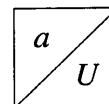


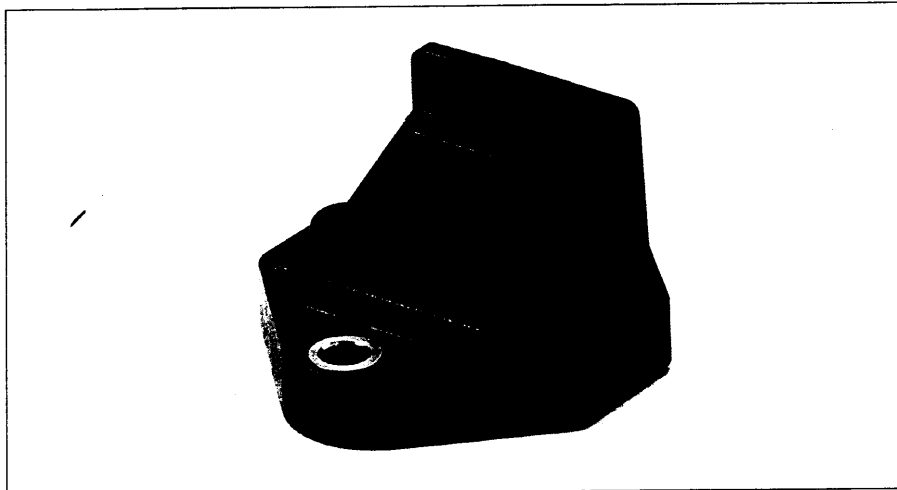
Acceleration sensors

Measurement of acceleration up to $\pm 5 g$

712-0242



- Ratiometric output signal
- Temperature-compensated
- Low pyroelectric sensitivity
- Hermetically sealed housing
- High-level EMC
- Overvoltage protection
- Short-circuit-proof
- Protected against reverse polarity



Application

This sensor is used in automotive applications to rule out the chance of false diagnosis in the engine electronics. It registers the vehicular accelerations which are caused by fluctuations in crankshaft speeds. In order to ascertain whether these crankshaft-speed fluctuations are the result of ignition misfire or a poor road surface, the newest engine-management systems also register the ignition misfires of individual cylinders.

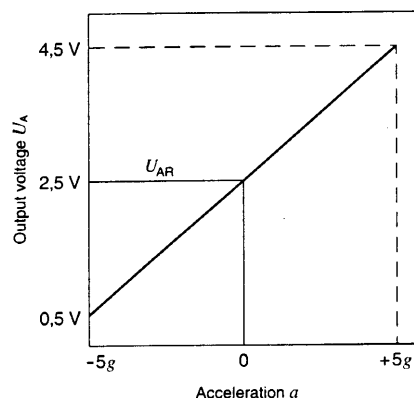
Design and function

The sensor element comprises a "bending element" composed of two antiparallel polarized piezoelectrical layers. If acceleration forces are applied to this "bending element", mechanical tension is caused which in turn results in a charge of electricity at the bending-element surfaces. This charge is evaluated by a hybrid circuit.

If mounted appropriately, this sensor can be used in the horizontal and in the vertical measurement directions, whereby the measurement direction is generally vertical to the clamping surface.

In case of the upwards vertical acceleration of the clamping surface, an output signal $U_A > U_0$ is generated, whereas the corresponding downwards acceleration generates a signal $U_A < U_0$. The output voltage U_A has a cosine relationship to the angle between the sensor measurement direction and the direction of acceleration. Taking an angle of 15° , this produces a (calculated) signal reduction of 3.4%.

