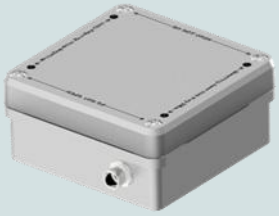
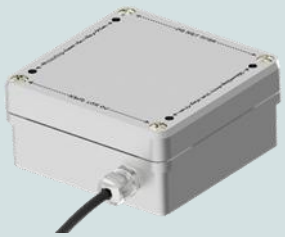
RECOVIB

INCLINOMETERS

DUAL AXIS INCLINOMETERS

DESIGNED TO WITHSTAND HARSH OPERATING CONDITIONS





Those dual axis inclinometers are designed to measure very small changes from the vertical level, either on the ground or in structures.

They exhibit high resolution and low thermal drift. Their mechanical design and enhanced internal surge protection make them particularly useful for the permanent outdoor monitoring of structures being subjected to various influences such as loading and foundation settlement.

FIELD OF APPLICATIONS

- Off-shore wind turbine foundations
- Bridges and piers
- Historical buildings
- Structural load testing
- Vessel and pontoon roll and pitch measurement
- Crane roll and pitch measurement
- Structural Health Monitoring

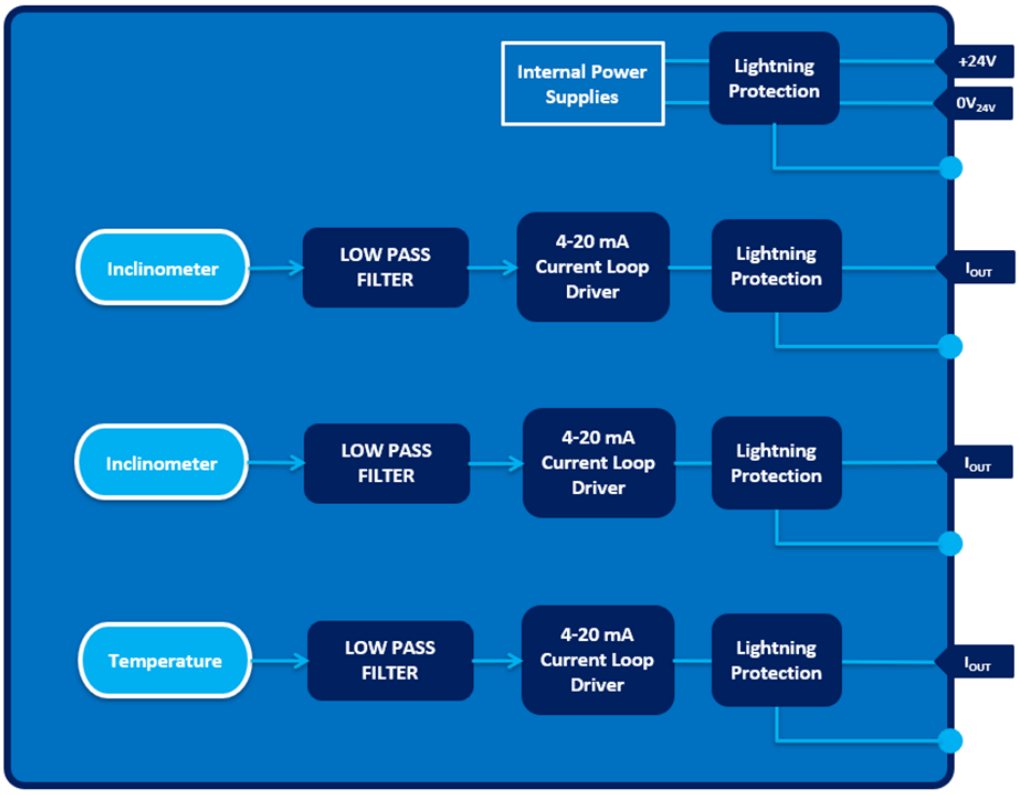
KEY FEATURES

- Biaxial
- High accuracy and resolution
- Excellent thermal stability
- 4-20 mA current loops for signal immunity and potentially long cable runs
- Enhanced surge protection
- Internal temperature sensor for residual thermal drift compensation
- Two models for horizontal or vertical mounting
- Easy to install

KEY BENEFITS

- Robustness to environmental conditions
- Short-term or permanent long-term monitoring
- Monitoring of remote areas

