

## Mitutoyo

Catalog No. US-1002



## Measuring Instruments Catalog

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02-214-0101

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# MSM-400

SERIES 377 — Stereo Microscopes

## FEATURES

- Bright, sharp images with real depth are recreated with resolution and excellent faithfulness to color, thus minimizing eye fatigue while increasing inspection efficiency and productivity.
- The MSM series provides a full range of advanced functions at an affordable price.
- User-friendly turret type (MSM-412, MSM-465) and a zoom type (MSM-Z414) are available.
- Continuous zooming, a standard feature, allows you to enlarge the object by 10 to 40 times in total magnification.
- MSM series can be connected to a digital camera or CCD camera to save captured images of the object or for simultaneous observation through different media.
- The extended depth of focus, long working distance and wide field of view increase work efficiency. The system is ideal for inspecting various objects such as electronics, plants, mineral compositions and biological cells.
- Various attachments expand applications and use. Extended MSM units can be used for appearance inspection systems or in teaching environments.



MSM-412



MSM-Z414



MSM-465

## SPECIFICATIONS

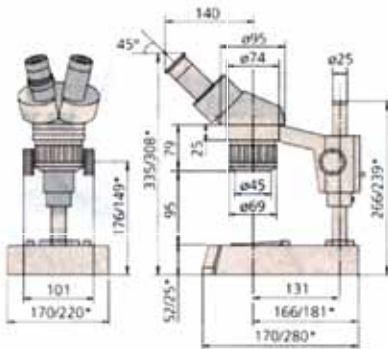
### Metric

| Model No.                     | MSM-412                   | MSM-Z414                  | MSM-465                   |
|-------------------------------|---------------------------|---------------------------|---------------------------|
| Order No.                     | 377-625E                  | 377-945E                  | 375-065E                  |
| Optical system                | Greenough's type          |                           |                           |
| Total magnification           | 10X, 20X                  | 10xT0 40X6X, 12X          |                           |
| Optical tub                   | Binocular                 | Binocular                 | Binocular                 |
| Pupil distance                | 54-76 mm (adjustable)     | 54-76 mm (adjustable)     | 54-76 mm (adjustable)     |
| Eyepiece                      | WF10X, WF5X, WF15X, WF20X | WF10X, WF5X, WF15X, WF20X | WF10X, WF5X, WF15X, WF20X |
| Objective                     | 1X, 2X                    | 1X to 4X                  | 1.2X, 2.5X, 5X1.2         |
| Working distance of objective | 95mm                      | 80mm                      | 89mm                      |
| Focusing travel               | 44mm                      | 44mm                      | 50mm                      |
| Maximum workpiece height      | 93mm                      | 95mm                      | 95mm*                     |
| Workstage size                | ø95mm                     | ø95mm                     | ø95mm                     |
| Dimensions                    | 151x285x343mm             | 151x285x343mm             | 151x285x343mm             |
| Mass                          | 4.9 kg (377-925B) 4.7 kg  | 5.3 kg (377-945B) 5.1 kg  | 4.8 kg (377-965B) 6.3 kg  |

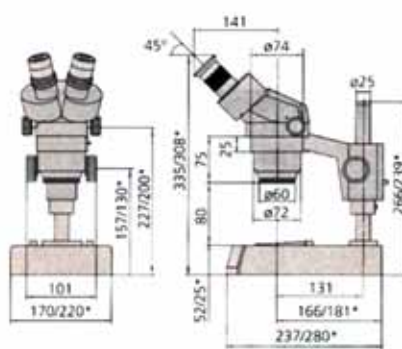
\*To denote your AC line voltage add the following suffixes to the order No. (e.g. : 377-925A)  
A for 120V K for 100V D for 220V E for 240/220V DC for China No suffix is required for 100V

## DIMENSION

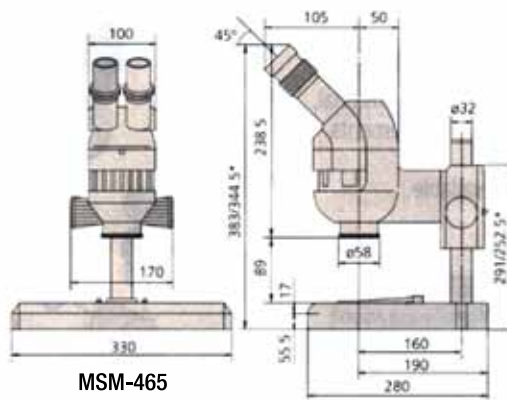
Unit: mm



MSM-412



MSM-Z414



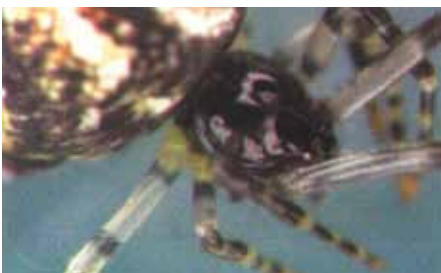
MSM-465



MSM-465



MSM-Z414



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## Optional Lenses

For MSM -412, Z414



5X eyepiece :  
377-026



15X eyepiece :  
377-028



20X eyepiece :  
377-028



0.5X Auxiliary  
objective:  
377-045



0.75X Auxiliary  
objective:  
377-046



1.5X Auxiliary  
objective:  
377-046

For MSM -465



6.25X eyepiece :  
377-066



15X eyepiece :  
377-067



20X eyepiece :  
377-068



32X eyepiece :  
377-069



0.5X Auxiliary  
objective:  
377-076



15X Auxiliary  
objective:  
377-077



2X Auxiliary  
objective:  
377-078

## Pocket Magnifiers

### SERIES 183

#### FEATURES

- Suitable for inspecting metal surfaces.

#### SPECIFICATIONS

| Metric        |           |            |
|---------------|-----------|------------|
| Magnification | Order No. | Remarks    |
| 25X           | 183-201   | Pen Type   |
|               | 183-202   | With stand |
| 50X           | 183-203   | With stand |



183-201



183-202



183-203

#### Optional Reticles for pocket comparators



183-120



183-103



183-104



183-105



183-106



183-107



183-108



183-109



183-110



183-111



183-122



183-113



183-114



183-115

## Pocket Comparators

### SERIES 183

#### FEATURES

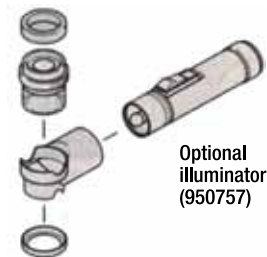
- By replacing optional reticles, dimensional, angle, and other types of measurements can be performed.
- Illuminator (950757) is available.

#### SPECIFICATIONS

| Metric        |           |                             |
|---------------|-----------|-----------------------------|
| Magnification | Order No. | Remarks                     |
| 8X            | 183-101   | Optional reticles available |
| 9X            | 183-121   | Optional reticles available |
| 10X           | 183-131   | Optional reticles available |



183-101



Optional illuminator (950757)

## Zoom Loupe

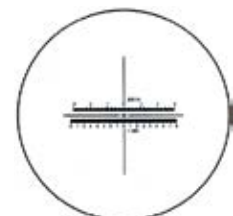
### SERIES 183

#### FEATURES

- Allows the user 8X-16X zoom observation.
- Magnification indicator is provided for 8X, 10X, 12X, 14X, and 16X observation.
- Metric and inch scales are provided for measuring.
- Comes with a carrying case.



