IMI SENSORS
A PCB DIVISION

MODELS **682C05 & (CS)649AX3**

BEARING FAULT DETECTORS

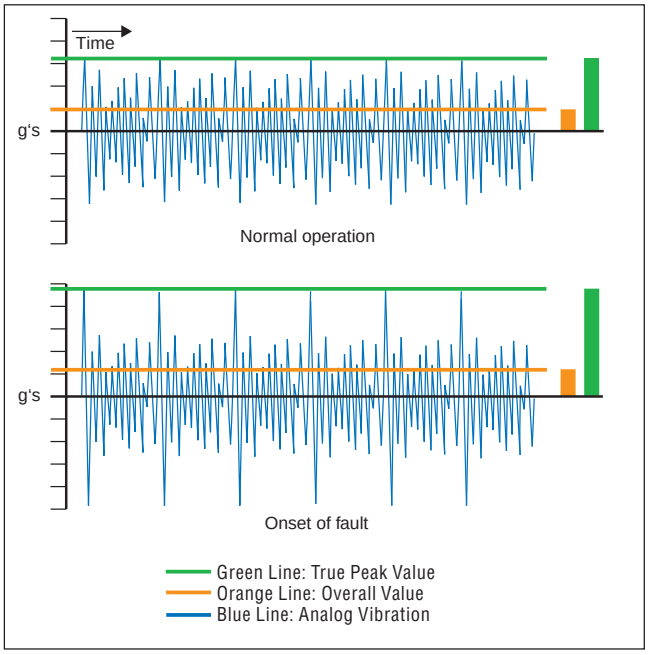
- Detects impacting associated with bearing faults, including spalling, cracking and lubrication problems
- Outputs a 4-20 mA current output signal for peak acceleration
- Operates with PLC, DCS, SCADA, alarm and control systems

TYPICAL APPLICATIONS

Bearings in:

- Motors
- Fans
- Pumps

Bearing faults create metal-to-metal impacts that manifest in vibration data as high-frequency, high-amplitude peaks. Typical vibration transmitters that utilize the RMS process cannot accurately identify these peaks. As an alternative, IMI Sensors has developed two products with a 4-20 mA output that are specifically designed to identify high-frequency, high-amplitude peaks.



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BEARING FAULT DETECTOR FUNCTIONALITY AND FEATURES

Bearing Fault Detector (Model 682C05): The Bearing Fault Detector offers three simultaneous signals- raw analog voltage output, current output proportional to overall vibration and current output proportional to true peak acceleration. The signal processing begins with a 100 mV/g VAC signal from a remotely-mounting ICP® accelerometer.

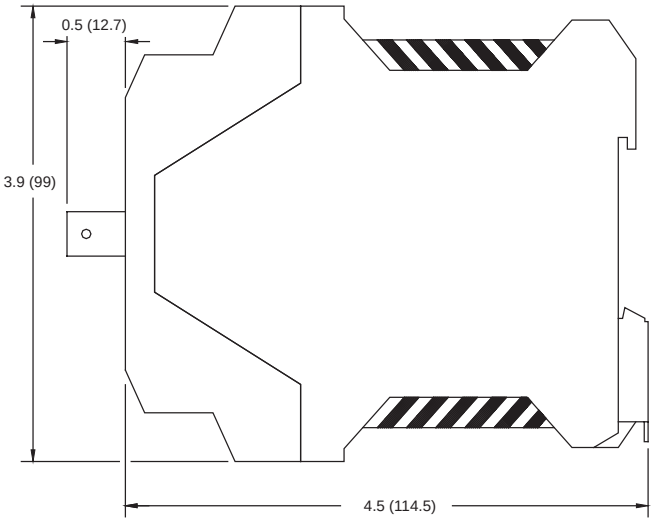
Output	Purpose	Signal Processing
0-5 VAC Analog Voltage	Spectral (FFT) analysis for fault diagnostics	VAC signal is re-transmitted through the BFD's BNC jack unprocessed
4-20 mA Current RMS/Peak Acceleration RMS/Peak Velocity	Ideal indicator of faults that occur at machine running speeds, such as imbalance, misalignment and looseness.	VAC signal is passed through a 10Hz HP filter/1 kHz LP filter and then an optional integration circuit (acceleration to velocity). A true RMS conversion circuit converts VAC to VDC and then a gain stage scales the signal to one of the field-selectable full scale measurement ranges. Lastly, the signal passes through an optional gain stage (RMS to peak) and then a VDC-to-current converter.
4-20 mA Current True Peak Acceleration	Ideal indicator of impacting or high-frequency energy bursts (ie. early-stage bearing and gear faults, such as spalling, friction and fatigue).	VAC signal is passed through 1 or 5 kHz HP filter (selectable) 100 kHz LP filter and then rectifier and sample & hold circuit to convert VAC to VDC. Highest amplitude that occurs within a 7-sec window is captured. Lastly, the signal passes through a VDC-to-current converter.

