CHARGE MODE ACCELEROMETERS

IMI SENSORS
A PCB DIVISION

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CHARGE MODE ACCELEROMETERS

Unlike ICP® accelerometers, charge mode accelerometers do not contain any internal microelectronics. This allows charge mode accelerometers to be used in far hotter environments than ICP® accelerometers (1200 °F [649 °C] vs 325 °F [162 °C]). Charge mode accelerometers for industrial and power generation applications can be broadly categorized around three distinct operating temperature maximums:

- 500-550 °F (260-288 °C)
- 900-1000 °F (482-538 °C)
- 1200 °F (649 °C)

CONSTRUCTION

A variety of mechanical designs are used to perform the transduction required of charge accelerometers. The designs consist of sensing crystals that are attached to a seismic mass. A preload ring or stud applies a force to the sensing element assembly to make a rigid structure and insure linear behavior. Under acceleration, the seismic mass causes stress on the sensing crystals which results in a proportional electrical output. The output is collected on electrodes and transmitted by wires to an electrical output connector that mates to a low noise transmission cable.

UHT-12™ ELEMENT

UHT-12™ is a new crystal designed for more accurate, lower noise measurements during large temperature variations. UHT-12™ technology reduces the effects of temperature variation. Pyroelectricity phenomenon may occur during large temperature fluctuations, generating “spikes” and disrupting behavior of the accelerometer and the test results. Accelerometers made with UHT-12™ technology have an improved data quality and features:

- Proprietary crystal technology sealed in a hermetic package provides long-term reliability.
- No pyroelectric output provides accurate low-frequency measurements.
- More consistent sensitivity over a wide temperature change provides greater accuracy.
- Shear mode crystals prevent base strain and transverse measurement errors.

HIGH IMPEDANCE CHARGE SIGNAL

Charge mode accelerometers do not require an external power source like ICP® accelerometers. When mechanical stress is applied, a high impedance charge signal is generated from the piezoelectric sensing element. The high impedance charge signal can be easily corrupted by cable noise and dirty environmental conditions. It is important to use low noise cables and keep electrical connections as clean as possible. A charge amplifier or in-line charge converter is needed for signal conversion before sending the signal to a data acquisition system or readout device. Charge amplifiers typically include settings that allow for gain/range adjustment. Other options may include filtering, signal integration and time constant adjustment for low frequency measurements.

Unlike ICP® sensors, charge sensors are not limited to a maximum 5 VAC full scale output range. Charge sensors can operate anywhere within the linear measurement range listed on the specification sheet. The charge output (pC/g) can then be converted by a charge amplifier or charge converter (mV/pC). Laboratory amplifiers typically have the ability to adjust gain (mV/pC) and measurement range. Charge converters typically have a fixed gain and measurement range.

FREQUENCY RESPONSE

Low frequency and discharge time constant specifications are not included on charge mode accelerometer spec sheets. These are electrical characteristics that are determined by the charge amplifier or in-line charge converter.

Every charge mode accelerometer has a natural frequency that will restrict the measurement frequency range to some upper limit. The natural frequency (resonance) is a mechanical characteristic imposed on the accelerometer by its physical design characteristics. Sensitivity rises rapidly as the natural frequency is approached which can often result in an overload of signal output.

RADIATION-HARDENED ENVIRONMENTS

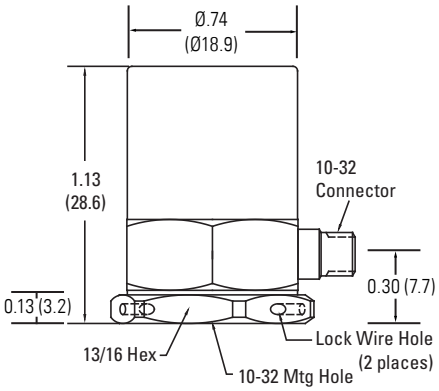
Many of the charge mode accelerometers are able to withstand radiation and therefore can be used in nuclear applications.

HIGH TEMPERATURE, SINGLE-ENDED OUTPUT

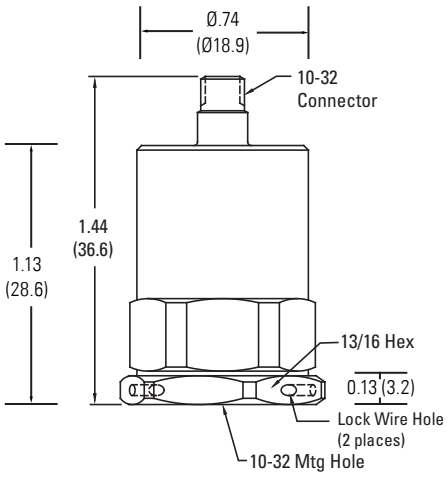
Models 357B53 & 357B54

TECHNICAL SPECIFICATIONS		
Model Number	**357B53**	**357B54**
Performance		
Sensitivity (±15%)	100 pC/g 10.2 pC/(m/s²)	100 pC/g 10.2 pC/(m/s²)
Measurement Range	±150 g pk ±1470 m/s² pk	±150 g pk ±1470 m/s² pk
Frequency Range (+5%)	Up to 3 kHz	Up to 3 kHz
Frequency Range (+10%)	Up to 3.5 kHz	Up to 3.5 kHz
Frequency Range (±3 dB)	Up to 5.5 kHz	Up to 5.5 kHz
Resonant Frequency	≥ 12 kHz	≥ 12 kHz
Non-Linearity	≤ 1%	≤ 1%
Transverse Sensitivity	≤ 5%	≤ 5%
Environmental		
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk	±2000 g pk ±19600 m/s² pk
Temperature Range (Operating)	-95 to +550 °F -71 to +288 °C	-95 to +550 °F -71 to +288 °C
Base Strain Sensitivity	0.0002 g/με	0.0002 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	1 E10 N/cm²
Electrical		
Output Polarity	Negative	Negative
Capacitance	930 pF	930 pF
Insulation Resistance (Room Temp)	> 1000 Gohm	> 1000 Gohm
Insulation Resistance (Max Operating Temp)	> 100 Mohm	> 100 Mohm
Electrical Isolation	Base Isolated	Base Isolated
Physical		
Sensing Element	Ceramic	Ceramic
Sensing Geometry	Shear	Shear
Housing Material	Titanium	Titanium
Sealing	Hermetic	Hermetic
Mounting	10-32 Female	10-32 Female
Electrical Connector	10-32 Jack	10-32 Jack
Weight	1.80 oz 51.0 g	1.80 oz 51.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 357B53	 357B54
Hardline Cable	N/A	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



