

G-Series Inclinometer

Instruction Manual G-Series Inclinometer



Model

NS-10/G

Version 1.0

G-Series Inclinometer

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Please pay attention to the instruction manual before you put into operation!

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1 Measurement Principle

The G-Series single axis inclinometer functions as an electronic 'switch', which actuates when a preset threshold angle is exceeded. The angle sensing element works on the conductivity principle, whereas the conductivity of the fluid inside the sensor is measured over a scattered field using an alternating current measurement method. The conductivity of the fluid is directly proportional to the fluid volume, and by measuring this difference, the angle of inclination is determined. When this alternating current measurement method is combined with the micro structuring of the sensor, and with a switching technique specially developed for this purpose, temperature coefficients of the sensor are virtually eliminated.

2 Method of Operation

The G-Series inclinometer measures the inclination on a continuous base using a micro controller based circuit, and emits a signal when a preset angle is exceeded in either a positive or negative direction (pre-set at factory $\pm 2.5^\circ$).

3 Usage Notes

The G-Series inclinometer has a maximum useful measurement range of $\pm 15^\circ$, with the actual threshold range of the switch being $\pm 10^\circ$. This allows the zero (level) point to be offset as much as $\pm 4.5^\circ$, while still maintaining switching accuracy. If the maximum $\pm 15^\circ$ is exceeded, unpredictable switching may occur. After applying power, allow 2 seconds for the sensor to stabilize prior to operation.

4 Installation

The G-Series has been designed for mounting on a vertical surface (i.e. wall), as shown in Fig. 1.1.. First, remove the four screws which hold the cover on. Once removed, you will see the two mounting holes. Place the G-Series onto the vertical surface to be measured, with the cable exit facing downward, and be sure to have the unit level within $\pm 4.5^\circ$. This can normally be accomplished by eye. If unsure, use a spirit level to confirm. If the unit is not level within $\pm 4.5^\circ$, the zero point setting may be rejected. Once level positioning is confirmed, use two M 4 screws (or similar) to attach the inclinometer to the surface to be measured. An inclination more than $\pm 4.5^\circ$ may cause the zero point setting to be rejected.

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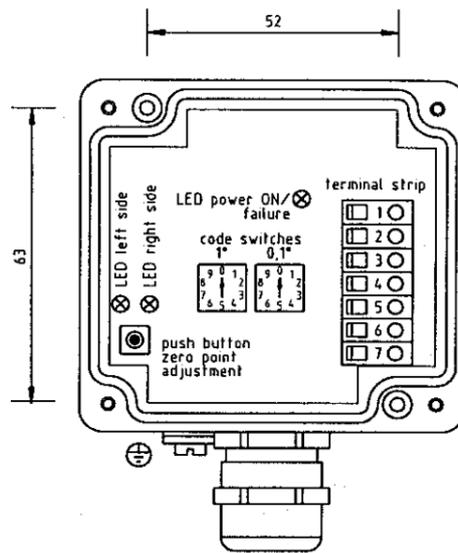


Fig. 1.1: Top view opened housing

5 Electrical Connection

Electrical connections are made by inserting a cable through the cable gland. The cable must have an outside diameter of between 10 to 14mm's for a proper fit. Fig.1.2. shows the correct connection points. The power supply, which must be between +14.4 to +30 VDC, is connected to terminals #1 and #2, with +power also being connected to terminal #4, which has been bridged at the factory with terminal #5.

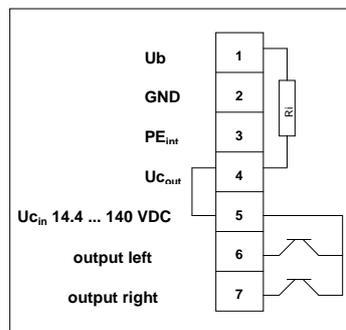


Fig. 1.2: Label connection note

Fig. 1.2 depicts the label glued to the inside of the lid, which shows the wiring schematic.

It should be noted that power supply is available from point 4 via an internal loop consisting of a 270 Ohm (1W) resistance.

The interference free functioning of the unit, in accordance with the EMC/ESD guidelines in section 6.1 (points 6 and 7), can no longer be guaranteed should operation **without** the bridge occur, for example to make use of an external switch voltage. External protection measures must be employed by the user in this case. Please note the technical data in section 11.

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6 EMC

6.1 Standards

The inclination switch NS-10/G with housing has been subjected to various tests. The EN 50121-3-2 norm from September 2000 was used as the basis for these tests.