183-304



Reticle Provided

#### SPECIFICATIONS

| Metric        |           |                                                 |
|---------------|-----------|-------------------------------------------------|
| Magnification | Order No. | Remarks                                         |
| 8X            | 183-304   | With reticle (Scale graduation : 0.1 mm, .0005) |

## Clear Loupe

### SERIES 183

#### SPECIFICATIONS

| Metric        |           |                    |
|---------------|-----------|--------------------|
| Magnification | Order No. | Remarks            |
| 7X            | 183-301   | Drawtube removable |
| 10X           | 183-302   | Drawtube removable |
| 15X           | 183-331   | Drawtube removable |



183-301



183-302



183-331



# Hardmatic HH-300

**SERIES 811 - Durometers for Rubber and Plastics Hardness Testing**

## FEATURES

Digital / Dial Durometers are suitable for testing the nature of the following materials — natural rubber, neoprene, polyesters, P.V.C., leather, Thiokol, nitrile rubber, wax, vinyl, cellulose acetates, glass polystyrene, etc.



## Technical Data

- Designed in accordance with the ASTM D 2240, ISO 868, ISO 7619, DIN 53 505, JIS K 6253, and JIS K 7215 specifications.
- Units are available in both Shore A and Shore D scales, and will test a wide variety of applications.
- The Digital Durometer is provided with data hold function, permitting the operator to make an error-free reading on the LCD screen.
- The Dial Durometer is provided with a peak retaining hand for error-free reading.

## Optional Accessory

- 19BAA180:** Holding bar\*
- 811-019:** Testing stand (Shore A)
- 811-012:** Testing stand (Shore D)
- 811-013:** Testing stand (Shore A)\*\*
- 811-014:** Testing stand (Shore D)\*\*
- 811-017:** Auxiliary weights (Shore A)
- 811-018:** Auxiliary weights (Shore D)

\*Only available on Compact Type Durometer.  
\*\*Long-leg Type Durometer attachment is included.

These stands are used to mount Durometers. They allow constant pressure hardness measurement by pressing the Durometer vertically on a workpiece.

- Anyone can perform repeatable hardness measurement due to fewer possibilities of human error and measurement variations.
- The supplied weights can be attached directly to a Durometer and allow constant-pressure hardness measurement of large samples for which a stand cannot be used.
- The supplied weights are used for calibrating the spring tension of Durometers.

## SPECIFICATIONS

| Order No.           | Digital     | 811-336                                                                                                                     | 811-336-01 | 811-332           | 881-338                                              | 811-338-01 | 811-334           |
|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------|------------|-------------------|------------------------------------------------------|------------|-------------------|
|                     | Dial        | 811-335                                                                                                                     | 811-335-01 | 811-331           | 881-337                                              | 811-337-01 | 811-333           |
| Model No.           | Digital     | HH-336                                                                                                                      | HH-336-01  | HH-332            | HH-338                                               | HH-338-01  | HH-334            |
|                     | Dial        | HH-335                                                                                                                      | HH-335-01  | HH-331            | HH-337                                               | HH-337-01  | HH-333            |
| Scale               |             | Shore A                                                                                                                     |            |                   | Shore D                                              |            |                   |
| Applications        |             | Natural rubber, soft elastomers, etc.                                                                                       |            |                   | Hard elastomers, plastics, hard rubber, ebonite etc. |            |                   |
| Resolution          |             | 0.5 (digital) or 1 (dial)                                                                                                   |            |                   | 0.5 (digital) or 1 (dial)                            |            |                   |
| Range               |             | HA: 10 - 90                                                                                                                 |            |                   | HD: 20 - 90                                          |            |                   |
| Standards           | ASTM D 2240 | ✓                                                                                                                           |            | ✓                 | ✓                                                    |            | ✓                 |
|                     | ISO 868     | ✓                                                                                                                           |            | ✓                 | ✓                                                    |            | ✓                 |
|                     | ISO 7619    | ✓                                                                                                                           |            | ✓                 | ✓                                                    |            | ✓                 |
|                     | DIN 53 505  | —                                                                                                                           |            | ✓                 | —                                                    |            | ✓                 |
|                     | JIS K 6253  | ✓                                                                                                                           |            | ✓                 | ✓                                                    |            | ✓                 |
|                     | JIS K 7215  | ✓                                                                                                                           |            | ✓                 | ✓                                                    |            | ✓                 |
| Pressure foot       |             | 44 x 18mm                                                                                                                   |            | ø18mm             | 44 x 18mm                                            |            | ø18mm             |
| Spring force (mN)   |             | 550±75H (H: Reading 10-90)                                                                                                  |            |                   | 444.5H (H: Reading 20-90)                            |            |                   |
| Indenter            |             | Blunt taper (Tip diameter: 0.79mm)                                                                                          |            |                   | Sharp point (Tip curvature: 0.1±0.01mm)              |            |                   |
| Tip angle           |             | 35°±0.25°                                                                                                                   |            |                   | 30°±0.5°                                             |            |                   |
| Indenter diameter   |             | 1.25mm                                                                                                                      |            |                   |                                                      |            |                   |
| Indenter protrusion |             | 2.5mm                                                                                                                       |            |                   |                                                      |            |                   |
| Functions           |             | Digital: Data hold, Zero-setting, SPC output, Power ON/OFF (Power supply: SR44 x 1pc) Analog Durometer: Peak retaining hand |            |                   |                                                      |            |                   |
| Type                |             | Compact                                                                                                                     |            | Long-leg          | Compact                                              |            | Long-leg          |
| Dimensions (W×D×H)  | Digital     | 60 x 28.5 x 151mm                                                                                                           |            | 60 x 28.5 x 193mm | 60 x 28.5 x 151mm                                    |            | 60 x 28.5 x 193mm |
|                     | Dial        | 56 x 33.5 x 144mm                                                                                                           |            | 56 x 33.5 x 186mm | 56 x 33.5 x 144mm                                    |            | 56 x 33.5 x 186mm |
| Mass                | Digital     | 290g                                                                                                                        |            | 310g              | 290g                                                 |            | 310g              |
|                     | Dial        | 300g                                                                                                                        |            | 320g              | 300g                                                 |            | 320g              |



- Workstage dimension : ø90mm
- Maximum sample height : ø90mm

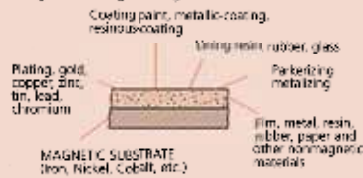


Refer to the Hardmatic HH-300 leaflet (E4137) for more details.



