8 Electronic Equipments

Digital Inside Comparator
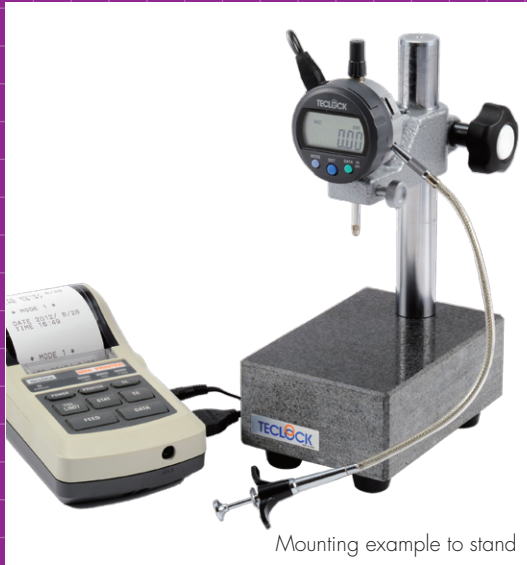
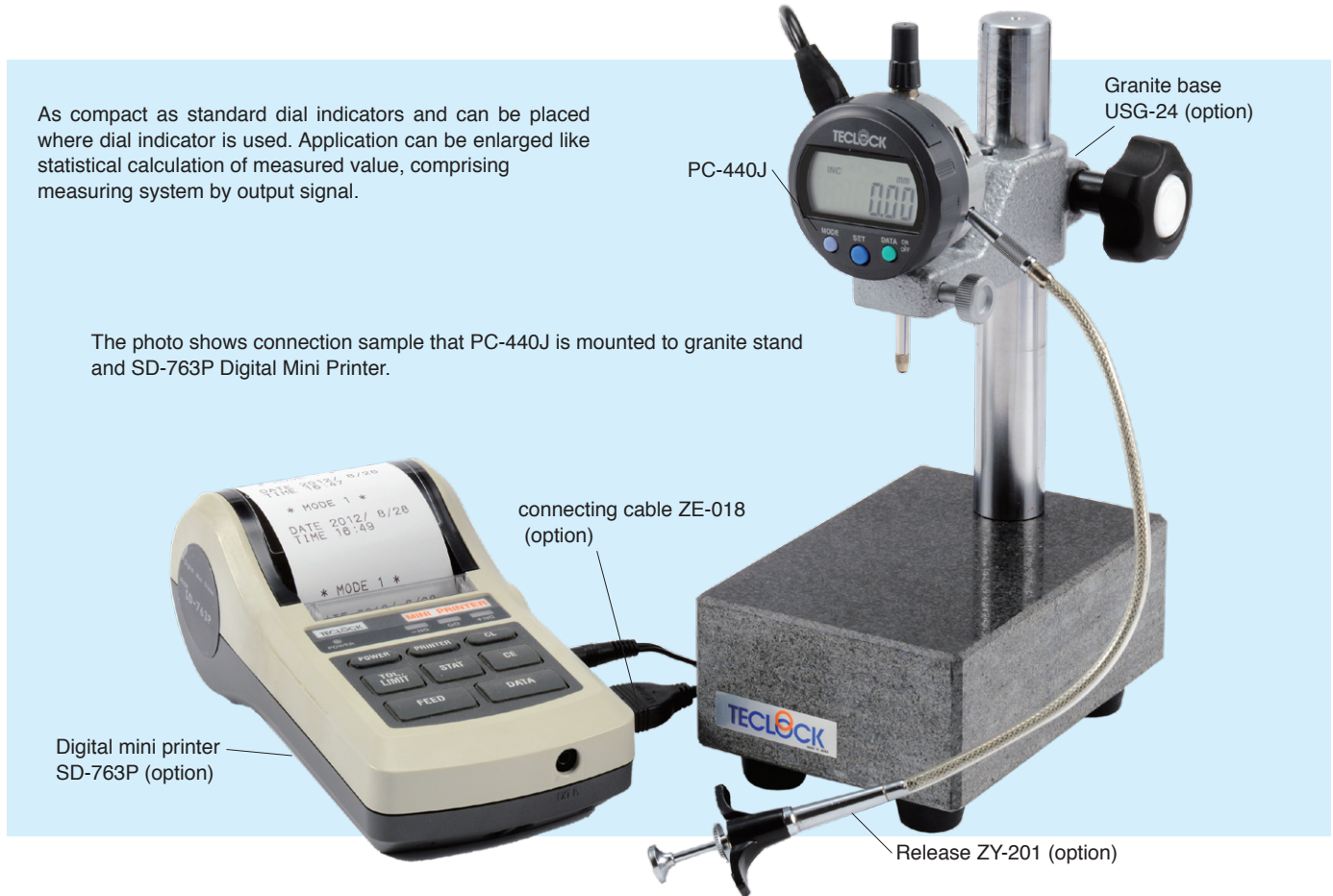Mounting example to stand

