Acceleration Sensor AS - 022

1   Application

The acceleration sensor AS-022 is used for measurement of vibration acceleration.
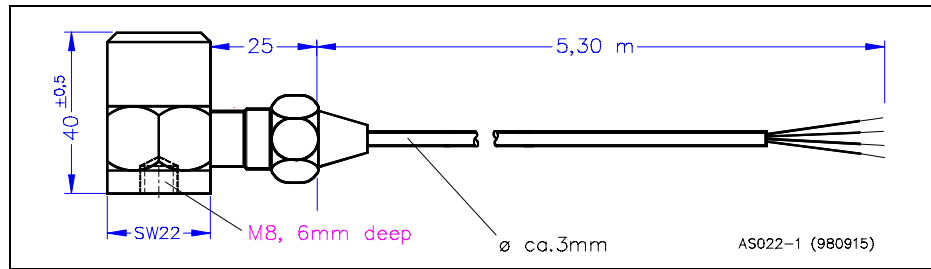

Fig. 1   Acceleration Sensor AS - 022

2   Measuring Principle

Acceleration sensors operate in accordance with the piezoelectric compression principle. Inside the sensor, a spring/mass damping system is formed by a piezoceramic disk and an internal sensor mass.

When introducing vibrations into this system, the mass exerts an alternating force on the ceramic disk and due to the piezoelectric effect electric charges are caused which are proportional to acceleration.

An integrated charge amplifier increases the output signal to a usable signal level.

3   Technical Data

Type	Piezoelectric acceleration sensor with integrated charge amplifier
Sensitivity	100 mV/g $\pm$ 5 % 10.2 mV/m/s^2 $\pm$ 5 %
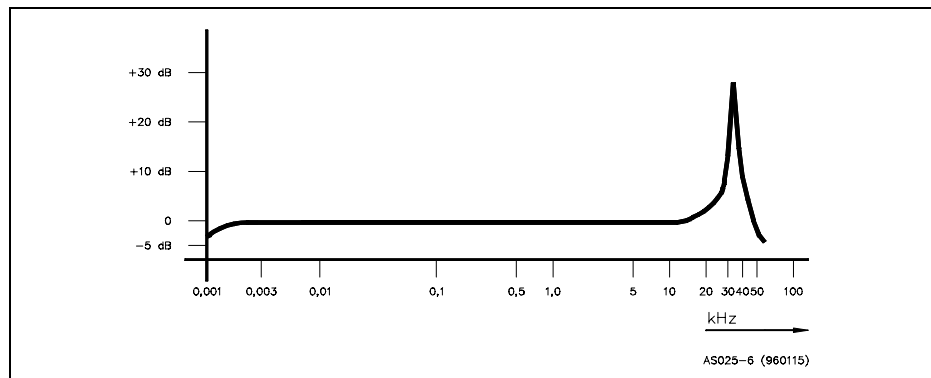
Fig. 2   Typical frequency response of sensitivity

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Overload capacity	continuous 500 g shock 5000 g (all directions) Fall from 1.5 m on concrete without damage
Dependence of sensitivity on operating voltage	< 1 %
Sensitivity deviation due to temperature	- 22 °C (- 7.6 °F) - 3 % + 22 °C (71.6 °F) 0 % + 65 °C (149 °F) + 2,5 % + 120 °C (248 °F) + 5,5 %
Operating temperature range	- 50 °C (-58 °F) ... + 125 °C (257 °F)
Storage temperature range	- 50 °C (-58 °F) ... + 150 °C (302 °F)
Measuring range	$\pm$ 80 g (U_B = -24 V...-30 V) $\pm$ 40 g (U_B = -20 V) $\pm$ 20 g (U_B = -18 V)
Linearity error	$\leq$ 0,1 %
Transverse sensitivity (80 Hz)	$\leq$ 7 %
Frequency range	4 ... 10 000 Hz ($\pm$ 0,5 dB) 1,5 ... 15 000 Hz ($\pm$ 3 dB)
Resonance frequency	35 kHz $\pm$ 3 kHz
Noise	0,1Hz-100 kHz $\leq$ 0,6 mV_{ss} 0,1Hz- 1 kHz $\leq$ 0,2 mV_{ss}
Voltage supply U_B	-24 V (-18 V...-30 V)
Output impedance	$\leq$ 5 Ω
Open-circuit potential (- 50 °C ... + 125 °C) (- 58 °F ... + 257 °F)	-12 V $\pm$ 2 V
Temperature sensitivity	< 0,01 g/K
Strain sensitivity	< 0,0003 g/ (μm/m)
Magnetic field sensitivity	< 0,003 g/mT
Insulation resistance (Housing supply voltage 0 V)	$\geq$ 20 $M\Omega$
Dielectric strength of insulation	500 V_{RMS}
Interference voltage suppression between housing and 0 V (frequency-dependent)	< 0,5 kHz $\geq$ 140 dB 1 kHz $\geq$ 120 dB 10 kHz $\geq$ 100 dB
Supply voltage feedthrough	$\leq$ 36 kHz < -30 dB
Stability with capacitive load	0 $\leq$ C_L $\leq$ 470 nF

