixture building by mouse click
• Ideal for online programming
• Parts list with material overview
• Documented structure
• Automatic weight determination
• allows data to be imported in Acis (*.sat), Iges (*.igs) and Step (*.stp) formats

FixtureBuilder software allows data to be imported in Acis (*.sat), Iges (*.igs) and Step (*.stp) formats The export functions it offers include Hoops file (*.hsf), Autodesk (*.dwf), 3d PDF (*.pdf) and Acis Files (*.sat). Integrated into Mitutoyo's MCOSMOS CMM software, FixtureBuilder allows data to be processed in all MCOSMOS import formats. The fixture design can be imported into the measuring software, either on its own or complete with component, and thus be used for offline programming of the coordinate measuring machine.
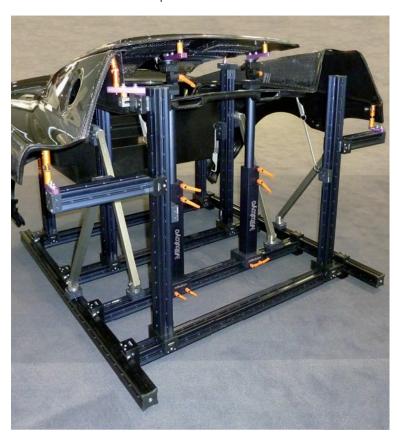
A parts list with assembly instructions is available in various output formats for the assembly of the real fixture created in FixtureBuilder. The 3-D function in PDF format is especially practical as it allows limitless variations on the view of the fixture model in the PDF document. The virtual design can therefore be examined from all possible views and positions.

CMM Fixtures

VARI-FIX

- flexible RST profiles
- fully height-adjustable
- rotative parts allow 360° positioning
- combinable with all eco-fix parts

Mitutoyo

CMM Enclosures

Protect your investment for contamination, improve reliability of measurements and reduce main-tenance costs. Mitutoyo's Inspection Enclosures are designed to help keep your CMMs and instru-ments free of airborne contamination.

Features and benefits:
• Standard fans create positive pressure inside the enclosure to exclude airborne contaminants, increase reliability of measurements and reduce CMM maintenance costs.
• Air-conditioning option is available to add temperature control to the clean air environment.
• Enclosed volume provides greatly improved working conditions for intricate inspection operations.
• Double doors fold back enabling easy access for part loading.
• Modular Design with removable panels enables easy construction around existing machines, straightforward relocation (if required) and assists in annual CMM servicing.
• Enclosures are robustly built to whitstand the demands of a busy shopfloor manufacturing facility.
• Transparent, polycarbonate, easy-clean panels pass sufficient light for normal use and are shatterproof, tough and durable.
• Clean, functional design enhances the appearance of your CMMs.

Technical details:
• Framework fabricated from extruded aluminium.
• Lower panels made from PVC - available in a variety of colours
• Upper panels in clear polycarbonate.

Mitutoyo

Quick Image

The ultimate in simple operation with **one click measurement.**
This non-contact 2D vision measuring system brings you a new concept in 2D vision measuring instruments. It offers several unique features to improve the efficiency of your measurements, including:
- Long focal depth and wide field of view.
- Double telecentric optical system.
- 3Mega-pixel colour camera.
- Four-quadrant LED ring light.
- Motorized stage models provide highest measurement efficiency.

Specifications

Measuring Mode	High-resolution mode and Normal mode
Optical system working distance	90 mm
Optical system depth of focus	**High-resolution mode** : ±0,6 mm (QI-A, QI-B and QI-C) **Normal mode** : ±11 mm (QI-A and QI-C) ±1,8 mm (QI-B)
Accuracy [1]	$E_{1(x,y)} = ±(3,5+0,02L)$ μm **L** = measured length (mm) [1]According to Mitutoyo inspection method
Optical system magnification	**QI-A and QI-C models** : 0,2X **QI-B models** : 0,5X
CCD camera	3 Megapixels colour CCD camera
Illumination	- Contour LED - Coaxial LED - 4-quadrant LED ring light

Optional accessories

No.	Description
937179T.	Footswitch
12AAJ088.	Reinforced footswitch
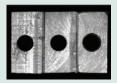
Image of a stepped block using the double telecentric objective showing the orthographic view produced.
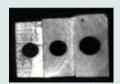
Image of the same object using a standard objective

Refer to the Quick Image brochure

QI-A 4020D

QI-C 2017D

QI-A models, 0,2x Magnification, Manual stage

Model	QI-A1010D	QI-A2010D	QI-A2017D	QI-A3017D	QI-A4020D
No.	**361-850A**	**361-851A**	**361-852A**	**361-853A**	**361-854A**
Travelling range X-, Y-axis [mm]	100 x 100	200 x 100	200 x 170	300 x 170	400 x 200
Travelling range Z-axis [mm]	100	100	100	100	100
Stage glass size [mm]	170 x 170	242 x 140	260 x 230	360 x 230	440 x 232
Max. stage loading kg	10	10	20	20	15
Mass kg	65	69	150	158	164

QI-B models, 0,5x Magnification, Manual stage

Model	QI-B1010D	QI-B2010D	QI-B2017D	QI-B3017D	QI-B4020D
No.	**361-855A**	**361-856A**	**361-857A**	**361-858A**	**361-859A**
Travelling range X-, Y-axis [mm]	100 x 100	200 x 100	200 x 170	300 x 170	400 x 200
Travelling range Z-axis [mm]	100	100	100	100	100
Stage glass size [mm]	170 x 170	242 x 140	260 x 230	360 x 230	440 x 232
Max. stage loading kg	10	10	20	20	15
Mass kg	65	69	150	158	164

QI-C models, 0,2x Magnification, Motorized stage

Model	QI-C2010D	QI-C2017D	QI-C3017D
No.	**361-860A**	**361-861A**	**361-862A**
Travelling range X-, Y-axis [mm]	200 x 100	200 x 170	300 x 170
Travelling range Z-axis [mm]	100	100	100
Stage glass size [mm]	242 x 140	260 x 230	360 x 230
Max. stage loading kg	10	20	20
Mass kg	72	153	161

Mitutoyo
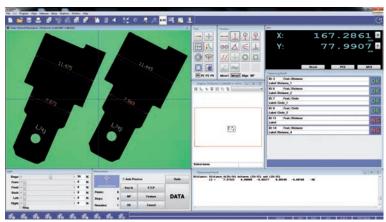
Software for Quick Image Systems

QIPAK

• One click measurement with QUICK GO / NG decision
• Single mouse-click edge-detection tools; very easy to use.
• Template tools for comparative analysis.
• Video image capture.
• Stage navigation function gives improved measurement cycles.
• Image stitching provides wide area measurement.

No.	Type
QIPAK	Software for Quick Image Systems

Example 1 screen layout QIPAK

Example 2 screen layout QIPAK
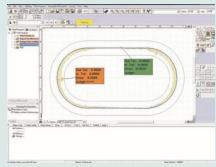
Specifications

QIPAK
Additional software (optional)

MEASURLINK (refer to the Measurlink page)

QS CAD-IMPORT/EXPORT

FORMTRACEPAK-AP [1]

[1] FORMTRACEPAK-AP

Simple and easy-to-use 2D contour analysis.
Graphic reports (geometry or scanning) edition.
Allows measurement by comparison.
For more information refer to FORMTRACEPAK-AP.

Manual Quick Scope QS-L Series

Series 359

This manual vision measuring system is an excellent surface observation system which you can use on a wide variety of workpieces.
The Quick Scope offers you the following benefits:
- 0,1 µm resolution and 150 mm Z-axis range.
- Power zoom enabling you to change magnification change quickly and easily.
- Fine illumination capability enabling you to change lighting to match your workpiece requirements.
- A quick release system on the stage, so you can switch instantly between coarse and fine movement.
- Quick navigation function allowing you to repeat measurements quickly.
- Motorized Z-axis enables fast and accurate Auto Focus.