Digital Outside Comparator

Electronic Digital Indicators (0.01 / 0.001mm), PC-series

- Data output and statistics transaction can be easily made by using digital indicator.
- 0.01mm and 0.001mm resolution digital indicators are available.
- Standard models are equipped with preset function and conventional models deleting preset functions are available.

As compact as standard dial indicators and can be placed where dial indicator is used. Application can be enlarged like statistical calculation of measured value, comprising measuring system by output signal.

The photo shows connection sample that PC-440J is mounted to granite stand and SD-763P Digital Mini Printer.
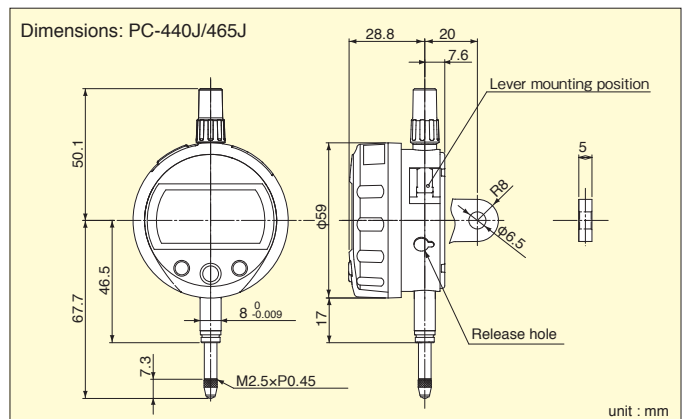
Granite base USG-24 (option)

PC-440J

connecting cable ZE-018 (option)

Digital mini printer SD-763P (option)

Release ZY-201 (option)

Measuring Range 12.7mm type / Standard models

PC-440J

Resolution 0.01mm
Measuring Range 12.7mm

PC-465J

Resolution 0.001mm
Measuring Range 12.7mm

Dimensions: PC-440J/465J

28.8   20
7.6

Lever mounting position

50.1

φ59

46.5

R8

φ6.5

5

67.7

17

$8 \; {}^{0}_{-0.009}$

Release hole

7.3

M2.5×P0.45
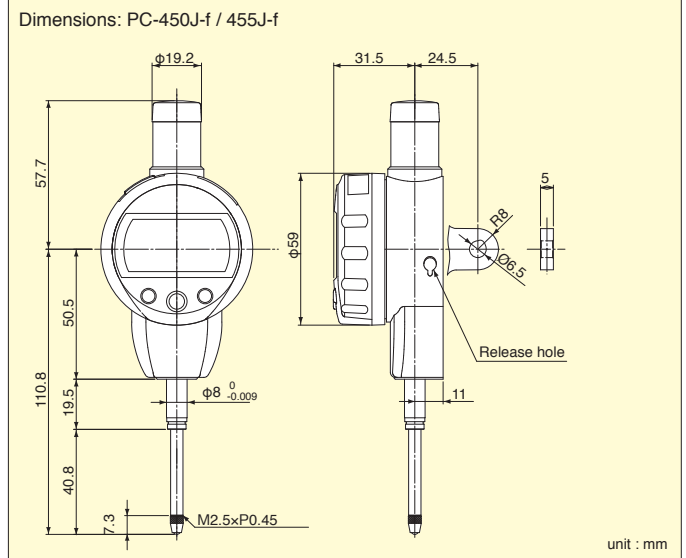
unit : mm

Supplied with Lug back as standard models.
Flat back and Lift lever are optional.

Measuring Range 25.4mm type / Standard models

PC-450J-f
Resolution 0.01mm
Measuring Range 25.4mm

PC-455J-f
Resolution 0.001mm
Measuring Range 25.4mm

Dimensions: PC-450J-f / 455J-f

unit : mm

Supplied with Flat back as standard models.
Lug back and Lift lever are optional.