## Application

Nonmagnetic coatings on magnetic substrate



Nonconductive coating on nonmagnetic substrate



## Optional Accessory

**0732135\*** Special probe for inside wall of bore  
 \*Not available for 179-721, 179-755, 179-756



Mini. bore diameter: 30mm  
 Max. measuring depth: 200mm

**526688:** AC adapter for Neo-Derm (100V AC)  
**526688A:** AC adapter for Neo-Derm (120V AC)  
**526688D:** AC adapter for Neo-Derm (220V AC)  
**526688E:** AC adapter for Neo-Derm (220/240V AC)  
**528041:** AC adapter for Digi-Derm (100V AC)  
**528041A:** AC adapter for Digi-Derm (120V AC)  
**528041D:** AC adapter for Digi-Derm (220V AC)  
**528041E:** AC adapter for Digi-Derm (220/240V AC)  
**936937:** SPC cable for Digi-Derm (1m)  
**965014:** SPC cable for Digi-Derm (2m)

## Consumables

**527599:** Calibration film (25µm, 1 pc.)  
**527600:** Calibration film (50µm, 1 pc.)  
**527601:** Calibration film (100µm, 1 pc.)  
**527602:** Calibration film (250µm, 1 pc.)  
**527603:** Calibration film (0.5mm, 1 pc.)  
**527604:** Calibration film (1.0mm, 1 pc.)  
**527605:** Calibration film (2.0mm, 1 pc.)  
**685013:** Calibration film (11.5mm, 1 pc.)  
**933038:** Metallic base for calibration film (magnetic)  
**937305:** Metallic base for calibration film (nonmagnetic)  
**937287:** Calibration film set (25µm, 50µm)  
**937288:** Calibration film set (25µm, 50µm, 100µm, 250µm)  
**937289:** Calibration film set (100µm, 250µm, 0.5mm, 1.0mm, 2.0mm)  
**945014:** Calibration film set (25µm, 50µm, 100µm, 250µm, 0.5mm, 1.0mm, 1.5mm)  
**945049:** Calibration film set (25µm, 50µm, 100µm, 250µm, 0.5mm, 1.0mm)

## Neo-Derm/Digi-Derm

## SERIES 179 - Electronic Coating Thickness Gage

## FEATURES

- Battery powered for portable use and can also operate on AC power with an optional adapter.
- Measurements are displayed on the clear LCD screen and can be output for SPC data analysis. (Digi-Derm)
- A set of calibration films and a metallic base is provided for each unit.
- Measures the thickness of nonmagnetic coating on magnetic substrate or a layer of nonconductive material on nonmagnetic substrate.
- Special probe for measuring the coating thickness on the inside wall of bores is optional (**732135**).



## SPECIFICATIONS

| Metric     |              |                               |                              |              |                              |              |
|------------|--------------|-------------------------------|------------------------------|--------------|------------------------------|--------------|
| Order No.  | 179-700      | 179-701                       | 179-702                      | 179-745      | 179-721                      | 179-755      |
| Display    | Analog meter | Analog meter                  | Analog meter                 | Digital, LCD | Analog meter                 | Digital, LCD |
| Range      | 0 - 50µm     | H: 0 - 100µm<br>L: 50 - 500µm | H: 0 - 600µm<br>L: 0.5 - 2mm | 0 - 1.5mm    | H: 0 - 100µm<br>L: 0 - 500µm | 0 - 1.0mm    |
| Resolution | —            | —                             | —                            | 0.001mm      | —                            | 0.001mm      |

| Inch                        |                                            |         |         |                  |                                                   |                  |
|-----------------------------|--------------------------------------------|---------|---------|------------------|---------------------------------------------------|------------------|
| Order No.                   | —                                          | 179-711 | 179-712 | 179-746          | —                                                 | 179-756          |
| Min. coating area           | ø5mm                                       | ø5mm    | ø5mm    | ø5mm             | ø8mm                                              | ø8mm             |
| Min. radius of curvature    | 3mm                                        | 3mm     | 3mm     | 3mm              | 7mm                                               | 7mm              |
| Min. thickness of substrate | 0.3mm                                      | 0.3mm   | 0.3mm   | 0.3mm            | 0.3mm                                             | 0.3mm            |
| Application                 | Nonmagnetic coatings on magnetic substrate |         |         |                  | Non-conductive coatings on nonmagnetic substrate* |                  |
| Dimensions (W x D x H)      | 106 x 62 x 163mm                           |         |         | 100 x 44 x 180mm | 106 x 62 x 163mm                                  | 100 x 44 x 180mm |
| Mass                        | 600g                                       |         |         | 500g             | 600g                                              | 500g             |

\*Measurement is impossible if the substrate is an austenitic stainless steel.

# PJ-A3000

## SERIES 302 - Profile Projectors

### FEATURES

- The PJ-A3000 Series profile projectors are medium-size models that feature high versatility and easy operation.
- Easy-to-read digital XY counter is located near the projection screen to minimize eye movement.
- Digital readout protractor screen facilitates angle measurement.



PJ-A3010F-200



PJ-A3005D-50  
PJ-A3005D-50E  
PJ-A3005R-50



PJ-A3010F-100  
PJ-A3010F-100E



PJ-A3005F-150  
PJ-A3005F-150E



PJ-A3010F-200  
PJ-A3010F-200E



PJ-A3000

Mitutoyo

### Technical Data

- Projected image : Inverted image  
Protractor screen
- Effective diameter : 315mm (12.4")
  - Screen material : Fine ground glass
  - Screen rotation :  $\pm 360^\circ$ , fine feed and clamp
  - Angle reading : Difital counter (LED)  
Resolution :  $1'$  or  $0.01^\circ$  (switchable)  
Range :  $\pm 370^\circ$   
ABS/INC mode switching, Zero Set
- Reference line : Cross hair line  
Projection lens : 10X (172-202)  
Optional : 20X, 50X, 100X
- Magnification accuracy
- Contour illumination :  $\pm 0.1\%$  or less
  - Surface illumination :  $\pm 0.15\%$  or less
- Maximum workpiece height : Refer to the projection capacity (H) below.
- Contour illumination
- Light source : Halogen bulb (24V, 150W)
  - Optical system : Telecentric system
  - 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 focus  
Resolution : 0.001mm or .0001"/0.001mm  
(.00005"/0.001mm : digital head)
- Power supply : 100 - 240V AC, 50/60Hz  
Mass : 105kg - 140kg

### Projection Capacity

D1 : Max. workpiece diameter whose edge line can be focused on the screen center  
D2 : Max. workpiece diameter whose edge line can be focused on the screen line

|                | Magnification |             |            |            |
|----------------|---------------|-------------|------------|------------|
|                | 10X           | 20X         | 50X        | 100X       |
| View field     | $\phi 31.5$   | $\phi 15.7$ | $\phi 6.3$ | $\phi 3.1$ |
| 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       |
| D1- 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         |
| D2             | 69 (23)       | 69 (23)     | 25         | 10         |

( ) : When using surface illumination  
\* Including PJ-A3000

Refer to the PJ-A3000 leaflet (E4233) for more details.



