



Thank you for purchasing the Digital Protractor.
Please read this manual thoroughly before use for proper operation.

DESCRIPTION

This angle gauge uses a liquid sensor to measure the angle of inclination of the instrument. The change in liquid level is converted to a corresponding electrical signal and displayed on the LCD.

FEATURES

- Angle can be measured as: degree (°), percent slope (%), or gradient (mm/M).
- Display will automatically flip if gauge is upside down for easy reading of overhead measurements.
- Audible beep feature when measurement is: 0°, 90°, 0%, or 0 mm/M.
- Back-light feature for reading in low light areas. Press the [照明] Button (Light) and Back-light will turn on for approx. 1 min.
- Hold Button to allow reading when display is inaccessible. Press [表示保持] Button (Hold) and display reading will hold.
- V-Groove base for measuring cylindrical surfaces. Also, Base has four magnets for vertical or overhead measurements on steel.

APPLICATIONS

- Piping and equipment construction and installation.
- Roofing and exterior construction.
- Tile cutting and setting.
- Steel and civil engineering measurement and construction.

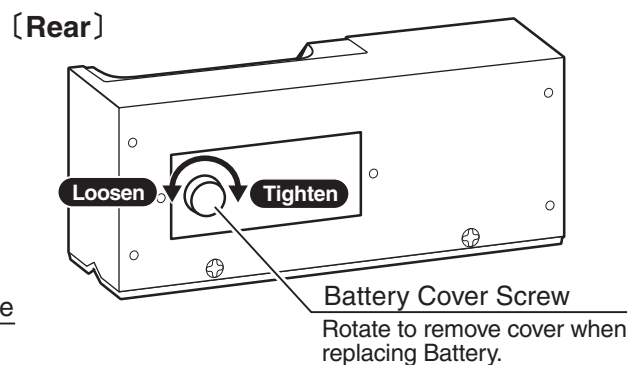
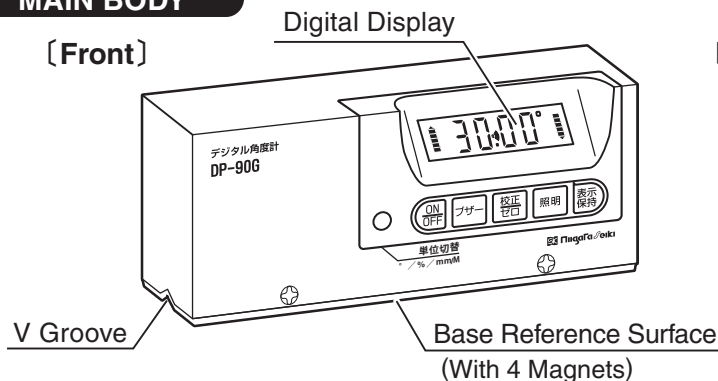
SPECIFICATIONS

* Specifications subject to change without notice.

- Model : DP-90G
- Measuring Range : $\pm 90.0^\circ$
- Resolution : Angle Display = 0.05°
Percent Display = 0.1%
Gradient Display = 1mm/M
- Accuracy : $0.0^\circ \sim 90.0^\circ = \pm 0.2^\circ$
- Display Stabilization Time : approx. 10 sec.
- Operating Temperature : $0 \sim 50^\circ\text{C}$
- Batteries : 9V Battery
- Dimension : $L173 \times W47 \times H68\text{mm}$ (excluding protrusions)
- Weight : 550g
- Accessories : Soft case, Manual, 9V Battery (for test)

PART IDENTIFICATION and FUNCTION

MAIN BODY



DIGITAL DISPLAY

① Arrow Display (Ex: indicates angle)

- Indicates direction to adjust tilt for level. Arrows display for angles between $0.05^\circ \sim 44.9^\circ$ to help in adjusting for horizontal. (In Figure, arrows are shown for example with right side of gauge elevated.)
- Arrows reverse at 45.1° for use as reference in vertical measurements. (Gauge can be used in horizontal or vertical direction.)
- Arrows shrink and go out at 0.00° , 90.00° and display as straight bar at 45.0°