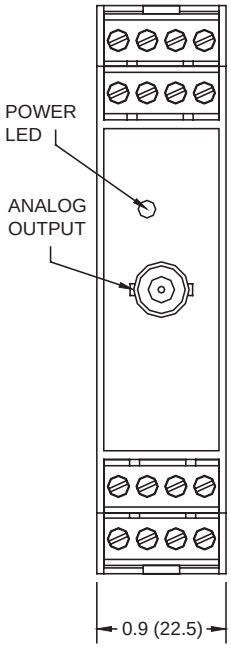
Bearing Fault Detector PLUS (Model [CS]649AX3): The Bearing Fault Detector Plus offers five non-simultaneous outputs- RMS acceleration, true peak acceleration, compensated peak acceleration, Crest Factor and Crest Factor Plus. The signal processing begins with a 100 mV/g VAC signal from an integral pellet ICP® accelerometer.

Output	Purpose	Signal Processing
4-20 mA Current RMS Acceleration	Ideal indicator of faults that occur at machine running speeds, such as imbalance, misalignment and looseness.	VAC signal is passed through: 2500Hz HP filter/ 10 kHz LP filter and then a true RMS conversion circuit to convert the VAC to VDC. A gain stage then scales the signal to the field-selectable full scale measurement range. Lastly, the signal passes through a VDC-to-current converter.
4-20 mA Current True Peak Acceleration	Ideal indicator of impacting or high-frequency energy bursts (ie. early-stage bearing and gear faults, such as spalling, friction and fatigue).	VAC signal is passed through: 250 kHz HP filter/ 10 kHz LP filter and then a rectifier and sample & hold circuit to convert the VAC to VDC. Highest amplitude that occurs within a 1-sec window is captured. Lastly, the signal passes through a VDC-to-current converter.
4-20 mA Current Compensated Peak Acceleration	Ideal indicator when user has various size/speed machinery on which they want to monitor bearings with a single alarm limit.	See True Peak Acceleration section of this table. Normalized ratio is calculated based on bearing speed and diameter. VDC converted to current. The output is a unit-less severity scale from 1 to 16.
4-20 mA Current Crest Factor	Ideal indicator for variable speed machinery because Crest Factor does not vary much at different speeds.	See RMS Acceleration and True Peak Acceleration sections of this table. Normalized ratio is calculated. VDC converted to current. The output is a unit-less severity scale from 1 to 16.
4-20 mA Current Crest Factor Plus	Ideal indicator for variable speed machinery when trending is not possible or not desired as the value will always increase over the bearing's entire life cycle as its condition worsens.	See RMS Acceleration, True Peak Acceleration and Crest Factor sections of this table. Normalized ratio is calculated. The three components are weighted differently such that the sum of the three always increases as bearing condition gets worse, even if one value decreases. VDC converted to current. The output is a unit-less severity scale from 1 to 16.

BEARING FAULT DETECTOR (MODEL 682C05)

