

Niigata Seiki co., ltd

Thank you for selecting the LEVELNIC DP-10XY digital angle meter.

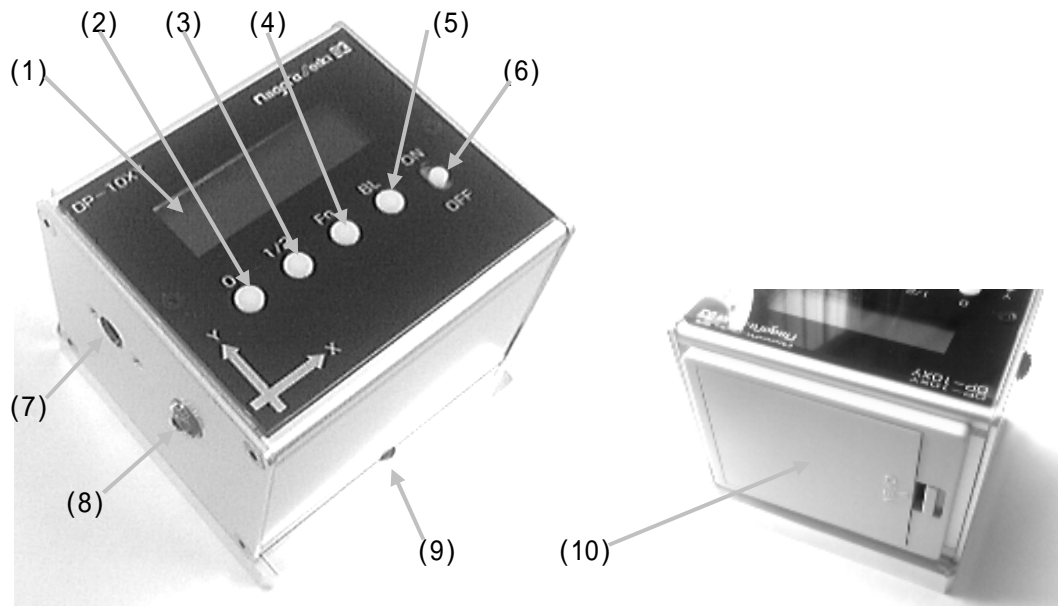
Before using the meter, read the operating manual fully to ensure you understand how to use the device properly and to ensure its continued operation for years to come.

<< Overview >>=====

This device is a two-axis digital angle meter for measuring inclinations on the X- and Y-axes. The inclination of each axis is digitally displayed as an angle (DEG). The measurement range of both axes is "+,-"9.99(DEG).

<< Features >>=====

- * The LCD shows two lines indicating the inclinations on the X- and Y-axes.
To measure only one axis, you can press a button to display only the data of one of the axes.
- * Similar to our LEVELNIC series electronic levels, this device has a "0" adjust button and a "1/2" adjust button, which enable you to define the reference value or halve the displayed value respectively at the flick of a button, thereby ensuring accurate inclination measurement.
- * The LCD is equipped with a backlight to enable measurements to be taken in the dark.
- * This device can output data to a computer via a signal output (RS-232C).
You can use the data-keeping function of the dedicated software to collate the measurement values.
- * You can also use the meter in Sensor mode.
In this mode, it serves as an inclination sensor rather than as a measurement device.
The resolution in Sensor mode is 0.002(DEG).
(In this mode, the "0" adjust button and the "1/2" adjust button are disabled to prevent errors in the displayed value due to inadvertent operation.)
- * There are holes (M5) in the base of the meter for attaching a jig.



(1) Display window

Displays the X- and Y-axis inclinations, the power status of the meter, and its measurement mode.

Inclination

Inclination is indicated as an angle (DEG).

When an inclination goes out of the measurement range, "Error" is displayed.

When the device is inclined in the directions indicated by the X or Y arrows on the panel, the value is positive.

When the device is inclined in the opposite direction, the value is negative.

Power status

The number displayed next to "B:" in the bottom right of the display indicates the power supply voltage.

When the voltage is 2.0 or greater, the voltage value is displayed.

This helps you understand the residual battery capacity.