② Battery Indicator

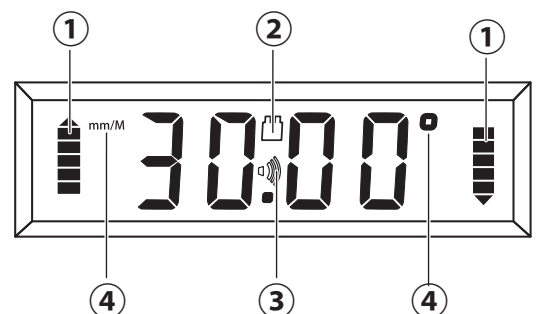
Automatically displays when battery is low.

③ Buzzer Icon

Press [ブザー] Button (Buzzer) to turn on icon and buzzer will beep at 0° , 90° , 0% and 0mm/M . Press again to disable buzzer.

④ °, %, mm/M Icon

Indicates display angle is in degrees (°), percent slope (%), or gradient (mm/M).



PART IDENTIFICATION and FUNCTION (continued)

OPERATION BUTTON

⑤ Display Switching Button

Changes display angle - degrees (°), percent slope (%), or gradient (mm/M).

⑥ ON/OFF Button (Power Button)

Press to turn on power, press again to turn off.

Power will turn off automatically if gauge is idle for about 6 min.

⑦ Buzzer Button

Press once and buzzer will beep at 0°, 90°, 0%, 0mm/M. Press again to disable buzzer.

⑧ Calibration/Zero Button

For use when calibrating horizontal and vertical setting, and for setting an angle as Zero-Point. (Please refer to: "Setting Zero," and "Calibration" sections below).

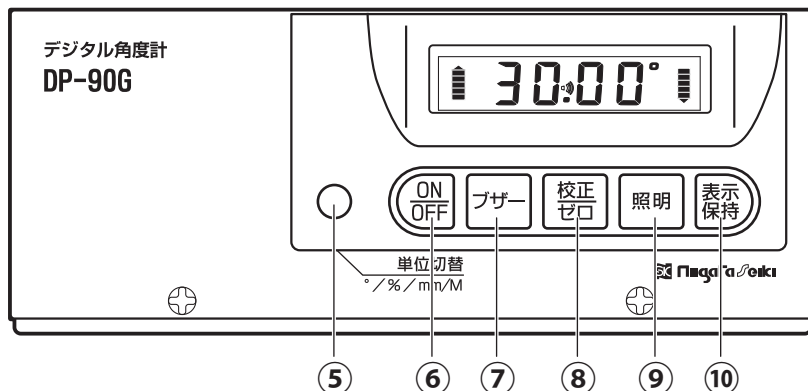
⑨ Light Button

Press once to turn on back-light, press again to turn off.

Light will turn off automatically in about 1 min.

⑩ Display Hold Button

Press once to hold value on display. Press again to release value and resume measurements.



OPERATION

ACCURACY CONFIRMATION

1. Make sure Base Reference Surface is clean and free of adhered contamination or dents.
2. Press the [ON/OFF] Button to turn on, and check icon to confirm proper units (°, %, mm/M).

[Horizontal Accuracy Check] (Figure:1)

3. Place gauge on a horizontal surface and turn on the power. After display has stabilized, rotate 180° at the same position. When display is stabilized, the reading should be same as before to confirm accuracy.