BLOCK DIAGRAM



CHARACTERISTICS

Tilt angle Channel Characteristics

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Measuring range			±15		°
Sensitivity (1)	0...1°		0.555		mA/°
			31.712		mA/g
Sensitivity error			±1		%
Output resolution (2)	10 Hz BW		0.0015		°
Sensitivity change with Temperature	-25...85°C		±0.015		%/°C
Offset	T° = 25°C	-0.2	0.0	0.2	°
		11.89	12.00	12.11	mA
Offset change with Temperature	-25...85°C		±0.002		°/°C
Non-linearity			±0.06		°
Output noise density	@ 5 Hz		0.0005		°/√Hz
Cross Axis Sensitivity			1	4	%
2nd order low-pass filter cutoff frequency	@ -3dB		12		Hz

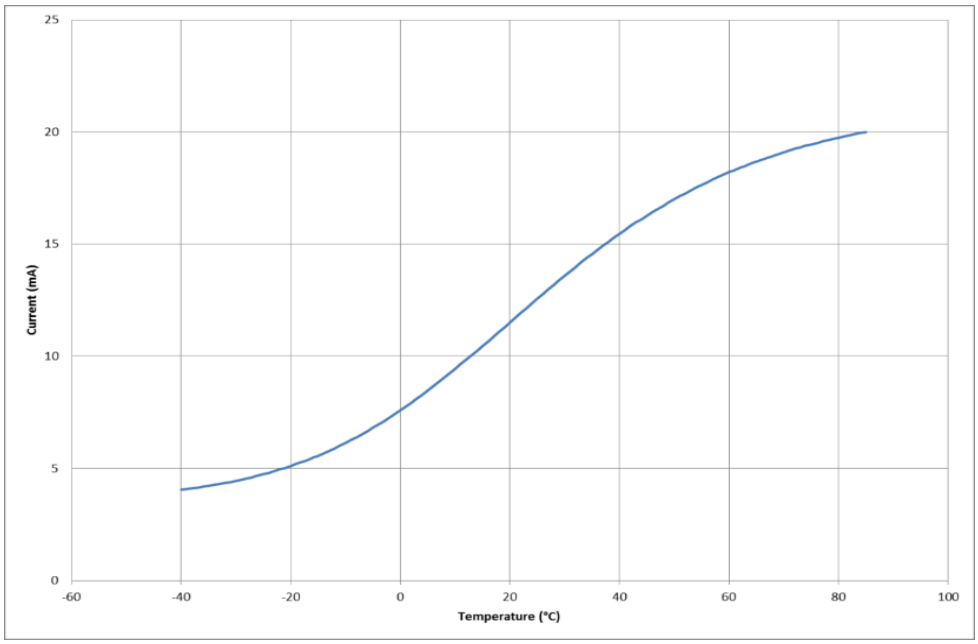
(1) The angle output has SIN curve relationship to current output

(2) Resolution = Noise density * √(bandwidth)

Temperature Channel Characteristics

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Measurement range		-40		+85	°C
Accuracy	From 0 to 70°C	-0.15		+0.15	°C
	Outside the 0 to 70°C range	-0.50		+0.50	°C
Temperature noise density				0.01	°C/√Hz
2nd order Butterworth low-pass filter cutoff frequency			1		Hz

Temperature Sensor Response Curve



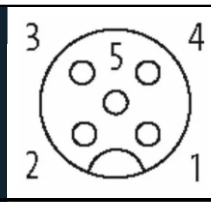
Power Supply

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Voltage		20	24	28	V_{DC}
Current		20		80	mA