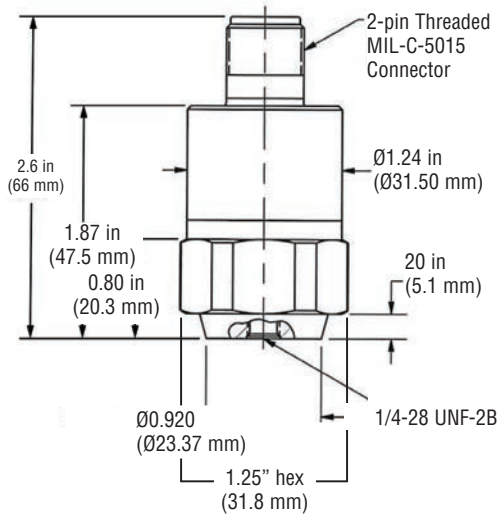
SPECIFICATIONS	
Model	**682C05**
Performance	
Channels	1
Sampling Time	7 sec
Input Signal	100 mV/g 10.2 mV/m/s²
Frequency Range (Overall Vibration)	10 to 1000 Hz
Frequency Range (True Peak Acceleration)	1 Hz to 100 kHz or 5 Hz to 100 kHz
Output Signal (AC Vibration)	100 mV/g 10.2 mV/m/s²
Output Signal (Overall Vibration)	4 to 20 mA
Output Signal (True Peak Acceleration)	4 to 20 mA
Output Range (Overall Vibration-Acceleration)	5.0, 10.0, 20.0 g pk or rms
Output Range (Overall Vibration-Velocity)	0.5, 1.0, 2.0 ips pk or rms
Output Range (True Peak Acceleration)	±50 g pk (± 491 m/s²)
Environmental	
Temperature Range	+32 to +159 °F 0 to +70 °C
Humidity Range (Non-Condensing)	<95 %
Electrical	
Power Required	24 VDC
Current Draw (Max)	150 mA
Settling Time (Max)	1 min
Excitation Voltage (To Sensor) (± 1VDC)	24 VDC
Constant Current Excitation (To Sensor) (± 1mA)	4 mA
Physical	
Housing Material	Polyamide
Status Indicator (Power On)	Green LED
DIN Rail Mount	1.38 in 35 mm
Electrical Connector-Input/Output/Power	Removable Screw Terminals
Electrical Connector-Raw, Analog Vibration Output	BNC Jack
Screw Terminal Wire Size	24-14 AWG
Weight	5.2 oz 145.2 gm





BEARING FAULT DETECTOR PLUS (MODEL CS649AX3)

SPECIFICATIONS		
Model Number	**(CS)649A03**	**(CS)649A93**
Performance		
Sampling Time	1 sec	
Output Signal	4-20 mA	
Output Range (True Peak Acceleration)	0-2 to 0-50 g	
Output Range (RMS Acceleration)	0-2 to 0-50 g	
Output Range (Crest Factor)	1 to 16	
Output Range (Crest Factor Plus)	1 to 16	
Output Range (Peak Acceleration with Correction)	1 to 16	
Peak Acceleration with Correction- Bearing Diameter	1.57 to 19.69 in 40 to 500 mm	
Peak Acceleration with Correction- Bearing Rotation Speed	600 to 4800 RPM 10 to 80 Hz	
Linearity (Loop Powered)	10%	
Environmental		
Overload Limit (Shock)	5000 g pk 49050 m/s^2 pk	
Temperature Range	-40 to 212 °F -40 to 100 °C	
Hazardous Area Approved	CSA (CS prefix only)	
Electrical		
Excitation Voltage	15 to 30 VDC	
Load Resistance	50(Vs-15) Ohm	
Electrical Isolation	>10^8 Ohm	
Physical		
Sensing Element	Piezoelectric Accelerometer	
Housing Material	Stainless Steel	
Sealing	Welded Hermetic	
Mounting Thread	1/4-28 UNF	1/4 - 18 NPT
Mounting Torque	3 to 5 ft-lb 4 to 7 Nm	
Electrical Connector	2-Pin MIL-C-5015	36 “ Flying Leads
Electrical Connector Position	Top	
Electrical Connections (Pin A)	4-20 mA Pos (+)	
Electrical Connections (Pin B)	4-20 mA Neg (-)	
Weight	5.7 oz 162 gm	7.86 oz 223 gm



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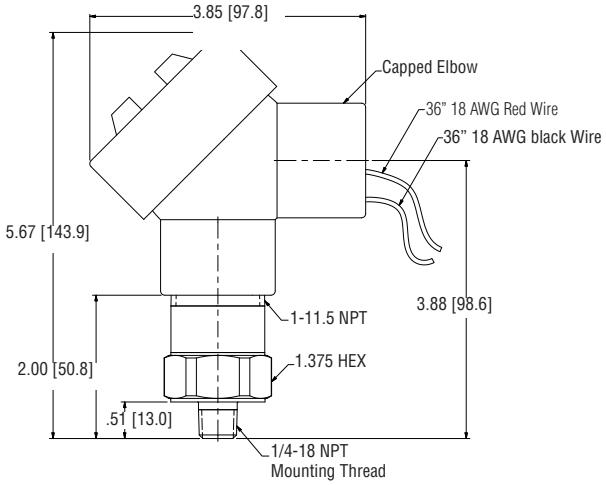

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