### Optional Accessory

- 172-203 : 20X projection lens set
- 172-204 : 50X projection lens
- 172-207 : 100X projection lens
- 172-229 : Oblique illumination mirror for 10X lens
- 172-230 : Oblique illumination mirror for 20X lens
- 172-116 : Standard scale (50 mm)
- 172-117 : Standard scale (2")
- 172-118 : Reading scale (200 mm)
- 172-161 : Reading scale (300 mm)
- 172-119 : Reading scale (8")
- 172-162 : Reading scale (12")
- 932105 : Overlay Chart set (12 Sheets)
- 172-160-2 : Green filter (for PJ-A3000, - 50 models)
- 172-160-3 : Green filter (for -100, -150, -200 models)
- 512305 : Halogen bulb (24V, 150W)
- 965012 : SPC cable (2m) for angle display output

### Fixture and Stage accessory

- 176-106 : Rotary table (Effective diameter : 66mm)
- 172-196 : Rotary table (Effective diameter : 100mm)
- 172-198 : Rotary table with fine feed wheel (Effective diameter : 100mm)
- 176-105 : Swivel center support (Max. workpiece dia. : 70mm)
- 172-197 : Swivel center support (Max. workpiece dia. : 80mm)
- 176-107 : Holder with clamp
- 172-378 : V-block with clamp (Max. workpiece dia. : 25mm)
- 999678 : Fixture mount adapter

| Availability | PJ-A3000<br>PJ-A3005R-50<br>PJ-A3005D-50/E | PJ-A3005F-150/E<br>PJ-A3010F-100/E<br>PJ-A3010F-200/E |
|--------------|--------------------------------------------|-------------------------------------------------------|
| 176-106      | ✓                                          | —                                                     |
| 172-196      | —                                          | ✓*                                                    |
| 172-198      | —                                          | ✓*                                                    |
| 176-105      | ✓                                          | ✓*                                                    |
| 172-197      | —                                          | ✓*                                                    |
| 176-107      | ✓                                          | ✓*                                                    |
| 172-378      | ✓                                          | ✓*                                                    |

\* Fixture mount adapter (999678) is required for PJ-A3010F-200/E



**QM-Data200**  
2-D data processing unit.



**Optoeye**  
Edge detection system for QM-Data 200

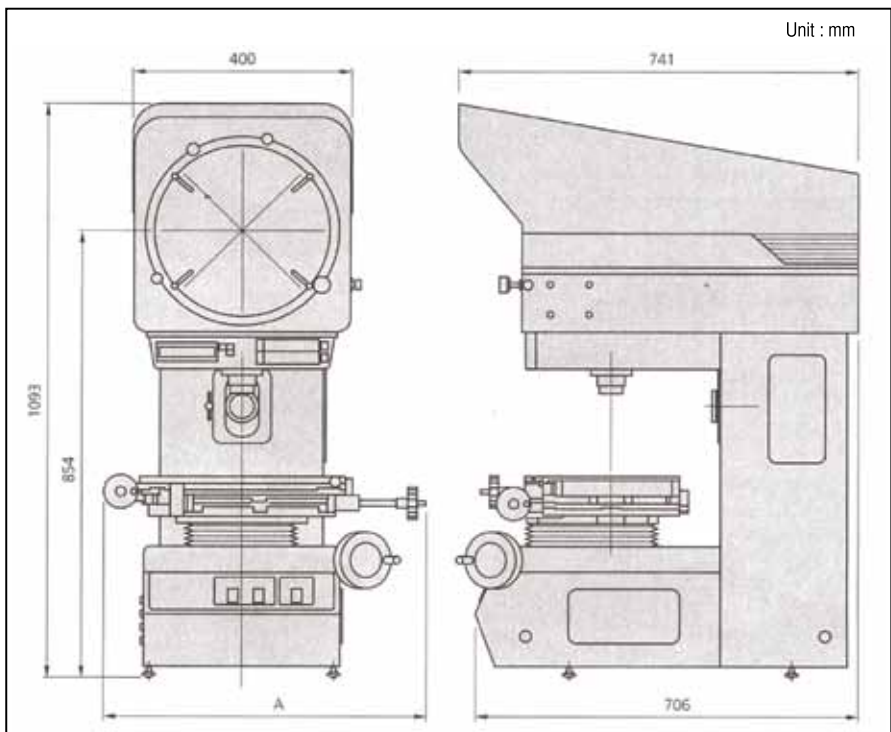
### SPECIFICATIONS

| Model No.               | PJ-A3005R-50        | PJ-A3005D-50   | PJ-A3005R-50E     | PJ-A3010F-100  | PJ-A3010F-100E    |
|-------------------------|---------------------|----------------|-------------------|----------------|-------------------|
| Order No. (metric)      | 302-709*            | 302-704*       | 302-708*          | 302-703*       | 302-707*          |
| Order No. (inch/metric) | 302-719*            | 302-714*       | 302-718*          | 302-713*       | —                 |
| XY stage travel range   | 50 x 50mm           | 50 x 50mm      | 50 x 50mm         | 100 x 100mm    | 100 x 100mm       |
| Measurement method      | Anglog head         | Rotary encoder | Rotary encoder    | Linear encoder | Linear encoder    |
| Floating function       | —                   | —              | —                 | X and Y axes   | X and Y axes      |
| XY stage table top size | 152 x 152mm         | 152 x 152mm    | 152 x 152mm       | 250 x 250mm    | 250 x 250mm       |
| XY stage effective area | 82 x 82mm           | 82 x 82mm      | 82 x 82mm         | 142 x 142mm    | 142 x 142mm       |
| Stage glass No.         | 380405              | 380405         | 380405            | 12BAE041       | 12BAE041          |
| Swiveling function      | —                   | —              | —                 | —              | —                 |
| Max workpiece loading   | 8kg                 | 8kg            | 8kg               | 10kg           | 10kg              |
| Remarks                 | w/o digital counter | —              | w/o angle counter | —              | w/o angle counter |

| Model No.               | PJ-A3005F-150  | PJ-A3005F-150E    | PJ-A3010F-200  | PJ-A3010F-200E    | PJ-A3000          |
|-------------------------|----------------|-------------------|----------------|-------------------|-------------------|
| Order No. (metric)      | 302-702*       | 302-706*          | 302-701*       | 302-703*          | 302-707*          |
| Order No. (inch/metric) | 302-712*       | —                 | 302-711*       | —                 | —                 |
| XY stage travel range   | 150 x 50mm     | 150 x 50mm        | 200 x 100mm    | 200 x 100mm       | Fixed             |
| Measurement method      | Linear encoder | Linear encoder    | Linear encoder | Linear encoder    | —                 |
| Floating function       | X and Y axes   | X and Y axes      | X and Y axes   | X and Y axes      | —                 |
| XY stage table top size | 280 x 152mm    | 280 x 152mm       | 380 x 250mm    | 380 x 250mm       | 160 x 145mm       |
| XY stage effective area | 185 x 84mm     | 185 x 84mm        | 266 x 170mm    | 266 x 170mm       | φ70mm             |
| Stage glass No.         | 381349         | 381349            | 382762         | 382762            | 200673            |
| Swiveling function      | —              | —                 | ±3°            | ±3°               | —                 |
| Max workpiece loading   | 10kg           | 10kg              | 15kg           | 15kg              | 8kg               |
| Remarks                 | —              | w/o angle counter | —              | w/o angle counter | w/o angle counter |

\* To denote your AC line voltage add the following suffixes to the order No. (e.g., **302-709A**)  
**A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

### DIMENSION



# Surftest SJ-201 / SJ-301

SERIES 178 - Portable Surface Roughness Tester



Surftest SJ-201

Surftest SJ-301

## FEATURES : SJ-201

- The display unit demonstrates IP53 protection level and is proof against dripping water and dust.
- The Built-in battery, if fully charged, allows approximately 500 measurements to be taken even on a site with no access to mains power.
- A convenient carrying case is supplied as standard for protecting the instrument in the field.
- Up to 10 measurement results can be saved in the built-in memory.
- Measurement results appear in large characters on the large LCD screen. Results can be confirmed at a glance.
- Detailed set-ups, such as change of standards and cutoff lengths, can be made by pressing the relevant buttons after sliding back the top cover.
- The SPC connector for Digimatic output and the RS-232C output connector are provided on the rear panel of the display unit for data output to external devices.
- Printout of recorded profiles is also possible if the tester is connected to the dedicated hand-held, built-in battery operated compact SJ-printer (optional).