Characteristic curve



U_{AR} Open-circuit output voltage

$U_A = U_0 \pm U_D$

Output-voltage excursion for measurement range

$U_D = \pm 2V$

Output voltage U_A

for acceleration $> +5g$ 4.5 V

for acceleration $< -5g$ 0.5 V

Technical data / Range

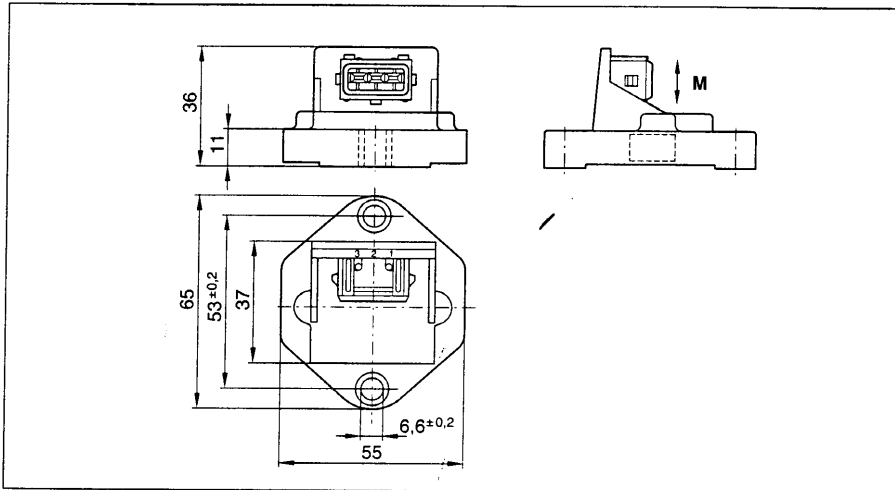
Part number	0 273 101 021
Measuring range	$\pm 5 g$
Limit of operating load	$\pm 10 g$
sustained in the sensor's dynamic core-frequency range without damage	
Overload protection	100 g
Peak amplitude: 20 times without damage	
Lateral sensitivity	$< 10 \%$
Nominal sensitivity at $f = 15.8 \text{ Hz}$	$2 \text{ V} / 5 g$
Operating-temperature range	$-40^\circ\text{C} \dots +105^\circ\text{C}$
Storage-temperature range	$-40^\circ\text{C} \dots +95^\circ\text{C}$
Service life (aging)	4000 h
in the operating-temperature range	
$-40^\circ\text{C} \dots +105^\circ\text{C}$	
Weight	75 g

Electrical specifications for $U_v = 5 \text{ V} \pm 3 \%$

Input current I_v	$< 20 \text{ mA}$
Output-voltage zero point U_0	$U_v / 2 = 2.5 \text{ V} \pm 100 \text{ mV}$
Sensitivity	$400 \text{ mV} / g \pm 12 \%$
Dynamic output resistance R_{AO} in the range $0 \dots 100 \text{ Hz}$	< 300
Load resistance R_L (pull-up above $+5 \text{ V}$)	$> 7.5 \text{ k}\Omega$
Load capacity C_L	$< 15 \text{ nF}$
Lower critical frequency f_L (-3 dB)	$0 \text{ Hz} < f_L < 5 \text{ Hz}$
Upper critical frequency f_H (-3 dB)	$50 \text{ Hz} < f_H < 100 \text{ Hz}$

Accessories

Connector 1 237 000 039



Installation instructions

The sensor must be securely screwed to the base. We recommend the use of M6 screws with collar or washer. Tightening torque: 2.5 N · m.

Explanation of symbols:

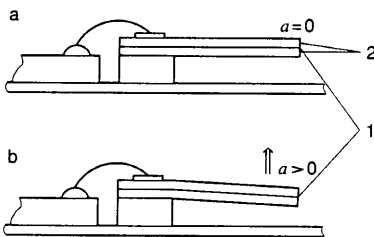
- U_A Output voltage
- U_0 Output-voltage zero point (ratiometric to U_V)
- U_D Dynamic portion of the output signal
- U_V Supply voltage
- g Acceleration due to gravity = $0.81 \text{ m} \cdot \text{s}^{-2}$

Connector-pin assignment:

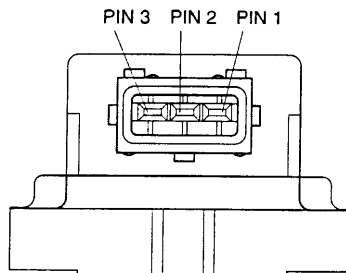
- Pin 1 + 5V (U_V)
- Pin 2 $\perp$
- Pin 3 OUT

Sensor principle

- a Without effect of acceleration,
- b with effect of acceleration,
- 1 Piezo-ceramic bending element ("measuring beam"),
- 2 Opposed-polarity layers.



Connector-pin assignment



Diagram

P piezo-ceramic element.

