



# ICP low noise-Seismometer

for Vibration Monitoring according to DIN 45669

## Technical specifications of the ICP low noise Seismometers 902XXX Series

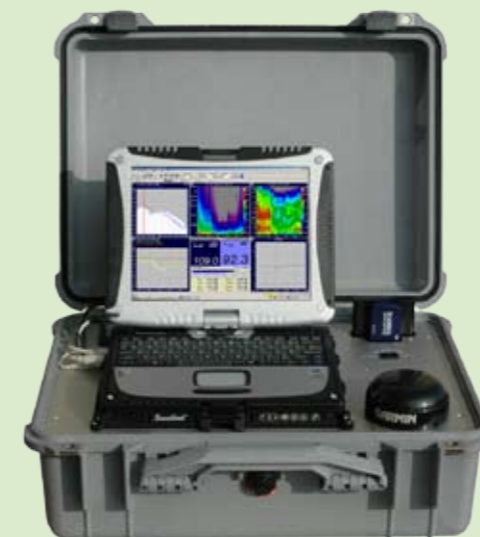
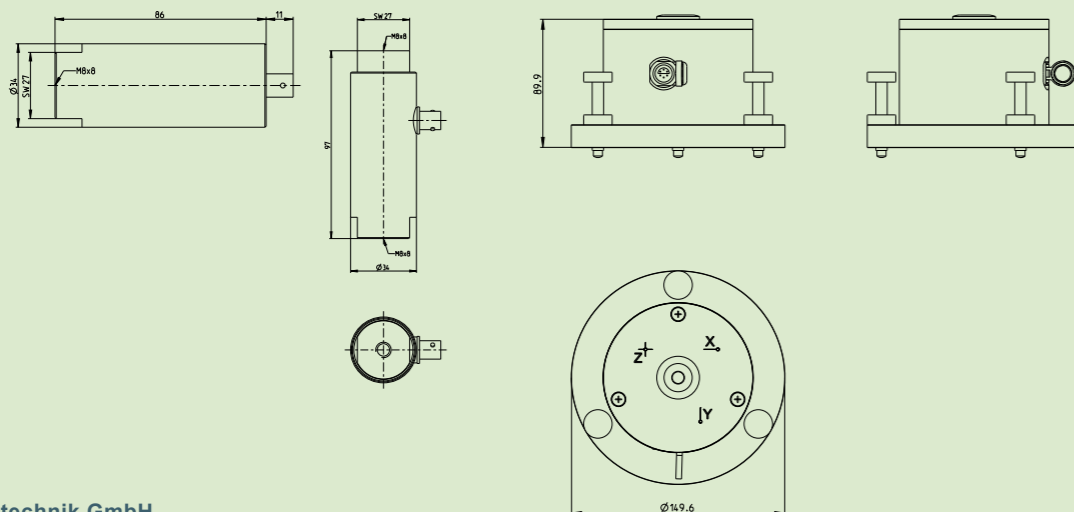
Type	902101,8	902100.1	902220.3	902219,7
Orientation	horizontal	vertical	Triaxial	Triaxial
Sensitivity	30 V/ms-1	30 V/m s-1	30 V/ms-1	30 V/ms-1
Case-to-coil motion	4 mm p-p	4 mm p-p	4 mm p-p	4 mm p-p
Linear Frequency range	1 – 80 Hz	1 – 80 Hz	1 – 80 Hz	1 – 315 Hz
Frequency range $\pm 3$ dB	0.8 Hz – 100 Hz	0.8 – 100 Hz	0.8 – 100 Hz	0.8 – 315 Hz
Dynamic range	>130 dB	>130 dB	>130 dB	>130 dB
Lower detection limit *)	0.1 $\mu\text{m/s}$	0.1 $\mu\text{m/s}$	0.1 $\mu\text{m/s}$	0.1 $\mu\text{m/s}$
Linearity / Phase *)	Class 1	Class 1	Class 1	Class 1
Power supply	ICP 2...20 mA	ICP 2...20 mA	3x ICP 2...20 mA	3x ICP 2...20 mA
Output voltage	$\pm 10$ V	$\pm 10$ V	$\pm 10$ V	$\pm 10$ V
Temperature range	-30°C ... +60°C	-30°C ... +60°C	-30°C ... +60°C	-30°C ... +60°C
Housing	Aluminium	Aluminium	Aluminium	Aluminium
Protection	IP 54	IP 54	IP 65	IP 65
Dimensions	34 x 90 mm	34 x 90 mm	90 x 150 mm	90 x 150 mm
Mounting	M8 screw	M8 screw	3x leveling screw	3x leveling screw
Weight	0.2 kg	0.2 kg	2.6 kg	2.6 kg
Connection	BNC	BNC	LEMO FFP.2S.306	LEMO FFP.2S.306

