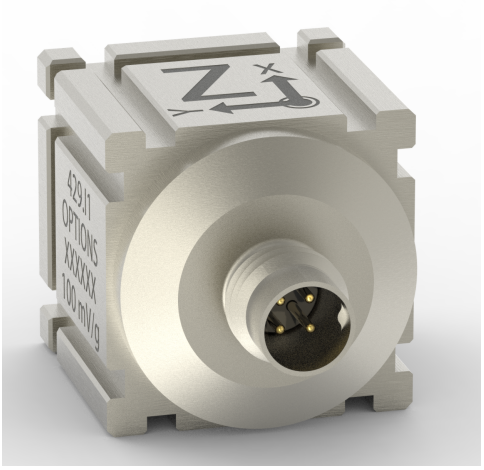
Laboratory IEPE TRIAXIAL MEMs Accelerometer InstantVib® Patented Electronic

Main Characteristics

- Analog Device MEMs inside (ADXL 356)
- Quasi-Static measurement down to 0.1 Hz
- Frequency capabilities up to 4 kHz
- Titanium slotted Housing with five sides mounting
- ± 40 g Dynamic with 100 mV/g sensitivity
- Broadband Resolution (1 Hz to 4 kHz): 0.002 g rms
- Spectral Noise as low as 80 µg /√ Hz at 0.3 Hz
- Ground isolated from the mounting surface
- TEDS-compatible (IEEE-P1451.4 Compliant)
- Microtech 4-pin connector (Wiring compatibility with Bruel & Kjaer triaxial Model 4529-B)
- Low price and high volume monthly production thanks to robotized assembly.



Model 429.I56-6-1 Shown
(17mmx17mm, Length 24mm, weight 15 grams)

Competitive advantages

Protected Worldwide by numerous patents, VibraSens has released an incredibly versatile accelerometer that is setting the future of vibration measurements. Our InstantVib IEPE electronic has been able to enhance the already excellent triaxial ADXL 356 MEMs from the company Analog Device. Microelectromechanical systems technology represents the future for vibrations acquisition needed by industry 4.0 and millions of IoT accelerometers. Compared to now-dated IEPE Piezoelectric vibration sensors, Model 429 InstantVib® IEPE MEMs sensor has the following advantages:

- Frequency response from 0.1 Hz to 4 kHz (-3dB).
- Tight ±5% sensitivity tolerance.
- 150 µg /√ Hz spectral noise at 0.1 Hz gives crystal clear quasi-static measurement.
- Instantaneous settling time so you can immediately start measuring even when doing the quasi-static measurement.
- Long-term sensitivity stability significantly better than piezo ceramic and similar to quartz accelerometer. Periodic recalibration is not needed.
- Large dynamic range ± 40 g for 100 mV/g sensor.
- Fully robotized lean assembly for repeatable sensors, better pricing, and better delivery time.
- Excellent protection from shocks enables reliable magnet mounting (no piezoelectric effect that burns input transistors).
- Lower Transverse sensitivity (thanks to MEMs high precision silicon machining).
- Less sensitive to base strain (Mems is smaller and better isolated than Piezo disc).
- Expensive glass seal connectors are not needed as the MEMs is not sensitive to humidity.
- Better temperature response (±1% from -40°C to + 125°C) thanks to tricky electronics and ADXL 356 MEMs performance.
- Ground isolated by design. The frequency response is not affected by any additional isolated option. No price increase applies.
- Low noise quasi-static measurement is possible even with such small and lightweight sensors.
- Better linearity as low as ±0.1% thanks to MEMs performance and optimized IEPE electronics.
- Not sensitive to a magnetic field.
- Stable or downtrend long-term pricing thanks to future increased MEMs manufacturing volume and fully robotized assembly.

Description

The InstantVib® IEPE Triaxial Laboratory MEMs accelerometer model 429 uses the industry-standard ©ICP / ©IEPE / 2-wire voltage transmission technique. With a 4mA constant current supply a 4 kHz AC signal is transmitted over 100 meters without distortion. Signal ground is isolated from the mounting surface and outer case to prevent any ground loops. The side connector is a standard Microtech 4-pins with a wiring compatible with Bruel & Kjaer equivalent triaxial sensor. It is equipped with a high-quality gold-plated contact socket, MIL certified for measurements in high vibrations and shock.
It can be interfaced with all devices with built-in IEPE compatible instruments like FFT analyzers, data acquisition cards, data collectors, ... The TEDS compatibility will also ease the auto-calibration of those instruments.
For a 4 kHz bandwidth, this sensor should be glued on the machine with instant adhesive. Nevertheless for quick modal measurement below 1 kHz plastic mounting clip UA-1408 from Bruel & Kjaer could be used.

