TECHNICAL COMPARISON:

100 mV/g vs. 50 mV/g ACCELEROMETERS

WHEN RELIABILITY MATTERS
CONNECT TO CONFIDENCE

INTRODUCTION

There are several differences between accelerometers with 100 mVg sensitivity and those with 50 mV/g sensitivity.

The current standard sensitivity in the condition monitoring industry is 100 mV/g. This was not always the case - 50 mV/g was the industry-standard sensitivity before 100 mV/g replaced it.

Previously, 50 mV/g accelerometers were utilized as a standard in the condition monitoring industry for two reasons:

- Sensor technology limited 100 mV/g accelerometers to a dynamic range of ±50 g regardless of the readout instrumentation to which it was connected
- Readout devices (the predecessor to modern analyzers) were limited to a ±5 V full scale range, which limited a 100 mV/g accelerometer to 50 g's of vibration range (100 mV/g x 50 g = 5 V)

Taking these limitations into consideration, users of this technology in the past would achieve a wider dynamic range of 100 g's using a 50 mV/g accelerometer (50 mV/g x 100 g = 5 V) when compared to a 100 mV/g accelerometer.

As technology has improved, the industry standards have changed and we can compare modern sensor technology when utilized with the auto-scale capability of modern data analyzers.

The following comparison of 100 mV/g vs. 50 mV/g sensitivity accelerometers will use CTC's **AC102 (100 mV/g)** and **AC117 (50 mV/g)** accelerometers. The technical datasheets for AC102 and AC117 are shown on pages 3-4 and will be referenced for this comparison. These sensors have identical dimensions and weights, making them ideal for this comparison.

AC102 Series

Multipurpose Accelerometer, Top Exit 2 Pin Connector, 100 mV/g, ±10%

CTC VIBRATION ANALYSIS HARDWARE

Product Features

Affordably Priced, Hermetically Sealed Sensors

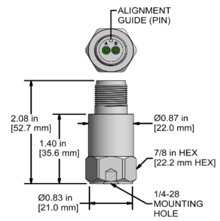
Perfect for Thousands of Applications

- 100 mV/g Sensitivity
- ± 80 g, peak Dynamic Range
- Standard 2 Pin MIL Connection or Integral Cable
  Note: Integral Cable Options are only for Permanent Monitoring Applications

AC102-1A

2 Pin Connector

Connector Pin	Polarity
A	(+) Signal/Power
B	(-) Common

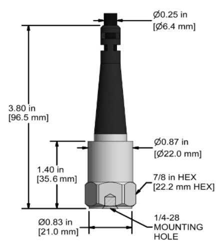


Stock Product

AC102-2C

CB103 Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

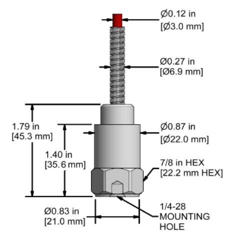


Built To Order

AC102-3C

CB206 Armored Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

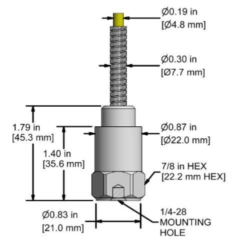


Built To Order

AC102-6C

CB611 Heavy Duty Armored Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

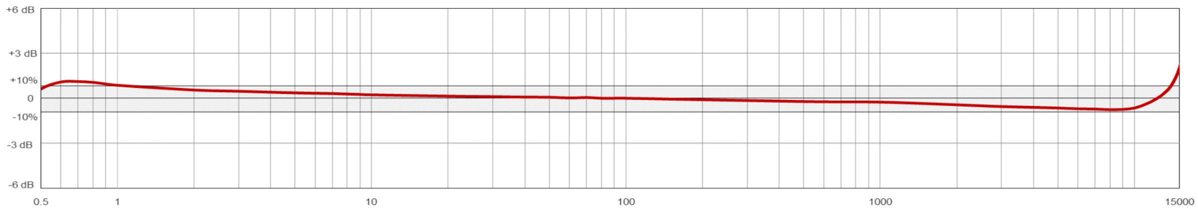


Built To Order

Specifications	Standard	Metric
Part Number	AC102	M/AC102
Sensitivity (±10%)	100 mV/g	
Frequency Response (±3dB)	30-900,000 CPM	0,5-15000 Hz
Frequency Response (±10%)	120-600,000 CPM	2,0-10000 Hz
Dynamic Range	± 80 g, peak	
Electrical		
Settling Time	<2.5 seconds	
Voltage Source (IEPE)	18-30 VDC	
Constant Current Excitation	2-10 mA	
Spectral Noise @ 10 Hz	14 µg/√Hz	
Spectral Noise @ 100 Hz	2.3 µg/√Hz	
Spectral Noise @ 1000 Hz	2 µg/√Hz	
Output Impedance	<100 ohm	
Bias Output Voltage	10-14 VDC	
Case Isolation	>10^8 ohm	