Specifications

Accuracy[1]	$E_{1(x,y)}$= (2,2 + 0,02**L**) µm
	$E_{1(z)}$= (4,5 + 0,006**L**) µm
	L=measured length (mm)
	[1]According to Mitutoyo inspection method
Illumination	- Contour: White LED
	- Coaxial: White LED
	- Ring Light: 4-quadrant White LED

Optional accessories

No.	Description
937179T.	Footswitch
12AAJ088.	Reinforced footswitch
02ATN695.	Calibration chart with holder
02AVA410	Z-Objective 1X
02AVA450	Z-Objective 2X

Refer to the Optical Accessories page for Quick Scope / Quick Vision for more information on calibration charts.

1X, 1.5X and 2X interchangebale lens

Quick Scope brochure on request

QS-L Z/AFC models

Model	QS-L2010Z/AFC	QS-L3017Z/AFC	QS-L4020Z/AFC
No.	**359-713-10**	**359-714-10**	**359-715-10**
Sensor type	Colour CMOS 3 Megapixels	Colour CMOS 3 Megapixels	Colour CMOS 3 Megapixels
AF (motorized Z-axis)	Yes	Yes	Yes
Objective lens	Zoom type	Zoom type	Zoom type
Travelling range X-, Y-axis [mm]	200 x 100	300 x 170	400 x 200
Travelling range Z-axis [mm]	150	150	150
Magnification (optical system)	0,75X -> 5,25X with 1,5X objective	0,75X -> 5,25X with 1,5X objective	0,75X -> 5,25X with 1,5X objective
Z-axis measurement	Motorized with AF	Motorized with AF	Motorized with AF
Max. stage loading kg	10	20	15
Mass kg	70	160	167

Mitutoyo
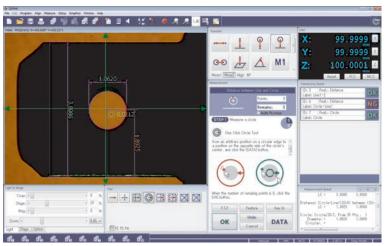
Software for Quick Scope Systems

QSPAK
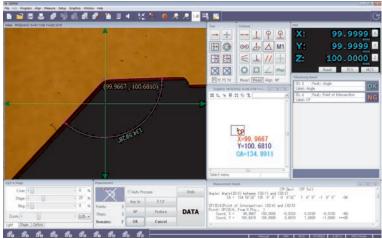
- Easy to use, single mouse-click edge-detection tools
- Template tools for comparative analysis.
- Video image capture.
- Stage navigation function for CNC machines giving you improved measurement cycles.

No.	Type
QSPAK	Software for Quick Scope systems
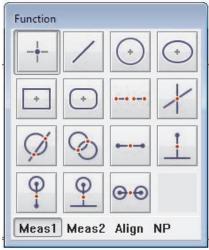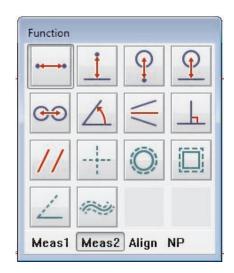
QSPAK Layout: Easy mode

QSPAK Layout: Pro mode

Measurement item commands
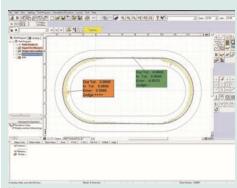
Specifications

QIPAK	MEASURLINK
Additional software (optional)	(refer to the Measurlink page)
	QS CAD-IMPORT/EXPORT
	FORMTRACEPAK-AP[1]

[1] FORMTRACEPAK-AP

Simple and easy-to-use 2D contour analysis.
Graphic reports (geometry or scanning) edition.
Allows measurement by comparison.
For more information refer to FORMTRACEPAK-AP

Quick Vision ACTIVE Series

Series 363

This CNC Vision Measuring System combines the flexibility of a high quality zoom lens with the speed of a state-of-the-art digital colour camera and offers the following benefits:
- Programmable LED stage and coaxial light
- Programmable 4-quadrant LED ring light
- High-resolution and high-speed CMOS colour camera
- High-quality 7-step zoom optics with interchangeable lenses
- Compact design
- Powerful, user-friendly QVPAK software
- Touch probe option: 364 Series or retrofit.

Specifications

Resolution	0,1 µm
Illumination	(White LED) • Contour • Coaxial • 4-quadrant ring light
Magnification change system	Zoom optical system with 8 positions Standard 1,5X magnification lens
Sensor type	High resolution CMOS colour camera
Additional objective lenses	1X and 2X magnification

Optional accessories

No.	Description
02ATN695	Calibration Chart, Pixel Calibration Chart with Holder
02ATV522	Machine Stand QVST-4L
02ATV515	Machine Stand QVST-2L
02AVA410	Z-Objective 1X
02AVA450	Z-Objective 2X

QV ACTIVE with optional Opti-fix clamping system

1X, 1,5X and 2X interchangeable lens

Quick Vision ACTIVE 404

No.	Type	Accuracy	Model	Range (X, Y, Z-axis) with Vision Head	Max. stage loading [kg]	Mass [kg]
363-109-10Y	QV ACTIVE 202	$E_{1(x,y)} = (2+0,3L/100)$ µm $E_{1(z)} = (3+0,5L/100)$ µm $E_{2(XY)}= (2,5+0,4 L/100)$ µm L = measured length (mm)	QV-L202Z1L-D	250 x 200 x 150 mm	10	155
363-110-10Y	QV ACTIVE 404	$E_{1(x,y)} = (2+0,3L/100)$ µm $E_{1(z)} = (3+0,5L/100)$ µm $E_{2(XY)}= (2,5+0,4 L/100)$ µm L = measured length (mm)	QV-L404Z1L-D	400 x 400 x 200 mm	20	324

Accuracy: According to Mitutoyo inspection method / Mass: Main Unit with Stand

Mitutoyo

Quick Vision APEX / HYPER Series

Series 363

This CNC Vision Measuring System is a floor-standing vision measuring machine which offers you the following benefits:
- Programmable LED stage and coaxial lighting.
- Programmable 4-quadrant LED ring light.
- Pattern focus function.
- Accuracy specifications conforming to ISO 10360-7 standard (on request).
- Temperature compensation as standard feature.
- Touch probe option: 364 Series or retrofit

Optional PFF Function (Points From Focus)
- PFF enhances the functionality of standard QV models with 3D topography measurements
- No additional sensor necessary
- High scanning range in Z axis from 2,7 mm up to 40,6 mm depending on the objective lens in use and in wide range mode

Touch Probe option
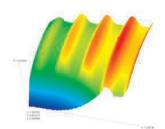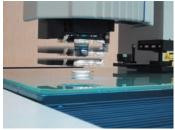
Quick Vision Apex 302 PRO

Workpiece to be measured with PFF

3D Analysis of PFF measurement

2D Analysis of PFF measurement

PRL = Programmable Ring Light
Fine control of angle and direction provides illumination for optimal measurement. You can set the angle in the range from 30° to 80°. This type of illumination is effective for enhancing the edge of inclined surfaces or very small steps. Illumination can be controlled independently from back or front, right or left. Measurement with edge enhancement is possible if you form a shadow by illuminating from only one direction.
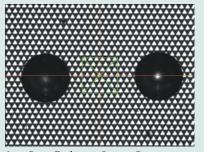
Specifications

Illumination	**White LED:** - Contour - Coaxial - 4 quadrant PRL
Magnification change system	Programmable Power Turret (PPT) 1X ; 2X ; 6X
Sensor Type	**QV PRO Models:** High sensitivity CCD B&W camera **QV PRO3 Models:** High sensitivity CCD Colour camera
Factory option	**For QV APEX and QV HYPER:** **- TAF** Tracking Auto Focus **For QV APEX:** **- PRO 3 models** Colour CCD camera Refer to the Quick Vision Accessories page for details
Additional objective lenses	Refer to the Optical Accessories page for Quick Scope / Quick Vision

Optional accessories

No.	Description
Calibration charts	
02ATN695.	Calibration chart with holder
Machine stands	
02ATN332.	Machine Stand for QV-302
02ATN333.	Machine Stand for QV-404
02ATN334.	Machine Stand for QV-606

Refer to the Optical Accessories page for Quick Scope / Quick Vision for more information on calibration charts.

Auto Focus Tool : type Pattern Focus
(tool for focusing on difficult surfaces such as mirrors, polished surface clear glass).