## FEATURES : SJ-301

- Large characters are displayed on the large easy-to-view LCD.
- Simple operations performed with the large LCD touch-panel
- The Measure-Start button and others frequently used are hard wearing and resistant to workshop contaminants
- Equipped with a large capacity battery that, when fully charged, allows approximately 600 measurements to be made.
- A convenient carrying case is supplied as standard for protecting the instrument in the field.
- A high-resolution, high-speed printer is built in the main unit.
- Five sets of measurement set-ups can be saved in the measurement unit and the optional memory card (compact flash memory) allows saving of set-ups and measurements.
- Measurement data also can be saved in the memory card in CSV format and then loaded onto a personal computer for data handling with spread sheet software.



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## Technical Data

|                            |                                                                     |
|----------------------------|---------------------------------------------------------------------|
| <b>X-axis (drive unit)</b> |                                                                     |
| Measuring range :          | 12.5mm                                                              |
| Measuring speed :          | 0.25, 0.5mm/s (0.25mm/s: S-type)                                    |
| Traversing, direction :    | Backward                                                            |
| <b>Detector</b>            |                                                                     |
| Range :                    | 350µm (-200µm to +150µm)                                            |
| Detecting method :         | Skid measurement                                                    |
| Measuring force :          | 4mN or 0.75mN (low force type)                                      |
| Stylus tip :               | Diamond, 90° / 5µmR<br>(60° / 2µmR: low force type)                 |
| Skid radius of curvature : | 40 mm                                                               |
| Skid force :               | less than 400mN                                                     |
| Detecting method :         | Differential inductance                                             |
| Power supply :             | Via AC adapter/rechargeable battery                                 |
| Battery life :             | Max. 600 measurements<br>(w/o printing)<br>Recharge time : 15 hours |
| Data output                | Via RS-232C interface/SPC output                                    |
| <b>Dimensions (WxDxH)</b>  |                                                                     |
| Control unit :             | 307 x 165 x 94 mm (SJ-301)<br>156.5 x 62 x 52 mm (SJ-201)           |
| Drive unit :               | 115 x 23 x 26 mm                                                    |
| <b>Mass</b>                |                                                                     |
| Control unit :             | Approx. 1.2kg (SJ-301)<br>Approx. 0.3kg (SJ-201)                    |
| Drive unit :               | 0.2kg                                                               |

## Evaluation Capability : SJ-301

|                                                                                                                                                                                                        |                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>Applicable standard :</b>                                                                                                                                                                           |                                                                       |
| JIS'82, JIS'94, JIS'01, DIN, ISO, ANSI                                                                                                                                                                 |                                                                       |
| <b>Assessed profile :</b>                                                                                                                                                                              |                                                                       |
| P (primary profile), R (roughness profile), DIN4776, roughness motif, waviness motif                                                                                                                   |                                                                       |
| <b>Evaluation parameters :</b>                                                                                                                                                                         |                                                                       |
| Ra, Ry, Rz, Rt, Rp, Rq, Rv, Sm, S, Pc, R3z, mr (c), Rpk, Rvk, $\delta c$ , Rk, Mr1, Mr2, Lo, Pp1, R, AR, Rx, A1, A2, Vo, HSC, mr, SK, Ku, $\Delta a$ , $\Delta q$ , Wte, Wx, W, AW (can be customized) |                                                                       |
| <b>Analysis graphs :</b>                                                                                                                                                                               |                                                                       |
| Bearing Area Curve (BAC 1/2), Amplitude Distribution Curve (ADC)                                                                                                                                       |                                                                       |
| Digital filter                                                                                                                                                                                         | 2CR, PC75, Gaussian                                                   |
| Cutoff length                                                                                                                                                                                          | $\lambda c$ : 0.08, 0.25, 0.8, 2.5, 8mm<br>$\lambda s$ : 2.5, 8, 25mm |
| Number of sampling length :                                                                                                                                                                            | X1, X3, X5, XL                                                        |
| Arbitrary length :                                                                                                                                                                                     | 0.3 to 12.5 mm, 0.1 mm increments                                     |
| Sampling length (L) :                                                                                                                                                                                  | 0.08, 0.25, 0.8, 2.5, 8mm                                             |
| Printer                                                                                                                                                                                                | Thermal printer                                                       |
| Printing width                                                                                                                                                                                         | 48mm (paper width : 58mm)                                             |
| <b>Recording magnification</b>                                                                                                                                                                         |                                                                       |
| Vertical magnification : 10X to 100,000X, Auto<br>Horizontal magnification : 1X to 1,000X, Auto                                                                                                        |                                                                       |

## Function

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

Statistical processing : Maximum value, minimum value, mean value, standard deviation, pass rate, frequency distribution chart of each parameter

GO/NG judgment :

- Upper/lower limits setting : 3 parameters
- GO/NG judgment rule : mean value, 16% rule, maximum value rule

Measurement conditions saving : Maximum 5 sets

Data saving : Save/retrieval of measurement conditions (up to 20 sets), evaluation data, sampling data, and statistical data with a memory card (option).

Calibration : Auto-calibration with the entry of numerical value.

Power saving function : If the auto-power-off function ON : Power turn off if not operated for 5 minutes

## SPECIFICATIONS/CONFIGURATION

| Model No.        | SJ-201P                   |                       | SJ-201R                    |                       | SJ-201S                             |                       | SJ-201M                   |                       |
|------------------|---------------------------|-----------------------|----------------------------|-----------------------|-------------------------------------|-----------------------|---------------------------|-----------------------|
| Order No. (mm)   | 178-920-2*                | 178-930-2*            | 178-985*                   | 178-995*              | 178-889-2*                          | 178-899-2*            | 178-920-2F*               | 178-930-2F*           |
| Order No. (inch) | 178-923-2*                | 178-933-2*            | 178-986*                   | 178-996*              | 178-912-2*                          | 178-913-2*            | —                         | —                     |
| Drive unit       | Standard type (178-230-2) |                       | Retractable type (178-235) |                       | Transverse tracing type (178-233-2) |                       | Standard type (178-230-2) |                       |
| Detector         | 4mN type (178-390)        | 0.75mN type (178-395) | 4mN type (178-390)         | 0.75mN type (178-395) | 4mN type (178-390)                  | 0.75mN type (178-395) | 4mN type (178-390)        | 0.75mN type (178-395) |
| Display unit     | Compact type              |                       | Compact type               |                       | Compact type                        |                       | Compact type              |                       |

| Model No.        | SJ-301                     |                       | SJ-301R                    |                       | SJ-301S                             |                       |
|------------------|----------------------------|-----------------------|----------------------------|-----------------------|-------------------------------------|-----------------------|
| Order No. (mm)   | 178-953-3*                 | 178-952-3*            | 178-980*                   | 178-990*              | 178-929-2*                          | 178-939-2*            |
| Order No. (inch) | 178-954-3*                 | 178-955-3*            | 178-987*                   | 178-997*              | 178-901-2*                          | 178-902-2*            |
| Drive unit       | Standard type (178-230-2)  |                       | Retractable type (178-235) |                       | Transverse tracing type (178-233-2) |                       |
| Detector         | 4mN type (178-390)         | 0.75mN type (178-395) | 4mN type (178-390)         | 0.75mN type (178-395) | 4mN type (178-390)                  | 0.75mN type (178-395) |
| Display unit     | Standard type with printer |                       | Standard type with printer |                       | Standard type with printer          |                       |