Model 357B53



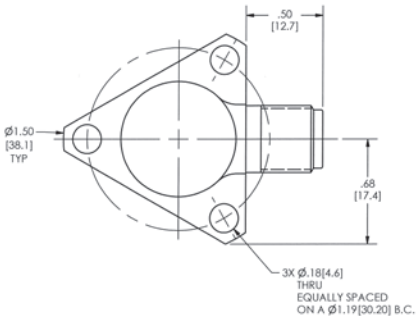
Model 357B54

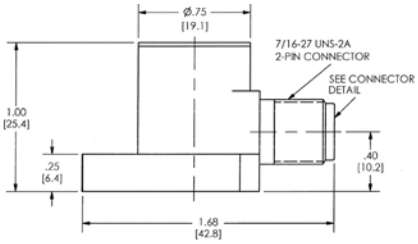
HIGH TEMPERATURE, DIFFERENTIAL OUTPUT

Models 357B81 & 357B82

TECHNICAL SPECIFICATIONS		
Model Number	**357B81**	**357B82**
Performance		
Sensitivity (±5%)	20 pC/g 2.04 pC/(m/s²)	50 pC/g 5.1 pC/(m/s²)
Measurement Range	±2000 g pk 19620 m/s² pk	±1000 g pk 9810 m/s² pk
Frequency Range (±5%)	Up to 9 kHz	Up to 6 kHz
Resonant Frequency	≥ 35 kHz	≥ 20 kHz
Non-Linearity	≤ 1%	
Transverse Sensitivity	≤ 5%	
Environmental		
Overload Limit (Shock)	±4000 g pk 39240 m/s² pk	±2000 g pk 19620 m/s² pk
Temperature Range (Operating)	-65 to +500 °F -54 to +260 °C	
Base Strain Sensitivity	.004 g/με	.001 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	
Electrical		
Output Polarity	Differential	
Capacitance (Pin to Pin)	2400 pF	2300 pF
Capacitance (Pin to Case)	30 pF	
Capacitance (Unbalance Between Pins)	≤ 2 pF	
Insulation Resistance (Pin-to-Case, Room Temp)	≥ 1 Gohm	
Insulation Resistance (Pin-to-Case, Max Operating Temp)	≥ 50 Mohm	
Insulation Resistance (Pin-to-Pin, Room Temp)	≥ 1 Gohm	
Insulation Resistance (Pin-to-Pin, Max Operating Temp)	≥ 10 Mohm	
Electrical Isolation	Case Isolated	
Physical		
Sensing Element	Ceramic	
Sensing Geometry	Shear	
Housing Material	Stainless Steel	
Sealing	Hermetic	
Mounting	8-32 Through Hole (3)	
Electrical Connector	2-pin 7/16-27	
Weight	1.75 oz 50.0 g	

SENSOR CHAIN COMPONENTS			
Sensor	 357B81, 357B82		
Hardline Cable	N/A		
Softline Cable	 045M19B	 045M21B	
Charge Amplifier	 422M182	 EEX682A40	 421B3X





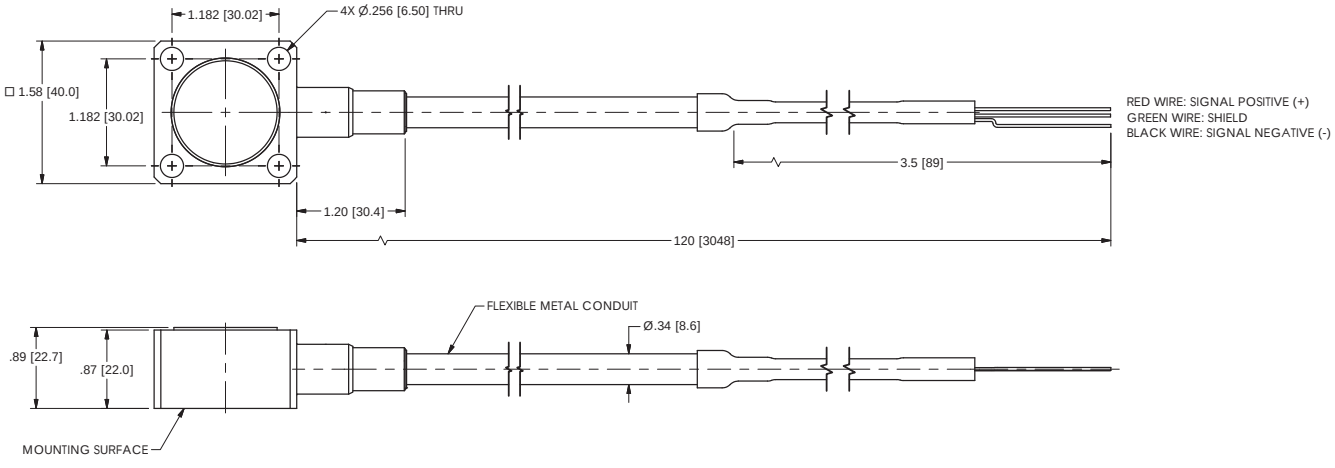
HIGH TEMPERATURE, DIFFERENTIAL OUTPUT

Model EX615A42

TECHNICAL SPECIFICATIONS	
Model Number	**EX615A42**
Performance	
Sensitivity (±5%)	100 pC/g 10.2 pC/(m/s²)
Measurement Range	±200 g pk ±2000 m/s² pk
Frequency Range (±5%)	Up to 5 kHz
Frequency Range (±10%)	Up to 6 kHz
Resonant Frequency	≥ 20 kHz
Non-Linearity	±1%
Transverse Sensitivity	< 5%
Environmental	
Overload Limit (Shock)	±1000 g pk 9800 m/s² pk
Temperature Range (Operating)	-65 to +500 °F -54 to +260 °C
Base Strain Sensitivity	0.003 g/με
Hazardous Area Approval	ATEX, CSA, IECEx
Electrical	
Output Polarity	Differential
Capacitance (Pin to Pin)	11100 pF
Capacitance (With Integral Cable)	35 pF/ft
Insulation Resistance (Room Temp)	≥1 Gohm
Insulation Resistance (Max Operating Temp)	≥100 Mohm
Electrical Isolation	Case Isolated

TECHNICAL SPECIFICATIONS	
Model Number	**EX615A42**
Physical	
Sensing Element	Ceramic
Sensing Geometry	Shear
Housing Material	Stainless Steel
Sealing	Hermetic
Mounting	1/4-28 Through Hole (4)
Cable Length	10 ft 3m
Cable Type	Armored 3-wire, low noise PTFE
Cable Termination	Pigtails
Weight (Without Cable)	6.7 oz 190.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 EX615A42	
Hardline Cable	N/A	
Softline Cable	N/A	
Charge Amplifier	 EX682A40	 421B3X