Measuring Range 12.7mm type / Popular models

PC-480S2
Resolution 0.01mm
Measuring Range 12.7mm

PC-485S2
Resolution 0.001mm
Measuring Range 12.7mm

Dimensions: PC-480S2 / 485S2

unit : mm
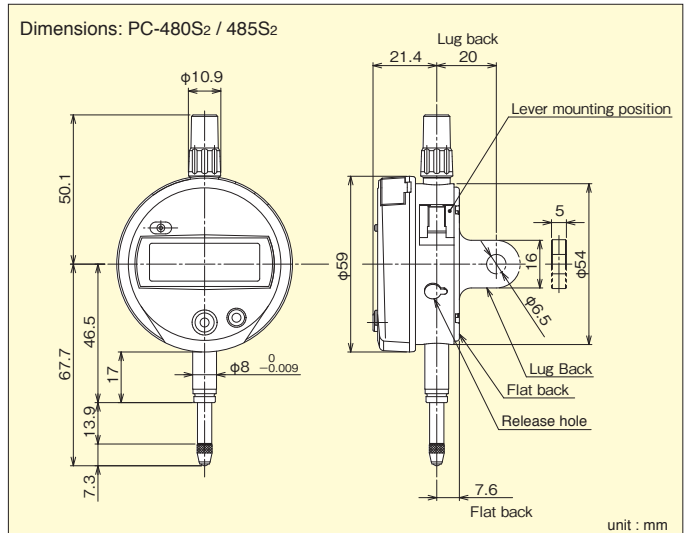
Supplied with Lug back as standard models.
Flat back and Lift lever are optional.

Specifications

Model	PC-440J	PC-465J	PC-450J-f	PC-455J-f	PC-480S2	PC-485S2
Measuring Range	0~12.7mm		0~25.4mm		0~12.7mm	
Resolution	0.01mm	0.001mm	0.01mm	0.001mm	0.01mm	0.001mm
Accuracy	0.02mm*	0.003mm*	0.02mm or less	0.003mm	0.02mm or less*	0.003mm or less*
Maximum response speed	1000mm/sec	480mm/sec	480mm/sec	480mm/sec	unlimited	
Contact force	1.0N or less	1.5N or less*	1.8N or less*		2.0N or less*	
Display	LCD display (6-digital & minus)				LCD display (5-digital & minus)	LCD display (6-digital & minus)
Operating temp	0~40℃					
Functions	Preset, Zero-set, Power OM/OFF, Counting direction switching, Digimatic code output				Origin-set, Power ON/OFF, Counting direction Switching, Digimatic code output Display rotation(330°)	
Power supply	SR44 (Button、Silver oxide cell)					
Battery life	Approx. 5,000hours in continuous service				Approx. 20,000hours in continuous service	
Contact Point	R=1.5mm (carbide)					
Contact point thread (ISO/JIS type)	M2.5×P0.45mm					
Weight	170g		186g		120g	150g

* The quantising error is not included.

Digital mini printer

· Multi-function mini printer for Digital Indicator

SD-763P

Dimensions

Release lever
Adapter jack
75.2
43.9
Input connector
Output connector

Recording paper cover/
Recording paper
GO/NG LED
Foot switch connector
94
Power source LED
201.1

unit : mm
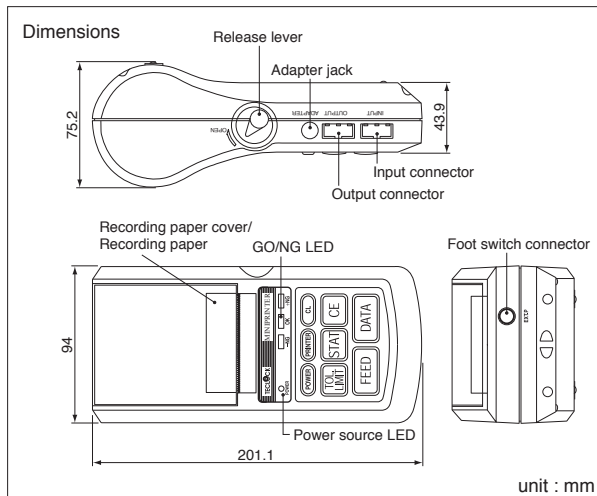
Mode 0
To print measured data, and judgement.

```
  * MODE 0 *

DATE 2002/ 7/ 9
TIME 13:45

*LIMIT MODE*
*LIMIT DATA  1*
*NO LIMIT DATA*
LIMIT1      7.472    mm

LIMIT2      2.849    mm

*NEW LIMIT DATA*
*LIMIT DATA  1*
DATE 2002/ 7/ 9
TIME 13:47

LSL         2.849    mm
USL         7.472    mm
TOL         4.623    mm

     1      5.395    mm
     2      4.827    mm
     3      4.826    mm
  ▼  4     -1.089    mm
  ▼  5     -2.727    mm
     6      4.385    mm
  ▲  7     10.392    mm
  ▲  8      9.045    mm
  ▼  9      2.098    mm
     10     3.747    mm
  ▼  11    -3.130    mm
```