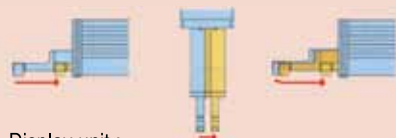
\* To denote your AC line voltage add the following suffixes to the order No. (e.g., 178-952-3A)  
**A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

### Detector + Drive unit + Display unit Combination

Detector: 0.75mN measuring force, 2 $\mu$ m stylus tip radius  
 4mN measuring force, 5 $\mu$ m stylus tip radius

Drive unit :

Standard type Transverse tracing type Retractable type



Display unit :



### Evaluation Capability : SJ-201

Applicable standard :

JIS'82, JIS'94, JIS'01, DIN, ISO, ANSI

Assessed profile :

P (primary profile), R (roughness profile), DIN4776\*,  
 (\*roughness MOTIF, SJ-201M)

Evaluation parameters :

Ra, Ry, Rz, Rq, S, Sm, Pc, R3z, mr (c), Rt, Rp, Rk, Rpk, Rvk,  
 Mr1, Mr2, A1, A2, Vo (can be customized) (R, AR, Rx : M-type)

Digital filter 2CR, PC75, Gaussian

Cutoff length  $\lambda_c$  : 0.25, 0.8, 2.5, mm

$\lambda_s$  : 2.5, 8mm

Number of sampling length : X1, X3, X5

Arbitrary length : 0.3 to 12.5 mm, 0.1 mm increments

Sampling length (L) : 0.25, 0.8, 2.5mm

### Function

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

GO/NG judgment :

Upper/lower limits setting : 2 parameters

Measurement conditions saving : Saves the conditions at the power OFF

Data saving : A maximum of 10 measurement results can be saved.

Calibration : Auto-calibration with the entry of numerical value.

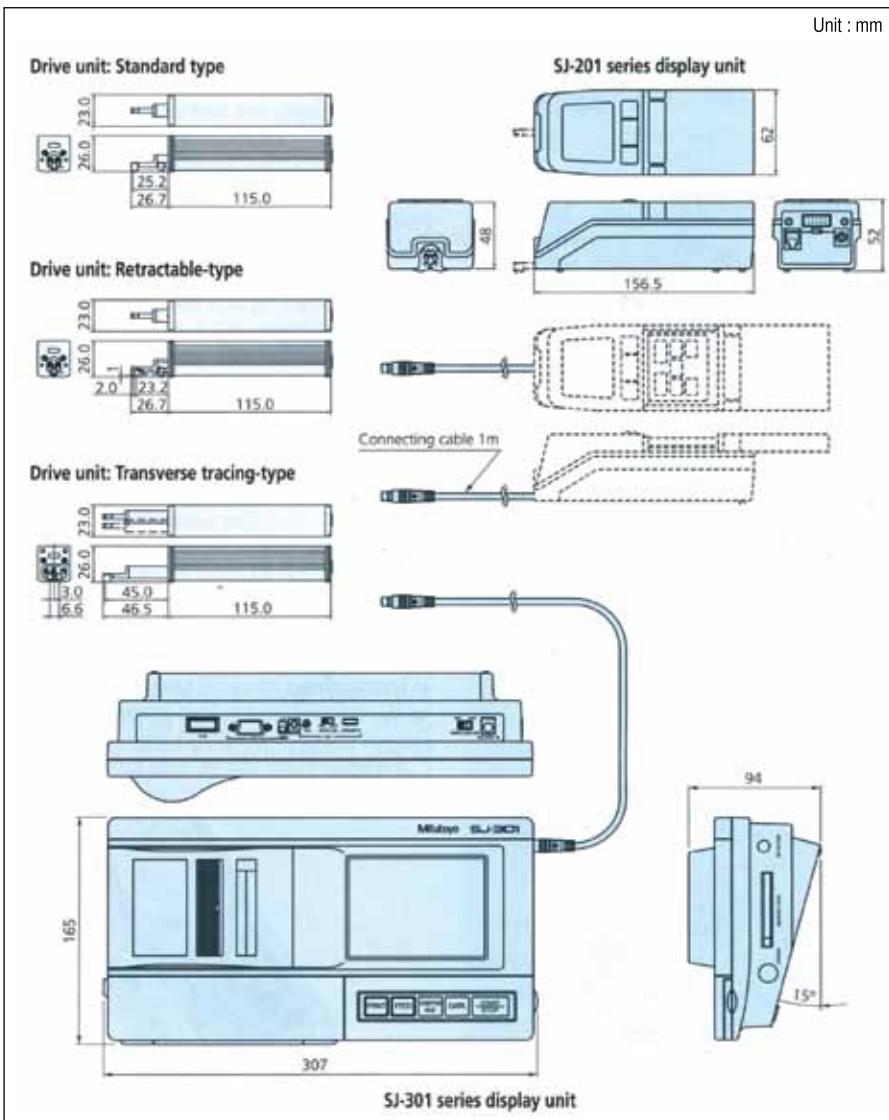
Power saving function : If the auto-power-off function is ON then power turns off if no operation for 30 seconds.



Refer to the Surftest SJ-201/301 leaflet (E4286) for more details.

## DIMENSION

Unit : mm





# Roundtest RA-10

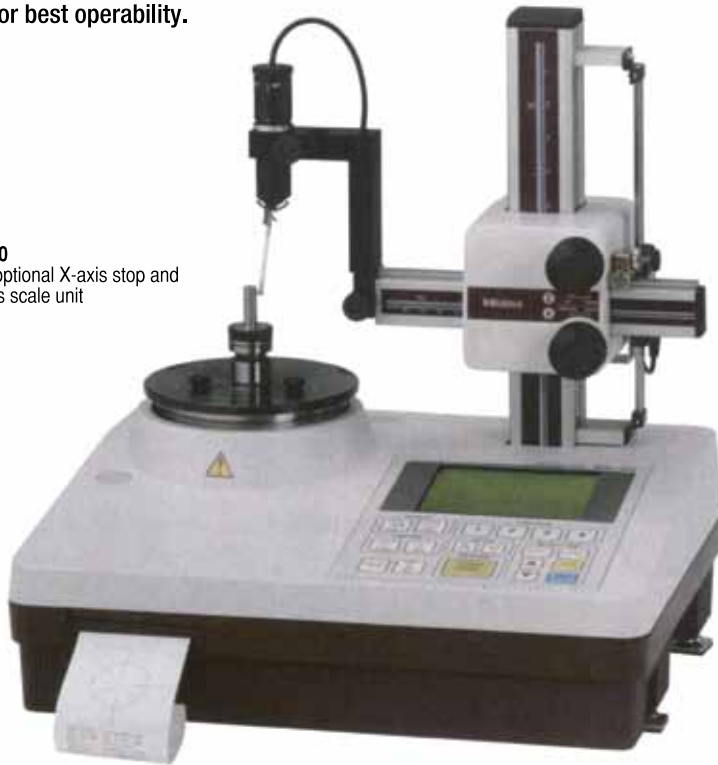
## SERIES 211 - Roundness Measuring Instruments

Compact roundness tester combines outstanding performance ratio with full measurement capabilities and beginner friendly operation

### FEATURES

- The key layout is large and simple so is easy to view and easy to understand.
- One-shot setup recall function : Complex setups are stored in advance, ready for recall when required by one-key operation.  
Zero-setting function : The detector's level can be set to zero (0) with one single key press. This relieves the user from the chore of meticulously positioning the detector.
- The operation handles for vertical direction (Z-axis) and radial direction (X-axis) adjustment have been positioned on the slider for best operability.
- Despite being a low-priced model, the rotary table with air bearings offers rotational accuracy as high as  $(0.04+6H/10000)\mu\text{m}$ , thus assuring a precision that compares well to that of higher models.
- Large LCD panel displays measurement results and recorded profiles in an easy to view fashion
- The machine calls for only a small installation space as its compact body integrates, electronics and printer.