\*) according to DIN 45669

horizontal

vertical

Tri-axial Seismometers



NoiseLOG\_mobil

- Civil Engineering
- Construction Site Monitoring
- Building Monitoring
- Bridge Monitoring
- Explosion Detection
- Tunnel and Dam Monitoring
- Earthquake Detection
- VC-criteria in nanotechnology facilities



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**Tri-axial and uni-axial ruggedized low-noise velocity sensors for multi-purpose applications**

The 902xxx series seismometers from SINUS Messtechnik GmbH were originally developed for use in measurements of building vibration.

**They comply fully with the requirements of the DIN 45669 standard** (the contents of which cannot be reproduced here for copyright reasons).

The 902xxx series seismometers are based upon an electromagnetic geophone, which satisfies the frequency- and phase-response requirements of DIN 45669 with the aid of an individually matched compensation filter.

Our special know-how in electronics design in combination with the state-of-the-art, low-noise electronic components guarantee the high degrees of precision and dynamics.

Each 3D seismometer of the 902xxx series contains three such geophones together with their respective compensation filters. Different sensors (according to their construction and labeling) are required for use in horizontal and vertical positions.

The 902xxx series seismometers are potentially applicable for scientific purposes and for earthquake monitoring, so long as the dynamic range and frequency response is taken into consideration.

A unique and very convenient feature of the 902xxx series seismometers is their ICP sensor interface.

This allows the sensors to be directly used with any measurement device having an ICP input (4 mA @ 24 V):

**no additional power supply is necessary.**

The ICP power supply and the requirements of DIN 45669 determine the frequency response of the seismometer.

**The dynamic range is extremely wide (> 130 dB).**

Thus, the seismometers have a dynamic range 30 dB wider than that of high-quality MEMS sensors. Vibration velocities in the range from 0.1 µm/s up to 3 m/s can be measured. The sensitivity of 30 V/m/S is absolutely sufficient for modern measurement devices with high-quality 24-bit analog-to-digital converters.

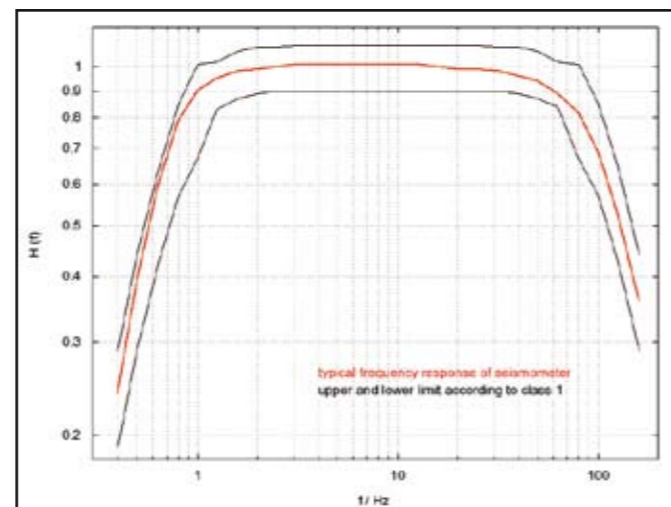
After its internal end-of-line test by SINUS Messtechnik GmbH, each seismometer is tested and calibrated by our cooperation partner SPEKTRA Schwingungstechnik and Akustik Dresden GmbH in their role as DKD / DAkKS accredited testing institutes. The DAkKS calibration certificate is provided within the scope of delivery.