Judgement

Perform statistical calculations

Histogram

Mode 1
To print measured data, judgement, perform statistical calculations, and generate histogram.

```
  * MODE 1*

DATE 2002/ 7/ 9
TIME 13:45

*NEW LIMIT DATA*
*LIMIT DATA  1*
DATE 2002/ 7/ 9
TIME 13:51

LSL        -0.016    mm
USL         4.543    mm
TOL         4.559    mm
```

```
  * RESULT *
N              12
MAX        6.507    mm
MIN       -1.414    mm
R          7.921    mm
x̄          2.74216  mm
σn         2.43469  mm
σn-1       2.54295  mm

-NG            2
+NG            2
P          33.333   %
Cp         0.299
Cpk        0.236
```

```
  * HISTOGRAM *
LSL        -0.016    mm
USL         4.543    mm
TOL         4.559    mm

DIV           10

-NG     2  □□
LSL
A       1  □
B       1  □
C       0
D       0
E       1  □
F       0
G       1  □
H       0
I       1  □
J       3  □□□
USL
+NG     2  □□

□=        1

A    -0.01600 mm  ~
B     0.43990 mm  ~
C     0.89579 mm  ~
D     1.35170 mm  ~
E     1.80760 mm  ~
F     2.26349 mm  ~
G     2.71939 mm  ~
H     3.17529 mm  ~
I     3.63119 mm  ~
J     4.08710 mm  ~
      4.54300 mm  ~
```

Mode 2
To print D-chart, perform statistical calculations, and generate histogram.

```
  * MODE 2 *

DATE 2002/ 7/ 9
TIME 13:55
    1     -3.132    mm
    2      1.782    mm
    3      2.608    mm
    4      6.590    mm
    5     -0.737    mm
    6     -0.737    mm
    7      1.705    mm
    8      1.705    mm

  * CANCEL *
    8      1.925    mm
    9      1.762    mm
    10     4.316    mm

*NEW LIMIT DATA*
*LIMIT DATA  1*
DATE 2002/ 7/ 9
TIME 13:58

LSL         0.452    mm
USL         3.591    mm
TOL         3.139    mm
```

```
            L    C    U

5.023mm|         ▶
6.959mm|         ▶
3.354mm|         |
2.964mm|       |
2.758mm|       |
1.373mm|     |
-0.397mm◀
1.457mm|     |
4.316mm|         ▶
0.819mm|   |
10
-0.547mm◀
1.490mm|     |   |
```

D-Chart

Mode 3
By entering data, it will calculate and draw a R-control chart.

```
*CLEAR SUB DATA*

* EXIT SUB GR. *

*CLEAR ALL DATA*

SUB GR. NO.    1
    1      4.121    mm
    2      0.326    mm
    3      0.326    mm
    4      4.643    mm
    5      2.733    mm
```

```
*CONTROL LIMIT*
DATE 2002/ 7/ 9
TIME 14: 7
NO.OF SUB GR.    1
SAMPLE SIZE      9

x̄       1.14478   mm
x̄-UCL   1.52963   mm
x̄-LCL   0.75992   mm
R̄       1.14200   mm
R̄-UCL   2.07387   mm
R̄-LCL   0.21013   mm
```

Operation result

Options

Model	Accessories
ZE-304	Recording Paper (10 packs)
ZE-110	RS-232C conversion cable 9 pins for AT connector
ZE-018	Extension cable 1m
ZE-019	Extension cable 2m
ZE-020	Extension cable 5m
ZE-109	Judgment result output cable
ZE-013	Foot switch