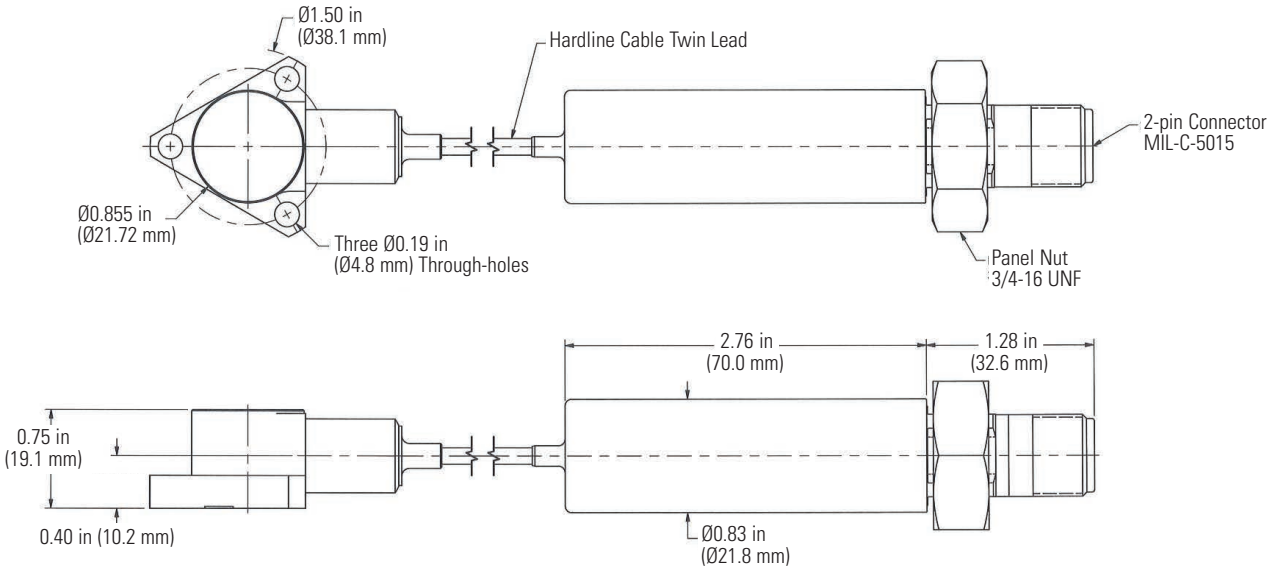


VERY HIGH TEMPERATURE, INTEGRAL CHARGE AMPLIFIER

Model EX600B13 & EX600B14

TECHNICAL SPECIFICATIONS		
Model Number	**EX600B13**	**EX600B14**
Performance		
Sensitivity (±5%)	100 mV/g 10.2 mV/(m/s²)	10 mV/g 1.0 mV/(m/s²)
Measurement Range	±50 g pk ±490 m/s² pk	±500 g pk ±4900 m/s² pk
Frequency Range (±5%)	4.7 to 3500 Hz	
Frequency Range (±10%)	3.4 to 5000 Hz	
Resonant Frequency	20 kHz	
Broadband Resolution (1 Hz to 10 kHz)	450 µg	
Non-Linearity	±1%	
Transverse Sensitivity	≤ 5%	
Environmental		
Overload Limit (Shock)	±1000 g pk ±9810 m/s² pk	
Temperature Range (Accelerometer)	-65 to +900 °F -54 to 482 °C	
Temperature Range (Charge Amplifier)	-60 to +250 °F -51 to 121 °C	
Base Strain Sensitivity	≤ 0.006 g/µε	
Hazardous Area Approval	ATEX, CSA	

TECHNICAL SPECIFICATIONS		
Model Number	**EX600B13**	**EX600B14**
Electrical		
Settling Time (@ 70 °F within 1% bias)	≤ 1.0 sec	
Discharge Time Constant	≥ .10 sec	
Excitation Voltage	22 to 28 VDC	
Constant Current Excitation	2.2 to 20 mA	
Output Impedance	< 1000 ohm	
Output Bias Voltage	12 to 16 VDC	
Spectral Noise (10 Hz)	30 µg/√Hz	
Spectral Noise (100 Hz)	8 µg/√Hz	
Spectral Noise (1 kHz)	4 µg/√Hz	
Electrical Isolation	Case Isolated	
Physical		
Sensing Element	UHT-12™	
Sensing Geometry	Shear	
Housing Material	Nickel Alloy	
Sealing	Hermetic	
Mounting	8-32 Through Hole (3)	
Cable Length	10 ft 3m	
Cable Type	MI Hardline	
Cable Termination	2-pin MIL-C-5015	
Weight (without cable)	9.5 oz 270.0 g	

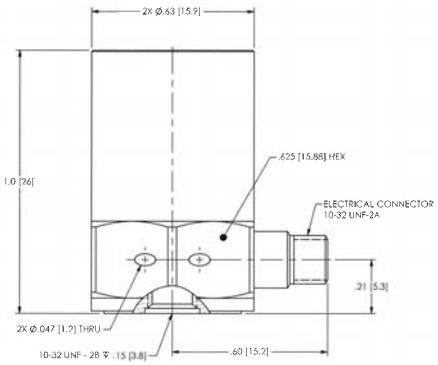


VERY HIGH TEMPERATURE, SINGLE-ENDED OUTPUT

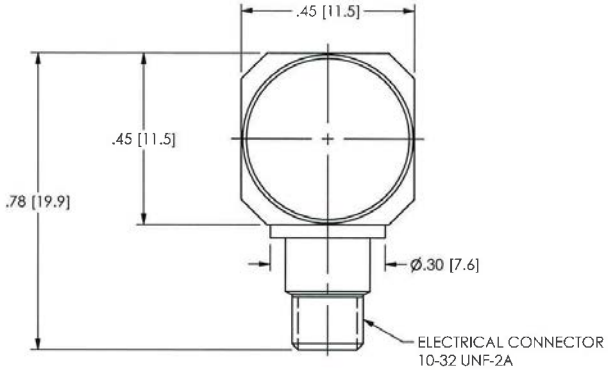
Models 357B61 & 357B69

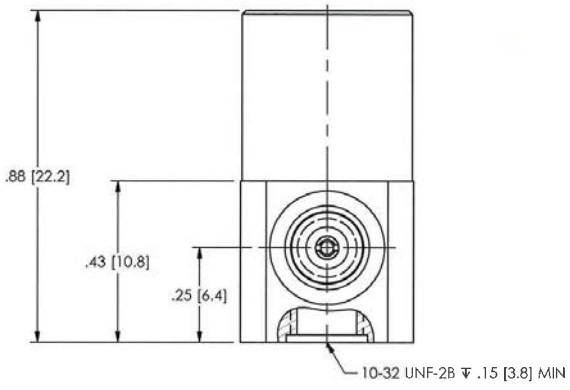
TECHNICAL SPECIFICATIONS		
Model Number	**357B61**	**357B69**
Performance		
Sensitivity (±10%)	10 pC/g 1.02 pC/m/s²	3.5 pC/g .357 pC/(m/s²)
Measurement Range	±1000 g pk ±9810 m/s² pk	±500 g pk ±4905 m/s² pk
Frequency Range (±5%)	Up to 5 kHz	Up to 6 kHz
Resonant Frequency	≥ 24 kHz	≥ 35 kHz
Non-Linearity	≤ 1%	≤ 1%
Transverse Sensitivity	≤ 3%	≤ 5%
Environmental		
Overload Limit	±5000 g pk ±49050 m/s² pk	±3000 g pk ±29420 m/s² pk
Temperature Range (Operating)	-65 to +900 °F -54 to 482 °C	-65 to +900 °F -54 to +482 °C
Base Strain Sensitivity	0.007 g/με	0.002 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	
Electrical		
Output Polarity	Negative	Negative
Capacitance	630 pF	275 pF
Insulation Resistance (Room Temp)	≥ 100 Mohm	> 1 Gohm
Insulation Resistance (Max Operating Temp)	> 100 kohm	
Electrical Isolation	Base Isolated	
Physical		
Sensing Element	Ceramic	Ceramic
Sensing Geometry	Compression	Compression
Housing Material	Nickel Alloy	
Sealing	Hermetic	Hermetic
Mounting	10-32 Female	10-32 Female
Electrical Connector	10-32 Jack	10-32 Jack
Weight	1.1 oz 30.0 g	0.56 oz 16.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 357B61	 357B69
Hardline Cable	 023FZXXXGA (023A10 = 10ft I 3m)	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