Refer to the Quick Vision brochure

Mitutoyo

Quick Vision APEX / HYPER Series

Series 363 - Quick Vision APEX / HYPER

Quick Vision 302
Range : 300 x 200 x 200 mm

Type	Quick Vision APEX 302 PRO	Quick Vision APEX 302 PRO3	Quick Vision HYPER 302 PRO
No.	**363-170-10SY**	**363-171-10Y**	**363-173-10SY**
Model	QV-X302P1L-D	QV-X302P3L-D	QV-H302P1L-D
Resolution μm	0,1	0,1	0,02
Accuracy[1]	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (0,8+0,2L/100)$ $E_{1(z)} = (1,5+0,2L/100)$ $E_{2(xy)} = (1,4+0,3L/100)$
Max. stage loading kg	20	20	15
Mass kg	360	360	360

Quick Vision 404
Range : 400 x 400 x 250 mm

Type	Quick Vision APEX 404 PRO	Quick Vision APEX 404 PRO3	Quick Vision HYPER 404 PRO
No.	**363-180-10SY**	**363-181-10Y**	**363-183-10SY**
Model	QV-X404P1L-D	QV-X404P3L-D	QV-H404P1L-D
Resolution μm	0,1	0,1	0,02
Accuracy[1]	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (0,8+0,2L/100)$ $E_{1(z)} = (1,5+0,2L/100)$ $E_{2(xy)} = (1,4+0,3L/100)$
Max. stage loading kg	40	40	30
Mass kg	579	579	579

Quick Vision 606
Range : 600 x 650 x 250 mm

Type	Quick Vision APEX 606 PRO	Quick Vision APEX 606 PRO3	Quick Vision HYPER 606 PRO
No.	**363-190-10SY**	**363-191-10Y**	**363-193-10SY**
Model	QV-X606P1L-D	QV-X606P3L-D	QV-H606P1L-D
Resolution μm	0,1	0,1	0,02
Accuracy[1]	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (1,5+0,3L/100)$ $E_{1(z)} = (1,5+0,4L/100)$ $E_{2(xy)} = (2+0,4L/100)$	$E_{1(x,y)} = (0,8+0,2L/100)$ $E_{1(z)} = (1,5+0,2L/100)$ $E_{2(xy)} = (1,4+0,3L/100)$
Max. stage loading kg	50	50	40
Mass kg	1450	1450	1450

Quick Vision Apex 404 PRO

Mitutoyo

Quick Vision STREAM PLUS Series

Series 363
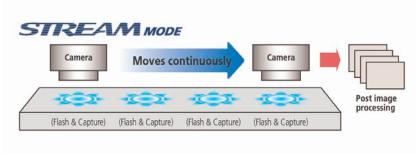
This CNC vision measuring system enables you to carry out measurements at lightning speed.
The Quick Vision Stream Plus offers you the following benefits:
• Non-stop measurement in your production environment thanks to high-tech lighting options.
• Combining quadricolour and stroboscopic lighting, it captures and processes all the workpiece images you need to make accurate and rapid measurements.

Quick Vision STREAM PLUS 606 PRO

STREAM Mode

- The measurement mode of non-stop vision measuring is referred to as the STREAM mode.

Specifications

Resolution	0,1 µm
CCD camera	High-sensitivity B&W, progressive scan CCD
Accuracy [1]	$E_{1(x,y)} = (1{,}5+0{,}3L/100)$ µm $E_{1(z)} = (1{,}5+0{,}4L/100)$ µm $E_{2(xy)} = (2+0{,}4L/100)$ µm L = measured length (mm) [1] According to Mitutoyo inspection method
Illumination	Hi-intensity LED (stroboscopic and continuous illumination, switchable) : - Contour (Blue) - Coaxial (RGB & W) - 4-quadrant PRL (RGB & W) (PRL : refer to the QV-ELF page) Pattern focus function (Pattern focus : refer to the QV-ACCEL page)

Additional Specifications

Factory option	**- Tracking Auto Focus (TAF)** (Refer to Quick Vision Accessories for details)
Additional objective lenses	Refer to the Optical Accessories page for Quick Scope / Quick Vision

Optional accessories

No.	Description
Calibration charts	
02ATN695.	Calibration chart with holder
Machine stands	
02ATN332.	Machine Stand for QV-302
02ATN333.	Machine Stand for QV-404
02ATN334.	Machine Stand for QV-606

Refer to the Optical Accessories page for Quick Scope / Quick Vision for more information on calibration charts.

Non-stop vision measurement

Refer to the Quick Vision brochure

Scan QR Code with your mobile device and watch our product videos on YouTube

Type	Quick Vision STREAM PLUS 302	Quick Vision STREAM PLUS 404	Quick Vision STREAM PLUS 606
No.	363-172-10Y	363-182-10Y	363-192-10Y
Model	QV-X302P1S-D	QV-X404P1S-D	QV-X606P1S-D
Range (X, Y, Z-axis) with Vision Head	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Max. measuring speed	40 mm/s	40 mm/s	40 mm/s
Max. drive speed (X-, Y-, Z-axis)	300 mm/s	XY : 400 mm/s Z : 300 mm/s	XY : 400 mm/s Z : 300 mm/s

Other features are identical to QV-APEX

Mitutoyo

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Quick Vision ACCEL Series

Series 363

This CNC vision measuring system is a moving-bridge type structure.
The Quick Vision ACCEL offers you the following benefits:
- The moving-bridge type structure results in a fixed stage. This means that the workpiece fixture can be designed more simply, which in turn means you need significantly fewer man-hours for fixture fabrication and inspection.
- The system comes complete with a machine stand.
- 3D topography measurements are possible with the optional PFF functionality.
- Touch probe option: 364 Series or retrofit
- Tracking Auto Focus (TAF) as factory option.

Touch Probe option

Specifications

Resolution	0,1 μm
High-sensitivity CCD camera	**PRO models** : B&W **PRO3 models** : Colour
Contour illumination	**PRO models** : White LED **PRO3 models** : White LED
Coaxial illumination	**PRO models** : White LED **PRO3 models** : White LED
4-quadrant PRL [1] illumination	**PRO models** : White LED **PRO3 models** : White LED (1) PRL : refer to the QV APEX
Pattern Focus [2]	**(2) See image below**
Magnification change system	Programmable Power Turret (PPT) 1X ; 2X ; 6X

Additional Specifications

Additional objective lenses	Refer to the Optical Accessories page for Quick Scope / Quick Vision
Factory option	**- Tracking Auto Focus (TAF)** Refer to Quick Vision accessories

Optional accessories

No.	Description
02ATN695.	Calibration chart with holder

Refer to the Optical Accessories page for Quick Scope / Quick Vision for more information on calibration charts.

Auto Focus Tool : type Pattern Focus (focusing for option difficult surfaces such as mirrors, polished surface clear glass).

Auto Focus Tool : Edge Focus type

Auto Focus Tool : Surface Focus type

Auto Focus Tool : Multi-point Auto Focus type

Quick Vision brochure on request

Quick Vision ACCEL 1212 PRO3

Model PRO	QV ACCEL 808 PRO	QV ACCEL 1010 PRO	QV ACCEL 1212 PRO	QV ACCEL 1517 PRO3
No.	**363-315-10Y**	**363-335-10Y**	**363-355-10Y**	**363-375-10Y**
Model PRO3	QV ACCEL 808 PRO3	QV ACCEL 1.010 PRO3	QV ACCEL 1.212 PRO3	QV ACCEL 1.517 PRO3
No.	**363-316-10Y**	**363-336-10Y**	**363-356-10Y**	**363-376-10Y**
Range (X, Y, Z-axis) with Vision Head	800 x 800 x 150 mm	1000 x 1000 x 150 mm	1250 x 1250 x 100 mm	1500 x 1750 x 100 mm
Max. drive speed X, Y-axis mm/s	400	400	300	300
Accuracy E1(x,y) [3]	(1,5+0,3L/100) μm	(1,5+0,3L/100) μm	(2,2+0,3L/100) μm	(2,2+ 0,3L/100) μm
Stage glass size [mm]	883 x 958	1186 x 1186	1440 x 1440	1714 x 1968
Max. stage loading kg	10	30	30	30
Mass kg	2050	2950	3600	4500

[3] According to Mitutoyo inspection method   **L** = measured length (mm)
For a description of PRO and PRO3 models, refer to QV-APEX

Mitutoyo

Quick Vision ULTRA

Series 363

This CNC vision measuring system gives you ultra-high accuracy.
The Quick Vision ULTRA offers you the following benefits:

- Axial translation straightness is maximised through the use of a precision air-bearing linear guide system.
- High resolution (0,01 μm) scales, manufactured at an ultra-precision facility located 11 m underground, are used on all axes.
- The scales are made from glass that has a virtually zero thermal expansion coefficient, so your measuring accuracy has minimal variation in changing temperatures.
- The base structure was designed using Finite Element Method analysis; this gives you the optimal stiffness/weight ratio combined with excellent geometrical stability, in terms of axial straightness/ perpendicularity, with changing temperatures.
- Accuracy specification conforming to ISO 10360-7 are available (on request).
- 3D topography measurements are possible with the optional PFF functionality.