Typical applications

Model 429 is so versatile that it can replace many Triaxial IEPE piezoelectric laboratory accelerometers each dedicated to a specific application.

Thanks to its 0.1 Hz quasi-static capabilities and an optimized 15° Maximum phase at 0.5 Hz, Model 429 sensor is ideal for modal measurement. We have also taken care of phase shift congruence between sensors to be within ±3°.

With 80 µg/√Hz spectral noise at 0.5 Hz and 150 µg/√Hz at 0.1 Hz, structural and low-speed vibration monitoring (paper industries, wind turbines, dams, ...) at very low frequency is now possible with a low cost, small and lightweight 15 grams sensor.

Balancing and general industrial monitoring like pumps, motors, and fans is also a perfect suit. Moreover, our patented electronic will give after analog or digital integration a perfectly stable velocity measurement so important in general industrial vibration monitoring. With 80 µg /√ Hz spectral noise at 0.5 Hz, low-speed machines down to 25 RPM can now be monitored with velocity parameters.

Typical customers

Vibration Engineers that are looking for a unique sensor for their on-road and modal testing vibration monitoring set-up. MEMs technology and fully automated assembly will for sure democratize the triaxial measurements.
Full assembly in-house, OEM customers will also benefit from a quick turnaround even with custom private labeling for sensors and packaging.

With VibraSens as the claimed inventor of the IEPE for MEMs vibration transducer, customers will have access to a unique accelerometer with unprecedented specifications previously unachievable by any now-dated piezoelectric sensors. We also offer customization for OEM-specific applications.

Call us for a trouble-free and low-cost solution for all your vibration sensor needs.

Approvals

Comparing apples to apples

As experts and World leaders in our field we think it is important for Vibration Engineers to understand the *value creation* using our IEPE MEMs triaxial laboratory vibration sensors.

Isolated: if not, you will have ground loop and measurements issues.
Settling time: Instantaneous. It will greatly accelerate your point to point measurement time.
Quasi Static: MEMs DC capabilities are way better when compared to noisy piezo sensors.
Spectral Noise: as low as possible below 1 Hz. Above 1 Hz it is a no brainer that acceleration is always present and above noise.
Pricing: Triaxial MEMs sensors are way cheaper than piezoelectric counterparts.
Temperature Influence: Almost negligible thanks to MEMs technology.

Revision History:
June 2021 : Released

Ordering information

To order, specify model number with below options :

429.I56- A - B

A : Sensitivity

6 ……..…… 100 mV/g ± 5 %

B : Connector

1 ……..……..…. Microtech 4-Pins

B(CC-DD) : Integral Cable

5(37-DD) ……..…… 4 Conductors, Shield., PU, OD 2.7mm, 80°C, UL

DD length in metres. Standard length are 2m, 5m, 10m, 15m, 20m, 30m, 40m, 50m.

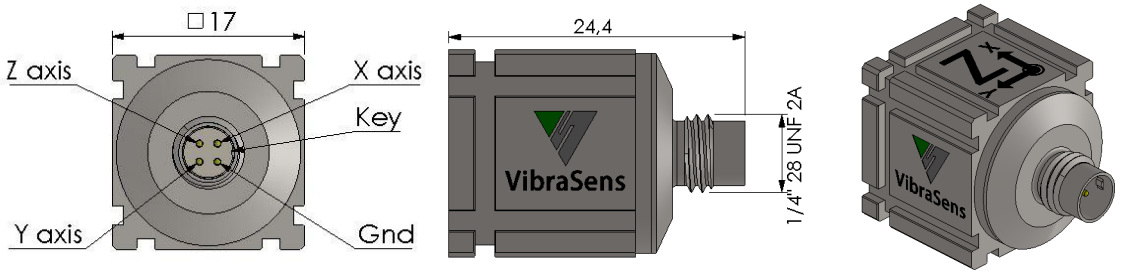
OEM / Customer Engraving :

Add ZXX at the end of the part number.
XX is a number supplied by VibraSens.

