MiniSense 100 Vibration Sensor

- High Sensitivity
- Good Frequency Response
- Excellent Linearity
- Shielded Construction
- Analog Output
- Withstands High Shock

The Minisense 100 is a low-cost cantilever-type vibration sensor loaded by a mass to offer high sensitivity at low frequencies. The pins are designed for easy installation and are solderable. Horizontal and vertical mounting options are offered as well as a reduced height version. The active sensor area is shielded for improved RFI/EMI rejection. Rugged, flexible PVDF sensing element withstands high shock overload. Sensor has excellent linearity and dynamic range, and may be used for detecting either continuous vibration or impacts.

The mass may be modified to obtain alternative frequency response and sensitivity selection (consult factory).

Dimensions (in millimeters)

Minisense 100H (P/N 101005939-1)

Minisense 100V (P/N 1005940-1)

Minisense 100HRH (P/N 1006015-1)

APPLICATIONS

- Washing Machine Load Imbalance
- Vehicle Motion Sensor
- Anti-Theft Devices
- Vital Signs Monitoring
- Tamper Detection
- Impact Sensing

FEATURES

- High Voltage Sensitivity (1 V/g)
- Over 5 V/g at Resonance
- Horizontal or Vertical Mounting
- Shielded Construction
- Solderable Pins, PCB Mounting
- Low Cost
- < 1% Linearity
- Up to 40 Hz (2,400 rpm) Operation Below Resonance

MiniSense 100 Vibration Sensor

performance specifications

Typical properties/specifications

Typical Properties (at 25 °C)

Parameter	Value	Units
Voltage Sensitivity (open-circuit, baseline)	1.1	V/g
Charge Sensitivity (baseline)	260	pC/g
Resonance Frequency	75	Hz
Voltage Sensitivity (open-circuit, at resonance)	6	V/g
Upper Limiting Frequency (+3 dB)	42	Hz
Linearity	+/-1	%
Capacitance	244	pF
Dissipation Factor	0.018	(none)
Inertial Mass	0.3	gram

Environmental Specifications

Storage Temperature	-40 to +80 deg C	
Operating Temperature	-20 to +60 deg C	
Weight	Minisense 100H	0.5 gram
	Minisense 100V	0.6 gram

functional description

The MiniSense 100 acts as a cantilever-beam accelerometer. When the beam is mounted horizontally, acceleration in the vertical plane creates bending in the beam, due to the inertia of the mass at the tip of the beam. Strain in the beam creates a piezoelectric response, which may be detected as a charge or voltage output across the electrodes of the sensor.

The sensor may be used to detect either continuous or impulsive vibration or impacts. For excitation frequencies below the resonant frequency of the sensor, the device produces a linear output governed by the "baseline" sensitivity quoted above. The sensitivity at resonance is significantly higher. Impacts containing high-frequency components will excite the resonance frequency, as shown in the plot above (response of the MiniSense 100 to a single half-sine impulse at 100 Hz, of amplitude 0.9 g). The ability of the sensor to detect low frequency motion is strongly influenced by the external electrical circuit, as described below (see "Electrical Description").

electrical description

The MiniSense 100 behaves electrically as an "active" capacitor: it may be modelled as a perfect voltage source (voltage proportional to applied acceleration) in series with the quoted device capacitance. Any external input or load resistance will form a high-pass filter, with a roll-off frequency as tabulated above, or calculated from the formula f(c) = 1/(2πRC). The impedance of the sensor is approximately 650 M ohm at 1 Hz. The active sensor element is electrically shielded, although care should be taken in the PCB design to keep unshielded traces as short as possible.

Lower Limiting Frequency (-3 dB roll-off)

External R (Ω)	LLF (Hz)	Desired LLF (Hz)	Required R (Ω)
10 M	65	10	65 M
100 M	6.5	1	650 M
1 G	0.65	0.1	6.5 G

MiniSense 100 Vibration Sensor

off-axis sensitivity

The sensitivity of the Minisense 100 follows a cosine law, when rotated horizontally around its axis, or vertically around its mid-point. At 90 degrees rotation in either plane, both baseline sensitivity and sensitivity at resonance are at a minimum. In theory, sensitivity should be zero in this condition. It is likely that some sensitivity around the resonance frequency will still be observed – but this may be unpredictable and is likely to be at least -16 dB with reference to the on-axis response. Note that the sensitivity at 30 degrees rotation is -1.25 dB (87% of on-axis response), at 60 degrees, it falls to -6 dB (50%).

The plots below show the change in sensitivity observed for either:

1) Rotation about major axis of sensing element, or
2) Rotation about mid-point of sensing element.

The information in this sheet has been carefully reviewed and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Furthermore, this information does not convey to the purchaser of such devices any license under the patent rights to the manufacturer. Measurement Specialties, Inc. reserves the right to make changes without further notice to any product herein. Measurement Specialties, Inc. makes no warranty, representation or guarantee regarding the suitability of its product for any particular purpose, nor does Measurement Specialties, Inc. assume any liability arising out of the application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Typical parameters can and do vary in different applications. All operating parameters must be validated for each customer application by customer's technical experts. Measurement Specialties, Inc. does not convey any license under its patent rights nor the rights of others.

ordering information

Description	Model No.	Part No.
Horizontal Mounting	LDTC-V	1005939-1
Vertical Mounting	LDTC-H	1005940-1
Horizontal Mounting Reduced Height	LDTC-RH	1006015-1

North America

Measurement Specialties, Inc.
1000 Lucas Way
Hampton, VA 23666
Sales and Customer Service
Tel: +1-800-745-8008 or
+1-757-766-1500
Fax: +1-757-766-4297
Technical Support
Email: piezo@meas-spec.com

Europe

MEAS Deutschland GmbH
Hauert 13
44227 Dortmund
Germany
Sales and Customer Service
Tel: +49 (0)231 9740 21
Technical Support
Tel: +49 (0)6074 862822
Email: piezoeurope@meas-spec.com

Asia

Measurement Specialties (China), Ltd.
No. 26 Langshan Road
Shenzhen High-Tech Park (North)
Nanshan District
Shenzhen, China 518107Sales and
Customer Service
Tel: +86 755 3330 5088
Technical Support
Email: piezo@meas-spec.com