Specifications

| Item	Description	Remarks
Printing Method	Line thermal 384 dot	
Character format	36 × 24 (Large) 24 × 16 (Normal)	
Printing Speed	0.5 sec. per line	When using AC adapter
Printing line numbers per printing roll	6500 lines / 1 roll (normal)/ 12000 lines / 1 roll (large)	
Power supply	AC adapter (6V, 500 mA) 4 Alkali batteries size AA (LR6) or 4 size AA Ni-MH batteries	Dual power supply *AC adapter input voltage within a range of 100VAC 5%
Operating Temperature	0 ~ 45°C (AC Adapter) 10 ~ 45°C (batteries)	
Storage Temperature	−10 ~ 50°C	In a package as specified by TECLOCK
Accuracy	2 min. max / month	
Clock battery life expectancy	Approx. 10 years	Average life expectancy
Battery life	10000 lines 1600 mAh Ni-MH Printing every 5 sec.	Average life expectancy but varies with usage
Dimensions	201.1 × 94 × 75.2 (D × W ×H)	
Weight	390 g	Without accessories
Printouts	Measurements, GO/NG judgment results	Mode 0
	Measurements, GO/NG judgment results, Number of measurements, MAX., MIN., Range, Standard deviation (σ-n,σn-1), Number of defects, Percentage of defects, Process capability index (Cp, Cpk), Histogram	Mode 1
	Same as above plus D-Chart	Mode 2
	Function of calculating the center value between the control limits required for generating various control charts	Mode 3
Processing capability	100000	Mode 0
	9999	Both Mode 1 and 2
	10 × 9999 = 99990 (Sample size × Number of sub-groups = total number of measurements) 5 sets of limit data	Mode3
Output function	Measured data (RS-232C, TTL level) GO/NG Judgment results (+NG, GO, −NG)	
Timer-controlled data input	0.25 sec, 1 sec, 5 sec, 30 sec, 1 min, 30 min, 60 min.	
Standard accessories	AC Adapter	100V~240V ZE-217 (JAPAN, USA, KOREA) 100V~240V ZE-218 (GERMANY) 100V~240V ZE-219 (U.K. and Other)
	Recording paper: 1 pc. (58 mm (W) 48 m (L))	When ordering Part No. ZE-304 (10 packs.)
	Strap	ZY-111
	Quick Reference	Q-036
	Operation manual	Q-035

Signal Gauge

- Tolerance can be set in the wide range of 0 – 5mm and it can be judged with lighting lamp apart from indication value of dial indicator.
- It can be directly connected to sequencer by protection circuit.

PU-490

Graduation 0.001mm
Measuring Range 5mm

Dimensions
Cable 2m
unit : mm
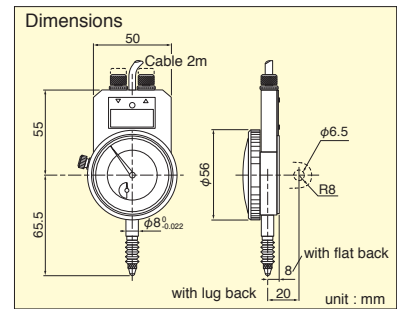
Specifications

Model	Graduation (mm)	Max. Indicating Range (mm)	Spindle travel (mm)	Dial Reading	Gauge error (μm)	A point of contact response (mm)	Measuring force (N)	weight (g)
PU-490	0.01	5	6	±0-50-100	±12	0.005	2.5 or less	180

Digital Comparators

- These are exclusive equipments which comparatively measure dimension of internal diameter and outer diameter.
- After placing master gauge on measuring table and setting up standard value (zero point set up), tolerance judging measurement against standard value is possible by measuring work piece.

- Cemented carbide is provided to stylus and anvil (anvil pin).
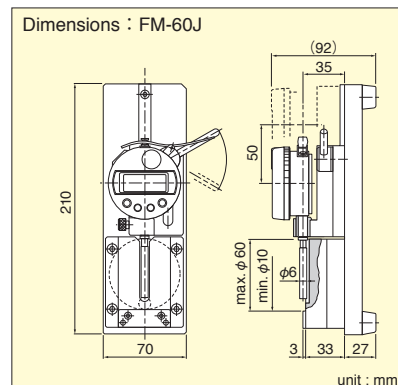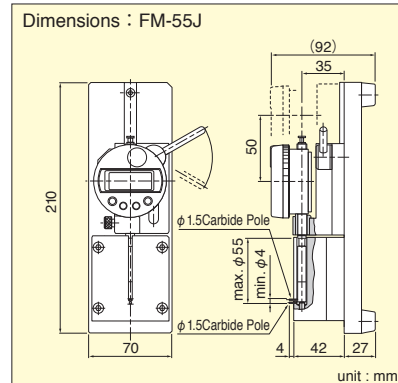- Special made products are complied for the measuring range except for below.