Model 357B61





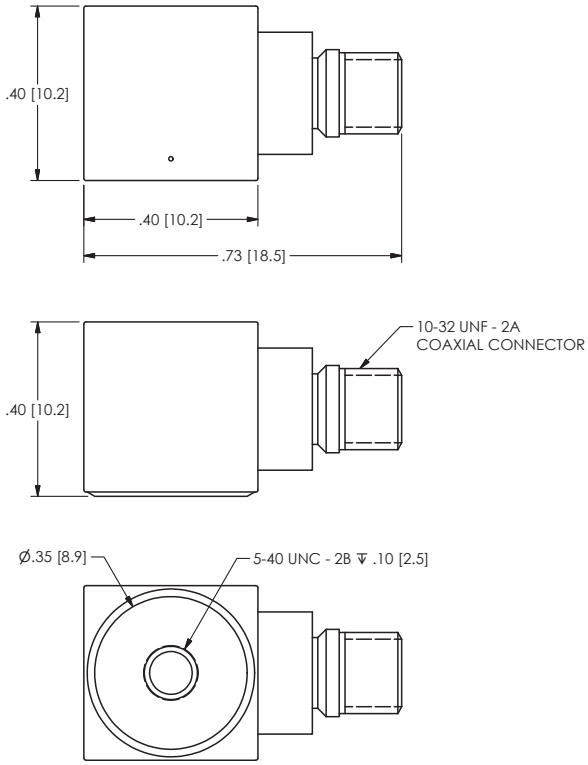
Model 357B69

VERY HIGH TEMPERATURE, SINGLE-ENDED OUTPUT

Model 357A63

SPECIFICATIONS	
Model Number	**357A63**
Performance	
Sensitivity (±10%)	0.53 pC/g 0.054 pC/(m/s²)
Measurement Range	±5000 g pk ±49050 m/s² pk
Frequency Range (±10%)	Up to 10 kHz
Resonant Frequency	45 kHz
Non-Linearity	≤ 1 %
Transverse Sensitivity	≤ 3 %
Environmental	
Overload Limit (Shock)	±5000 g pk ±49050 m/s² pk
Temperature Range (Operating)	-65 to +900 °F -54 to +482 °C
Base Strain Sensitivity	0.003 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Electrical	
Output Polarity	Positive
Capacitance (Pole-to-Pole)	60 pF
Insulation Resistance (Room Temp)	>1 Gohm
Insulation Resistance (Max Operating Temp)	>1 Mohm
Electrical Isolation	Case Isolated
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	5-40 Female
Electrical Connector	10-32 Jack
Weight	0.31 oz 8.7 g

SENSOR CHAIN COMPONENTS		
Sensor	 357A63	
Hardline Cable	 023FZXXXGA (023A10 = 10ft I 3m)	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)

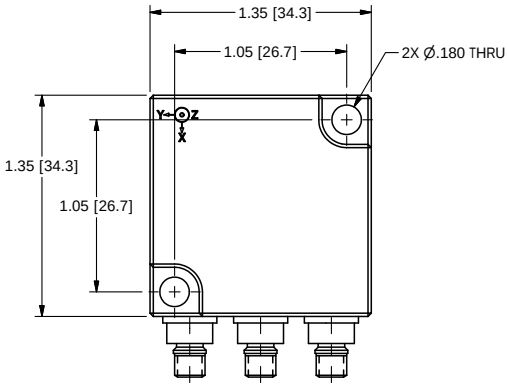


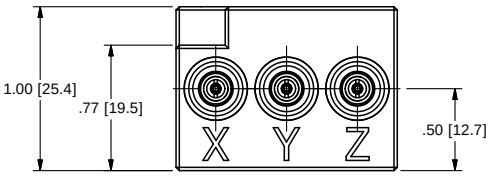
VERY HIGH TEMPERATURE, SINGLE-ENDED OUTPUT TRIAXIAL

Model EX356A73

TECHNICAL SPECIFICATIONS	
Model Number	**EX356A73**
Performance	
Sensitivity (±5%)	3.2 pC/g 0.33 pC/(m/s²)
Measurement Range	±500 g pk ±4905 m/s² pk
Frequency Range (±5%)	Up to 4 kHz
Resonant Frequency	25 kHz
Non-Linearity	≤ 1 %
Transverse Sensitivity	≤ 5 %
Environmental	
Overload Limit (Shock)	±3000 g pk ±29400 m/s² pk
Temperature Range (Operating)	-67 to +900 °F -55 to +482 °C
Base Strain Sensitivity	0.003 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Hazardous Area Approval	ATEX, CSA, IECEx
Electrical	
Output Polarity	Negative
Capacitance (Pole-to-Pole)	120 pF
Insulation Resistance (Room Temp)	> 1 Gohm
Insulation Resistance (Max Operating Temp)	> 100 kohm
Electrical Isolation	Case Isolated
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	8-32 Through Hole (2)
Electrical Connector	10-32 Jacks (3)
Weight	6.0 oz 170.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 EX356A73	
Hardline Cable (x3)	 023FZXXXGA (023A10 = 10ft I 3m)	
Softline Cable (x3)	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier (x3)	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



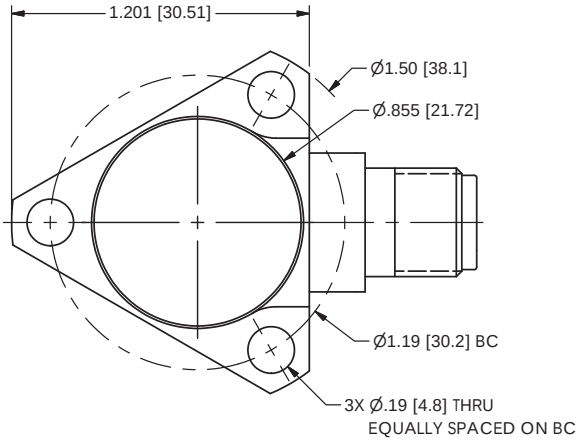


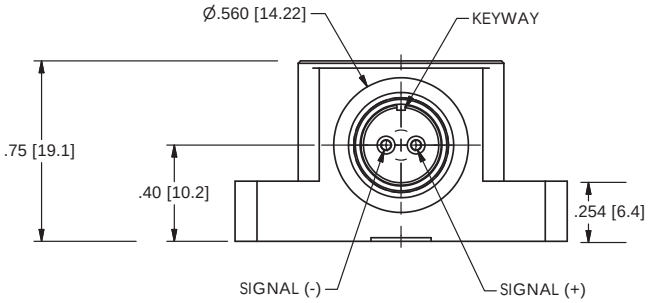
VERY HIGH TEMPERATURE, DIFFERENTIAL OUTPUT

