IMI SENSORS
A PCB DIVISION

Model 674A91

Vibration Transmitter with an IO-Link communication protocol and digital processing along with an top exit M12 connector, temperature out measured at board level

Installation and Operating Manual

For assistance with the operation of this product,
contact the PCB Piezotronics, Inc.

Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
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PCB PIEZOTRONICS
AN AMPHENOL COMPANY

General

OPERATING GUIDE

for use with

674A91 IO-Link Piezoelectric Vibration Transmitter

PCB ASSUMES NO RESPONSIBILITY FOR DAMAGE CAUSED TO THIS PRODUCT AS A RESULT OF PROCEDURES THAT ARE INCONSISTENT WITH THIS OPERATING GUIDE.

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DECRIPTION

Congratulations on the purchase of a quality PCB IO-Link Vibration Transmitter. In order to ensure the highest level of performance for this product, it is imperative that you properly familiarize yourself with the correct mounting and installation techniques before attempting to operate this device. If, after reading this manual, you have any additional questions concerning this sensor or its application, feel free to call an Application Engineer at 716-684-0001 or the closest PCB representative.

The 674A91 Industrial IO-Link Digital Output Sensor combines the capabilities of a piezoelectric vibration sensor and a typical 4-20mA vibration transmitter. The sensor communicates via IO-Link digital interface and the parameters measured are proportional to vibration data that includes RMS Acceleration, True Peak Acceleration, RMS Velocity, Peak Velocity and Crest Factor. In addition to the vibration data, the unit also transmits the relative temperature of the sensor. Typical applications are monitoring fans, ventilators, electric motors, pumps, centrifuges, separators, generators, turbines, and similar oscillating mechanical systems.

The vibration sensor is used exclusively for measuring mechanical vibrations on machines and mechanical systems. Use is only permitted within the specifications stated in the datasheet.

The vibration sensor provides the data obtained as process data via the IO-Link interface in accordance with the "IO Link Consortium" standard. The vibration sensor is to be integrated into an IO-Link network and should be used only in this way.

SAFETY INSTRUCTIONS

The relevant national or international directives and the instruction manual for the product must be followed. Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. It is imperative to the protection of operating personnel and the plant that the device is operated in accordance with its intended use.

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator. Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product.
These personnel must have read and understood the instruction manual and the further documentation. Prior to using the product make yourself familiar with it. Read the document carefully.

SENSOR LOCATION

Characteristics like location, ruggedness, amplitude range, accessibility, temperature, and portability are extremely critical.

For optimum performance and measurement find a rigid location on the machine casing that most accurately represents the vibration of the rotor, bearing, fan, etc. to be measured.

INSTALLATION-MECHANICAL

When choosing a mounting method, consider closely both the advantages and disadvantages of each technique. However, the most important and often overlooked consideration is the effect the mounting technique has on the high-frequency performance of the Vibration Transmitter.

Shown hereafter are six possible mounting techniques and their effects on the performance of a typical piezoelectric Vibration Transmitter. The mounting configurations and corresponding graph demonstrate how the high-frequency response of the Vibration Transmitter may be compromised as mass is added to the system and/or the mounting stiffness is reduced.

Note: *The low-frequency response is unaffected by the mounting technique, except in the Hand Probe. That is governed by the sensor electronics.*