When the voltage drops below 2.0, the following descriptions are displayed:

"CHK" >> Measurement is possible, but you are recommended to change the batteries or switch to the AC adapter soon.

"NG" >> Stop measurement immediately and change the batteries or use the AC adapter to supply power.

Measurement mode

In normal operation, the measurement unit of "DEG" is displayed in the upper right.

When the device is operating in Sensor mode, it displays "DEG s".

When operating in Sensor mode, the device displays values to three decimal places.

For instructions on switching to Sensor mode, refer to the description for the "Fn" button.

(2) "0" adjust button ("0-call")

Pressing the "0" adjust button changes the displayed values for X and Y to zero.

Press and hold the button for about one second to activate it.

If either axis indicates an error, the button does not work.

The button also does not work when any of the values hidden by the "Fn" button is "Error".

(3) "1/2" adjust button ("1/2-call")

Pressing the "1/2" adjust button halves the values displayed.

The displayed values change the "1/2" adjust button is released.

Press and hold the button for about one second to activate it.

If either axis indicates an error, the button does not work.

The button also does not work when any of the values hidden by the "Fn" button is "Error".

(4) "Fn" button (Function button)

Changing the display contents

Pressing the "Fn" button cycles the displayed items between both X and Y together, X only, and Y only.

Switching to Sensor mode

While pressing and holding the "Fn" button, turn on the power of the meter.

When the device displays "Sensor mode OK", release the button.

In Sensor mode, the display displays "DEG s".

The resolution of the display is 0.002(DEG), while the range is "+,-"9.998(DEG).

An error is indicated by +9.999 or -9.999, instead of letters "Error".

The "0" adjust button and the "1/2" adjust button are disabled to prevent errors in the displayed value due to inadvertent operation.

(5) "BL" button (Backlight button)

Pressing the "BL" button activates the backlight of the display window for one minute.

Pressing the "BL" button while the backlight is on turns the backlight off.

(6) Power switch

The power switch is a slide switch.

The device is ready to operate normally about eight seconds after the switch is turned on.

Any reference points defined by the "0" adjust button or "1/2" adjust button are disabled when the power switch is turned off.

It is therefore necessary to define any reference points again after switching the device on.

(7) AC adapter jack

For connecting an external power supply. (center positive, 3V DC input)

Use with the accessory AC adapter.

(8) Signal output jack

Displayed values can be output using an RS-232C signal.

For details, refer to "External Signal Output".

(9) Base

There are two M5 holes in the base.

These holes are for securing the device to another special base or a jig.

The holes are 70mm apart and 10mm deep.

(10) Battery housing

The battery housing takes two AA batteries.

When you remove the battery housing lid, you will see the indications of polarity (+,-).

Ensure the batteries are inserted in the right direction.

<< Horizontal Reference >>=====

This device is adjusted so that the difference between zero display at the time of power-on and the actual horizontal plane is within "+,-"0.15(DEG). (factory default)

To measure an incline based on a more accurate measurement of the horizontal plane, set the horizontal reference (zero point for horizon) before taking any actual measurements.

In order to achieve an accurate inclination measurement even on a plane that has been worn down over time or when using an additional jig or base, define a horizontal reference.

By using the "0" adjust button and the "1/2" adjust button, you can easily set an accurate horizontal reference.

[Roles of the "0" adjust and "1/2" adjust]

Because the sensor works off the gravitational center of the earth, you can ascertain the zero point of the horizon through the following method:

Assume an incline with an angle of θ to the horizontal.

Place a board with a weight suspended from it on this incline.

The weight then inclines toward end A of the board at angle θ from a line running perpendicular to the slope.

If you turn the board around (180 DEG), the weight then inclines toward end B of the board at angle θ from a line running perpendicular to the slope.

Thus, even without any absolute reference (a line running perpendicular to the slope), we can detect the value of "2 X θ " by turning the board through 180 DEG.

