

«Precision Electronic Level»

Compact Digital Level DL-S1

LEVELNIC Owners Manual



Thank you for purchasing Niigata Seiki LEVELNIC.

Please read this manual thoroughly before use to insure proper operation and a long service life.

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[INTRODUCTION]

This high precision electronic level uses the displacement of a pendulum to determine angle of inclination.

Displacement is converted to an electronic signal and is displayed as mm/m inclination on the digital display.

[FEATURES]

- ◎ Differential transformer technology for high sensitivity and stable output.

- ◎ Can measure a wide range of slope angles compared to a bubble level.
(±9.99 mm/m)

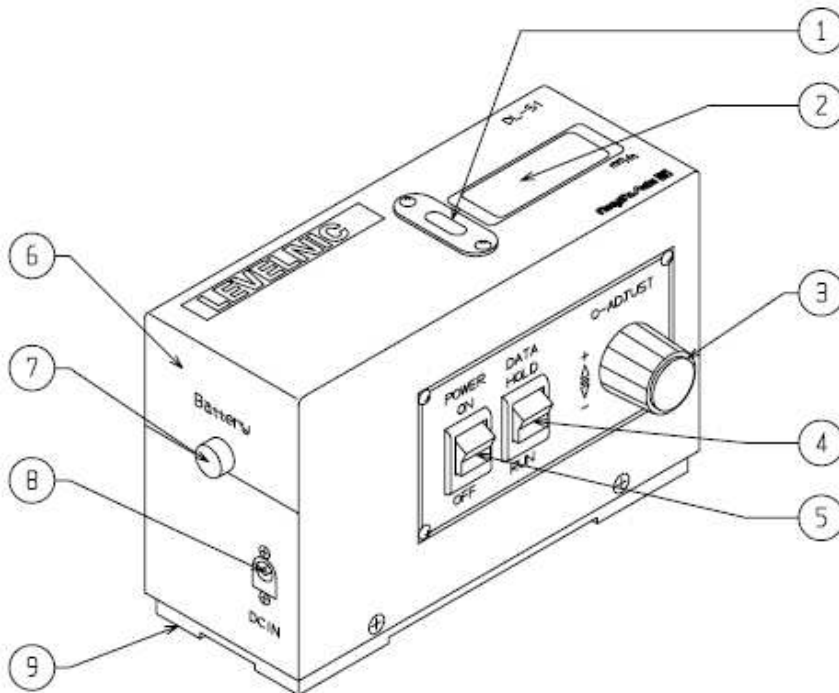
- ◎ Fast response compared to bubble level.
(Full range response time approx. 10 sec.)

- ◎ Easy to read digital display reduces user fatigue and errors..

- ◎ Hold switch for use even when display is hard to see, such as overhead or confined spaces.

- ◎ Power using battery or AC adapter.
(AC adapter sold separately.)

[PART IDENTIFICATION]



- (1) Secondary Bubble Level
- (2) Display
- (3) 0-Adjust Knob
- (4) Hold Switch
- (5) Power Switch
- (6) Battery Cover
- (7) Battery Cover Screw
- (8) Power Jack
- (9) Base

[DESCRIPTION]

(1) Secondary Bubble Tube (Spirit) Level

For checking the instrument is level in the roll direction (perpendicular to the measurement axis.)

(2) Display

Displays the slope angle in mm/m, and low battery indicator.

If angle is out of range, display will read "OVER".

When battery level is getting low, "AC" will show on the display

When "AC" is displayed, please replace battery or switch to the optional AC adapter.

(3) 0-Adjust Knob

For setting the zero-point of the gauge.

Use it to set the display to 0, or to halve the display value when setting zero-point before measuring.

(4) Hold Switch

HOLD Switch allows you to fix the reading on the display.

Use when display is not visible in measurement position, such as overhead or in poor lighting.