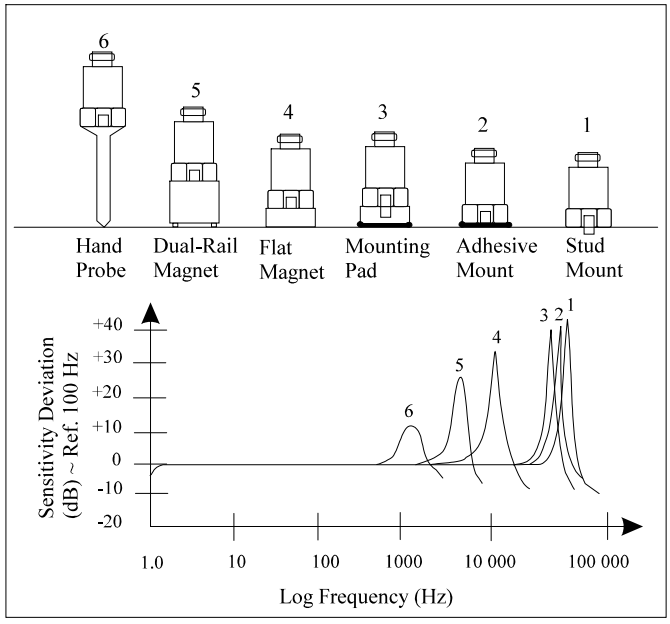


Figure 1. Assorted Mounting Configurations and Their Effects on High Frequency

STUD MOUNT
This mounting technique requires smooth, flat contact surfaces for proper operation and is recommended for permanent and/or secure installations. Stud mounting is also recommended when testing at high frequencies.

Note: *Do NOT attempt mounting on curved, rough, or uneven surfaces, as the potential for misalignment and limited contact surface may significantly reduce the sensor's upper operating frequency range.*

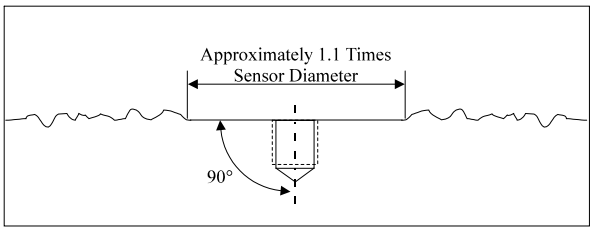


Figure 2. Mounting Surface Preparation

STEP 1: First, prepare a smooth, flat mounting surface, then drill and tap a mounting hole in the center of this area as shown in Figure 2 and if applicable in accordance with the **Installation Drawing** for the specific sensor that is being mounted**.**

A precision-machined mounting surface with a minimum finish of 63 μin (0.00016 mm) is recommended. (If it is not possible to properly prepare the test structure mounting surface, consider adhesive mounting as a possible alternative.) Inspect the area, checking that there are no burrs or other foreign particles interfering with the contact surface.

STEP 2: Wipe clean the mounting surface and spread on a light film of grease, oil, or similar coupling fluid prior to installation.

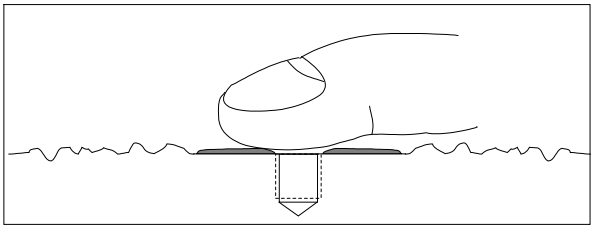


Figure 3. Mounting Surface Lubrication

Adding a coupling fluid improves vibration transmissibility by filling small voids in the mounting surface and increasing the mounting stiffness. For semi-permanent mounting, substitute epoxy or another type of adhesive.

STEP 3: Screw the mounting stud into the base of the accelerometer and hand-tighten. Then, screw the sensor/stud assembly into the prepared tapped hole and tighten to the recommended mounting torque as indicated on the specification sheet or if supplied the installation drawing.

Note: *It is important to use a torque wrench during this step. Under-torquing the sensor may not adequately couple the device; over-torquing may result in stud failure.*

ADHESIVE MOUNT
Adhesive mounting is often used for temporary installation or when the test object surface cannot be adequately prepared for stud mounting. Adhesives like hot glue and wax work well for temporary mounts; two- part epoxies and quick-bonding gels provide a more permanent mount.

Note: *Adhesively mounted sensors often exhibit a reduction in high-frequency range. Generally, smooth surfaces and stiff adhesives provide the best frequency response.*

METHOD 1 - Adhesive Mounting Base
This method involves attaching a base to the test structure, then securing the sensor to the base. This allows for easy removal of the Vibration Transmitter.