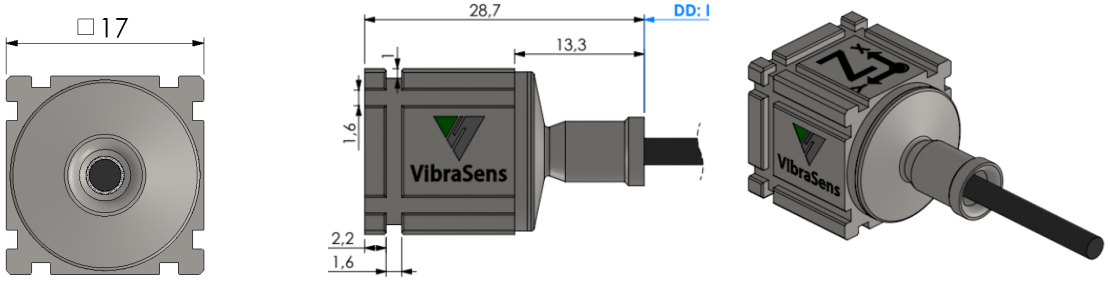
In stock Model

429.I56-6-1 Triaxial accelerometer, side Microtech connector, 100 mV/g ±5%

Configurations



Connector (standard version)



Integral Cable (special version, call factory)
Brown (X-Axis), White (Y-Axis), Black (Z-Axis), Blue (0V)

Patents

Europe (Priority 2018-05-22) ……..…… FR1854259A(Granted) - EP3572818A1(pending)
United States of America ……..…… US2019361473A1 (pending)
China ……..……..…..…… CN110514869A (pending)
Other patents applied and are still pending

Specifications

Dynamic (all axis)

Frequency response A=6 (100mV/g) ……..……..…… see Fig1
±5 % : 0.5 to 2000 Hz
±10 % : 0.3 to 3000 Hz
±3 dB : 0.1 to 4000 Hz

Mounted Resonant frequency ……..……...……..…… 5.5 kHz Nom.

Dynamic range
A=6 (100mV/g) ……..……..……...……..…… ±40 g pk

Transverse response sensitivity …..……..……..…. < 1.5%

Linearity ……..……..…… .± 0.1%

Warm up time - Discharge time constant ……..…… 10 msec
Settling time (within 10% of Bias) ……..……..……..…. 500 msec

Electrical (all axis)

Electrical Grounding …..……...…. Isolated from machine ground and housing

Electrical Isolation (Base) ……..…. 100 MΩ Min

Capacitance to ground ……..…. Tbd pF Nom

Output impedance ……...……..…. 5 Ω Nom

DC output bias voltage ……..……..…. 12.65 VDC±.1%

DC output bias voltage versus temperature ……..…. see Fig2

Residual noise (24°C) : A=6 (100mV/g)
0.1 Hz ……..……... 150 µg /√ Hz
0.5 Hz ……..……... 80 µg /√ Hz
10 Hz ……..……... 80 µg /√ Hz
100 Hz ……..……... 80 µg /√ Hz
1000 Hz ……..……... 80 µg /√ Hz

Power requirements (IEPE Compatible) ……..…… Constant current : +4 to +20mA DC
3 axis, 2 axis or even 1 axis can be powered to get triaxial measurements

Current consumption (For all 3-axis) ……..……..…… 1.5 mA
Power consumption with 24V compliance voltage (For all 3-axis) ……...…… 36 mW

Transmission Length (distorsion <1%, 5 kHz bandwidth, 4mA constant current) ……..... 100 metres
, 10mA constant current) ……... 350 metres

WARRANTY: Dommage to the built-in electronics resulting from the application of incorrect power is NOT covered by warranty. Under no circumstances should a voltage be supplied to an IEPE accelerometer without a current regulating circuit. This may include ohmmeters, multimeters and continuity testers.