(5) Power Switch

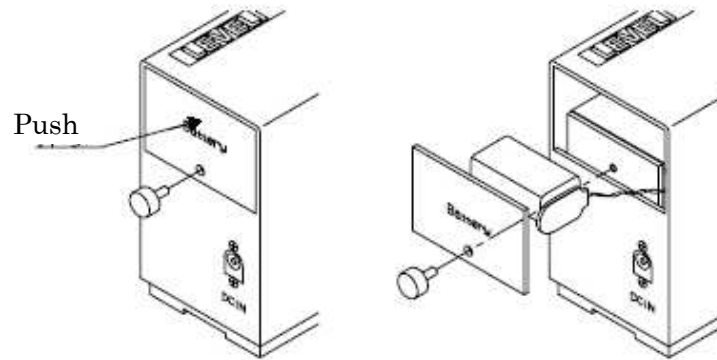
After turning ON, instrument is ready to use in about 5 sec.

(6) Battery Cover

Battery storage case.

(7) Battery Cover Screw

Secures the Battery Cover. Unscrew to remove when replacing battery.
After unscrewing, push in on top of cover if it is difficult to remove.



(8) Power Jack

Power input for connecting the optional AC Adapter.
When the AC adapter is connected, the Battery is automatically disconnected from the instrument circuitry.

(9) Base

[HOW TO USE]

This is a precision instrument. Please handle with care and avoid any shock or mishandling.

Before use, wipe the instrument base and the surface or object to be measured using a soft cloth or lens cloth moistened with mineral spirits or alcohol to remove any grease and contamination.

Place the instrument on the surface to be measured.

Turn on the meter by pressing the Power Switch.

For best results, wait about 20 min. after power on for internal circuitry to stabilize.

The zero-point will shift up to 0.01mm/m when first turned on as the system warms up. If this level of precision is not needed, you can begin measurements as soon as it is turned on.

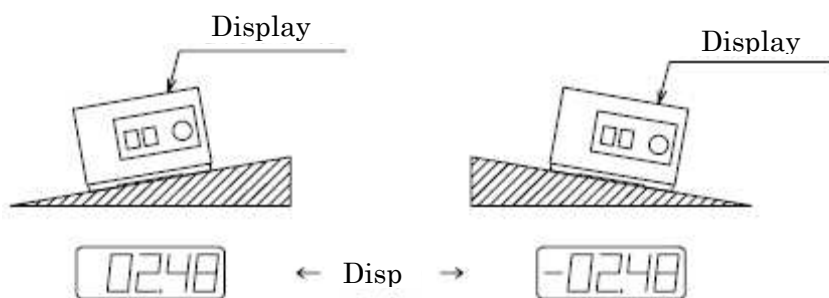
Make sure there is no difference in temperature between the instrument and the object to be measured.

For highest precision, we recommend that all measurements are performed in a temperature controlled room, following the standard practice used for all precision metrology.

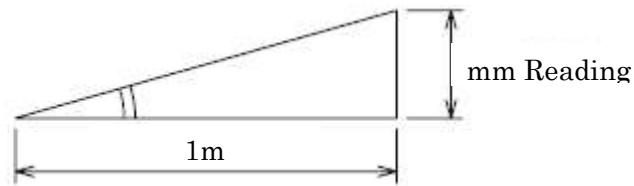
After use, protect the base of the instrument by coating with rust-preventive oil before storage.

When viewed from the front (with the Display on the right side,) if the right side is elevated, the angle reading will be an increasing positive number.

If the left side is elevated, the angle reading will be negative.



The Gauge will display the angle of inclination as mm/m, which is the elevation for the surface over a distance of 1 meter.



The actual height difference over a specified distance or pitch can be calculated as follows:

$$\text{Height Difference over Pitch} = \text{Reading} \times \frac{\text{Pitch}}{1000} \text{ [mm]}$$

For the example with the measurement pitch = 100mm,

$$\begin{aligned} \text{Height Difference over Pitch} &= \text{Reading} \times \frac{100}{1000} \text{ [mm]} \\ &= \text{Reading} \times 0.1 \text{ [mm]} \end{aligned}$$

100

[ZERO-POINT SETTING]

The instrument does not have a preset absolute zero-point..

When first turned on, a reading of zero will not necessarily indicate that the gauge is at true horizontal position. If a zero-point is required, it must be set each time the instrument is switched on.