STEP 1: Prepare a smooth, flat mounting surface. A minimum surface finish of 63 μin (0.00016 mm) generally works best.

STEP 2: Stud-mount the sensor to the appropriate adhesive mounting base according to the guidelines set forth in **STEPS 2** and **3** of the Stud Mount Procedure.

STEP 3: Place a small portion of adhesive on the underside of the mounting base. Firmly press down on the assembly to displace any extra adhesive remaining under the base.

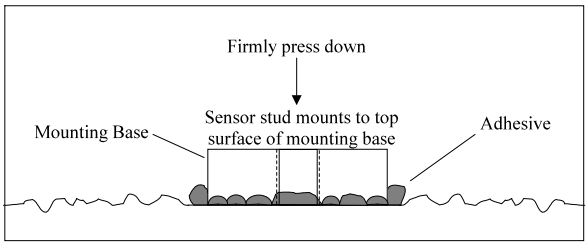


Figure 4. Mounting Base: Adhesive Installation

METHOD 2 - Direct Adhesive Mount
For restrictions of space or for convenience, the Vibration Transmitter can be adhesive-mounted directly to the test structure.

STEP 1: Prepare a smooth, flat mounting surface. A minimum surface finish of 63 μin (0.00016 mm) generally works best.

STEP 2: Place a small portion of adhesive on the underside of the sensor. Firmly press down on the top of the assembly to displace any adhesive.

Note: Be aware that excessive amounts of adhesive and/or type of adhesive can make sensor removal difficult or impossible.

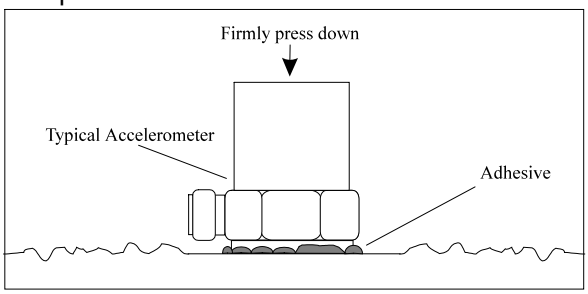


Figure 5. Direct Adhesive Mounting

MAGNETIC MOUNT
Magnetic mounting provides a convenient means for making portable measurements and is commonly used for machinery monitoring and other portable or tending applications.

Note: The correct magnet choice and an adequately prepared mounting surface is critical for obtaining reliable measurements, especially at high frequencies. Poor installations can cause as much as a 50% drop in the sensor frequency range.

Not every magnet is suitable for all applications. For example, rare earth magnets are commonly used because of their high strength. Flat magnets work well on smooth, flat surfaces, while dual-rail magnets are required for curved surfaces. In the case of non-magnetic or rough surfaces, it is recommended that the user first weld, epoxy or otherwise adhere a steel mounting pad to the test surface. This provides a smooth and repeatable location for mounting.

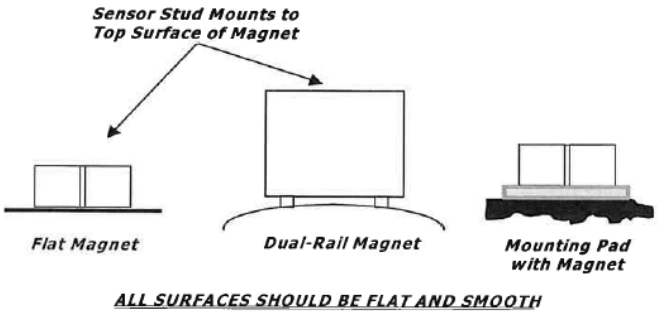


Figure 6. Magnet Mounting Types

STEP 1: After choosing the correct magnet type, inspect the unit, verifying that the mounting surfaces are flat and smooth.

