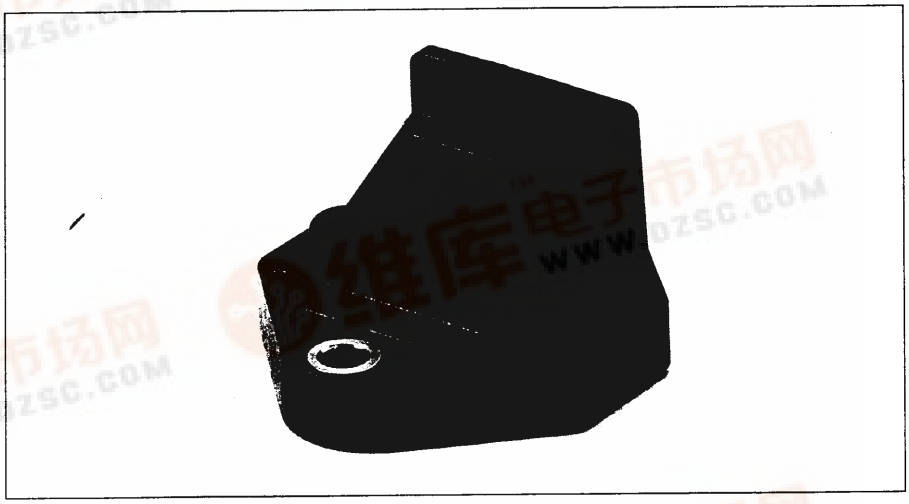
Acceleration sensors

Measurement of acceleration up to ± 5 *g*

712-0242

a/U

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



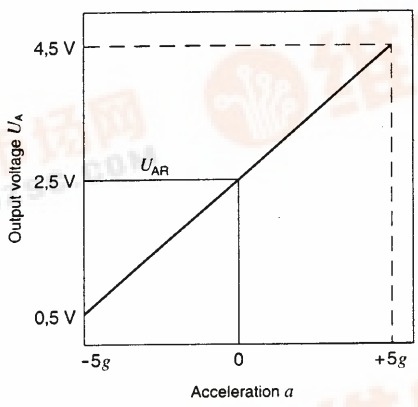
Application

This sensor is used in automotive applications to rule out the chance of faulse 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 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 > +5*g*	4.5 V
for acceleration < –5*g*	0.5 V

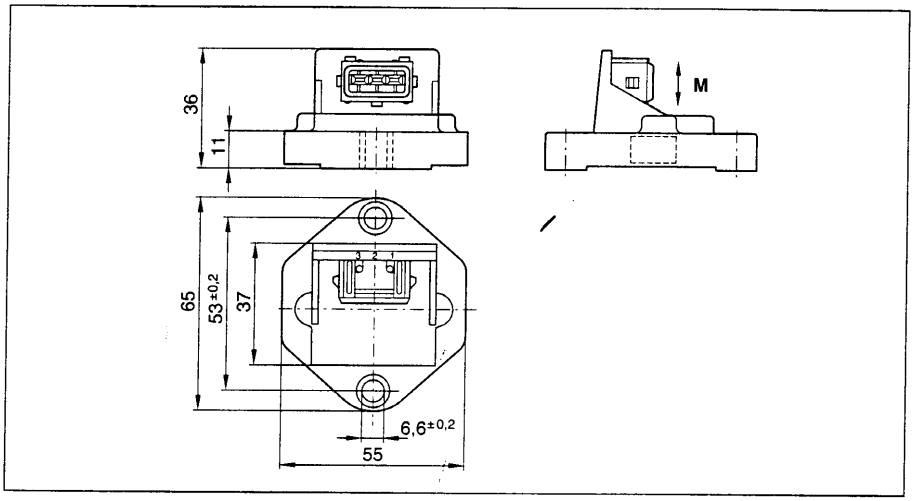
Technical data / Range

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

Electrical specifications for U_v = 5 V ± 3 %	
Input current I_v	< 20 mA
Output-voltage zero point U_o	U_v / 2 = 2.5 V ± 100 mV
Sensitivity	400 mV / *g* ± 12 %
Dynamic output resistance R_{AO} in the range 0...100 Hz	< 300
Load resistance R_L (pull-up above + 5 V)	> 7.5 kΩ
Load capacity C_L	< 15 nF
Lower critical frequency f_u (– 3 dB)	0 Hz < f_u < 5 Hz
Upper critical frequency f_o (– 3 dB)	50 Hz < f_o < 100 Hz

Accessories

Connector	**1 237 000 039**



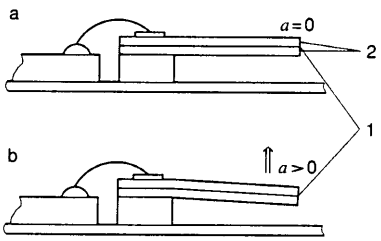
Installation instructions
The sensor must be securely screwed to the base. We recommend the use of M6 screws with collar or washer. Tightening torque: 2.5 N · m.

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 m · s^{-2}

Connector-pin assignment:
Pin 1 + 5V (U_V)
Pin 2 ⊥
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

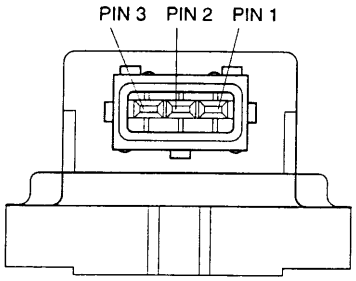


Diagram
P piezo-ceramic element.