Compliance / Excitation Voltage for Full dynamic ……..…. +22 to +28 VDC

Protection :

Overvoltage ……..……..……... Yes
Reverse polarity ……..……..……. Yes
ESD Protection ……..……..……... > 40 V

Transducer Electronic Datasheet ..……...…..……...…. Yes for All 3-Axis

The TEDS data retention can work up to 125 °C. High-temperature usage can reduce the lifetime of the TEDS chip.
This does not have any impact on the specifications of the accelerometer.
TEDS is only recommended for use during the measurement setup phase

Environmental

Temperature, operating continuous (Standard Grade MEMs)	-40 to 125 °C (-40 to 250 °F)
(Military Grade MEMs)	-55 to 125 °C (-67 to 250 °F)
Temperature, non operating	-55 to 150 °C (-67 to 302 °F)
Sensitivity Temperature response	see Fig3 0.02% / °C from -45°C to +125°C
Temperature Transient Sensitivity	TBD g/°C
Magnetic Sensitivity (50Hz, 0.038 T)	TBD g/kG
Humidity / Enclosure	IP68
Base Strain Sensitivity (at 250 με in base plane)	TBD (g/με)
Acceleration limit : Shock (any axis, 0.1 ms)	± 5 000 g peak
Continuous vibration	± 500 g peak

Physical

Outline Drawing	429.I56_Outline
Design	Capacitive based, microelectromechanical systems (MEMS)
Size (□ x Height)	17mm x Height 24 mm
B=1 Connector	Microtech 4-pin receptacle, ¼"–28 UNF (titanium)
B=5(37-DD) Integral Cable	Polyurethane, shielded, 4xAWG28, OD 2.7mm, 80°C Part number 600111.02_UL, UL 20549/10954, halogen free, flame retardant IEC 60332-1-2 13.5 gr/meter Brown (X-Axis), White (Y-Axis), Black (Z-Axis), Blue (0V)
Sensor Weight	15 gr Nom (0.5 Oz)
Material	Titanium Grade 5
Mounting	Adhesive or clip 1 x 1.6 mm slots for clip mounting on five sides

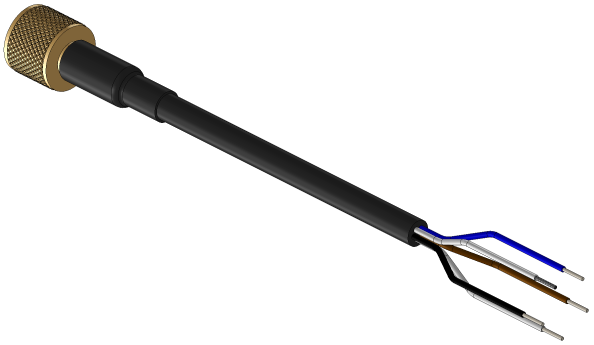
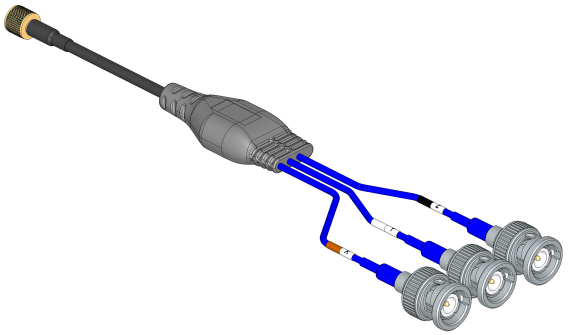
European Directive - International Compliance

EMC Directive	2014/30/EU EN/IEC 61000-6-3 / EN/IEC 61000-6-4 / EN/IEC 61000-6-1 / EN/IEC 61000-6-2 EN/IEC 61326 / CISPR 22
European RoHS2	2011/65/EU
European Reach Regulation	1907/2006 & 2018/830
Safety	2011/65/EU EN/IEC 61010-1 / ANSI/UL 61010-1

Accessories, supplied

Calibration supplied	Sensitivity for all axis (5g, 160 Hz)
Plastic Black Box (ref. 609002.01)	13 x 7 x 4 cm

Accessories, not supplied

10.01-A1-SB1-37-DD 	Cable assembly, 4-pin Microtech Connector to flying leads Raw cable Part number 600111.02_UL, polyurethane, shielded, 4xAWG28, OD 2.7mm, 80°C, 13.5 gr/meter UL 20549/10954, halogen free, flame retardant IEC 60332-1-2 (Cable part number : 600111.02) Brown (X-Axis), White (Y-Axis), Black (Z-Axis), Blue (0V) DD Standard length : 2m, 5m, 10m, 15m, 20m, 30m, 40m, 50m. 
10.01-SB1-37-DD-TCF02-56-LL 	Cable assembly, 4-pin Microtech Connector to BNC (x3) Raw cable Part number 600111.02_UL, polyurethane, shielded, 4xAWG28, OD 2.7mm, 80°C, 13.5 gr/meter UL 20549/10954, halogen free, flame retardant IEC 60332-1-2 DD Standard length : 2m, 5m, 10m, 15m, 20m, 30m, 40m, 50m. LL Standard length : 30 cm. 
Bruel & Kjaer UA-1408	set of 100 Mounting clips 
501.01	Calibration, back to back, single point., A4 certificates

Repair

Repair of the electronic / plastic connector / broken pins is not possible.