STEP 2: Prepare a smooth, flat mounting surface. A minimum surface finish of 63 µin [0.0016 mm] generally works best. After cleaning the surface and checking for burrs, wipe on a light film of silicone grease, machine oil or similar-type coupling fluid.

STEP 3: Stud-mount the accelerometer to the appropriate magnet according to the guidelines set forth in the Standard Stud Mount Procedure.

STEP 4: Mount the magnet/sensor assembly to the prepared test surface by gently ‘rocking” or “sliding” it into place.

Note: Magnetically mounting accelerometers carelessly has the potential to generate very high (and very damaging) g levels. To prevent damage, install the assembly gently. If unsure, please contact the factory for assistance.

HANDHELD OR PROBE TIP MOUNT
This method is NOT recommended for most applications. It is generally used only for machinery monitoring and other portable trending applications. Both the accuracy and repeatability at low (<5 Hz) and high frequency (>1 kHz) ranges are questionable.

INSTALLATION-ELECTRICAL
The unit must be connected by a qualified electrician. The national and international regulations for the installation of electrical equipment must be adhered to.

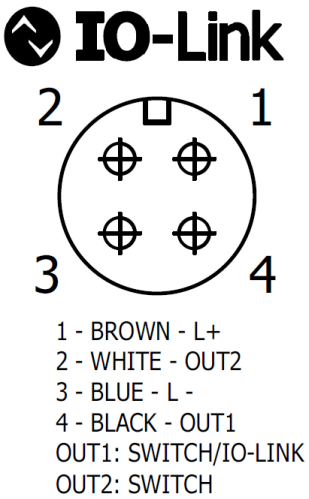


Figure 7. Connector/Integral Cable Wiring

An M12 unshielded cable can be used in most applications. If issues do arise, it is recommended that a shielded M12 cable assembly be used (with the shield connected to earth ground) especially in a very noisy electrical environment.

IO-Link FUNCTIONALITY

This sensor uses an IO-Link communications interface to deliver continuous process data and diagnostic data of the sensor. IO-Link is a standardized worldwide (IEC 61131-9) for direct communication with sensors and devices that have embedded IO-Link software.
This sensor meets standards for IO-Link system and interface 1.1 (V.1.1.3) Compliance IO-Link 1.1. Version 1.1.3

Configuration

IO-Link sensors can be configured and parameterized using an IO-Link configuration tool and an IO-Link Master. Switching outputs can be configured to turn logic level devices on and off. IO-Link data is integrated into an application program using standard function blocks.
The IODDs necessary for the configuration of the unit, process data structure, diagnostic information, and data parameters can be found at www.pcb.com.

UNITS

Acceleration Unit

There are three choices for acceleration unit
- g: gravitational unit, 1g=32.2ft/sec^2 or 9.81m/sec^2.
- m/sec^2: meters per second squared
- mg: gravitational unit, 1mg=0.0322ft/sec^2

Velocity Unit

There are three choices for velocity unit
- in/s: inches per second
- m/s: meters per second
- mm/s: millimeter per second

Temperature Unit

There are two choices for temperature unit
- °F: Fahrenheit
- °C: Celsius

MEASUREMENTS

Velocity - RMS

Velocity RMS is the measurement of fatigue related defects. It is used to identify issues that are related to unbalance, misalignment, looseness or other types of faults that can occur within the frequency range of the machine being monitored. It is best suited in the medium frequency range of vibration, 10Hz to 1000Hz.

Acceleration-RMS

Acceleration RMS is used to analyze force related defects that occur at higher frequency. It is commonly used to identify issues that are related to bearings, gear mesh or electrical faults.

Velocity Peak

Velocity Peak is the calculated value from Velocity RMS. This value equals 1.414 x Velocity RMS.

True Acceleration Peak

True Acceleration Peak displays the maximum peak real time value of the acceleration signal. Shocks in the acceleration can occur once or periodically from an impact or similar especially during bearing failures. The True Peak Acceleration value starts increasing during early stage bearing failures and is most sensitivity during the middle stage of failure. The use of true Acceleration Peak is a valuable tool in analyzing early bearing defects.