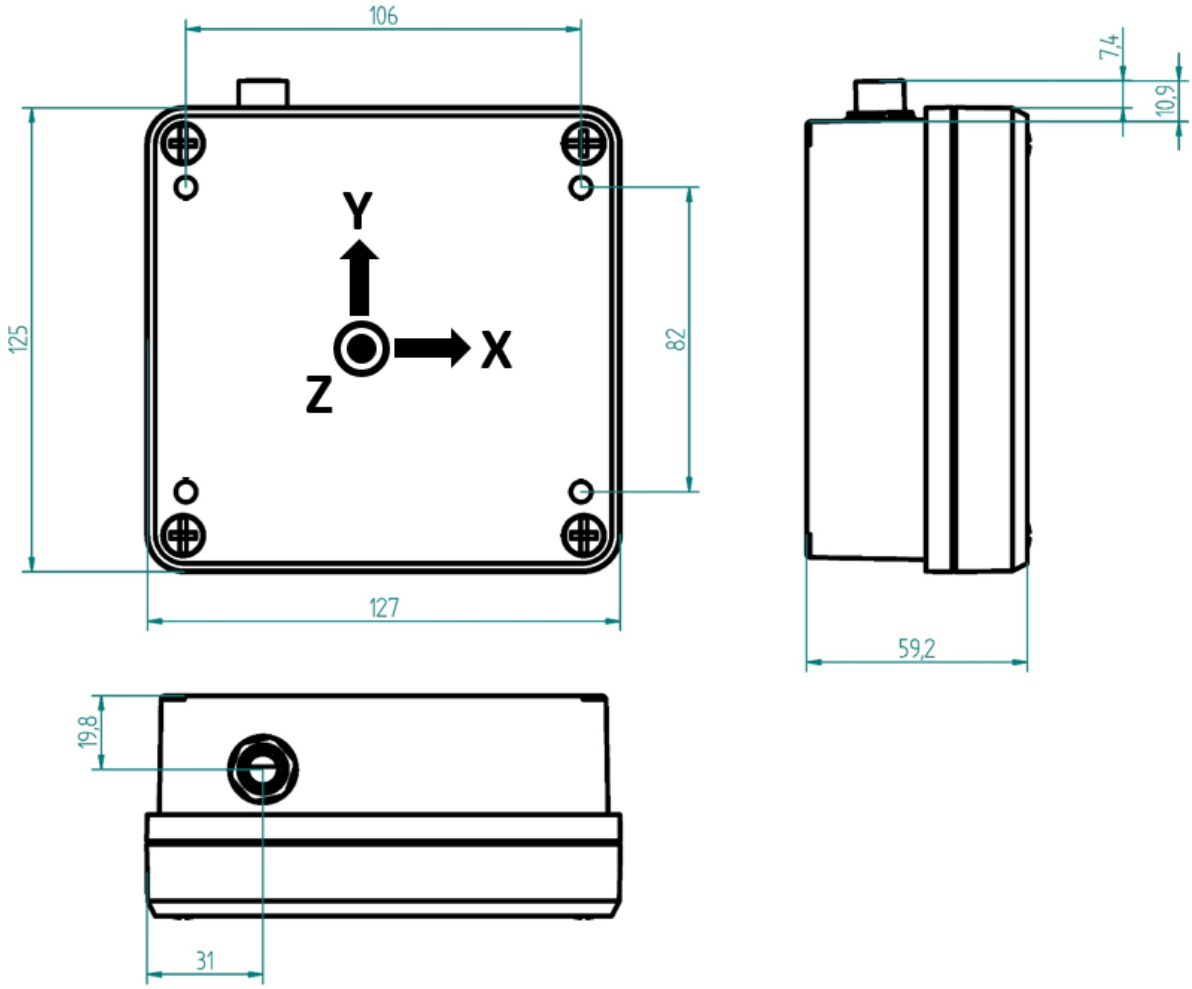
ELECTRICAL CONNECTIONS - Cable Gland Model

Signal sensing	5 x 0,25²
Sensor supply +24Vdc input	Brown
Sensor supply 0 Vdc input	White
Tilt Y Axis Out	Yellow
Tilt Z Axis Out	Grey
T° Out	Green

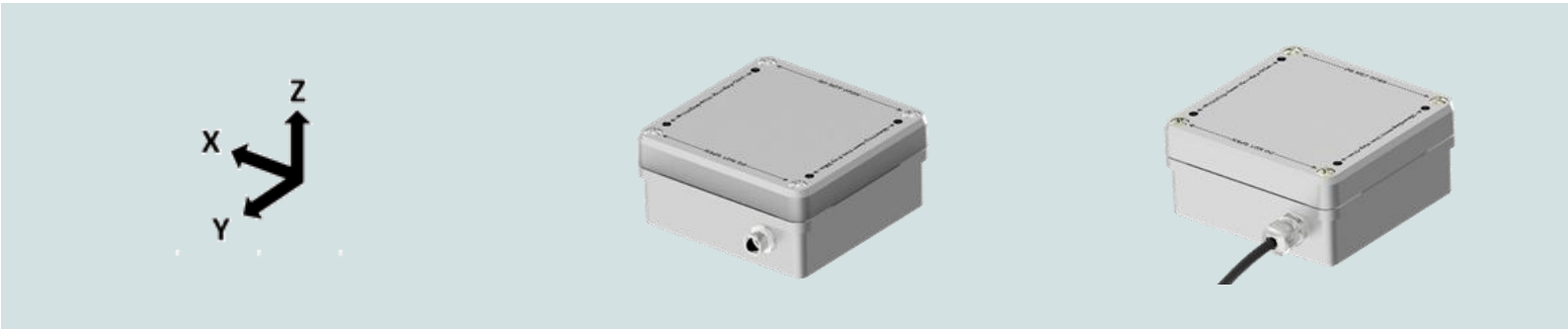
ELECTRICAL CONNECTIONS - M12 Connector Model