In this way, calibration error is eliminated and the zero-point is set accurately each time.

Setting the zero-point to true horizontal is accomplished using the 0 adjust and 1/2 adjustment procedures.

If the reference surface is outside the adjustment range of the instrument, the zero-point can not be set and the surface level must be moved to within the adjustment range.

A) For comparing relative slope of different surfaces.

- (1) Place the instrument on the surface to be used as the reference.
- (2) When the display has settled, adjust the 0-Adjust Knob to set the display to zero.

A relative zero-point has now been set for use in comparative angle measurements.

B) If there is a true horizontal reference surface available.

- (1) Place the instrument on the surface to be used as the reference.
- (2) When the display has settled, adjust the 0-Adjust Knob to set the display to zero.

Zero-point has now been set for absolute measurements.

C) If surface is not known to be level.

- (1) Place the instrument on the surface to be used as the reference.
- (2) When the display has settled, adjust the 0-Adjust Knob to set the display to zero.
- (3) Rotate the instrument 180° in the same spot on the surface.
- (4) When the display has settled, turn the 0-Adjust Knob to reduce the display reading by 1/2 .

Zero-point is now set at true horizontal.

The display will show the absolute tilt of the surface the instrument is on.

If the reference surface is not level in the roll direction, (perpendicular to the measurement axis) there is a possibility of introducing some error to the measurement so make sure the surface is first leveled to reduce roll.

« Calibration using 0-adjust and 1/2-adjust procedures. »

The zero-point reference is set without an absolute reference by using the direction of Earth's gravity for reference. This can be understood from the following procedure.

Suppose a slope having an angle θ with respect to the horizontal plane.

Place on that slope a board with a weight suspended on thread.

The weight will move toward side A of the board at an angle θ from the line perpendicular to the slope.

When the board is turned 180° , the weight now moves toward side B of the board by angle θ from the line perpendicular to the slope.

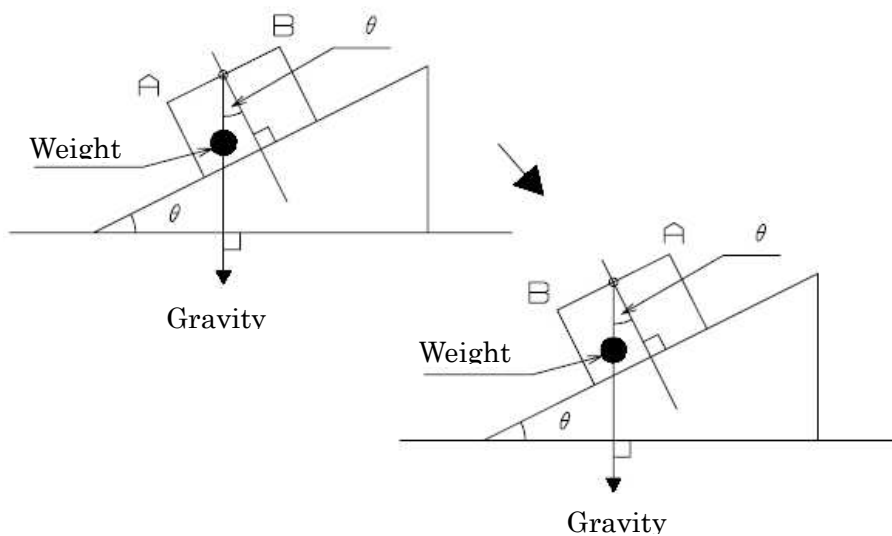
Using this method, even without a true horizontal reference, we can determine the value of the angle $2\times\theta$, where θ is the angle of the slope in reference to the horizon.

By dividing by two, we can determine θ , the tilt of the slope.

If the gauge is set to zero on a slope, then when the gauge is rotated 180° it will show the angle twice the actual angle of the slope.

If the reading is then halved, it will show the angle of the slope, and by adjusting the slope until that reading is zero, we can adjust the surface to horizontal.

Using this method for setting the horizontal reference, the reference set is always accurate and the gauge reliable. For an instrument with built in reference, there is chance that it will be inaccurate and yet will continue to be used without knowing of the deviation.