Crest factor

The crest factor is the unitless calculated value of Acceleration(pk) divided by Acceleration(RMS). It is very useful measurement in trending bearing condition over time. As a bearing starts to degrade, the Peak Acceleration increases while the RMS acceleration remains relatively stable. Trending the Crest Factor is a good way to predict the onset of bearing issues so that maintenance can be scheduled before machine damage could occur.
Note: If the RMS acceleration measures at or below 0.008gs (0.08m/s^2), the Crest Factor will return a 0. This is to minimize false alarms when the monitored equipment has been turned off and very low vibration is present. The unit will still measure the True Peak Acceleration and RMS acceleration if the user still wishes to trend the values.

Temperature

The returned value is the measurement of the internal temperature of the sensor including effects from the ambient environment. This would include air temperature and mounting surface temperature. The system compensates for internal heating caused by the internal circuit and the value returned is a relative measurement of the surrounding area. For the sensor to reach a stable equilibrium between the internal temperature and ambient environment, please allow at least 30 minutes in a steady state or slow changing temperature. This will guarantee a returned value closer to the actual ambient temperature.
The resolution of the temperature value is ~1.5°C (~2.7°F). Therefore you will see numbers change 1-3 degrees depending on temperature and units displayed.

FILTERS

The 674A91 incorporates 2 filters that are user selectable

DC Filter

This is an analog 1 pole high pass filter that can be either set to 1Hz or 10Hz.
- Use the 1Hz selection on slow speed machinery. This will help to measure the low frequency signals more accurately. Please note that this can cause the velocity values to vary more due to the analog integration in the unit. If using this and the values are changing more than desired, average several samples together to stabilize the measurement.

- Use the 10Hz for medium to high speed machinery. Normally these applications have minimal vibration energy below 10Hz and it will help in reading much more stable and repeatable values.

High Pass Filter

This selection uses an 8 pole digital high pass filter in conjunction with the Acceleration measurements. This setting will have no impact on the Velocity measurements.

- None: In this setting, the acceleration measurements are calculated from the DC High Pass filter setting up to 10kHz. This is useful in measurements other than bearing faults.
- 1kHz: This setting adds a 1kHz high pass filter for the acceleration and crest factor calculation. This setting can pick up some lubrication and cavitation issues that sometimes occur in the 2-3kHz range in addition to bearing faults that occur beyond 5kHz.
- 5kHz: This setting adds a 5kHz high pass filter for the acceleration and crest factor calculation. This setting is useful if measuring for bearing impacting issues. This includes a spall, crack, inner race fault, outer race fault etc…

OUTPUTS

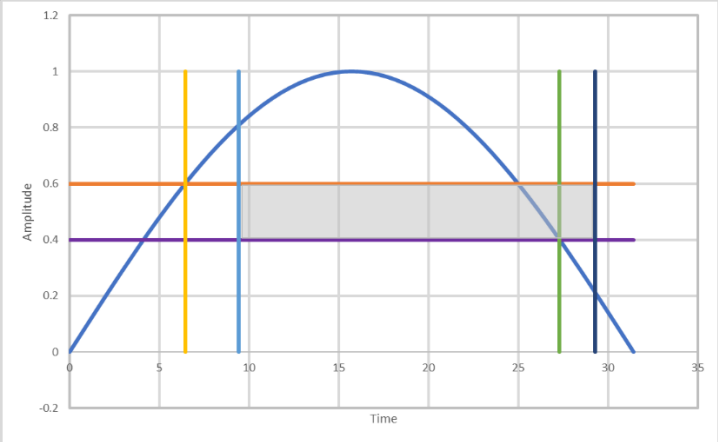
In addition to the Io-Link digital communication, the 674A91 can have up to two additional logic level outputs as shown in Figure 6, Out 1 and Out 2. In normal Io-Link operation, only Out 2 is available since Out 1 is the Io-Link communication line. To use both outputs, the unit requires power and ground but no communication can occur.