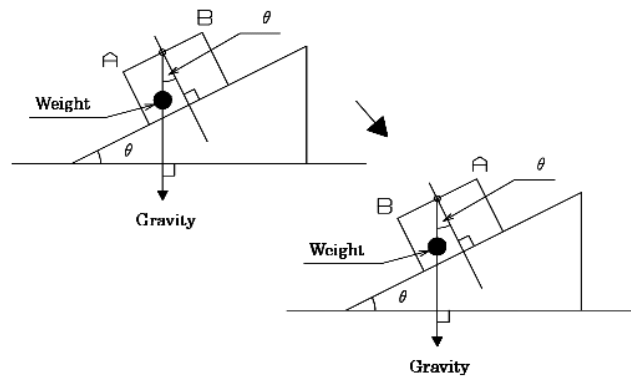
As halving "2 X θ " give us θ , we can obtain the horizontal plane.

Therefore, if one side of an inclined plane is assumed to be zero, the reversed plane will indicate an angle that is twice the actual inclination.

Halving such indication gives the inclination of the plane.

You can adjust this plane to horizontal by adjusting the inclination of the slope (the object to be measured) to zero.

Conversely, anything with an absolute reference is likely to be applicable even without recognizing any disorder of the reference plane.



[Changing the measurement range due to shifts in the reference point]

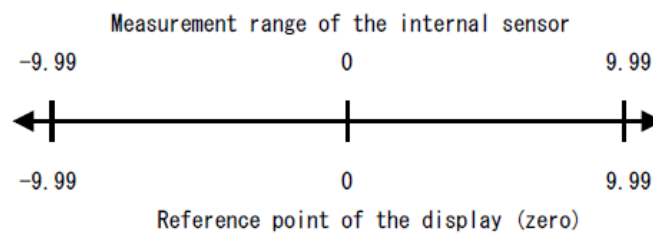
By using the "0" adjust or "1/2" adjust buttons, you can shift the reference point of the display by resetting to zero or halving the value.

If the measured value is out of the measurement range of the internal sensor ("+" , "-" 9.99 DEG), an error is issued.

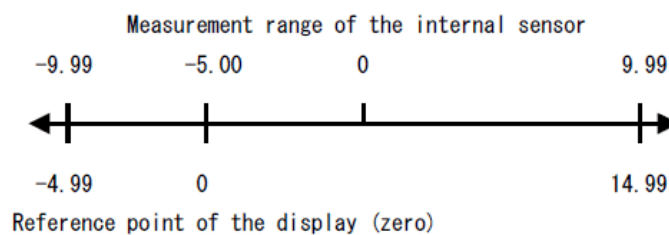
After the reference point has been shifted using the "0" adjust or "1/2" adjust buttons, no error is issued even if the display exceeds 10(DEG), so long as the displayed angle is within the internal sensor's measurement range.

In contrast, if the displayed angle is outside the internal sensor's measurement range and the display indicates a value that is lower than 10(DEG), an error is issued.

* Reference point doesn't shift



* Reference point has been shifted (ex. : -5 DEG >>> "0" adjust)



<< Using the Meter >>=====

This device is a precision measuring instrument.

Be careful to avoid dropping or hitting the device or subjecting it to any impact.

The meter is adjusted so that the difference between zero display at the time of power-on and the actual horizontal plane is within "+,-"0.15(DEG). (factory default)

For the purpose of inclination measurement from a more accurate horizontal plane, set the horizontal reference prior to taking any actual measurements.

[Measurement values]

Inclination is indicated as an angle (DEG).

When an inclination goes out of the measurement range, "Error" is displayed.

When the device is inclined in the directions indicated by the X or Y arrows on the panel, the value is positive.

When the device is inclined in the opposite direction, the value is negative.

[Setting the zero point / horizontal reference]

A) Comparison measurement with a slope

(1) Place the meter on the reference slope, and wait for the display to stabilize.

(2) Press the "0" adjust button to set the display to zero.

The zero point for comparison is now set.

B) If a horizontally-adjusted plane is available

(1) Place the meter on the horizontal plane and wait for the display to stabilize.

(2) Press the "0" adjust button to set the display to zero.

The horizontal reference is now set.

C) If you are not sure whether the plane is horizontal

(1) Place the meter on the plane and wait for the display to stabilize.

(If an error is issued, the inclination of the plane is beyond the measurement range.
Adjust the inclination so that it is within the measurement range.)

(2) Press the "0" adjust button to set the display to zero.

(3) Reverse the direction of the meter (turn it 180 DEG) in the same location, and wait for the display to stabilize.