DAI		1	OUT Tilt Y Axis	4-20mA current output
		2	OUT Tilt Z Axis	4-20mA current output
		3	OUT T°	4-20mA current output
		4	+24VDC	Sensor supply + input
		5	0VDC	Sensor supply - input

DIMENSIONS

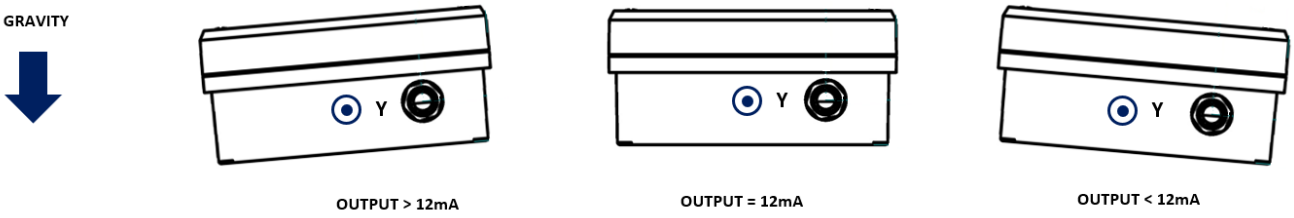


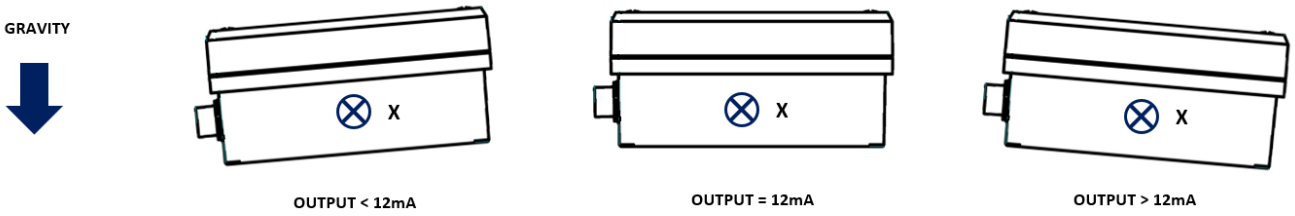
REFERENCE DIRECTIONS



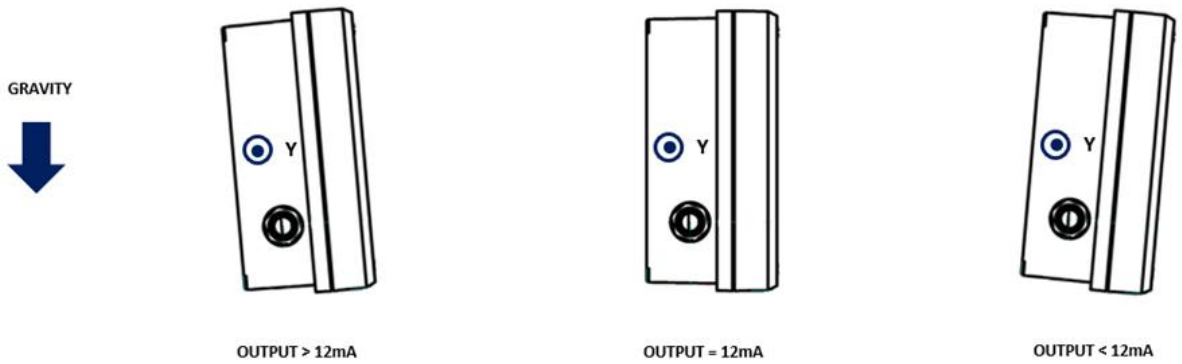
RESPONSE

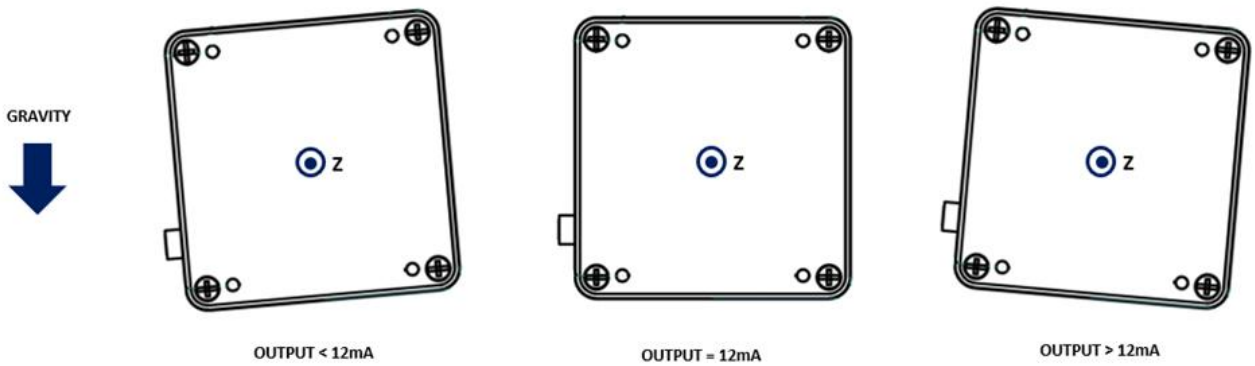
Horizontal Mounting Model





Vertical Mounting Model





CERTIFICATIONS

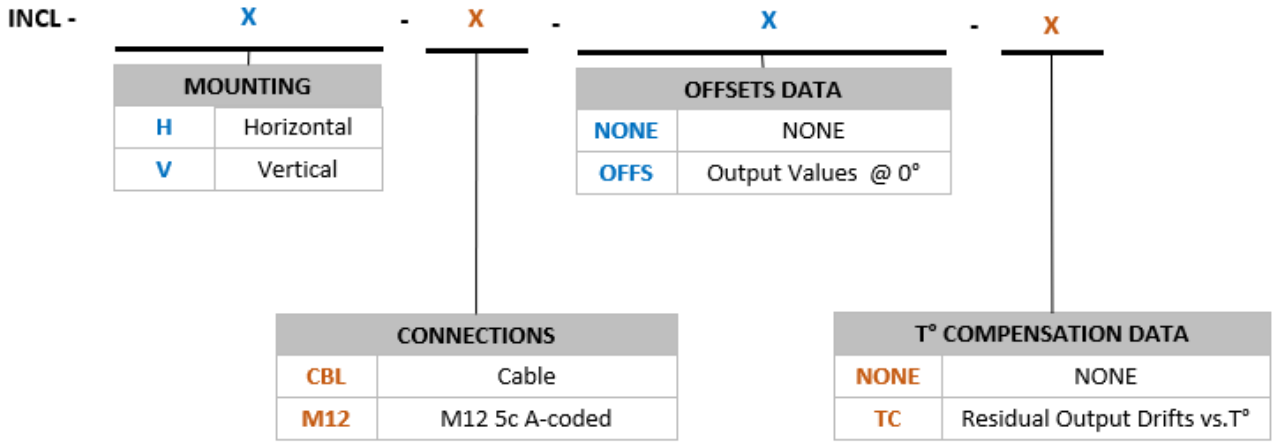
Electromagnetic Compatibility

Standard	Limit / Level
Emission	
EN 55011 Radiated Emission	30 MHz – 1 GHz Group 1 – Class A
FCC 47 Part 15 Radiated Emission	30 MHz – 1 GHz Class A
Immunity	
EN 61000-4-2 Electrostatic Immunity	4kV / contact 2, 4 & 8kV /air Criterion B
EN 61000-4-3 Radiated, radio frequency, electromagnetic field immunity	80 MHz – 1 GHz @ 10 V/m 1.4 – 2 GHz @ 3 V/m 2 – 2.7 GHz @ 1 V/m @ 80% AM 1 kHz
EN 61000-4-4 Electrical fast transient / burst immunity	2 kV – 100 kHz on signal lines Criterion B
EN 61000-4-6 Immunity to conducted disturbances, induced by radio-frequency fields	10 V (150 kHz-80 MHz) Criterion A
EN 61000-4-8 Power frequency magnetic field immunity	Continuous field 30 A/m Short duration field 100 A/m 50 & 60 Hz Criterion A

Operating Temperature

Standard	Limit / Level
IEC 60068-2-14 Change of Temperature	Cycling between -40°C and +85°C
IEC 60068-2-1 Cold	Operation at -40°C (including cold start)
IEC 60068-2-2 Dry Heat	Operation at 85°C

ORDERING REFERENCE



EXAMPLE
INCL - V - M12 - OFFS - TC

NOTE

- When ordering with cable connections, cable is mounted at the factory. Please specify required length.
- Standard cable gauge is 0.25 mm^2 (AWG24). Higher cable gauge might be required for long cable runs.
- Residual Output Drifts vs. T° are given for the range -10°C to +40°C by default

ENGINEERING SERVICES

- Special coatings
- Special cables
- Integration with monitoring systems and cloud platform
- Adaptations for underwater use
- Adaptations for marine environment
- Other temperature range for residual output drifts vs. temperature