Quick Vision ULTRA 404 PRO

By using FEM (Finite Element Method) analysis of the base design, the placement of stiffening ribs and beams has been determined for the Ultra Quick Vision to provide optimal structural rigidity.

Ultra-precision scale manufacturing facility 11 metres underground

Ultra-high accuracy crystallized glass scale with virtually zero thermal expansion.
The Ultra Quick Vision is equipped with a crystallized glass scale having a resolution of 0.01 μm and linear expansion coefficient of 0.08 x 10^{-6}/K. This virtually zero thermal expansion means the Ultra Quick Vision can minimise accuracy fluctuation due to thermal changes.

Quick Vision brochure on request

Type	Quick Vision ULTRA 404 PRO
No.	**363-518-10SY**
Model	QV-U404P1N-D
Range (X, Y, Z-axis) with Vision Head	400 x 400 x 200 mm
Accuracy [1]	$E_{1(x,y)} = (0{,}25 + 0{,}1L/100)$ μm $E_{1(z)} = (1{,}5 + 0{,}2L/100)$ μm $E_{2(xy)} = (0{,}5 + 0{,}2L/100)$ μm L = measured length (mm)
Resolution μm	0,01
Magnification change system	Programmable Power Turret (PPT) 1X ; 2X ; 6X
Dimensions (W x D x H) [2] mm	1.172 x 1.735 x 1.910
CCD camera	High-sensitivity CCD B&W
Max. drive speed (X-, Y-, Z-axis)	150 mm/s
Illumination	Halogen (Cold light via optical fibre) - Contour - Coaxial - 4-quadrant PRL **(PRL : refer to the QV-APEX page)**
Max stage loading [kg]	40
Stage glass size [mm]	493 x 551
Mass [2] kg	2150

[1] According to Mitutoyo inspection method.
[2] Including machine stand

Quick Vision HYBRID Type 1 Series
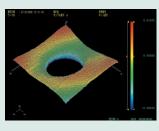
Specifications
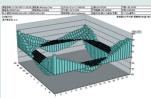
Factory option
- **Colour CCD camera**
  QV PRO 3 models

Curved-form analysis (MSHAPE-QV)
2D / 3D contour lines display
2D / 3D unfiltered profile display
Shadowgraph display
Curved plane analysis
Unfiltered profile analysis, etc.

Data processing (QV Graph)
3D bar chart display
3D surface chart display
2D continuous cross-section graph display

Quick Vision brochure on request

Series 365 - CNC Vision Measuring System

This CNC vision measuring system is a multi-sensor machine.
The Quick Vision HYBRID Type 1 offers you the following benefits:
- It allows you to make vision measurements with a CCD camera, and carry out high-speed scanning, by applying a vision measurement unit in parallel with a non-contact displacement sensor.
- The focusing point method minimises the difference in the measuring face reflectance and gives you high measurement reproducibility.
- The double pinhole method (less directivity) is employed as the measurement principle.

Quick Vision H1 APEX 404 PRO

Quick Vision Hybrid system - Type 1

The scanning laser system for Quick Vision HYBRID adds 3D profiling capability. The laser probe with 0.01 µm resolution continuously scans the workpiece surface and gathers coordinate data, enabling the evaluation of surface contours, peak heights, etc. The double pinhole detection method is adopted to prevent measurement being affected by the colour, reflection factor, etc., of the surface.

<u>Available for</u> Quick Vision APEX ; Quick Vision STREAM PLUS ; Quick Vision HYPER and Quick Vision ACCEL models.

Mitutoyo

Quick Vision HYBRID Type 1 Series

Series 365 - CNC Vision Measuring System

Quick Vision ACCEL-based
Accuracy when using vision sensor: Same as standard Quick Vision ACCEL
Accuracy $E_{1(z)}$ when using non-contact displacement sensor: QV ACCEL 808 and 1010 (2,5+0,4L/100) µm
QV ACCEL 1212 and 1517 (3,5+0,5L/100) µm [1]

Type	Quick Vision H1 ACCEL 808	Quick Vision H1 ACCEL 1010	Quick Vision H1 ACCEL 1212	Quick Vision H1 ACCEL 1517
No.	365-315-10Y	365-335-10Y	365-355-10Y	365-375-10Y
Model	QVH1-A808P1L-C	QVH1-A1010P1L-C	QVH1-A1212P1L-C	QVH1-A1517P1L-C
Range - Vision	800 x 800 x 150 mm	1000 x 1000 x 150 mm	1250 x 1250 x 100 mm	1500 x 1750 x 100 mm
Range - Non-contact Displacement Sensor (Type 1)	680 x 800 x 150 mm	880 x 1000 x 150 mm	1130 x 1250 x 100 mm	1380 x 1750 x 100 mm

Quick Vision APEX-based
Accuracy when using vision sensor: Same as standard Quick Vision APEX
Accuracy $E_{1(z)}$ when using non-contact displacement sensor: (1,5+0,4L/100) µm [1]

Type	Quick Vision H1 APEX 302	Quick Vision H1 APEX 404	Quick Vision H1 APEX 606
No.	365-170-10SY	365-180-10SY	365-190-10SY
Model	QVH1-X302P1L-D	QVH1-X404P1L-D	QVH1-X606P1L-D
Range - Vision	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 1)	180 x 200 x 200 mm	280 x 400 x 250 mm	480 x 650 x 250 mm

Quick Vision HYPER-based
Accuracy when using vision sensor: Same as standard Quick Vision HYPER
Accuracy $E_{1(z)}$ when using non-contact displacement sensor: (1,5+0,2L/100) µm [1]
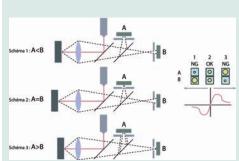
Type	Quick Vision H1 HYPER 302	Quick Vision H1 HYPER 404	Quick Vision H1 HYPER 606
No.	365-173-10SY	365-183-10SY	365-193-10SY
Model	QVH1-H302P1L-D	QVH1-H404P1L-D	QVH1-H606P1L-D
Range - Vision	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 1)	180 x 200 x 200 mm	280 x 400 x 250 mm	480 x 650 x 250 mm

Quick Vision STREAM PLUS-based
Accuracy when using vision sensor: Same as standard Quick Vision STREAM PLUS
Accuracy $E_{1(z)}$ when using non-contact displacement sensor: (1,5+0,4L/100) µm [1]

Type	Quick Vision H1 STREAM PLUS 302	Quick Vision H1 STREAM PLUS 404	Quick Vision H1 STREAM PLUS 606
No.	365-172-10Y	365-182-10Y	365-192-10Y
Model	QVH1-X302P1S-D	QVH1-X404P1S-D	QVH1-X606P1S-D
Range - Vision	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 1)	180 x 200 x 200 mm	280 x 400 x 250 mm	480 x 650 x 250 mm

QV-Hybrid Type 1 : Laser principle, double pinhole method
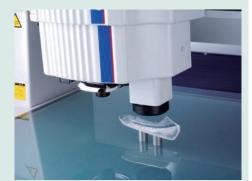
Quick Vision HYBRID Type 4 Series

Series 365 - CNC Vision Measuring System

- The Quick Vision HYBRID type 4 is a multi-sensor machine that enables the topography of the surface and the thickness of transparent objects to be measured.
- The measuring range of the scanning sensor is 0-1200 µm.
- Effective even for high inclination angles both of mirrored surfaces and diffuse surfaces. Maximum measurable inclination angle : ±80° (diffuse surface).
- Achieves high resolution and high accuracy height measurement by the wavelength confocal method using axial chromatic aberration.
- The automatic light intensity control provides reliable measurements even when reflectance of the measured surface changes during measurement.
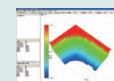
Hybrid Type 4 system

The Quick Vision Hybrid Type 4 is a machine which allows vision measurement with a CCD camera and high-speed scanning with a non-contact displacement sensor.