Fig 1. Frequency Response (valid for all 3 axis)

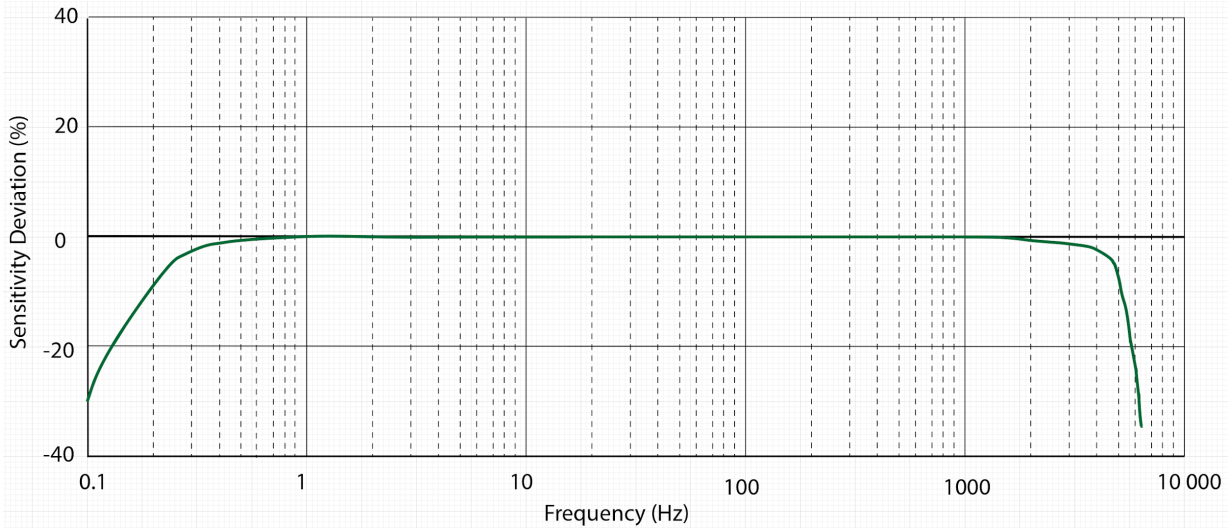


Fig 2. DC (Bias) deviation versus temperature

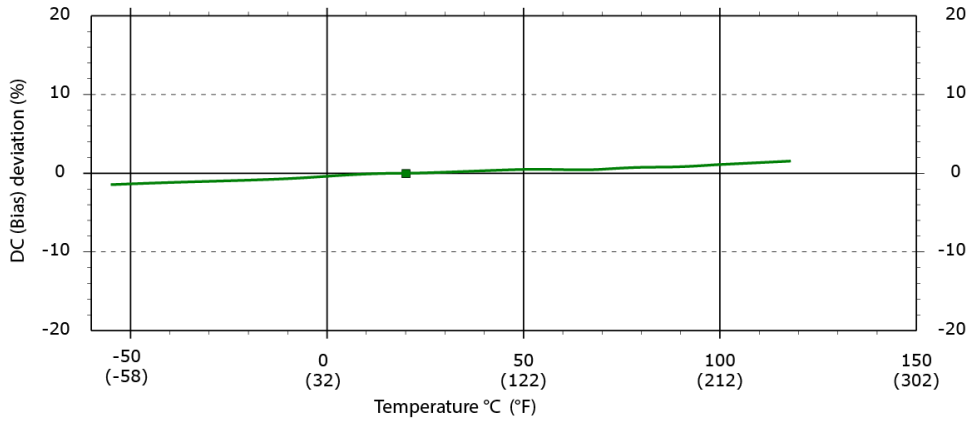


Fig 3. : Sensitivity deviation versus temperature