**Built in filters according to DIN 45669 for easy use with any high-end data-logger/analyzer**

Through the internal analog compensation filters, which are individually adapted to each geophone the sensors meet the requirements of DIN 45669 regarding:

- Lower detection limit: 0.1 µm/s
- Linearity/Phase: class 1
- Cross-axis sensitivity: < 5 %

The following diagram shows the typical frequency response of the 80 Hz seismometer 902220.3

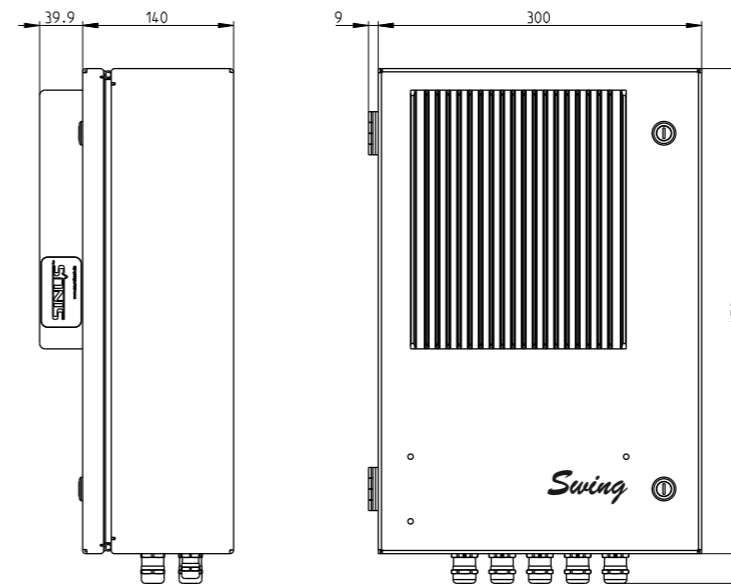
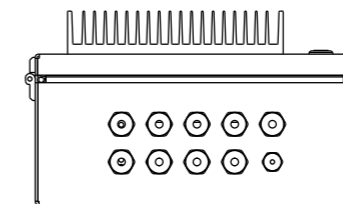


Metro of Santiago de Chile

**Easy set-up, commissioning and administration of the measuring stations and the entire system**

Preferred measurement devices for the seismometers are the Apollo family from SINUS Messtechnik GmbH:

- Apollo\_Box:** portable 4-channel device with USB interface for connection to PC
- Soundbook:** robust, portable 8-channel device integrated with Panasonic Toughbook Soundbook with additional protection case and battery/charger
- NoiseLOG:** 19" rack with high-end industrial PC for up to 96 channels
- Typhoon:** permanent measurement station with 4/8/16 channels in a wall-mount Case (IP 54) and remote-control via TCP/IP. Additional sensors are available, e.g. outdoor microphone, weather station, video camera...
- SWING:** permanent measurement station with 4/8/16 channels in a wall-mount Case (IP 54) and remote-control via TCP/IP. Additional sensors are available, e.g. outdoor microphone, weather station, video camera...



Dimensions of the SWING monitoring station

**Software packages for real-time measurement, monitoring and post-processing from SINUS**

SINUS Messtechnik GmbH offers the full solution for measurement and analysis of vibration data including post-processing:

**SAMURAI**  
SAMURAI is the multi purpose software package for real-time measurement and analysis including vibration measurement according to the DIN 45669 (SAMURAI option Building Acoustics recommended). The software allow the parallel measurement of noise and vibration according to the IEC 61672 and DIN 45669 standard. A wide range of additional software options are available.

**RecServer**  
This software package allows the automatic monitoring with GPS-synchronized noise & vibration monitoring stations for explosion detection and similar applications. All data and command are transferred via Internet or LAN connection.

**AUDITOR**  
The AUDITOR software package allows post-processing of vibration measurement data in combination with the noise measurement data, weather data and NoiseCAM-video documentation.



Metro of Leipzig during construction