The Hybrid Type 4 CPS sensor is available for Quick Vision Apex/Hyper and Quick Vision Stream Plus models.
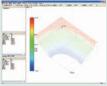
Scanning measurement with automatic movement of the Z-axis
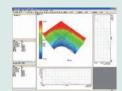
Form analysis of plastic molded parts having a slope.

Solid colour display

Shaped display

Extraction of arbitrary section

Quick Vision H4 HYPER 606 PRO

1: QV APEX-based
Accuracy when using vision sensor: Same as standard Quick Vision APEX
Accuracy $E_{1(2)}$ when using non-contact displacement sensor: (1,5+0,4L/100) µm[1]

Type	Quick Vision H4 APEX 302	Quick Vision H4 APEX 404	Quick Vision H4 APEX 606
No.	**365-413-10SY**	**365-433-10SY**	**365-453-10SY**
Model	QVH4A-X302P1L-D	QVH4A-X404P1L-D	QVH4A-X606P1L-D
Range (X, Y, Z-axis) with Vision Head	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 4)	176 x 200 x 200 mm	276 x 400 x 250 mm	476 x 650 x 250 mm

2: QV STREAM PLUS-based
Accuracy when using vision sensor: Same as standard Quick Vision STREAM PLUS
Accuracy $E_{1(2)}$ when using non-contact displacement sensor: (1,5+0,4L/100) µm[1]

Type	Quick Vision H4 STREAM PLUS 302	Quick Vision H4 STREAM PLUS 404	Quick Vision H4 STREAM PLUS 606
No.	**365-415-10Y**	**365-435-10Y**	**365-455-10Y**
Model	QVH4A-X302P1S-D	QVH4A-X404P1S-D	QVH4A-X606P1S-D
Range (X, Y, Z-axis) with Vision Head	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 4)	176 x 200 x 200 mm	276 x 400 x 250 mm	476 x 650 x 250 mm

3: QV HYPER-based
Accuracy when using vision sensor: Same as standard Quick Vision HYPER
Accuracy $E_{1(2)}$ when using non-contact displacement sensor: (1,5+0,2L/100) µm[1]

Type	Quick Vision H4 HYPER 302	Quick Vision H4 HYPER 404	Quick Vision H4 HYPER 606
No.	**365-416-10SY**	**365-436-10SY**	**365-456-10SY**
Model	QVH4A-H302P1L-D	QVH4A-H404P1L-D	QVH4A-H606P1L-D
Range (X, Y, Z-axis) with Vision Head	300 x 200 x 200 mm	400 x 400 x 250 mm	600 x 650 x 250 mm
Range - Non-contact Displacement Sensor (Type 4)	176 x 200 x 200 mm	276 x 400 x 250 mm	476 x 650 x 250 mm

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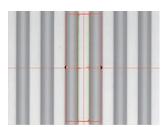
Quick Vision White Light Interferometer
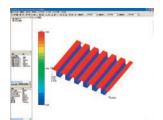
Series 363

- Combined non contact measurements with vision system and White Light Interferometer (WLI)
- Easy alignment and positioning with vision sensor
- Full QVPAK functionality with Vision system
- Enhanced functionality with WLI-system for high resolution topography evaluation such as surface roughness analysis

Quick Vision WLI 404 PRO

QV WLI Objective lenses
Magnification 10X: Field of View 0,32 x 0,24 mm
Magnification 25X: Field of View 0,128 x 0,096 mm
Magnification 5X: Field of View 0,64 x 0,48 mm

WLI optical system head

Interference fringes and intensity depiction

Video image of part

3D Analysis of measured part

2D Analysis of measured part

Specifications when using vision sensor are same as Quick Vision HYPER

Type	Hyper Quick Vision WLI 302	Hyper Quick Vision WLI 404	Hyper Quick Vision WLI 606
No.	**363-713-10SY**	**363-714-10SY**	**363-715-10SY**
Model	QVW-H302P1L-D	QVW-H404P1L-D	QVW-H606P1L-D
Range (X, Y, Z-axis) with Vision Head	300 x 200 x 190 mm	400 x 400 x 240 mm	600 x 650 x 220 mm
Range with WLI Head	215 x 200 x 190 mm	315 x 400 x 240 mm	515 x 650 x 220 mm
Tube Lens WLI Head	2x	2x	2x
Repeatability WLI Head	$2\sigma \leq 0,08$ µm	$2\sigma \leq 0,08$µm	$2\sigma \leq 0,08$µm
Z-axis measuring range WLI Head	170 µm	170 µm	170 µm
Max. stage loading kg	15	25	35

Scan QR Code with your mobile device and watch our product videos on YouTube

MiScan Vision System

Series 364 - CNC Vision Measuring System

The MiSCAN MVS-HYPER and MVS-APEX vision systems combine advanced image processing with tactile scanning measurements.

- The MVS-HYPER 302 can be equiped with either the MPP-Nano probe or SP25M scanning probe
- MPP-Nano is a high accuracy scanning probe for measurement of minute parts and uses stylus modules with tip diameters varying from 125 upto 500 µm
- MVS-HYPER 404 and MVS APEX 404 models are equipped with the SP25M scanning probe for standard scanning jobs with medium size measuring range.
- The MiSCAN Vision Systems are driven by the powerful combination of MCOSMOS and VISION-PAK-PRO software to garantee maximum functionality for both non-contact and tactile measurements.
- All the benefits of the standard QUICK VISION HYPER/APEX systems are also incorporated in the MiSCAN Vision systems

MPP-NANO Module 0.8 master gear measurement

MPP-NANO mold scanning

SP25M

| 02ATX718 | 02ATX719 | 02ATX721 | 02ATX722 |
| R125-85-20 | R300-85-40 | R500-85-45 | R500-125-85 |
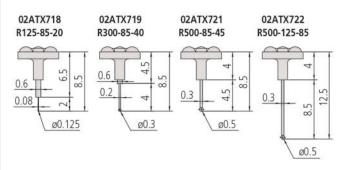
Type	MiSCAN HYPER 302	MiSCAN APEX 404	MiSCAN HYPER 404
No.	364-502SY	364-511SY	364-512SY
Model	MVS-H302P1L-D	MVS-X404P1L-D	MVS-H404P1L-D
Measuring range using vision sensor	300 x 200 x 200 mm	400 x 400 x 250 mm	400 x 400 x 250 mm
Resolution µm	0,02	0,1	0,02
Measuring range using scanning probe	175 x 200 x 200 mm	275 x 400 x 250 mm	275 x 400 x 250 mm
Measurement accuracy with vision sensor [µm]	$E_{1x}, E_{1y} = (0,8+0,2L/100)$ $E_{1z} = (1,5+0,2L/100)$ $E_{2xy} = (1,4+0,3L/100)$	$E_{1x}, E_{1y} = (1,5+0,3L/100)$ $E_{1z} = (1,5+0,4L/100)$ $E_{2xy} = (2,0+0,4L/100)$	$E_{1x}, E_{1y} = (0,8+0,2L/100)$ $E_{1z} = (1,5+0,2L/100)$ $E_{2xy} = (1,4+0,3L/100)$
Measurement accuracy with scanning probe [µm]	$E_{0,MPE} = (1,9+0,4L/100)$	$E_{0,MPE} = (2,5+0,6L/100)$	$E_{0,MPE} = (1,9+0,4L/100)$
Max. stage loading kg	15	40	30
Mass kg	360	579	579

603

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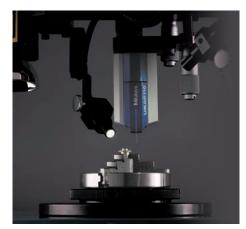
UMAP Vision System Series

UMAP : Ultra Micro Accurate Probe

The UMAP (Ultra Micro Accurate Probe) is a micro-form measuring system
The UMAP offers you the following benefits:
• Dual functions of high-accuracy contact and non-contact measurement in one machine.
• Contact (micro-stylus UMAP probe) and non-contact (vision probe) measuring probes are installed.
• You can measure micro-features of parts previously impossible to reach.
• Several diameters of micro-stylus are available from 15 µm to 300 µm.