Specifications	Standard	Metric
Environmental		
Temperature Range	-58 to 250°F	-50 to 121°C
Maximum Shock Protection	5,000 g, peak	
Electromagnetic Sensitivity	CE	
Sealing	Welded, Hermetic	
Submersible Depth	200 ft.	60 m
SIL Rating	SIL 2	
Physical		
Sensing Element	PZT Ceramic	
Sensing Structure	Shear Mode	
Weight	3.2 oz	90 grams
Case Material	316L Stainless Steel	
Mounting	1/4-28	
Connector (Non-Integral)	2 Pin MIL-C-5015	
Resonant Frequency	1,380,000 CPM	23000 Hz
Mounting Torque	2 to 5 ft. lbs.	2,7 to 6,8 Nm
Mounting Hardware	1/4-28 Stud	M6x1 Adapter Stud
Calibration Certificate	CA10	

Typical Frequency Response



AC117 Series

High G Measurement Accelerometer, Top Exit 2 Pin Connector, 50 mV/g, ±10%

VIBRATION ANALYSIS HARDWARE

Product Features

50 mV/g General Purpose Sensor

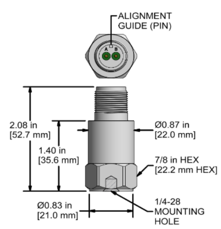
Excellent for Higher g Applications

- ±100 g, Dynamic Range
- 50 mV/g, ±10% Sensitivity
- 1,0-12500 Hz (60-750,000 CPM)

AC117-1A

2 Pin Connector

Connector Pin	Polarity
A	(+) Signal/Power
B	(-) Common

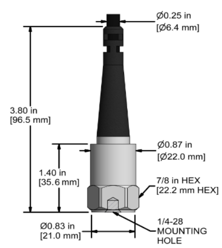


Stock Product

AC117-2C

CB103 Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

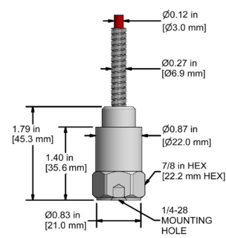


Built To Order

AC117-3C

CB206 Armored Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

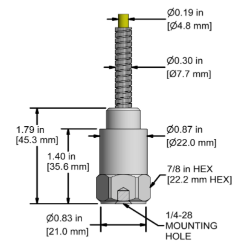


Built To Order

AC117-6C

CB611 Heavy Duty Armored Integral Cable

Conductor	Polarity
Red	(+) Signal/Power
Black	(-) Common
Shield	Cable Drain Wire

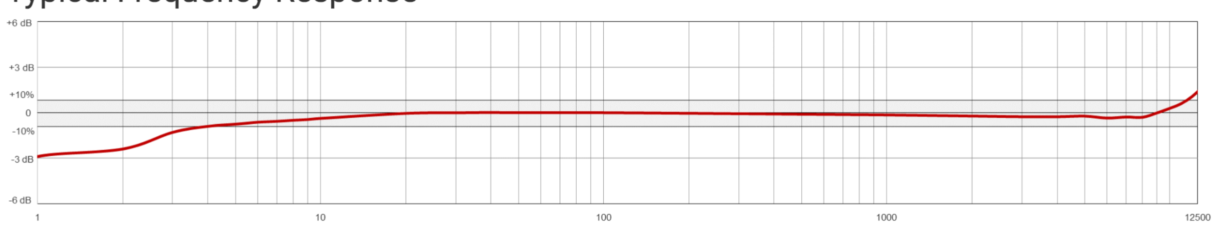


Built To Order

Specifications	Standard	Metric
Part Number	AC117	M/AC117
Sensitivity (±10%)	50 mV/g	
Frequency Response (±3dB)	60-750,000 CPM	1,0-12500 Hz
Frequency Response (±10%)	240-540,000 CPM	4,0-9000 Hz
Dynamic Range	± 100 g, peak	
Electrical		
Settling Time	<2 Seconds	
Voltage Source (IEPE)	18-30 VDC	
Constant Current Excitation	2-10 mA	
Spectral Noise @ 10 Hz	8 µg/√Hz	
Spectral Noise @ 100 Hz	2.5 µg/√Hz	
Spectral Noise @ 1000 Hz	1.7 µg/√Hz	
Output Impedance	<100 ohm	
Bias Output Voltage	10-14 VDC	
Case Isolation	>10^8 ohm	