RA-10  
with optional X-axis stop and  
Z-axis scale unit



Optional X-axis stop



Optional Z-axis scale unit

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### Technical Data

|                                                                                              |                                                                     |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Turntable                                                                                    |                                                                     |
| Rotational accuracy :                                                                        | $(0.04+6H/10000)\mu\text{m}$                                        |
|                                                                                              | H : Probing height (mm)                                             |
| Rotating speed                                                                               | 6rpm                                                                |
| Table top diameter :                                                                         | $\phi 150\text{mm}$                                                 |
| Maximum probing diameter :                                                                   | $\phi 100\text{mm}$                                                 |
| Maximum workpiece diameter :                                                                 | $\phi 320\text{mm}$                                                 |
| Maximum workpiece weight :                                                                   | 10kg                                                                |
| Vertical column (Z-axis)                                                                     |                                                                     |
| Vertical travel :                                                                            | 117mm                                                               |
| Maximum probing height :                                                                     | 152mm from the turntable top                                        |
| Maximum probing depth :                                                                      | 100mm (min. ID : $\phi 30\text{mm}$ )                               |
| Horizontal arm (X-axis)                                                                      |                                                                     |
| Horizontal travel :                                                                          | 75mm (Including a protrusion of 25mm the turntable rotation center) |
| Probe and stylus                                                                             |                                                                     |
| Measuring range :                                                                            | $\pm 1000\mu\text{m}$                                               |
| Measuring force :                                                                            | 70 to 100mN                                                         |
| Standard stylus :                                                                            | 12AAB681, carbide ball, $\phi 1.6\text{mm}$                         |
| Measuring direction :                                                                        | Two directional                                                     |
| Stylus angle adjustment :                                                                    | $\pm 45^\circ$ (with graduations)                                   |
| Data analysis unit :                                                                         |                                                                     |
| Processing unit :                                                                            | Built-in                                                            |
| Data analysis items :                                                                        |                                                                     |
| Roundness, Coaxiality, Concentricity, Flatness, Circular runout (radial)                     |                                                                     |
| Reference, circles for roundness evaluation :                                                |                                                                     |
| LSC, MZC, MIC, MCC                                                                           |                                                                     |
| Recording device :                                                                           |                                                                     |
| Built-in thermal line printer (optional external printer)                                    |                                                                     |
| Recording magnification :                                                                    |                                                                     |
| X5 to X200,000 (15-step)                                                                     |                                                                     |
| Roughness component reduction :                                                              |                                                                     |
| Low pass filter, band pass filter                                                            |                                                                     |
| Filter type :                                                                                |                                                                     |
| 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian, filter OFF |                                                                     |
| Cutoff value :                                                                               |                                                                     |
| 15upr, 50upr, 150upr, 500upr, 15-150upr, 15-500upr, 50-500upr,                               |                                                                     |
| Number of measuring sections                                                                 |                                                                     |
| 1-section to 5-section : Roundness, Coaxiality, Flatness                                     |                                                                     |
| 1-section to 3-section : Circular runout (radial)                                            |                                                                     |
| 2-section : Concentricity                                                                    |                                                                     |
| Air supply                                                                                   |                                                                     |
| Air pressure :                                                                               | 390kPa                                                              |
| Air consumption :                                                                            | 30L/min.                                                            |
| Power supply :                                                                               | 100V AC-240V AC, 50/60Hz                                            |
| Dimensions (W x D x H) :                                                                     | 450 x 360 x 486mm                                                   |
| Mass :                                                                                       | 26kg                                                                |



### Optional Accessory

- 211-052 : Quick chuck (OD : 1-79mm, ID : 16-69mm)  
 211-051 : Collet chuck (OD : 0.5-10mm)  
 12AAH425 : Alignment table  
 211-032 : Quick chuck (OD : 1-79mm, ID : 25-69mm)\*  
 211-031 : Micro-chuck (OD : 1.5mm max.)\*  
 12AAH320 : X-axis stop  
 12AAH318 : Z-axis scale unit  
 211-013 : Vibration damping stand  
 \_\_\_\_\_ : Interchangeable styli

\* Can be installed on the alignment table (12AAH425) only.



211-052



211-051



12AAH425



211-032



211-031



211-013

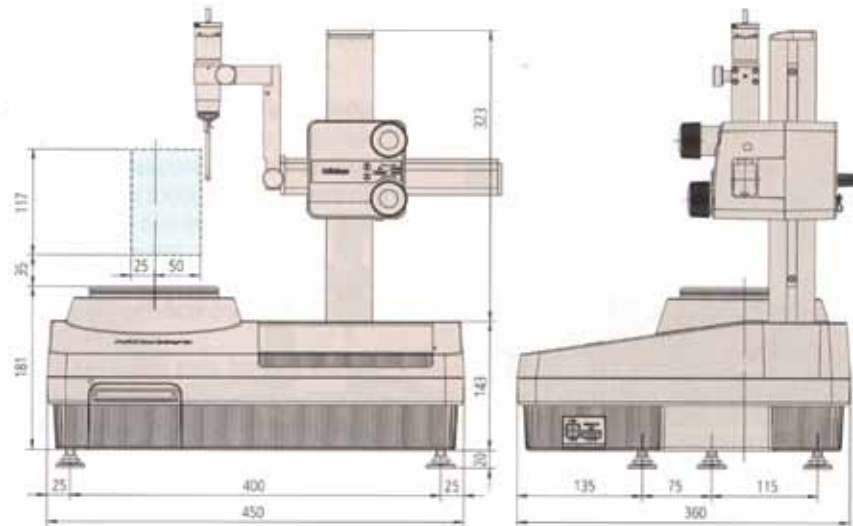
### CONSUMABLE PARTS

- 12AAH181 : Printer paper 10 rolls/set  
 358592 : Element for air filter 1 pc/set  
 358593 : Element for air regulator 10 pcs/set