UMAP Probe Unit

UMAP Probes
(ultrasonic micro stylus probes)
Stylus ultrasonic micro-vibration and its amplitude-sensing enable UMAP probe to perform contact measurement of micro-features of parts.
5 choices of stylus tip diameter are available from 15 µm to 300 µm.

Hyper UMAP 302 Type 2

UMAP 101
ø15 µm
L = 0,2 mm

UMAP 103
ø30 µm
L = 2 mm

UMAP 107
ø70 µm
L = 5 mm

UMAP 110
ø100 µm
L = 10 mm

UMAP 130
ø300 µm
L = 16 mm

Type 2 - QVPAK + CCD + UMAP Probe

Type	Hyper UMAP 302 Type 2	Ultra UMAP 404 Type 2
No.	**364-713-10SY**	**364-717-10SY**
Model	UVS2-H302P1L-D	UVS2-U404P1N-D
Range (X-, Y-axis) [1]	185 x 200 mm	285 x 400 mm
Range (Z-axis) [1]	**- UMAP 101/103 :** 175 mm **- UMAP 107/110 :** 180 mm **- UMAP 130 :** 185 mm	**- UMAP 101/103 :** 175 mm **- UMAP 107/110 :** 180 mm **- UMAP 130 :** 185 mm
Accuracy [2]	$E_{1(x,y)} = (0,8+0,2L/100)$ µm $E_{1(Z)} = (1,5+0,2L/100)$ µm	$E_{1(x,y)} = (0,25+0,1L/100)$ µm $E_{1(Z)} = (1,5+0,2L/100)$ µm
Repeatability (σ)	**- UMAP 101/103/107 :** 0,1 µm **- UMAP 110/130 :** 0,15 µm	**- UMAP 101/103/107 :** 0,08 µm **- UMAP 110/130 :** 0,12 µm

Refer to the UMAP Vision system brochure

FORMTRACEPAK-AP
Simple and easy-to-use 2D contour analysis.
Graphic reports (geometry or scanning) edition.
Allows measurement by comparison.
For more information refer to FORMTRACEPAK-AP.

QV3DCAD-Online
Automatic program generation from 3D CAD files
issued from a CAD system (must be associated
with a converter).

Vision Measuring Machines brochures on request
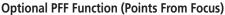
Software for Quick Vision Systems

QVPAK

- QVPAK controls multiple sensors: CCD, Touch Probe, continuous scanning devices, special UMAP or LNP probes.
- Powerful mathematical algorithms are provided that help you to detect difficult edges via noise filters (similar to morphological filters) and advanced detection tools that take into account the texture of the target surface.
- Partprogramming and editing is made easy with the user friendly Easy Editor.
- 3D graphic display or measuring planes display with the QVClient QVGraphic.
- QVPAK also offers you various QVClients (standard), real assistants for users (programmation mode) or operators (production mode) such as QVSmartEditor and QVNavigator.

Optional software modules for Quick Vision System
- Formtracepak-AP-QV for 2D contour analysis
- Formtracepak-Pro for 3D surface analysis
- QV Part Manager for managing the execution of parts programs of multiple parts
- Easypag-Pro for offline generation of part programs from 2D CAD data
- QV3DCAD-online for online generation of part programs from 3D CAD files
- MeasurLink for statistical process control (SPC)
- QV3DPAK for 3D topography measurements (see explanation below)
- For more information refer to the Vision Measuring Machines brochures

Optional PFF Function (Points From Focus)
- PFF enhances the functionality of standard QV models with 3D topography measurements
- No additional sensor necessary
- High scanning range in Z axis from 2,7 mm upto 40,6 mm depending on the objective lens in use and in wide range mode
- PFF is a retro fittable option for Quick Vision ELF, Quick Vision APEX/HYPER, Quick Vision ACCEL and Quick Vision ULTRA.
  Please contact your local Mitutoyo office for more detailed information.

Workpiece to be measured with PFF

3D Analysis of PFF measurement
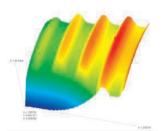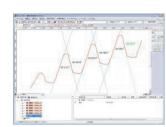
2D Analysis of PFF measurement

Example of the QVPAK screen layout.

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Accessories for Quick Vision Systems

Touch Probe Option - Series 364 or Retrofit

An optional touch probe (TP) is available for following QV models:
Quick Vision-ACTIVE; Quick Vision-APEX ; Quick Vision-HYPER ; Quick Vision-ACCEL.
• The Quick Vision-TP system allows you to carry out both non-contact and contact measurements.
• Compatible with Renishaw Touch Probe TP 20 or TP 200.
• An optional MCR20 rack for storing probe modules enhances functionality even more.

Quick Vision ACTIVE with Touch Probe option

Quick Vision-APEX with Touch Probe option

TP20
Compact stylus change type.

TP200
Compact and high accuracy stylus change type
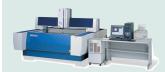
Styli kit M2
Starter

Quick Vision-ACTIVE models

QV-APEX and HYPER models

Quick Vision Accel models

Refer to the Quick Vision brochure

Accessories for Quick Vision Systems

Tracking Auto Focus

Tracking Auto Focus Function TTL (Through The Lens) *
For Quick Vision-APEX, Quick Vision-HYPER, Quick Vision-STREAM PLUS, Quick Vision-ULTRA
The Tracking Auto Focus unit (TAF) allows stable, high-speed measurement in the Z-axis, due to the Knife-edge method adopted in the detection system.
The TAF function tracks the waviness and warp of the workpiece surface in Z direction and enhances throughput compared with normal measuring mode.
When TAF is used on a Quick Vision Stream Plus model, fully non-stop measurements become possible.

Coaxial laser Tracking Auto Focus (TAF)

Laser spot of Tracking Auto Focus system (TAF)

Measurement example : Height of leads on a QFP package

TAF (Tracking Auto Focus)*

No.	Objective lens	Tracking range [mm]	Laser spot diameter [µm]
TAF-HR2,5X	QV-HR2,5X	±0,5	2,1
TAF-SL2,5X	QV-SL2,5X	±0,5	3,1
TAF-5X	QV-5X	±0,125	1,5
TAF-HR1X	QV-HR1X	±3,15	5,2
TAF-SL1X	QV-SL1X	±3,15	8

*factory option

Specifications

QV Index Head	Automatic multi-plane measurement is possible with the optional index table
Min. rotation angle	0,1 °
Max. rotation speed	10 rpm
Positioning Accuracy	±0,5°
Max. workpiece ø [mm]	140

QV Index Head

Using the QV Index to rotate the workpiece makes it possible to automatically measure multiple surface without having to dismount/remount the workpiece.

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Objective Lenses and Calibration Charts

Objective Lenses and Calibration Charts

No.	Model
02ALT630	QV WLI A-10X
02ALT670	QV WLI A-25X
02ALY400	QV WLI A-5X

1. QV-Objective lens - HR and SL (Long Working Distance) models

No.	Magnification	NA [2]	Model	Turret lens Mag. QV	Monitor Mag. QV	Working distance [mm]
02AKT199	0,5X		QV-SL0,5X	1X 2X 6X	16X 32X 96X	30,5
02ALA150	1X		QV-SL1X	1X 2X 6X	32X 64X 192X	52,5
02ALA170	2,5X		QV-SL2,5X	1X 2X 6X	80X 160X 480X	60
02ALA420	5X		QV-5X	1X 2X 6X	160x 320X 960X	33,5
02ALG010	10X		QV-SL10X	1X 2X 6X	320X 640X 1920X	30,5
02ALG020	25X		QV-25X	1X 2X 6X	800X 1600X 4800X	13
02AKT250	1X	0,084	QV-HR1X	1X 2X 6X	32X 64X 192X	40,6
02AKT300	2,5X	0,21	QV-HR2,5X	1X 2X 6X	80X 160X 480X	40,6
02AKT650	10X	0,42	QV-HR10X	1X 2X 6X	320X 640X 1920X	20

Other Accessories

Machine Stands

No.	Model
02ATN695	Calibration chart with holder
02ATN697	Compensation chart with holder

Additional Specifications

Remarks
- The monitor magnifications are approximate values.
- QV-10X, QV-25X : Depending on the workpiece the illumination may be insufficient at a turret lens magnification of 2X and 6X for QV models.
- QV-25X : The PRL illumination is restricted in its usable position.