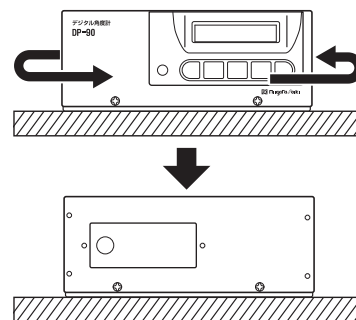
(If readings are within normal range of instrument error of $\pm 0.2^\circ$)

[Vertical Accuracy Check] (Figure:2)

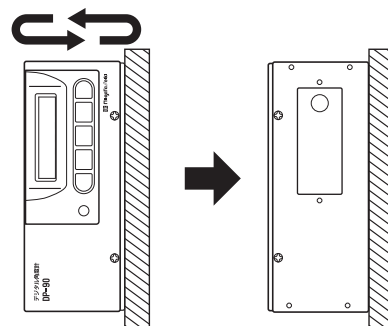
4. Place gauge on a vertical surface with display side up, and turn on the power. After display has stabilized, rotate gauge 180° in horizontal direction at the same position, keeping the display on the upper portion. When display is stabilized, the reading should be same as before to confirm accuracy.

(If readings are within normal range of instrument error of $\pm 0.2^\circ$)

* If accuracy checks, gauge is ready to take measurements.



(Figure:1)



(Figure:2)

SETTING ZERO AT ARBITRARY ANGLE

* Zero Point can be set at any angle of inclination.

1. At desired angle, wait for display to stabilize and press the [表示保持] Button (Display Hold).
2. When the display blinks, press the [校正/ゼロ] Button (Calibration/Zero). This angle is now set as zero.
3. Press [表示保持] Button (Display Hold) again to cancel this setting.

OPERATION (continued)

CALIBRATION

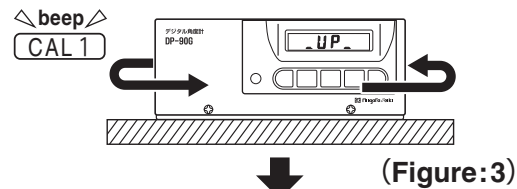
* Calibration is required if accuracy check error is greater than $\pm 0.3^\circ$, or under certain conditions:

- If instrument is subject shock or vibration, or large changes in temperature.
- If battery is removed, as when gauge is not used for a long time.

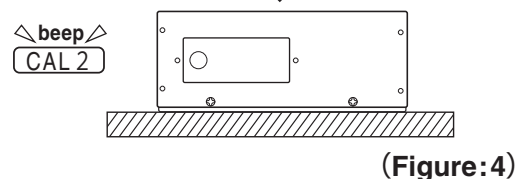
* Full calibration procedure of steps 1 to 17 below must be performed. Follow the figures, and use the display "UP" text as a guide.

[Horizontal Calibration]

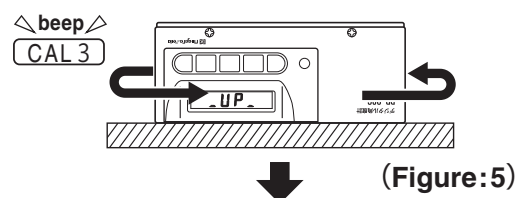
1. Place the Base of the Gauge on a clean, flat surface which is roughly horizontal and press the [ON/OFF] Button to turn on.
 2. After about 15 seconds, press the [校正/ゼロ] Button (Calibration/Zero) and hold for two seconds.
"CAL" will flash on display, and then display will change to "UP" $\leftrightarrow$ "-1-" text.
 3. After about 15 seconds, gauge will <beep>, and display will flash "CAL1". (Figure:3)
Display will then change to "UP" $\leftrightarrow$ "-2-" text.
 4. Rotate instrument 180° horizontally, in same location on surface.
 5. Gauge will <beep>, and display will flash "CAL2". (Figure:4)
Display will then change to "UP" $\leftrightarrow$ "-3-" text.
 6. Next step is to repeat for top surface of gauge.
 7. Gauge will <beep>, and display will flash "CAL3". (Figure:5)
Display will then change to "UP" $\leftrightarrow$ "-4-" text.
 8. Rotate instrument 180° horizontally, in same location on surface.
 9. Gauge will <beep>, and display will flash "CAL4". (Figure:6)
Display will then change to "UP" $\leftrightarrow$ "-5-" text.
- * Horizontal calibration is now complete, Continue on to perform vertical calibration.