Model 357A100

TECHNICAL SPECIFICATIONS	
Model Number	**357A100**
Performance	
Sensitivity (±5%)	5 pC/g .51 pC/m/s²
Measurement Range	±200 g pk ±1962 m/s² pk
Frequency Range (±5%)	Up to 4 kHz
Frequency Response (±10%)	Up to 5 kHz
Resonant Frequency	20 kHz
Non-Linearity	≤ 1%
Transverse Sensitivity	≤ 5%
Environmental	
Overload Limit (Shock)	±1000 g pk ±9810 m/s² pk
Temperature Range (Operating)	-65 to +900 °F -54 to +482 °C
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Electrical	
Output Polarity	Differential
Capacitance (Pin to Pin)	120 pF
Capacitance (Pin to Casing)	32 pF
Insulation Resistance (Pin to Pin, Room Temp)	> 1 Gohm
Insulation Resistance (Pin to Casing, Room Temp)	> 1 Gohm
Insulation Resistance (Pin to Pin, Max Operating Temp)	> 100 kohm
Electrical Isolation	Case Isolated
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	8-32 Through Hole (3)
Electrical Connector	2-pin 7/16-27
Weight	2.32 oz 66.0 g

SENSOR CHAIN COMPONENTS			
Sensor	 357A100		
Hardline Cable	 013GNXXXGP		
Softline Cable	 045M19B	 045M21B	
Charge Amplifier	 422M182	 EX682A40	 421B3X



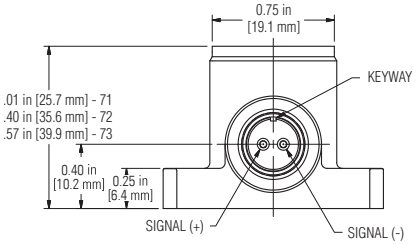


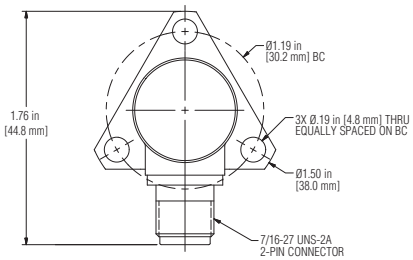
VERY HIGH TEMPERATURE, DIFFERENTIAL OUTPUT

Models (EX)357C71, (EX)357C72 & 357C73

TECHNICAL SPECIFICATIONS			
Model Number	**(EX)357C71**	**(EX)357C72**	**357C73**
Performance			
Sensitivity (±5%)	10 pC/g 1.02 pC/m/s²	50 pC/g 5.10 pC/m/s²	100 pC/g 10.2 pC/m/s²
Measurement Range	±1000 g pk ±9810 m/s² pk	±500 g pk ±4905 m/s² pk	±300 g pk ±2943 m/s² pk
Frequency Range (±5%)	Up to 4 kHz	Up to 2.5 kHz	Up to 2 kHz
Resonant Frequency	≥ 25 kHz	≥ 13 kHz	≥ 11 kHz
Non-Linearity	≤ 1%		
Transverse Sensitivity	≤ 5%		
Environmental			
Overload Limit (Shock)	±2000 g pk ±19620 m/s² pk	±2000 g pk ±19620 m/s² pk	±1000 g pk ±9810 m/s² pk
Temperature Range (Operating)	-65 to +900 °F -54 to +482 °C		
Base Strain Sensitivity	0.033 g/με		
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad		
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²		
Hazardous Area Approval	ATEX (EX only)	ATEX (EX only)	N/A
Electrical			
Output Polarity	Differential		
Capacitance (Pin to Pin)	525 pF	990 pF	1860 pF
Capacitance (Pin to Casing)	26 pF		
Insulation Resistance (Pin to Pin, Room Temp)	> 1 Gohm		
Insulation Resistance (Pin to Casing, Room Temp)	> 1 Gohm		
Insulation Resistance (Pin to Pin, Max Operating Temp)	> 100 kohm		
Electrical Isolation	Case Isolated		
Physical			
Sensing Element	Ceramic		
Sensing Geometry	Compression		
Housing Material	Nickel Alloy		
Sealing	Hermetic		
Mounting	8-32 Through Hole (3)		
Electrical Connector	2-pin 7/16-27		
Weight	2.60 oz 75.0 g	3.15 oz 90.0 g	4.0 oz 115.0 g

SENSOR CHAIN COMPONENTS			
Sensor	 (EX)357C71, (EX)357C72, 357C73		
Hardline Cable	 013GNXXXGP		
Softline Cable	045M19B	045M21B	
Charge Amplifier	 422M182	 EX682A40	 421B3X





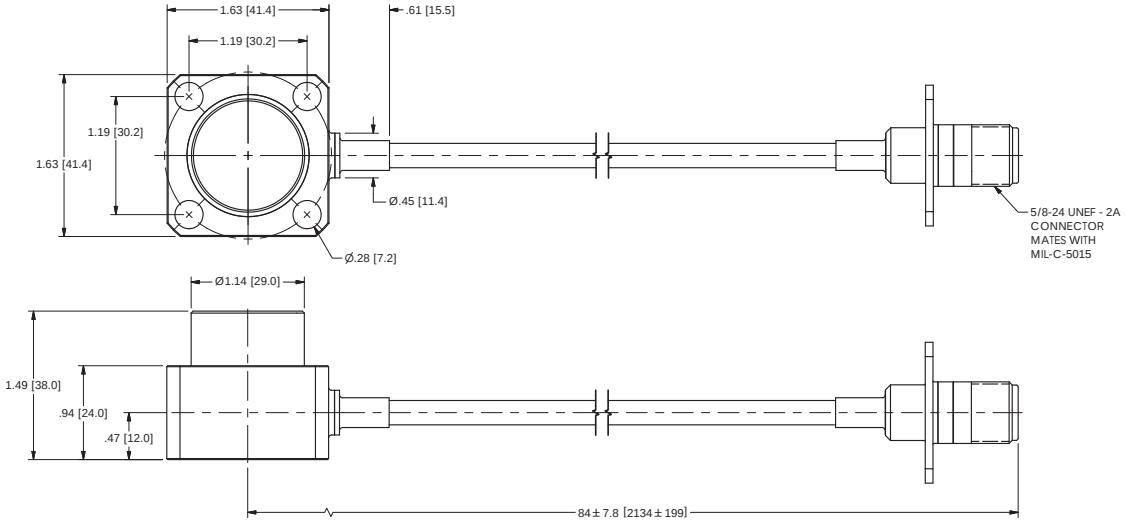
VERY HIGH TEMPERATURE, DIFFERENTIAL OUTPUT

