

RECOVIB

STRUCTURAL HEALTH SENSORS



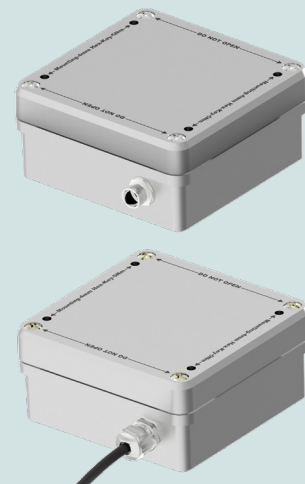
STRUCTURAL HEALTH SENSORS

SENSORS SPECIFICALLY MADE FOR PERMANENT OUTDOOR STRUCTURAL MONITORING

The Structural Health Sensors combine a 2-axis accelerometer with a temperature sensor.

Their enhanced internal surge protection and electromagnetic interference immunity makes them particularly suitable for the permanent monitoring of tall outdoor structures.

The Structural Health Sensors can perform measurements in extreme conditions ranging from -40°C to $+85^{\circ}\text{C}$. They are of course dust and watertight to IP66. We have a proven track record of several thousands of such sensors operating reliably around the world..



FIELD OF APPLICATIONS

Monitoring of Slender Structures

Slender structures, such as telecommunication towers, chimneys and elevated water reservoirs can be very sensitive to dynamic wind loading. Indeed, wind-induced forces can cause significant dynamic response which may lead to structural damages. In the case of telecommunication towers, they can also lead to signal transmission distortion. Therefore, design criteria for slender structures must include dynamic stiffness which depends on the main resonances frequencies and inherent structural damping. These characteristics must be measured when the structure is first erected and compared with the design data. It is also recommended that they are measured during maintenance activities.

In addition, in harsh/windy environments, the permanent monitoring of structural vibrations is recommended. Indeed, the natural frequencies of a structure can be obtained from acceleration measurements and the shifts of these natural frequencies values can be a good criterion for the evaluation of the structure's integrity, allowing for preventive action.