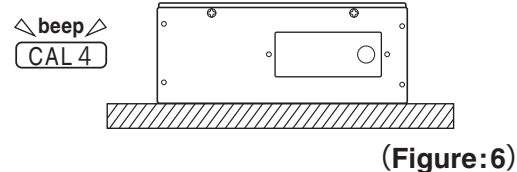
(Figure:3)



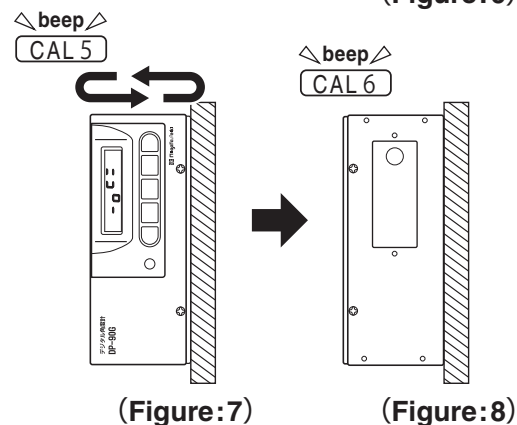
(Figure:4)



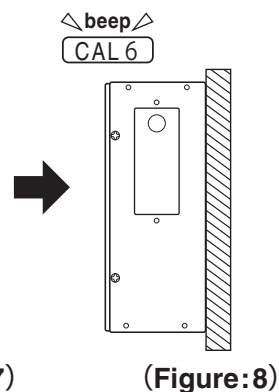
(Figure:5)



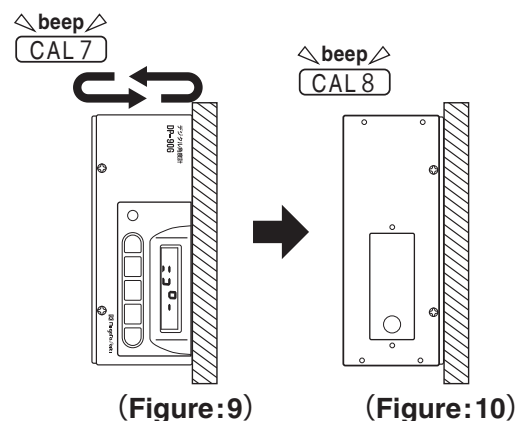
(Figure:6)



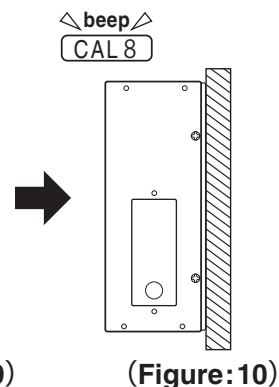
(Figure:7)



(Figure:8)



(Figure:9)



(Figure:10)

[Vertical Calibration]

10. Hold the Base of the Gauge on a flat surface which is roughly vertical with the Display side up.
11. After about 15 seconds, gauge will <beep>, and display will flash to "CAL5". (Figure:7)
Display will then change to "UP" $\leftrightarrow$ "-6-" text.
12. Rotate instrument 180° horizontally, and hold to same location on surface.
13. Gauge will <beep>, and display will flash to "CAL6". (Figure:8)
Display will then change to "UP" $\leftrightarrow$ "-7-" text.
14. Next step is to repeat for gauge with display in the lower position.
15. Gauge will <beep>, and display will flash to "CAL7". (Figure:9)
Display will then change to "UP" $\leftrightarrow$ "-8-" text.
16. Rotate instrument 180° horizontally, and hold to same location on surface.
17. Gauge will <beep>, and display will flash to "CAL8". (Figure:10)
* Calibration is now complete.