Model EX619A11

TECHNICAL SPECIFICATIONS	
Model Number	**EX619A11**
Performance	
Sensitivity (±5%)	50 pC/g 5.1 pC/(m/s²)
Measurement Range	±500 g ±4905 m/s² pk
Frequency Range (±5%)	Up to 3 kHz
Frequency Response (±10%)	Up to 5 kHz
Resonant Frequency	> 18 kHz
Non-Linearity	±1%
Transverse Sensitivity	< 5%
Environmental	
Overload Limit (Shock)	±2000 g pk ±19620 m/s² pk
Temperature Range (Operating)	-65 to +900 °F -54 to +482 °C
Base Strain Sensitivity	0.033 g/με
Hazardous Area Approval	ATEX, CSA, IECEx
Electrical	
Output Polarity	Differential
Capacitance (Pin to Pin)	1525 pF
Capacitance (Pin to Case)	250 pF
Insulation Resistance (Pin to Case, Room Temp)	≥ 1 Gohm
Insulation Resistance (Pin to Pin, Room Temp)	≥ 1 Gohm
Insulation Resistance (Pin to Pin, Max Operating Temp)	≥ 100 kohm
Electrical Isolation	Case Isolated

TECHNICAL SPECIFICATIONS	
Model Number	**EX619A11**
Physical	
Sensing Element	Ceramic
Sensing Geometry	Compression
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	1/4-28 Through Hole (4)
Cable Length	7ft 2.1m
Cable Type	MI Hardline
Cable Termination	2-pin MIL-C-5015
Weight (With Cable)	19.4 oz 550.0 g

SENSOR CHAIN COMPONENTS	
Sensor	 EX619A11
Hardline Cable	N/A
Softline Cable	N/A
Charge Amplifier	 422M182



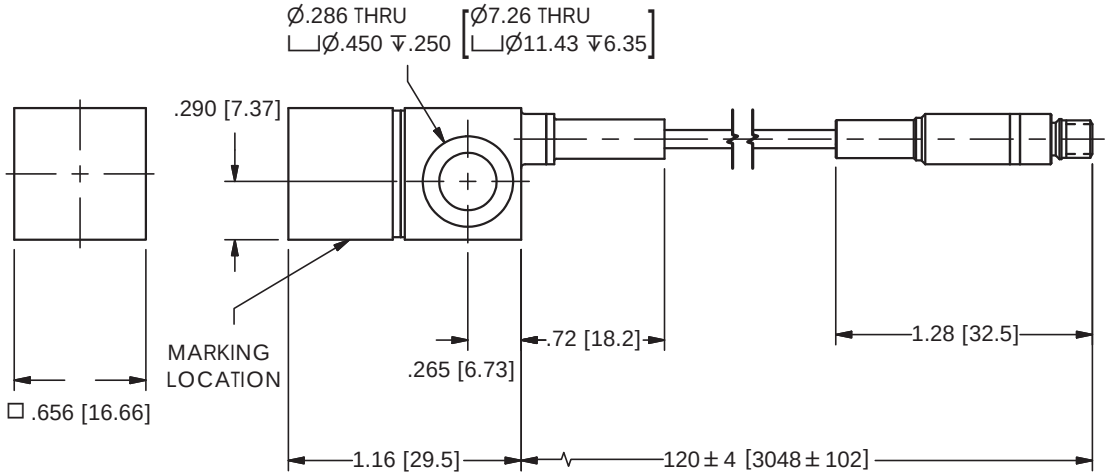
EXTREME TEMPERATURE, SINGLE-ENDED OUTPUT

Models EX357E90 & EX357E91

TECHNICAL SPECIFICATIONS		
Model Number	**EX357E90**	**EX357E91**
Performance		
Sensitivity (±10%)	5 pC/g 0.51 pC/(m/s²)	
Axis of Measurement (Compared to Direction of Mounting Screw)	Parallel	Perpendicular
Measurement Range	±1000 g pk ±9800 m/s² pk	
Frequency Range (±5%)	Up to 3 kHz	
Frequency Range (± 1 dB)	Up to 5 kHz	
Resonant Frequency	≥ 14 kHz	≥ 13.5 kHz
Non-Linearity	≤ 2.5%	
Transverse Sensitivity	≤ 5%	
Environmental		
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk	
Temperature Range (Operating)	-67 to +1200 °F -55 to +649 °C	
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	
Hazardous Area Approval	ATEX, CSA, IECEx	
Electrical		
Output Polarity	Negative	
Capacitance	990 pF	1000 pF
Insulation Resistance (Room Temp)	> 100 Mohm	
Insulation Resistance (Max Operating Temp)	≥ 10 kohm	
Electrical Isolation	Case Isolated	

TECHNICAL SPECIFICATIONS		
Model Number	**EX357E90**	**EX357E91**
Physical		
Sensing Element	UHT-12™	
Sensing Geometry	Shear	
Housing Material	Nickel Alloy	
Sealing	Hermetic	
Mounting	1/4-28 Through Hole (1)	
Cable Length	10 ft 3m	
Cable Type	MI Hardline	
Cable Termination	10-32 Jack	
Weight (Without cable)	1.8 oz 50.0 g	

SENSOR CHAIN COMPONENTS		
Sensor	 EX357E90, EX357E91	
Hardline Cable	N/A	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



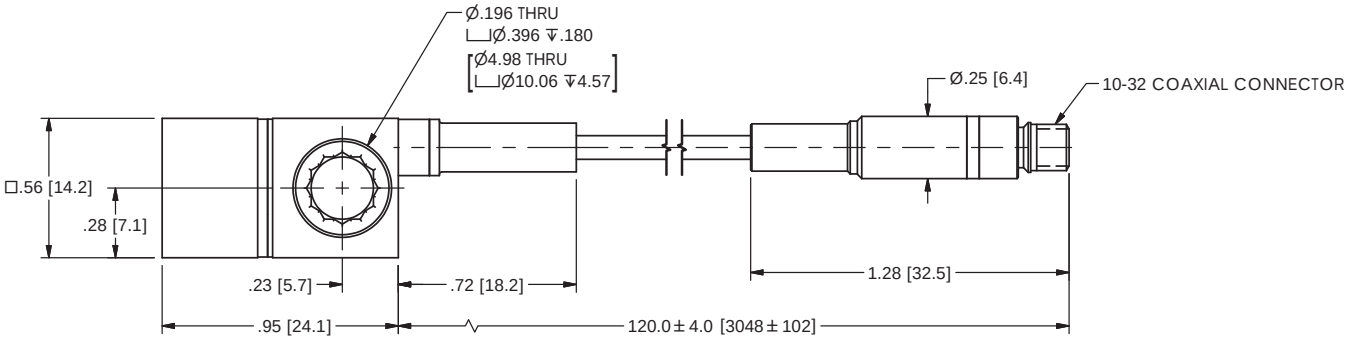
EXTREME TEMPERATURE, SINGLE-ENDED OUTPUT

Models EX357E92 & EX357E93

TECHNICAL SPECIFICATIONS		
Model Number	**EX357E92**	**EX357E93**
Performance		
Sensitivity (±10%)	2.3 pC/g 0.23 pC/(m/s²)	
Axis of Measurement (Compared to Direction of Mounting Screw)	Parallel	Perpendicular
Measurement Range	±1000 g pk ±9800 m/s² pk	
Frequency Range (±5%)	Up to 3 kHz	
Frequency Range (± 1 dB)	Up to 5 kHz	
Resonant Frequency	≥ 15 kHz	
Non-Linearity	≤ 2.5%	
Transverse Sensitivity	≤ 5%	
Environmental		
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk	
Temperature Range (Operating)	-67 to +1200 °F -55 to +649 °C	
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	
Hazardous Area Approval	ATEX, CSA, IECEx	
Electrical		
Output Polarity	Negative	
Capacitance	1000 pF	
Insulation Resistance (Room Temp)	> 100 Mohm	
Insulation Resistance (Max Operating Temp)	≥ 10 kohm	
Electrical Isolation	Case Isolated	