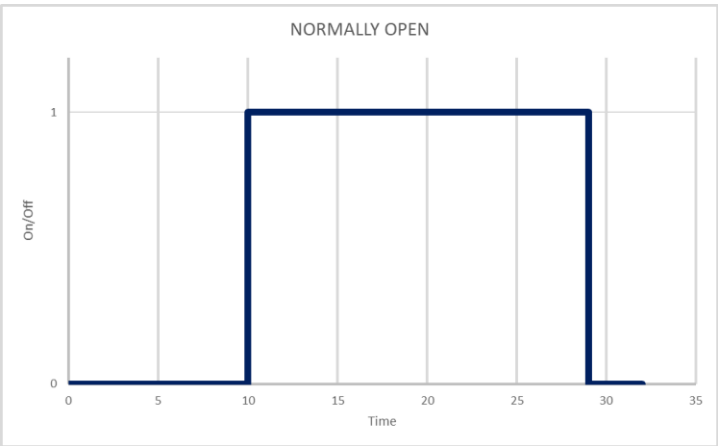
The configuration for both Output 1 and Output 2 are identical with the following generic settings/adjustments.

OUTPUT LOGIC CONTROL

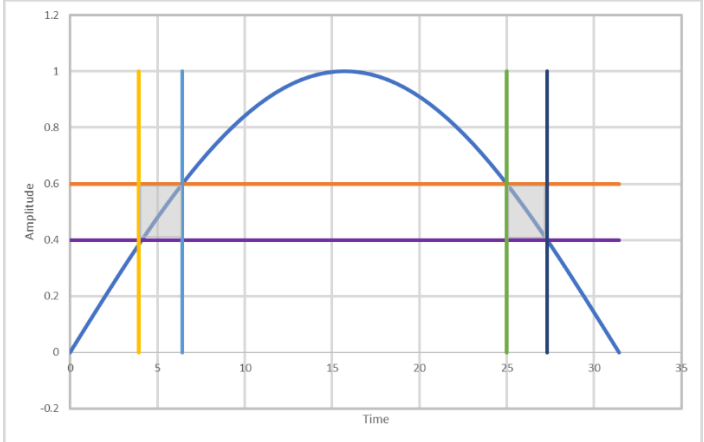
- Hysteresis normally open
- Hysteresis normally closed
- Window normally open
- Window normally closed
- Output Off

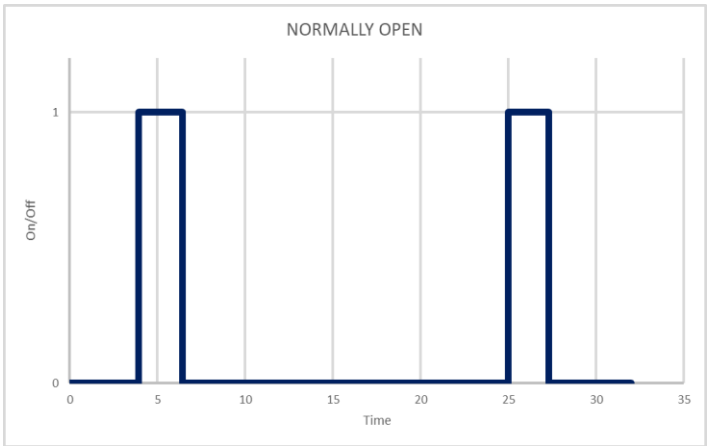
Hysteresis (Normally Open/Normally Closed)
Example:
Switch Point = 0.6 (Any unit)
Reset Point =0.4 (Any unit)
Set Delay=3 seconds
Reset Delay=2 seconds





Window (Normally Open/Normally Closed)
Example:
Window High Point = 0.6 (Any unit)
Window Low Point =0.4 (Any unit)
Set Delay=0 seconds
Reset Delay=0 seconds





SWITCH TYPE

The Out 1 and Out 2 can be configured Active High or Active low.