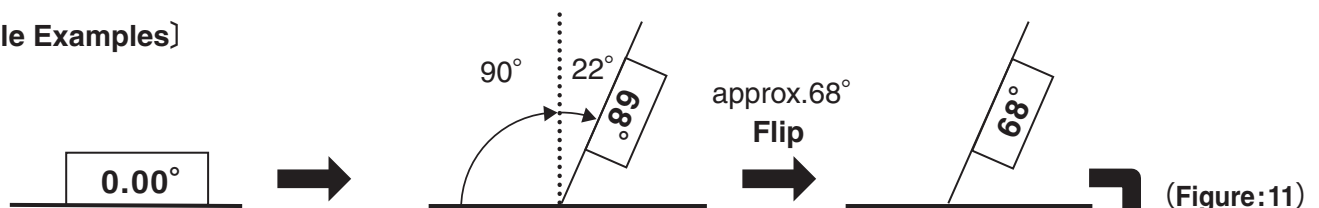
⚠ CAUTION

1. Only press [校正 / ゼロ] Button (Calibration/Zero) during calibration or zero setting. Pressing at any other time will cause inaccurate measurements.
2. When battery is replaced, power will automatically turn on. This is normal operation; to turn off press the [ON/OFF] Button.
3. Do not drop or subject to shock as it may cause poor accuracy.
4. The bottom of the instrument contains magnets, please keep from keep away from sensitive items such as computers, watches, compass, etc. as it may cause a malfunction.
5. Do not disassemble instrument under any circumstances.

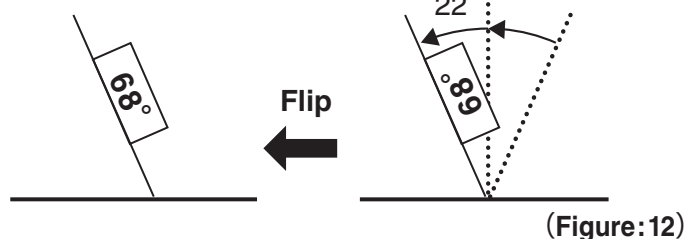
DISPLAY ORIENTATION

* For angle about 22° beyond 90°, Display will automatically flip to make it easier to read. (Display value of about 68°)
Please use care when taking measurement to avoid misreading display. (Figure:11)

[Angle Examples]



- After the display flips, to return to original direction, move back toward starting angle. For angle about 22° beyond 90° in the other direction, display will return to original orientation. (Display value around 68°) (Figure:12)
- If position does not exceed 90°, the display will not flip.



CONVERSION TABLE

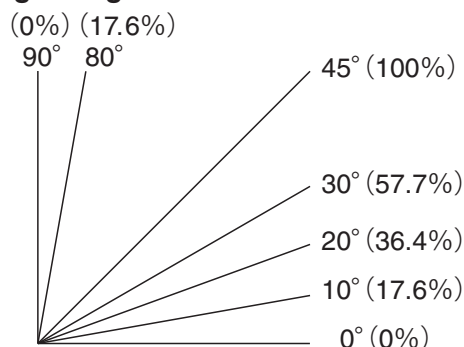
a. Gradient

Gradient	1/200	1/150	1/115	1/100	1/80	1/50	1/40	1/30	1/20	1/10
Percent	0.5%	0.7%	0.9%	1.0%	1.3%	2.0%	2.5%	3.3%	5.0%	10.0%
Degrees	0.3°	0.4°	0.5°	0.6°	0.7°	1.1°	1.4°	1.9°	2.9°	5.7°

b. Angle

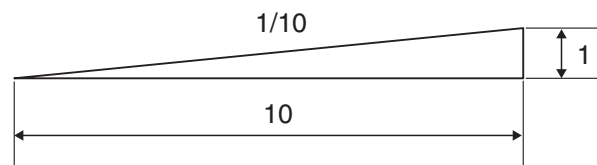
Degrees	0.0°	10.0°	20.0°	30.0°	45.0°	60.0°	70.0°	80.0°	90.0°
Percent	0.0%	17.6%	36.4%	57.7%	100%	57.7%	36.4%	17.6%	0.0%

[Angle Diagram]



[Gradient Diagram]

(10% = 0.1)



* When displaying percent slope, gauge will display angle referenced to horizontal from 0° to 45°(0% to 100%), and referenced to vertical for 45.1° to 90°(100% to 0%).

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