Digital inside Comparator
FM-55J

Resolution 0.001mm
Measuring Range 4~55mm

Dimensions：FM-55J
φ1.5 Carbide Pole
max. φ55
min. φ4
φ1.5 Carbide Pole
unit : mm

Digital outside Comparator
FM-60J

Resolution 0.001mm
Measuring Range 10~60mm

Dimensions：FM-60J
max. φ60
min. φ10
unit : mm

Example

Effective for measuring internal diameter of thin ring (FM-55)

Specifications

| Model	Resolution (mm)	Gauge accuracy* (mm)	Measuring Range (mm)	Indicating Range (mm)	Measuring force (N)
FM-55	0.001	0.003	4~55	12	1.5 or less
FM-60	0.001	0.003	10~60	12	1.5 or less

*The quantizing error is not included.

Both models can print out data with SD-763P digital mini printer and ZE-018 connection cable.

Sensor Gauge Digital type

- Springs and pressed parts which are used for precision equipments, computer terminal and home electric goods can be measured just before their shapes are changed due to measuring force.
- If detecting contact between sensor (contact point) and work piece by energizing, it simultaneously sounds (buzzer) when LED lamp is lighting.. Then read the value which is detected.
- Micro-motion is adjusted by 12mm with upper knob.
- Work piece of maximum 150mm can be measured by using block gauge.
- As detection is implemented by energizing, work piece which is not energized can not be measured.

Dimensions

微動装置 12mm

φ25

215 175 0~130 80 40 (102) (148) 65 80

Contact Point φ0.8

unit : mm
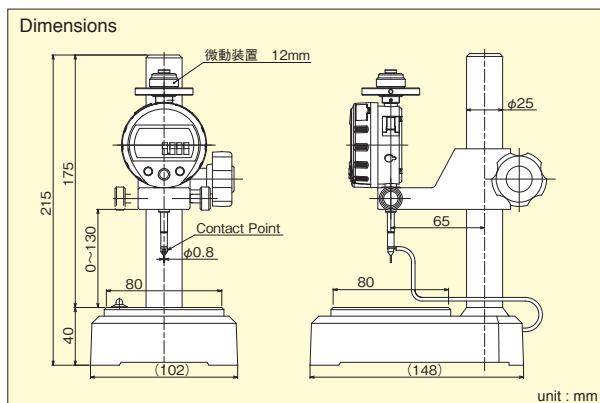
Example
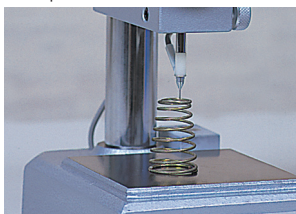
Measuring height of coil spring

SD-465A

Resolution 0.001mm
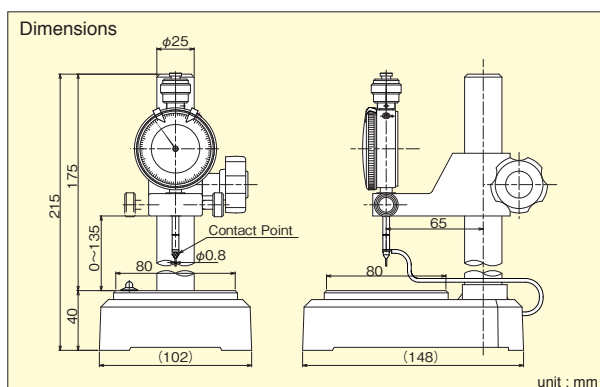Measuring Range 12mm

Coarse Knob · adjusting knob

LED Lamp

Specifications

Model	Display	Resolution (mm)	Indicating Range (mm)	Measuring Range (mm)	Gauge error (μm)	specimen table size (mm)	Power supply	Weight (kg)
SD-465A	Digital	0.001	12	Max. 150	±3[*1]	W80×D80	DC3V (AA size battery×2) [*2]	3.4

[*1] The quantizing error is not included.   [*2] SR-44 battery for digital indicator

Sensor Gauge Dial type

- Micro-motion is adjusted by 10mm with upper knob.

Dimensions

φ25

215 175 0~135 80 40 (102) (148) 65 80

Contact Point φ0.8

unit : mm

SD-101A

Graduation 0.001mm
Measuring Range 10mm

LED Lamp

Specifications

Model	Display	Resolution (mm)	Indicating Range (mm)	Measuring Range (mm)	Gauge error (μm)	specimen table size (mm)	Power supply	Weight (kg)
SD-101A	Dial (analog)	0.01	10	Max. 150	±15	W80×D80	DC3V (AA size battery×2)	3.4

- Specification of minimum display 0.01mm digital type, that of dial type of its graduation 0.001mm and type without stand can be produced with treatment of special order. Please contact our branch nearby for detail.