Calibration Glass chart & Compensation glass chart with holder
A calibration or compensation chart is used to calibrate or compensate for the pixel size of the CCD sensor, autofocus accuracy and the optical axis offset at each magnification of the Programmable Power Turret (PPT) or of the zoom.

Modular Clamping System OPTI-FIX

The modular clamping system for vision measuring systems

This modular and flexible clamping system is ideal for use with vision measuring systems including profile projectors, measuring microscopes and image analysis measuring machines.
OPTI-FIX offers you the following benefits:

- The system's highly compact components enable you to keep parts in the required position during measurement.
- It enables you to make reliable repeated measurements on a batch of parts, or measurements in particular positions.
- The system elements are assembled with dovetail joints.
- You are offered a choice of several kits.

Holding a cylindrical part between clamping tips.

Toothed rule that lets light pass
Spring flange locking the part in the measurement position.

Batch measurement of identical parts placed against the right-angled frame.
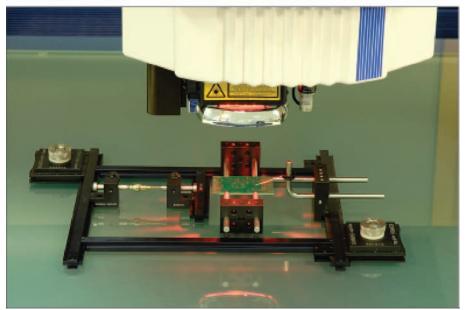
Refer to the OPTI-FIX brochure

No.	Model	Description
K551056	Opti-Set Start	- Comprising 16 elements - Construction of a right-angled frame of dimensions 250x100mm
K551057	Opti-Set Basic	- Comprising 26 elements - Construction of a frame of dimensions 200x100mm
K551059	Opti-Set Advanced	- Comprising 51 elements - Construction of a frame of dimensions 400x250mm - Allows aerial positioning of parts
K551060	Opti-Set Professional	- Comprising 115 elements - Construction of frame of dimensions 400x250mm - Complete and highly versatile kit
K551058	Opti-Set Rotation	- Comprising 23 elements - Construction of frame of dimensions 250x200mm - Including accessories for holding cylindrical parts
K550298	Opti-Set Round	- Comprising 18 elements allowing aerial positioning of complex parts - This kit is supplied in a case (see photo below)
K550989	Adjustable magnetic clamp	Only 3 clamps are necessary to hold the OPTI-FIX clamping system to the machine surface

Opti-Set Round

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Modular Clamping System OPTI-FIX

OPTI-FIX Clamping System

Electronic board raised to give clearance for the components on its underside. Placed directly on the glass stage of the machine without the OPTI-FIX clamping system, the electronic board would not lie flat. The set-up is held on the glass surface by 2 suction

Example of application for holding prismatic parts (without the OPTI-FIX clamping system, the part could not be positioned correctly). The set-up is held on the glass surface by a magnetic clamp attached to the stage frame.

Mini-vice (internal-external)

Precision quick chuck

Clamping jaw

Jaw tip ø0-2

Jaw tip ø1-3
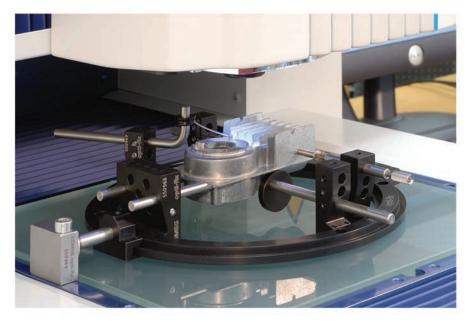
Jaw tip ø4-5

Perpendicular jaw tip

OPTI-FIX brochure on request

Batteries
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Washers, Anvils
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Mirrors, Stage Glass
Page 613

Paper Rolls, Ink Ribbons, Bulbs
Page 614

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Batteries

Batteries

No.	To fit product	Product No.	Description
011037	QM-Height DP-1DX Digi-Test DP-1VR DP-1VR (UK only)	518-22x 264-501 209-5xx 264-504-5D 264-504-5E	4 x LR-6
011076	DP-1HS	264-503	4 x
011263	Indicator	209-xxx	1 x LCR-123A
011372	Contact Block	900xxx	2 x
05SAA217D	Height Gauge	192-6xx	1 x CR-2.032
12BAA240D			
352011	MST201/401/402	178-121/178-907	1 x
938882	Micrometer/Caliper Height Gauge Height Gauge	All models 192-6xx 570-xxx	1 x SR-44
353489	MST-501 CBH-400	178-961 218-982	3 x LR-14

Washers, Anvils

Carbide-tipped Anvils for Series 511

No.	Measuring range (inside)	Anvil number
21DZA213A	18/35 mm	1
21DZA213B	18/35 mm	2
21DZA213C	18/35 mm	3
21DZA213D	18/35 mm	4
21DZA213E	18/35 mm	5
21DZA213F	18/35 mm	6
21DZA213G	18/35 mm	7
21DZA213H	18/35 mm	8
21DZA213J	18/35 mm	9
21DZA232A	35/60 mm or 50/150 mm	1
21DZA232B	35/60 mm or 50/150 mm	2
21DZA232C	35/60 mm or 50/150 mm	3
21DZA232D	35/60 mm or 50/150 mm	4
21DZA232E	35/60 mm or 50/150 mm	5
21DZA232F	35/60 mm or 50/150 mm	6
21DZA232G	50/150 mm	7
21DZA232H	50/150 mm	8
21DZA232J	50/150 mm	9
21DZA232L	50/150 mm	10
21DZA232M	50/150 mm	11
102178	Extension for 35/150 mm	

Replacement Washers for Series 511

Thickness 0.5 mm	Thickness 1 mm	Thickness 2 mm	Thickness 3 mm
No.	No.	No.	No.
205457	205458	205459	205460
205623	205624		

Mirrors, Stage Glass

Projection Lenses for Profile Projectors

PJ250

Magnification	Lens	Oblique illumination mirror assembly	Oblique illumination mirror
	No.	No.	No.
10X	172-125	172-290	515514
20X	172-126	172-291	515515

PJ300

Magnification	Lens	Oblique illumination mirror assembly	Oblique illumination mirror
	No.	No.	No.
10X	172-202	172-292	515516
20X	172-203	172-293	515517

Stage Glass for Profile Projectors and Microscopes

No.	Dimensions [mm]
200674	ø60 mm
200662	ø66 mm
200673	ø80 x 5 mm
383141	ø84 mm
200667	ø100 x 5 mm
384111	ø180 mm
380405	96 x 96 x 5 mm
380495	154 x 96 x 5 mm
12BAE041	154 x 154 x 5 mm
515264	190 x 160 x 5 mm or 190 x 160 x 6 mm
381349	196 x 96 x 5 mm
382762	280 x 180 x 6 mm
517505	310 x 170 x 8 mm

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Paper Rolls, Ink Ribbons, Bulbs

Ink Ribbons

No.	Quantity	To suit product	Product No.
198728	5	DP-1HS	264-503

Paper Rolls

No.	Quantity	To suit product	Product No.
353535	1	MST501	178-961
908353-1	2	MPK10 MPK100 MPK120	264-103 264-xxx 264-xxx
011074	5	DP-1HS	264-503
011046	10	MST201 MST301 MST4	178-121 178-127/178-128 178-911
09EAA082-5	5	DP-1VR DP-1VR (UK only)	264-504-5D 264-504-5E
12AAA802	10	LH-600B (thermal printer) LH-600C (thermal printer) LH-600D (thermal printer)	518-321-0 518-331-20/518-332-20 518-341-20/518-342-20
12AAN052	10	LH-600E/ LH-600EG	518-351D-21/518-352D-21
270004	10	STP2 DP-1DX/1AT	178-802 264-501/502
270490	10	Multiprinter	164-515
997471	10	RA300 RA400	211-961/211-962 211-963/211-964
997662	10	RA112/122	211-921/941
998698D	10	RA114	211-705