### DIMENSION

#### External dimensions

Unit : mm

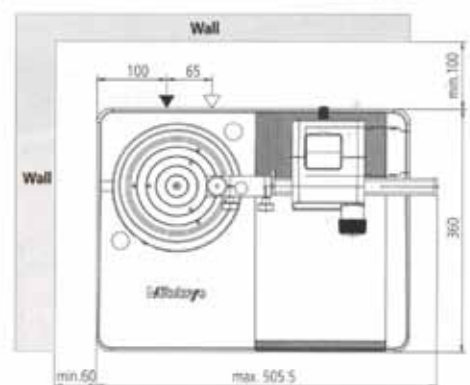


#### Turntable top view



#### Installation floor plan

▼ Power inlet  
 ▽ Air inlet



# AR-10, AR-20, ARK-600, ATK-600

## SERIES 810 - Rockwell/Rockwell Superficial Hardness Testing Machine

### FEATURES : AR-10, AR-20

- Economy type Rockwell hardness testing machines.
- Diamond indenter (HRA, HRD, HRC) and 1/16" diameter steel ball indenter (HRF, HRB, HRG) are provided.
- The dial indicator can be zero-set automatically, allowing the preliminary test load to be applied with the table elevation wheel only.
- Test load selection can be made with wheel. (AR-20)



AR-10



AR-20

### FEATURES : ARK-600, ATK-600

- Diamond indenter and 1/16" diameter steel ball indenter are provided as standard.
- The ARK-600 is designed for testing Rockwell hardness. The ATK-600 can measure Rockwell and Rockwell Superficial hardness scales by one unit.
- The measured hardness is displayed on the large LED.
- Test load selection can be easily made with the selection wheel.



ARK-600



ATK-600

### SPECIFICATIONS

| Model No.              | AR-10               | AR-20               | ARK-600             | ATK-600                                  |
|------------------------|---------------------|---------------------|---------------------|------------------------------------------|
| Order No.              | 810-200*            | 810-201*            | 810-218*            | 810-257*                                 |
| Preliminary test force | 98.07N              | 98.07N              | 98.07N              | 98.07, 29.42N                            |
| Test force             | 588.4, 980.7, 1471N | 588.4, 980.7, 1471N | 588.4, 980.7, 1471N | 147.1, 294.2, 441.3, 588.4, 980.7, 1471N |
| Minimum reading        | 0.5HR               | 0.5HR               | 0.1HR               | 0.1HR                                    |
| Test force setting     | By weight exchange  | By dial             | By dial             | By dial                                  |

\* To denote your AC line voltage add the following suffowing suffixes to the order No. (e.g., 810-200A)  
**A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

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### Technical Data

|                        |                                                            |
|------------------------|------------------------------------------------------------|
| Preliminary test force | : 29.42N*, 98.07N                                          |
| Test force             | : Rockwell superficial* : 147.1, 294.2, 441.3N             |
|                        | : Rockwell : 588.4, 980.7, 1471N                           |
| Test force setting     | : By dial (by weight exchange : AR-10)                     |
| Load control           | : Automatic (loading duration, unloading)                  |
| Minimum reading        | : 0.1HR (ARK-600, ATK-600), 0.5HR (AR-10, AR-20)           |
| Anvil                  | : Flat (ø64mm)                                             |
| Max. specimen height   | : 140mm (165mm: AR-10)                                     |
| Max. specimen depth    | : 122mm (115mm: AR-10) (from the center of indenter shaft) |
| Stage elevation        | : Manual                                                   |
| Data output **         | : RS-232C, Digimatic code (SPC)                            |
| Power supply           | : 100/120/220/240V AC, 50/60Hz                             |
| Dimensions (W x D x H) |                                                            |
| AR-10                  | : 215 x 455 x 682mm                                        |
| AR-20                  | : 210 x 486 x 680mm                                        |
| ARK-600                | : 210 x 486 x 680mm                                        |
| ATK-60                 | : 210 x 486 x 720mm                                        |
| Mass                   |                                                            |
| AR-10                  | : 38kg                                                     |
| AR-20                  | : 40kg                                                     |
| ARK-600                | : 40kg                                                     |
| ATK-60                 | : 42kg                                                     |

\*ATK-600 only

\*\*ARK-600 and ATK-600 only

### Optional Accessory

|          |                                                              |
|----------|--------------------------------------------------------------|
| 19BAA292 | : Diamond indenter (Min. to ø22mm, HR-500)                   |
| 19BAA072 | : Diamond indenter (AR-10, AR-20, ARK-600)                   |
| 19BAA073 | : Diamond indenter (ATK-600)                                 |
| 19BAA074 | : 1/16" DIA steel ball indenter                              |
| 19BAA082 | : Spare 1/16" steel ball (10 pcs. set)                       |
| 19BAA076 | : 1/4" DIA steel ball indenter                               |
| 19BAA084 | : Spare 1/4" steel ball (10 pcs. set)                        |
| 19BAA075 | : 1/8" DIA steel ball indenter                               |
| 19BAA083 | : Spare 1/8" steel ball (10 pcs. set)                        |
| 19BAA077 | : 1/2" DIA steel ball indenter                               |
| 19BAA085 | : Spare 1/2" steel ball (10 pcs. set)                        |
| 810-037  | : Round tables (ø180mm)                                      |
| 810-038  | : Round tables (ø250mm)                                      |
| 810-043  | : Spot anvils (ø12mm)                                        |
| 810-030  | : Spot anvils (diamond tipped type for Rockwell Superficial) |
| 810-044  | : Spot anvils (ø5.5mm)                                       |
| 810-040  | : V-anvils (ø40mm, 30mm groove width)                        |
| 810-041  | : V-anvils (ø40mm, 6mm groove width)                         |
| 810-042  | : V-anvils (ø10mm, 8mm groove width)                         |
| 810-029  | : V-anvils (400mm length, 30mm groove width)                 |
| 19BAA123 | : Hardness test blocks (30HRC-35HRC)                         |
| 19BAA124 | : Hardness test blocks (45HRC-50HRC)                         |
| 19BAA125 | : Hardness test blocks (60HRC-65HRC)                         |
| 19BAA126 | : Hardness test blocks (90HRB-95HRB)                         |
| 19BAA127 | : Hardness test blocks (30HRB-35HRB)                         |
| 19BAA128 | : Hardness test blocks (64HR30N-69HR30N)                     |
| 19BAA129 | : Hardness test blocks (74HR30T-79HR30T)                     |
| 810-622  | : Printer (DPU-414, 100V)                                    |
| 19BAA262 | : Connecting cable                                           |
| 19BAA157 | : Printer paper                                              |
| 19BAA161 | : Measuring microscope (20x model)                           |
| 19BAA318 | : Measuring microscope (40x model)                           |
| 19BAA319 | : Measuring microscope (100x model)                          |
| 19BAA277 | : ø1mm carbide ball indenter                                 |
| 19BAA279 | : ø2.5mm carbide ball indenter                               |
| 19BAA280 | : ø5mm carbide ball indenter                                 |
| 19BAA284 | : ø10mm carbide ball indenter                                |
| 19BAA281 | : Spare ø1mm carbide ball (5pcs. set)                        |
| 19BAA283 | : Spare ø2.5mm carbide ball (5pcs. set)                      |
| 19BAA162 | : Spare ø5mm carbide ball (1pc)                              |
| 19BAA163 | : Spare ø10mm carbide ball (1pc)                             |
| 19BAA027 | : Hardness tes block (200HBW)                                |
| 810-643  | : Vibration damping stand (for HR-500 series)                |
| 810-642  | : Vibration damping stand (for AR/ARK/ATK series)            |
| 11AAA001 | : EXPAK data processing program                              |