[LEVELING A SURFACE]

Leveling in one direction.

(1) Place the instrument on the surface or object to be measured and check the level in the roll direction using the secondary bubble tube level. Adjust the 0-Adjust Knob to set the display to zero.

If the display can not be adjusted to zero, the surface may be outside the adjustment range. Adjust the position of the surface to get it within the range of the instrument.

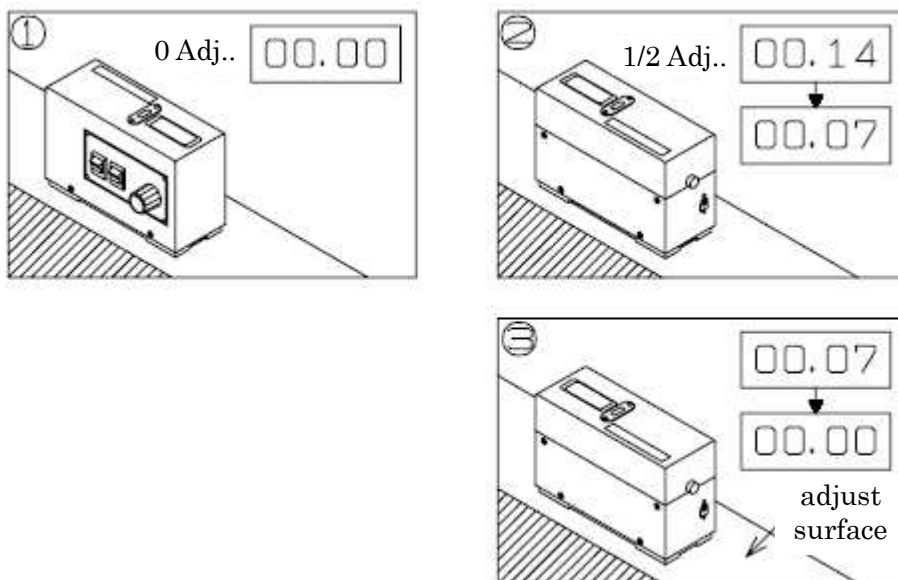
(2) Rotate the instrument 180°, and check the secondary bubble tube to make sure it reads the same. Turn the 0-Adjust Knob to reduce the display reading by 1/2 .

If the secondary bubble tube reading has changed, then the tilt in the roll direction may have shifted introducing an error to the operation. Adjust the surface being measured to prevent shift before repeating.

(3) Adjust the tilt of the surface to make the instrument's display read zero.

(4) Rotate the instrument 180° again, to confirm that the reading is zero and the surface is level.

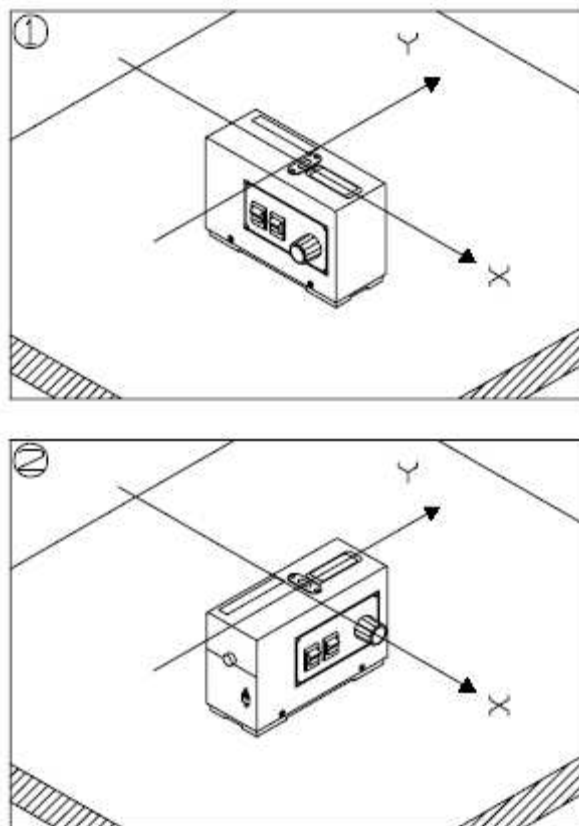
If it does not read zero after rotating, then repeat steps (1) ~ (4) above.