TECHNICAL SPECIFICATIONS		
Model Number	**EX357E92**	**EX357E93**
Physical		
Sensing Element	UHT-12™	
Sensing Geometry	Shear	
Housing Material	Nickel Alloy	
Sealing	Hermetic	
Mounting	10-32 Through Hole (1)	
Cable Length	10 ft 3m	
Cable Type	MI Hardline	
Cable Termination	10-32 Jack	
Weight (Without cable)	1.6 oz 45.0 g	

SENSOR CHAIN COMPONENTS		
Sensor	 EX357E92, EX357E93	
Hardline Cable	N/A	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



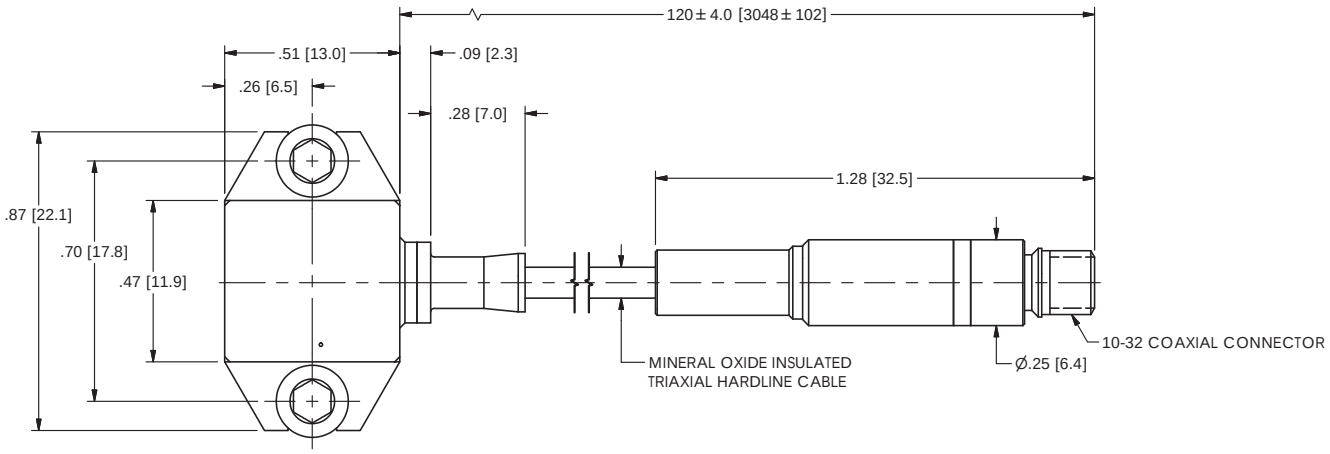
EXTREME TEMPERATURE, SINGLE-ENDED OUTPUT

Model 357A64

TECHNICAL SPECIFICATIONS	
Model Number	**357A64**
Performance	
Sensitivity (±10%)	1.15 pC/g 0.117 pC/(m/s²)
Measurement Range	±1000 g pk ±9800 m/s² pk
Frequency Range (±10%)	Up to 10 kHz
Resonant Frequency	45 kHz
Non-Linearity	≤ 5 %
Transverse Sensitivity	≤ 1 %
Environmental	
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk
Temperature Range (Operating)	-65 to +1200 °F -54 to +649 °C
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Electrical	
Output Polarity	Positive
Capacitance (Pole-to-Pole)	1000 pF
Insulation Resistance (Room Temp)	≥ 1 Gohm
Insulation Resistance (Max Operating Temp)	≥ 30 kohm
Electrical Isolation	Case Isolated

TECHNICAL SPECIFICATIONS	
Model Number	**357A64**
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	6-32 Through Hole (2)
Cable Length	10 ft 3m
Cable Type	MI Hardline
Cable Termination	10-32 Jack
Weight	0.35 oz 10.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 357A64	
Hardline Cable	N/A	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



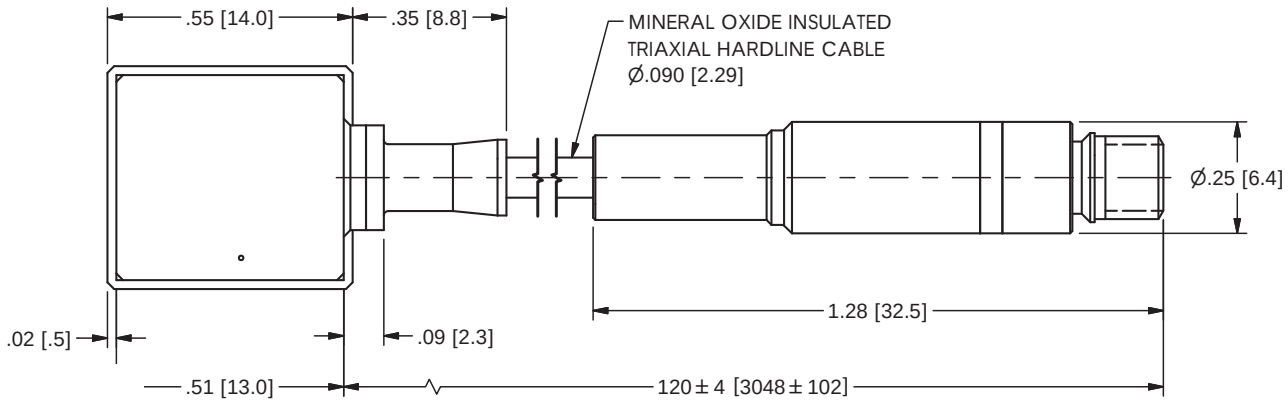
EXTREME TEMPERATURE, SINGLE-ENDED OUTPUT

Model 357M168

TECHNICAL SPECIFICATIONS	
Model Number	**357M168**
Performance	
Sensitivity (±10%)	1.15 pC/g 0.117 pC/(m/s²)
Measurement Range	±1000 g pk ±9800 m/s² pk
Frequency Range (±10%)	Up to 10 kHz
Resonant Frequency	45 kHz
Non-Linearity	≤ 5 %
Transverse Sensitivity	≤ 1 %
Environmental	
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk
Temperature Range (Operating)	-65 to +1200 °F -54 to +649 °C
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Electrical	
Output Polarity	Positive
Capacitance (Pole-to-Pole)	1000 pF
Insulation Resistance (Room Temp)	> 1 Gohm
Insulation Resistance (Max Operating Temp)	> 30 kohm
Electrical Isolation	Case Isolated

TECHNICAL SPECIFICATIONS	
Model Number	**357M168**
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	Weld tabs
Cable Length	10 ft 3m
Cable Type	MI Hardline
Cable Termination	10-32 Jack
Weight	0.35 oz 10.0 g