Paper Rolls, Ink Ribbons, Bulbs

Bulbs

No.	To fit product	Illumination	Description
011315			10,8V 30W
02AKJ023D	377-090-1DD		8W
101479	TM10		6,3V
11BAC224			AVK-A
162151	CF 10 (Halogen)		6V 10W
19BAA095	AVK-C MVK-E3/-G/-VL		6V 15W (10 pcs)
200672	PJ250	Surface	10V 70W
383038D	TM505/510		24V 2W
510187	PV600	Surface	10V 300W
512305	PH14 PH350H/353H/361H/600H (Halogen) PJ251/321/2500/3000/300H(Halogen) PJ311/PJ311 T4/Z1 (Halogen) PV600/5000/350H/500H (Halogen) PJH30/3000 (Halogen)	Surface or Contour	24V 150W
513614	DR DV4 SR (Halogen)		6V 10W
513666	FS50/110 (Halogen) TM/111/301/311/321/331		6V 20W
513667N	FS50F/50L/110 (Halogen) MF200 (Halogen) HV TM111/301/311/321/331 MF505/510/1020/1030 MF505TH/510TH/1020TH/1030TH TF510F/510FW/1020F		12V 50W
515557	TM200	Contour	8V 24W
515558	TM200	Surface	8V 24W
515559	TM Illumination		8V 12W

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Mitutoyo

Mitutoyo in Europe

As Europe has become more integrated, a huge and vital market is being created. Mitutoyo is well placed for the integrated expansion of the European market. Under the strategic direction of Mitutoyo Europe GmbH there is a large production, sales and service network at your disposal, with (at present) more than 85 offices in 33 European countries.

Our leading market representation ensures that Mitutoyo's customers can take full advantage of the potential of the opportunities in this growing market - several integrated supply chain service functions supporting our dealer partners and commercial customers. We provide our clients on-site service in the areas of demand planning, integrated supply systems, distribution management, warehousing and fleet management.

Mitutoyo guarantees its service for installation, calibration, inspection and repair. From the smallest caliper towards the largest measuring device, just rely on our service. Moreover we support international customers with multilingual staff. A Japanese company opening a facility in Europe? Mitutoyo trains your staff in the Japanese language. A German company relocates capital equipment to a new plant in Russia? Mitutoyo supports your staff in Russia in the German language. Mitutoyo is where you are!

Research and development

Research and development is the cornerstone of our growth strategy and we are always seeking to provide innovative solutions by continually investing in our research and development capabilities. In recent times, the company has established itself as one of the world's most innovative providers of measuring technologies.

With substantial financial, technological and human investment Mitutoyo continues to develop advanced measurement solutions for quality assurance. New concepts, principles and technologies are constantly under development. Innovations are leading to continual improvement of our current products and may also form the basis of entirely new product lines.

Specialised products

If you want to accurately measure down to the micron under challenging conditions, you cannot afford mistakes in the choice of instruments and you do not want to deal with compatibility issues. Mitutoyo users have no interface problems and know they can rely on measurement systems from a supplier with one of the widest product ranges in the world.

Our current product portfolio includes more than 5000 specialised measuring instruments, from the traditional analogue micrometer to the highly accurate 3D coordinate measuring machines. The product range and Mitutoyo system solutions are optimally matched and work closely together. Mitutoyo complies with the requirements of international quality systems, including ISO 9001 and ISO / TS 16949 (automotive) and AS9100 (aerospace), as well as MSA R & R studies. This will not change in the future.

Proven quality

When it comes to quality assurance, only what is proven or what is provable matters. Your work demands guarantees regarding quality assurance.

Mitutoyo provides certificates and quality guarantees. These include a TÜV quality seal, an internationally recognised calibration certificate, guarantee card confirming IP protection, CE, etc.. With equipment that is, amongst other things, of proven high quality, you can concentrate fully on your own quality assurance.

Customised solutions

Mitutoyo stands for technological competence and ensures, in addition to sound advice, outstanding performance in project management and engineering. A good example is the M^3 Solutions concept. M^3 stands for Mitutoyo Measurement Metrology and is a service aimed at providing individual measurement solutions. This ensures we can meet the very specific needs of customers in the field related to production and integrated quality assurance.

M^3 Solutions include measurement task definition, environmental analysis and solution development including costs, project management and delivery of the plan. Additionally, you can rely on the vast experience of the largest single provider of length measurement technology to ensure your own specific requirements are met.

Training and knowledge

Do you want to know more? Then Mitutoyo is the right place. In our education and training center MIM (Mitutoyo Institute of Metrology) we offer software courses and seminars concerning the basics of 3D coordinate measuring technology, imaging metrology, surface roughness measurements and the subjects of hardness, roundness and using basic hand-held measuring tools.

Apart from knowledge, MIM is also focused on the dialogue between specialists. Therefore, it is not only intended for customers of Mitutoyo, but also for all other experts in the field of manufacturing, service, education, science and research.

Technical support

Mitutoyo provides full support, especially in the area of technical customer service. We cover your needs from A to Z. Client services are extensive and range from regular maintenance of your equipment to repairing in our specialised workshops. From your first call, you benefit from the expertise of our technical customer service, even before the purchase of a measuring

between laboratories in fifteen countries, giving Mitutoyo a unique position in global metrological expertise. All fifteen calibration laboratories meet the high demands of ISO 17025.

The ISO / EC 17025 describes the general requirements for the competence of calibration laboratories. Mitutoyo performs all calibrations in accordance with this directive.

Each calibration and repair division contains a calibration laboratory enabling us to provide an optimal service in the area of calibration. To get an overview of what Mitutoyo calibration can do for you, please visit our website.

system. We advise you regarding the equipment specification that represents the best solution for your measurement needs. We can also show you how to get the best out of your existing equipment. We provide training in the use of our products to ensure optimal usage of software. All Mitutoyo hand-held measuring instruments sent in for repair are returned in a timely fashion after attention from our team of experienced and skilled technicians.

With this expertise and many years of experience we can advise customers with respect to maintenance, repair and calibration requirements for any other Mitutoyo measuring instrument.

Calibration by Mitutoyo
The standard for many of our clients

Through a unique international network of accredited Mitutoyo calibration laboratories we provide you with the security of metrological cross-checking

Optimisation by Mitutoyo

Part programming by Mitutoyo is a service that many of our clients benefit from. You can use our team of support specialists to help automate your measurement procedures.

Mitutoyo also offers a measurement service that may be a good solution for you if you are unable to carry it out due to lack of time, manpower or capacity. Our 3D coordinate measuring machines provide very accurate measurements and, if you wish, our specialists can write individual measurement programs for your Mitutoyo CMM.

We can provide part programming on site, thus ensuring our specialists can directly support you or your staff when writing or designing measurement programs.

Mitutoyo

European Network

Since opening up the European market in the early sixties Mitutoyo has been continuously consolidating its presence in this economically important region.

We have been preparing for the expansion of the European market well in advance before it became reality to this extent. As a result, a close net of production, sales and service facilities in more than 85 establishments with different focal points is available to the customers in 33 European countries.

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In January 2010 Mitutoyo synchronised and strengthened the concerted pan-European activities by the establishment of an European headquarters. The location of Mitutoyo Europe GmbH is Neuss in the vicinity of Dusseldorf, Germany.

Mitutoyo Europe GmbH oversees all the activities of Mitutoyo's sales, service and production facilities throughout Europe and adjacent markets, including those of business strategies of such European operations. A Mitutoyo Europe GmbH key objective is to promote coordination amongst its European Group Companies in order to optimise its sales and technical support services in the best interests of customer satisfaction. A strong community for Europe's future.

■ **Headquarter**
■ **Sales Company**
■ **Service Center**
■ **Calibration Center**
■ **M³ Solution Center**
■ **Mitutoyo Institute of Metrology**
■ **Research and Development Facility**
■ **Manufacturing Facility**

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