Leveling in two directions (X, Y direction)

- (1) For one direction, (for example the X-direction,) follow the above procedure for “Leveling in one direction.”
- (2) Repeat the procedure for the other direction (the Y-direction.)
- (3) When adjusting in one direction, it is possible that the perpendicular direction will be affected and no longer level. It may be necessary to repeat steps (1), (2), several times to bring the two axis into level.

When the reading is zero for the level placed in any position, the surface is level.



[SHIPPING]

This is a precision instrument. When carried or shipped, care must be taken to avoid damage. Please be careful not to subject instrument to shock, vibration, or excessive forces when shipped.

Hand Carrying

Always transport in supplied case.

Transport in upright position and not on side or upside down.

When placing the gauge into the storage case, use care since the outer body is larger than the base and will get stuck.

When transporting in automobile, please put on passenger seat and minimize vibration and shock to instrument.

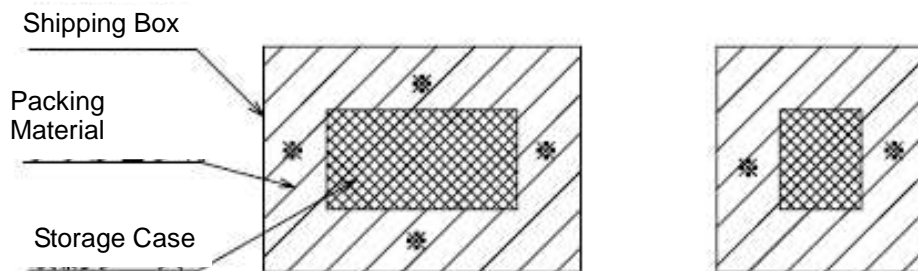
When moving, keep the instrument upright.

Shipping via Truck or Carrier

Please prepare a shipping box with internal size approximately 20cm larger than the storage case in all dimensions.

Place the instrument in the storage case, and place the case in the box with all sides protected with appropriate packing material (such as shredded paper or similar cushioning material.) Pack with enough material to ensure the case will stay centered in the box and will be protected from shock.

The case should be right-side up, and the box marked to insure the box is kept upright during shipping, and not on side or upside down.



※Protect all six sides from shock with 10cm of packing material

[NOTICES]

- This is a precision instrument, handle with care. While in use and during transport, protect from excessive shock, vibration, or excessive force to the main body or to the measuring surface.
- The measuring base is critical component for accurate measurements, use care to protect from corrosion.
- After use, clean any rust or dirt from instrument and apply rust preventive oil to the base before storing in the case.
- If not used for a long period, remove battery.
- Store in cool, dry location out of direct sunlight, and protect from high humidity or severe temperature changes.
- Make sure surface to be measured is free of any dirt or burrs which may cause damage to measuring surface.
- Keep away from magnets and strong magnetic fields.
- When used in a support capacity for other equipment, it can easily be damaged; please use care to avoid scratches or corrosion.
- Do not modify or use for purpose other than original intended use.

[SPECIFICATIONS]

Model	DL-S1
Measurement Range	±9.99 mm/m
Resolution	0.01mm/m
Operating Temp. range	0~40°C
Accuracy (※1)	±1.3 %rdg [17 ~ 23°C] ±3.0 %rdg [0 ~ 40°C]
Repeatability.....	Within ± 0.01 mm/m
Power	9V (standard 9V battery - JIS S-006P) (1 x) AC100V adapter
Continuous Use Time (※2)	Zinc-Carbon battery - approx. 25 hours. Alkaline battery - approx. 50 hours.
Dimensions (※3)	159 (L) × 78 (W) × 104 (H) mm
Base Dimensions	150 (L) × 55 (W) mm
Weight	2.0kg
Accessories	9V Battery Storage Case Owner's Manual

(※1) % rdg is "percentage of reading"

(※2) Slight variation depending on usage conditions.

(※3) For DL - S1V, Height (H) is 111 mm.

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