SENSOR CHAIN COMPONENTS		
Sensor	 357M168	
Hardline Cable	N/A	
Softline Cable	 003EBXXXEB (003A10 = 10ft | 3m)	
Charge Amplifier	 422E35, 422E36 (Non Rad Hardened)	 422E65/A, 422E66/A (Rad Hardened)



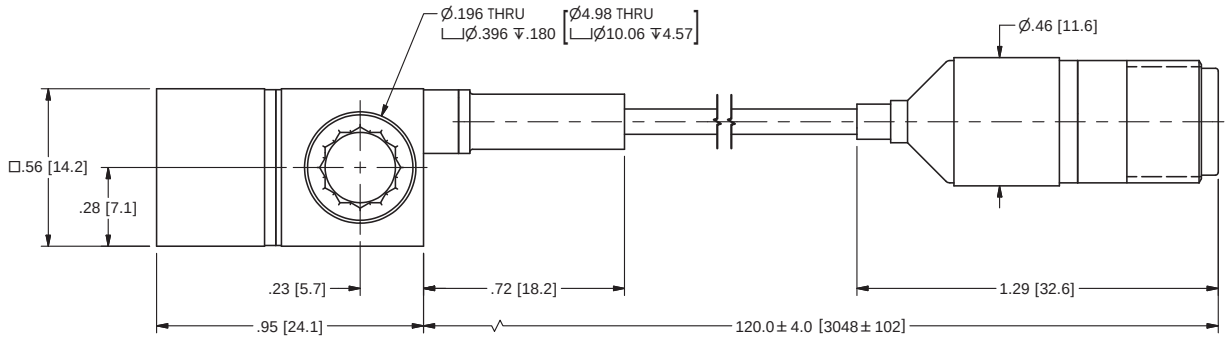
EXTREME TEMPERATURE, DIFFERENTIAL OUTPUT

Models EX357A94 & EX357A95

TECHNICAL SPECIFICATIONS		
Model Number	**EX357A94**	**EX357A95**
Performance		
Sensitivity (±10%)	3.3 pC/g 0.34 pC/(m/s²)	
Axis of Measurement (Compared to Direction of Mounting Screw)	Parallel	Perpendicular
Measurement Range	±1000 g pk ±9800 m/s² pk	
Frequency Range (±5%)	Up to 3 kHz	
Frequency Range (±1 dB)	Up to 5 kHz	
Resonant Frequency	≥ 15 kHz	
Non-Linearity	≤ 1%	
Transverse Sensitivity	≤ 5%	
Environmental		
Overload Limit (Shock)	±2000 g pk ±19600 m/s² pk	
Temperature Range (Operating)	-67 to +1200 °F -55 to +649 °C	
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad	
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²	
Hazardous Area Approval	ATEX, CSA, IECEx	
Electrical		
Output Polarity	Differential	
Capacitance	520 pF	
Insulation Resistance (Room Temp)	> 100 Mohm	
Insulation Resistance (Max Operating Temp)	≥ 10 kohm	
Electrical Isolation	Case Isolated	

TECHNICAL SPECIFICATIONS		
Model Number	**EX357A94**	**EX357A95**
Physical		
Sensing Element	UHT-12™	
Sensing Geometry	Shear	
Housing Material	Nickel Alloy	
Sealing	Hermetic	
Mounting	10-32 Through Hole (1)	
Cable Length	10 ft 3m	
Cable Type	MI Hardline	
Cable Termination	2-pin 7/16-27	
Weight (Without cable)	1.6 oz 45.0 g	

SENSOR CHAIN COMPONENTS			
Sensor	 EX357A94, EX357A95		
Hardline Cable	N/A		
Softline Cable	 045M19B	 045M21B	
Charge Amplifier	 422M182	 EX682A40	 421B3X



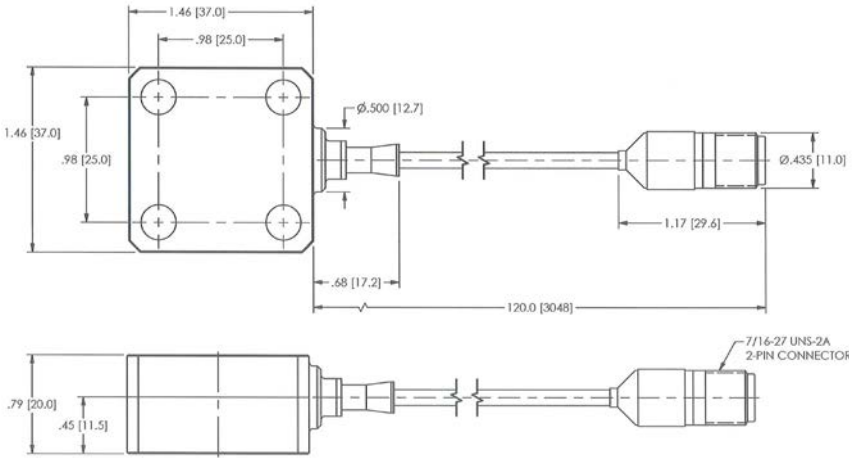
EXTREME TEMPERATURE, DIFFERENTIAL OUTPUT

Model EX611A00

TECHNICAL SPECIFICATIONS	
Model Number	**EX611A00**
Performance	
Sensitivity (±5%)	10 pC/g 1.02 pC/(m/s²)
Measurement Range	±200 g pk ±1962 m/s² pk
Frequency Range (±5%)	Up to 2.8 kHz
Frequency Range (±10%)	Up to 3.7 kHz
Resonant Frequency	> 17 kHz
Non-Linearity	≤ 1 %
Transverse Sensitivity	≤ 5 %
Environmental	
Overload Limit (Shock)	±5000 g pk ±49050 m/s² pk
Temperature Range (Operating)	-65 to +1200 °F -54 to +650 °C
Base Strain Sensitivity	0.033 g/με
Radiation Exposure Limit (Integrated Gamma Flux)	1 E8 rad
Radiation Exposure Limit (Integrated Neutron Flux)	1 E10 N/cm²
Hazardous Area Approval	ATEX, CSA, IECEx
Electrical	
Output Polarity	Differential
Capacitance (Pin to Pin)	250 pF
Capacitance (Pin to Case)	110 pF
Insulation Resistance (Pin to Case, Room Temp)	> 1 Gohm
Insulation Resistance (Pin to Pin, Room Temp)	> 1 Gohm
Electrical Isolation	Case Isolated

TECHNICAL SPECIFICATIONS	
Model Number	**EX611A00**
Physical	
Sensing Element	UHT-12™
Sensing Geometry	Shear
Housing Material	Nickel Alloy
Sealing	Hermetic
Mounting	M6 Through Hole (4)
Cable Length	10 ft 3m
Cable Type	MI Hardline
Cable Termination	2-pin 7/16-27
Weight (without cable)	6.3 oz 180.0 g

SENSOR CHAIN COMPONENTS			
Sensor	 EX611A100		
Hardline Cable	N/A		
Softline Cable	 045M19B	 045M21B	
Charge Amplifier	 422M182	 EX682A40	 421B3X



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