(4) Press the "1/2" adjust button to halve the displayed value.

The horizontal reference is now set.

The displayed value indicates the inclination of the plane on which the meter is placed.



"0" adjust: display X: 0.00 DEG >>>> 180(DEG) turn: display X: -0.44 DEG
display Y: 0.00 display Y: -0.20

V
V

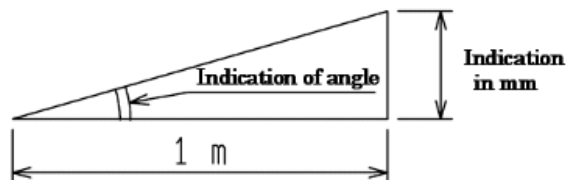


1/2 adjust: display X: -0.22 DEG
display Y: -0.10

[Changing the unit]

Although the unit used on the meter cannot be changed, the unit used in the window of the dedicated software on a PC can be switched between DEG (angle) and mm/M.

The measurement mm/M refers to the difference in height per meter, indicated in millimeters.

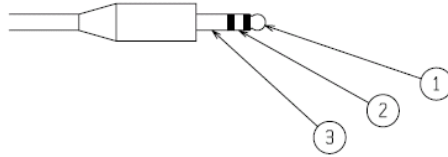


<< External Signal Output >>=====

The device outputs displayed values via RS-232C.

Use a mini stereo plug as the connector (PC cable included).

If the meter indicates the power status as "B: NG" no signal is output.



- (1) TD (Output) : Transmission data
- (2) CTS (Input) : Transmission allowed
- (3) GND : Ground

Communication method : Start-stop synchronization (asynchronization)

Communication control : Hardware-controlled (via CTS)

Baud rate : 1,200 bps

Data length : 8 bits

Stop bit : 1

Parity bit : none

Output signal level : "+,-"5V to "+,-"10V

Input signal level : "+,-"3V to "+,-"15V

Each transmission sends a signal containing 24 characters (12 X 2 rows) as transmission data (TD).

This data contains:

- 1 - 2 : Indication of axis (X:)
- 3 - 11 : Measurement data (including spaces)
- 12 : Carriage Return (CR)
- 13 - 14 : Indication of axis (Y:)
- 15 - 23 : Measurement data (including spaces)
- 24 : Carriage Return (CR)

E.g.) Carriage Return at 12nd bit makes it seem to contain two rows.

(1)(2)(3)(4)(5)(6)(7)(8)(9)(10)(11)(12) (" " denotes a space)

X	:	*	-	*	9	.	8	7	*	*	CR	Normal display (negative value)
Y	:	*	*	*	5	.	4	3	*	*	CR	Normal display (positive value)
X	:	*	-	1	9	.	8	7	*	*	CR	Normal display (if shift of reference allows a value beyond -9.99 to be displayed)
Y	:	*	*	1	5	.	4	3	*	*	CR	Normal display (if shift of reference allows a value beyond 9.99 to be displayed)

X	:	*	-	*	E	r	r	o	r	*	CR	Normal display (negative error output)
Y	:	*	*	*	E	r	r	o	r	*	CR	Normal display (positive error output)
X	:	*	-	*	9	.	8	7	*	*	CR	Normal display (if display switching eliminates the indication of Y: value)
Y	:	*	*	*	*	*	*	*	*	*	CR	Normal display (if display switching eliminates the indication of Y: value)
X	:	*	*	*	*	*	*	*	*	*	CR	Normal display (if display switching eliminates the indication of X: value)
Y	:	*	*	*	5	.	4	3	*	*	CR	Normal display (if display switching eliminates the indication of X: value)
X	:	*	*	-	9	.	8	7	6	*	CR	Sensor mode (negative value)
Y	:	*	*	*	5	.	4	3	2	*	CR	Sensor mode (positive value)
X	:	*	*	-	9	.	9	9	9	*	CR	Sensor mode (negative error output)
Y	:	*	*	*	9	.	9	9	9	*	CR	Sensor mode (positive error output)

Data is output at intervals of 2.5 seconds.

The position of the minus signs differs between normal display and sensor mode.

The output signal is controlled by CTS.