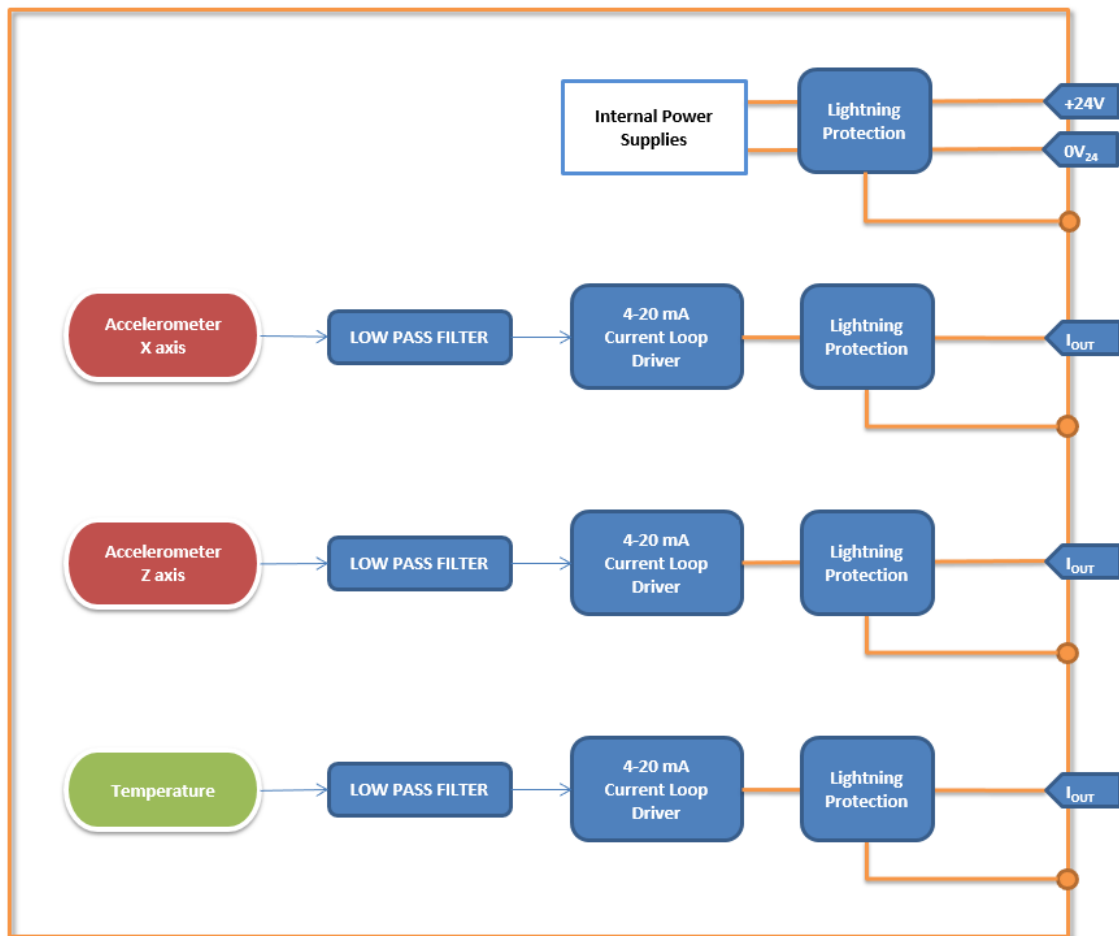
KEY FEATURES

- 4-20 mA current loops for signal immunity and potentially long cable runs
- Enhanced surge protection
- Measurements down to DC for the monitoring of very low frequency structural modes

KEY BENEFITS

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

BLOCK DIAGRAM



CHARACTERISTICS

Acceleration Channel Characteristics - High Resolution

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Acceleration range			±5		g
Sensitivity ⁽¹⁾	T°=25°C	1.554	1.586	1.617	mA/g
Sensitivity change with Temperature	Delta from +25°C		-100	-200	ppm/°C
Zero-g level	T°=25°C	-125	0	+125	mg
		11.8	12.0	12.2	mA
Zero-g level change with Temperature	Delta from +25°C		±0.5	±2	mg/°C
			±0.8		µA/°C
Non-linearity			±0.5		% FS
Acceleration noise density	@ 40Hz		8		µg/√Hz
Cross Axis Sensitivity			2	3	%
2 nd order low-pass filter cutoff frequency	@ -3dB		100		Hz

(1) Sensitivity can be easily derived from 2 measurements at +1g and -1g as accelerometers measure DC

Acceleration Channel Characteristics - Standard Resolution

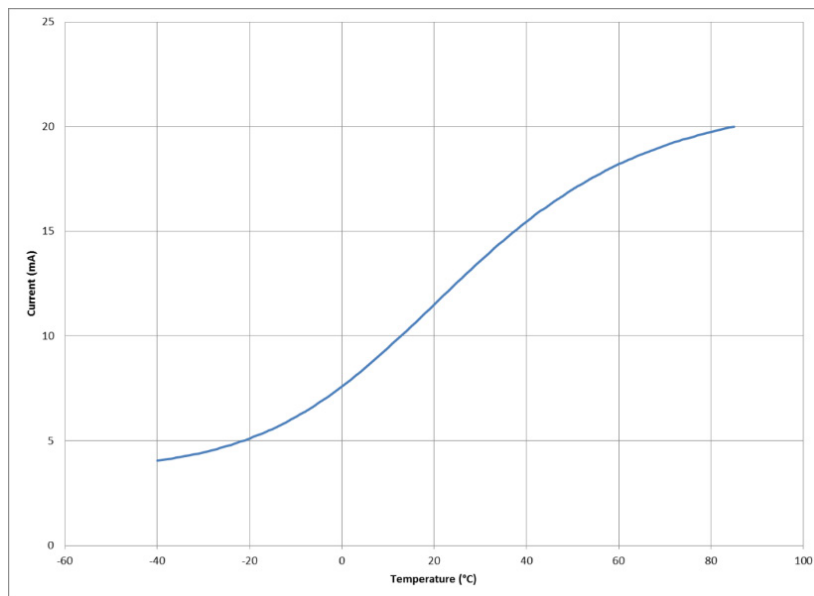
Parameter	Test Condition	Min.	Typ.	Max.	Unit
Acceleration range		±5.4	±6		g
Sensitivity ⁽¹⁾	T°=25°C	1.205	1.339	1.473	mA/g
Sensitivity change with Temperature	Delta from +25°C		±100		ppm/°C
Zero-g level	T°=25°C	-450	0	+450	mg
		11.4	12.0	12.6	mA
Zero-g level change with Temperature	Delta from +25°C		±0.5		mg/°C
			±0.7		µA/°C
Non-linearity			±0.5		% FS
Acceleration noise density	@ 40Hz		50		µg/√Hz
Cross Axis Sensitivity			2	3	%
2 nd order low-pass filter cutoff frequency	@ -3dB		100		Hz

(1) Sensitivity can be easily derived from 2 measurements at +1g and -1g as accelerometers measure DC

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
2 nd order Butterworth low-pass filter cutoff frequency			1		Hz