Housing	Stainless steel, hermetically sealed, rugged industrial design
Protective system	IP 66
Weight	70 g (2.47 oz)
Fixing	Central fixing by means of stud M8 x 14; max. tightening torque 4.5 Nm M8 / 1/4" 28 UNF; max. tightening torque 3.5 Nm
EMC	EN 50082-2: 1995 item 1.1, 1.2, 1.4, 2.1, 2.2 EN 50081-2: 1994 item 1.1, 1.2

Connection

Shielded PVDF cable
Cable ends: open
Length = 5.3 m
Bending radius $\geq$ 30 mm

Core colours

$-U_B$	red
Signal	yellow
0 V	white
Shield	yellow/black

Admissible length of signal cables

$$l = \frac{470}{C_K \times f}$$

l	=	admissible length of signal cable	[m]
C_K	=	cable capacity	[nF/m]
f	=	max. effective transmission frequency (for f < 1 kHz, f is to be set to 1 kHz)	[kHz]
470	=	product of frequency and max. capacitive load	

If the cable length to be bridged exceeds the calculated value, a line driver is to be provided at a suitable location.

4 Mounting

4.1 Coupling

General rule:

The weight of the acceleration sensor should be lower at least by the factor ten than the weight relevant for vibration measurement of the measuring object onto which it is mounted.

Reason

The acceleration sensor is an additional mass which applies a load on the measuring object and changes the vibrational behaviour of the latter.

4.2 Mounting of acceleration sensor

Note:

The acceleration sensor requires a friction-locked, contact resonancefree and rigid mounting to the measuring object, in particular for measurements at high frequencies.

♦ AS-022 is to be mounted with the stud supplied.

Selectable:

- Stud M8 x 14

- Stud M8 / 1/4" 28 UNF
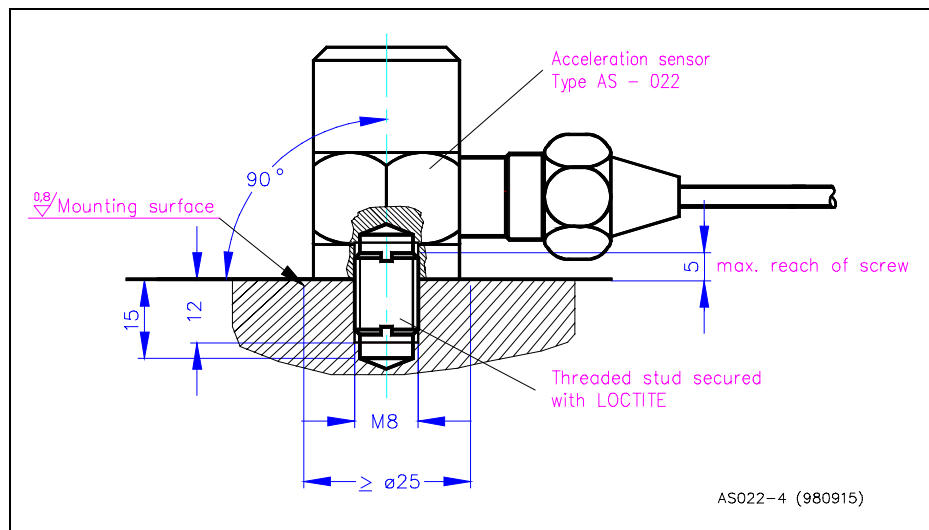
The sensor can be mounted in any position.

Fig. 3   Mounting

- The mounting surface in the area of AS-022 must be plane and machined.

- Provide mounting surface with threaded hole M8 or 14", 12 mm deep.

- Apply a thin film of silicone grease on the mounting surface to prevent contact resonance.

- Screw stud into the mounting surface in accordance with fig. 3 and secure same (e.g. with LOCTITE)

- Max. reach of screw $\leq$ 5 mm for acceleration sensors to be adhered to.

- Screw AS-022 onto the stud.
  Observe max. tightening torque in accordance with stud.

5   Electrical Connection

Installation of connecting cable

- Use metal conduit or protective tubes to protect the cable from mechanical damages as well as to safeguard the increase of EMC.

- Connecting cable not to be installed in parallel to energy lines. If this is not possible, the minimum distance should be 1 m.

If the connecting cable is to be extended

- Use shielded signal cables only.

- Protect connecting points with a suitable junction box (e.g. AC-121).

Linking the connecting cable with the monitoring system

- Assign terminals or sockets in accordance with the operating instructions for the monitoring system.