CTS is a command signal that determines whether the device outputs a signal.

<< Transporting the Meter >>=====

This device is a precision measuring instrument.

Be careful to avoid dropping or hitting the device or subjecting the measurement surface or device body to excessive pressure or impacts.

[Carrying by hand]

Carry the device in the supplied case.

[Road transport]

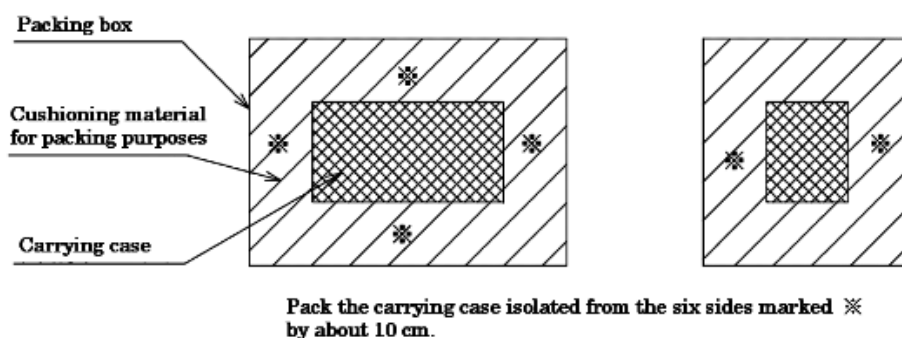
To protect the supplied case from damage during transportation, prepare a rugged box large enough to enclose the case.

Place the device inside the supplied case and then pack this into the rugged box.

[Air transport]

Prepare a rugged box that has inner dimensions that are at least 20cm greater than those of the supplied case on all axes.

Place the device inside the supplied case and then pack this into the rugged box, with buffering material (such as shredded paper) surrounding the case.



<< Precautions >>=====

This device is a precision measuring instrument.

Be careful to avoid dropping or hitting the device or subjecting the measurement surface or device body to excessive pressure or impacts.

The measurement surface at the bottom is an important functional part; take care to avoid any change in its shape (dents, etc.).

Remove dust and dirt, and store it in its case after use.

If the device will not be used for a long time, remove the batteries to avoid failure due to leaking fluid.

Avoid storing the device in areas that are subject to direct sunlight or high temperature; store it in an area with minimal fluctuations in temperature and humidity.

Remove any dust in the area of use.

Otherwise this may cause damages to the measurement surface or any objects being measured.

Note that any use of the device as an auxiliary tool for a purpose other than measurement may cause damage to the device or cause it to fail.

<< Specifications >>=====

Model	DP-10XY
Measurement range	"+, -"9.99 DEG (Error for deviations from the range) (*1)
Minimum readout	0.01 DEG
Reading accuracy	"+, -"0.01 DEG (Within the measurement range "+, -"2 DEG) "+, -"0.05 DEG (Beyond the measurement range "+, -"2 DEG)
Repetitive accuracy	"+, -"0.01 DEG
XY orthogonal accuracy	1%
Operational temperature	0 to 40 degrees
Response time (measurement frequency)	About 2.5 sec/cycle
Output	Compliant with RS-232C
Power supply	2 AA batteries AC adapter (3V output)
Continuous operation	10 hours (with alkaline batteries) (*2)
Outer dimensions	88(L) X 85(W) X 73(H) mm
Base dimensions	85(L) X 85(W) mm
Weight	560g (including batteries)
In Sensor mode:	
Measurement range	"+, -"9.998 DEG (Displays 9.999 if beyond the range; no error issued)
Minimum readout	0.002 DEG
Limited functions	"0" adjust, "1/2" adjust and display switching are disabled
Accessories	
AC adapter (3V output)	
2 AA batteries	
Storage case	
Cable to connect with a PC	
Dedicated software for the angle meter	
Operating manual	

Notes

*1 : Measurements can also be displayed as mm/M (inclination) with the dedicated software.

*2 : Varies depending on the usage conditions, including ambient temperature.

Rechargeable AA batteries with a nominal voltage of 1.2V are also available, though the characteristics of their discharge voltage waveform shorten the period from the beginning of "B:CHK" to battery exhaustion.