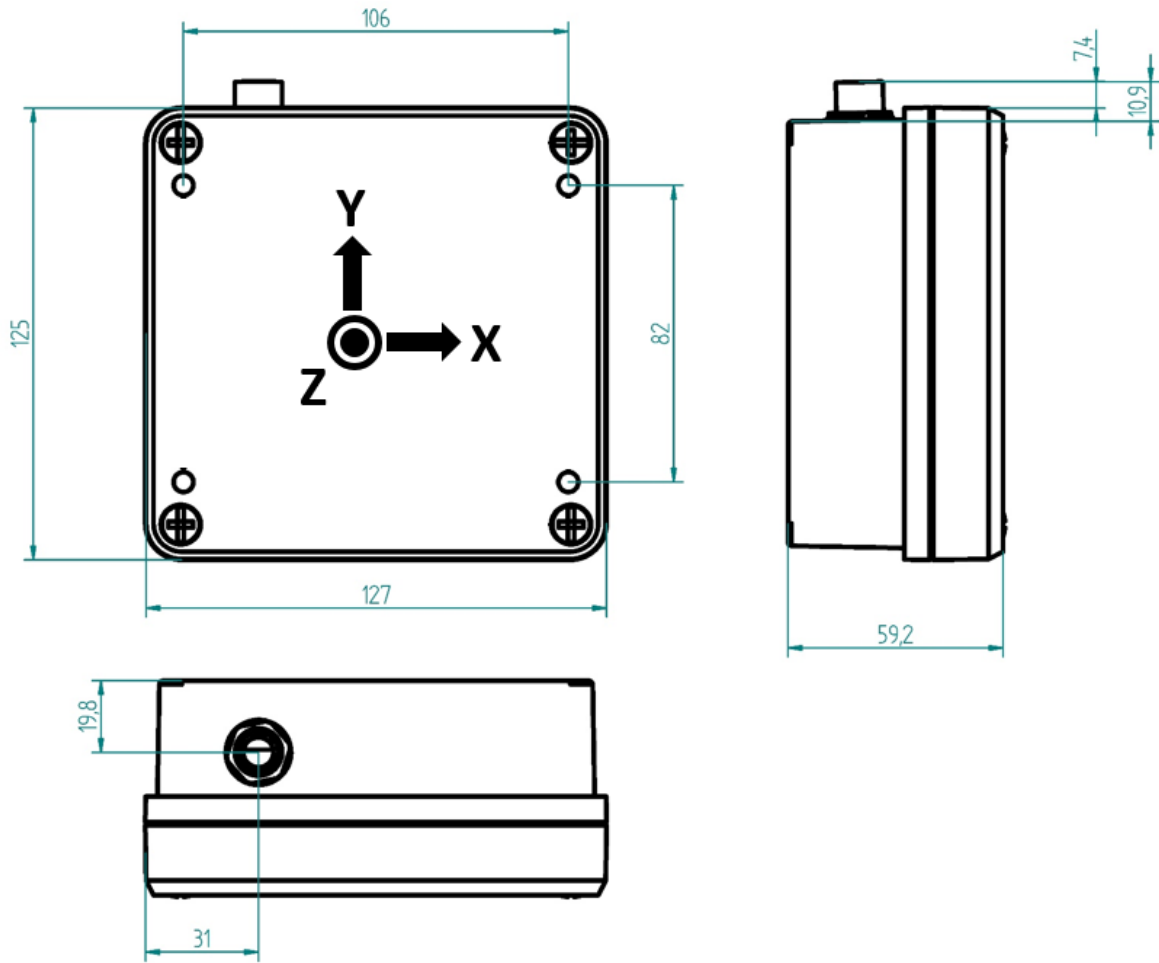
Temperature Sensor Response Curve



Power Supply

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Voltage		20	24	28	VDC
Current		20		80	mA

DIMENSIONS



REFERENCE DIRECTIONS



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	80MHz - 1 GHz @ 10V/m 1.4 - 2GHz @ 3V/m 2 - 2.7GHz @ 1V/m @ 80% AM 1kHz
EN 61000-4-4 Electrical fast transient / burst immunity	2kV - 100kHz on signal lines Criterion B
EN 61000-4-6 Immunity to conducted disturbances, induced by radio-frequency fields	10V (150kHz-80MHz) Criterion A
EN 61000-4-8 Power frequency magnetic field immunity	Continuous field 30A/m Short duration field 100A/m 50 & 60Hz Criterion A

Operating Temperature

Standard	Limit / Level
IIEC 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

SHS - X - X

RESOLUTION	
STD	standard
HR	high

CONNECTIONS	
CBL	Cable
M12	M12 5C A coded

EXAMPLE

SHS - HR - CBL

NOTE

When ordering with cable connections, the cable is mounted at the factory. Please specify required length. Standard cable gauge is 0.25 mm² (AWG24). Higher cable gauge might be required for long cable runs.

ENGINEERING SERVICES

- Other resolutions and/or measurement ranges
- Special coatings
- Special cables
- Integration with monitoring systems and cloud platform
- Adaptations for underwater use