Specifications	Standard	Metric
Environmental		
Temperature Range	-58 to 250°F	-50 to 121°C
Maximum Shock Protection	5,000 g, peak	
Electromagnetic Sensitivity	CE	
Sealing	Welded, Hermetic	
Submersible Depth	200 ft.	60 m
Physical		
Sensing Element	PZT Ceramic	
Sensing Structure	Shear Mode	
Weight	3.2 oz	90 grams
Case Material	316L Stainless Steel	
Mounting	1/4-28	
Connector (Non-Integral)	2 Pin MIL-C-5015	
Resonant Frequency	1,380,000 CPM	23000 Hz
Mounting Torque	2 to 5 ft. lbs.	2,7 to 6,8 Nm
Mounting Hardware	1/4-28 Stud	M6x1 Adapter Stud
Calibration Certificate	CA10	

Typical Frequency Response



FREQUENCY RESPONSE

One of the primary characteristics when comparing an accelerometer is the frequency response range that each accelerometer is capable of accurately measuring. Each accelerometer has a standard sensitivity (100 mV/g or 50 mV/g) with a published tolerance to which it will generate an output to the stated sensitivity.

	AC102 (100 mV/g)	AC117 (50 mV/g)
±3 dB	.5 Hz - 15,000 Hz	1 Hz - 12,500 Hz
±10%	2 Hz - 10,000 Hz	4 Hz - 9,000 Hz

The above chart helps to understand which speeds each accelerometer sensitivity is effective at detecting. In both cases for lower frequency and for higher frequency, the 100 mV/g sensitivity is superior to the 50 mV/g sensitivity. To further specify, the AC102 (100 mV/g) accelerometer allows you to detect frequencies from 0.5 Hz - 1 Hz and 12,500 Hz - 15,000 Hz within a tolerance of ±3 dB which is not a capability with the AC117 (50 mV/g) accelerometer.

DYNAMIC RANGE

The next characteristic we are going to look at is the dynamic range of each accelerometer. The dynamic range is the characteristics of the transducer that allows the electronic amplifier to pass signal from a given amount of vibration.

	Sensitivity	Dynamic Range
AC102	100 mV/g	±80 g, peak
AC117	50 mV/g	±100 g, peak

If we reflect on the earlier topic of legacy readout devices having a ±5 V full scale range limit and combine this limitation with the ±80 g, peak dynamic range of the AC102, the user would experience signal clipping. However, with modern technology and the ability of auto scaling through digital signal analyzers, the user will not experience signal clipping when utilizing a sensor like the AC102 that has a ±80 g, peak dynamic range.

SPECTRAL NOISE

The last difference between both sensor technologies is spectral noise. This characteristic only affects the signal of the sensor at extreme low speeds. In a real-world setting, the user is likely to never face issues from spectral noise from either 100 mV/g or 50 mV/g accelerometers. However, for our comparison we will adventure into the differences.

	AC102 (100 mV/g)	AC117 (50 mV/g)
10 Hz	14 µg/√Hz	8 µg/√Hz
100 Hz	2.3 µg/√Hz	2.5 µg/√Hz
1,000 Hz	2 µg/√Hz	1.7 µg/√Hz

In conclusion, CTC's modern 100 mV/g accelerometer technology with ±80 g dynamic range allows the user to identify bearing faults at slower and higher speeds when utilized with modern analyzers. This helps users predict bearing failure in earlier stages when compared to past users utilizing 50 mV/g sensor technology with legacy readout devices.

CTC is the world leader in the design and manufacture of industrial accelerometers, piezo velocity transducers, 4-20 mA vibration sensors, and proximity probes as well as all related mounting hardware, cabling, and junction boxes. Our products enable efficient vibration monitoring for predictive maintenance in a wide variety of industries. Industries served include cement, mining, petrochemical, food & beverage, auto, steel, wind, paper & pulp, power generation, water & wastewater treatment, pharmaceutical, hospitals, bottling, and more. Our mission is to offer the widest variety of accelerometers and vibration hardware products, which are compatible with data collectors and online monitoring systems, as well as the tools for installation.

CTC VIBRATION ANALYSIS HARDWARE

The CTC product line features vibration analysis hardware for heavy industry.

All CTC products are backed by our unconditional, lifetime warranty. If any CTC product should ever fail, we will repair or replace it at no charge.

PRO PROXIMITY PROBE SYSTEMS

The PRO line offers the industry's most reliable proximity probe sets.

All PRO products are backed by a lifetime warranty on materials and workmanship. PRO will repair or replace any of our products as long as the product was not subjected to misuse, neglect, natural disasters, improper installation, or modification.

All stock products may be returned for a 25% restocking fee if returned in new and unused condition within 90 days of shipment. Built-to-order and private-label products qualify for a 50% refund if returned in new and unused condition within 90 days of shipment. Custom products are quoted and built specifically to the requirements of the customer, which may include completely custom product design or private-labeled versions of standard products for OEM customers. Custom products are non-cancellable, non-returnable, and non-refundable.