The following standard requirements have been met successfully:

1. Measuring of interference fields/radiation (EN 55011/ EN 50121-3-2)
2. Measuring of interference voltage (EN 55011/ EN 50121-3-2)
3. Resistance to electromagnetic interference (EN 61000-4-3 / 50121-3-2)
4. Resistance to breaks in and variations of voltage (EN 50155 / EN 50121-3-2)
5. Resistance to rapid transients (bursts) (EN 61000-4-4 / EN 50121-3-2)
6. Resistance to transients (surge) (EN 50155 / EN 50121-3-2)
7. Resistance against HF in leads (EN 61000-4-6 /EN 50121-3-2)

The evidence to ESD interference (EN 61000-4-2 / EN 50121-3-2) does not need to be demonstrated, while the housing needs to be grounded. Under normal operating conditions, prevents the inclination switch from being accessed by untrained personnel.

7 Setting Switch Point

The switching points for positive and negative inclination are set via two coding switches located inside the housing. Coding switch 1 sets degrees and coding switch 2 sets tenths of a degree (see Fig. 1.1).

8 Setting Zeroing

The inclinometer zero point has been factory pre-calibrated to absolute 0°. The zero point of the inclinometer may be reset by pressing the 'zero point adjustment' button for 2-3 seconds (see Fig. 1.1), provided the inclinometer is within -4.5° to +4.5° of level. It should be noted that by doing so, the factory zero calibration is voided. Successful zeroing is indicated by the power light going off briefly and then coming on again. A blinking light indicates the user that zeroing was not successful and must be repeated. The LED will continue blinking until a new positioning and/or a new zeroing has successfully taken place.

9 Operation

After switching on the power a red LED indicates that the inclinometer is fully operational. The inclinometers switching point is factory set at exactly 2.5°. The switching point can be adjusted as necessary with a small screwdriver. The left coding switch can be used to set the switching point in increments of 1°, the right coding switch in increments of 0.1°, which means that 9.9° is the largest angle that can be set. Care should be taken to set switching points accurately and to avoid setting the coding switches between two positions. If the switching point threshold is exceeded, the switch current ~10mA (maximal 50mA) attached to terminal #5 will be passed through to either terminal #6 or #7, depending on the angle of inclination. The switching voltage must be in a range of +0.1 up to maximal +140VDC.

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The switch hysteresis is factory set at 0.1°.

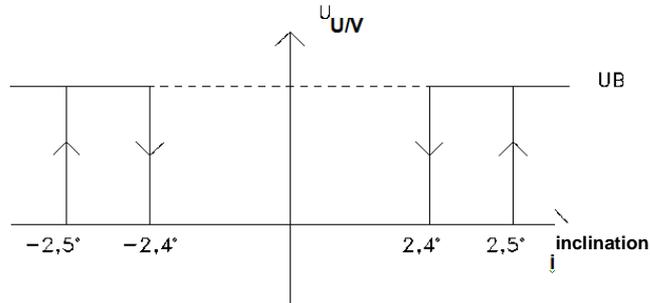


Fig.1.3

The Fig.1.3 shows how the switches behave when the switching point has been set to 2.5° in the factory and terminals #4 and #5 are bridged.

10 Optical Information

Importance of the optical indication LED's of the system circuit board in the housing:

Indicator	Status	Meaning
Power LED	On	Operation
Power LED	Flashing	Interference or zeroing required
Left LED	On	Limit for left switching point setting exceeded
Right LED	On	Limit for right switching point setting exceeded

11 Specification

	Conditions	Min	Typ	Max	Units
Measurement range		-10		+10	°
Resolution			0.001		°
Switch threshold adjustment	Single step	0.1		9.9	°
Accuracy		-0.1		+0.1	°
Accuracy(absolute)	T=-25...+85°C	-0.25		+0.25	°
Switch output ⁽¹⁾	load		10	50	mA
Switch voltage		+0.1		+140	VDC
Switch hysteresis		0.05		0.15	°
Terminal strip		0.08		2.5	mm ²
Metric screw M20	Diameter cable	10		14	mm

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Voltage supply		+14.4	+30	VDC
Current consumption		15	20	mA
Operation temperature		-25	+85	°C
Storage temperature		-40	+85	°C
Protection class IP		67		
Weight		380		G
Housing dimensions	W x D x L	80 x 75 x 57		mm

12 General Notes

12.1 Safety Notes

The G-Series inclinometer was built and tested using the most modern methods available. Despite all the care, a small risk is always present during use, as with all electronic devices, due to the inherent dangers of electricity. In addition, care should be taken to ensure that the tools required during connection and setup do not cause any short circuits or damage the electronics in any other way.

12.2 No Alterations to Structural Design or other Changes

The G-Series inclinometer must not be altered in any manner, either structurally or safety wise, without our express permission. Meas Deutschland GmbH is not liable for damage resulting from any type of alteration. In particular, any repairs to or soldering of electronic components is prohibited.

13 Packaging for Delivery

Safe single package "Blitz Versandbox", company "Ratioform", type CVB (45x107x60 mm, for one piece) type will be used for the delivery of the product.

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14 Additional Information

ORDERING INFORMATION

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