- Active High: This is used to drive an output using the hardware pin.
  Note, maximum current is 125mA at 24VDC.
- Active Low: This is used to sink an input using the hardware pin.
  Note, maximum current is 125mA at 24VDC.

SELECT MEASUREMENT

Any of the measured values can be used to trigger the Out 1 and Out 2 pins and variables.

- RMS Velocity
- Peak Velocity
- RMS acceleration
- Peak Acceleration
- Crest Factor
- Temperature

RMS Velocity

Switch Point Range:	0.079ips to 2.12ips 2mm/s to 53.9mm/s
Reset Point Range:	0ips to 2.087ips 0mm/s to 53.0mm/s

Peak Velocity

Switch Point Range:	0.079ips to 3.00ips 2mm/s to 76.20mm/s
Reset Point Range:	0ips to 2.957ips 0mm/s to 75.1mm/s

RMS Acceleration

Switch Point Range:	0.204g to 35.372g 2m/s^2 to 346.9m/s^2
Reset Point Range:	0g to 35.228g 0m/s^2 to 345.5m/s^2

Peak Acceleration

Switch Point Range:	0.204g to 50.014g 2m/s^2 to 490.5m/s^2
Reset Point Range:	0g to 49.810g 0m/s^2 to 488.5m/s^2

Crest Factor

Switch Point Range:	2 to 50
Reset Point Range:	0 to 49

Temperature

Switch Point Range:	-36.4°F to 185°F -38°C to 85°C
Reset Point Range:	-40°F to 181.4°F -40°C to 83°C

DELAYS

The 674A91 has various time delays that are used to determine the state of Out1 and Out2.

Start Up Delay

This timer is used on power up to disable the Out1 and Out2 from being activated. The time came be set from 0 seconds (No start up delay) to 60 seconds. The intent of this delay is in case the monitored equipment is going thru a resonance/high vibration while it is ramping up in speed and the user does not want the unit to alarm until after it reaches a steady state.

Set Delay/Reset Delay

These delays are used to determine when to switch on/off the Out1 and Out2 parameters and hardware lines. The functionality of these delays are shown in the OUTPUT LOGIC CONTROL section of this manual.

FAULT

Fault Out 1 and Fault Out 2 can be used in addition to the vibration parameters or temperature to switch Out1 and Out2. In the Off state, a fault will not have any effect on the Out1 and Out2 state. In the On state, if a fault is detected, the unit will switch Out1, Out 2 or both (depending on settings) regardless of the Vibration or Temperature readings.

Some examples of a fault are:

- Transceiver errors
- Flash Memory errors
- Initialization of peripheral devices errors

DEVICE STATUS / ERROR COUNT

As in FAULT above, if a malfunction is detected, the Device Status will give a fault condition. The issue(s) that caused the Device Status be Not Ok, will be shown in the Detailed Device Status registers(1-4).

If a Device Status fault is detected, the Error Count register will increase by 1 to signify how many have occurred.

OPERATING HOURS

This is a running timer that accumulates the total number of hours that the unit has been on. To reset back to zero, please use the Reset ParSet Operate.

SYSTEM COMMANDS

Application Reset

Set to default all device parameters except identification tags (strings)

Back-to-Box

Set to default all device parameters and turn off device communication until next power up

Start Self-Test

Auto check of the sensor driver

Self-Test Result

Result of the driver test. Can be 0 which means error occurred or 7 for device driver working ok

CALIBRATION

Accelerometer calibration provides, with a definable degree of accuracy, the necessary link between the physical quantity being measured and the electrical signal generated by the sensor. In addition, other useful information concerning operational limits, physical parameters, electrical characteristics, or environmental influences may also be determined. Without this link, analyzing data becomes a nearly impossible task. PCB provides a calibration record that documents the exact characteristics of each sensor. (The type and amount of data varies depending on the sensor type, contractual regulations, and other special requirements.)

Under normal operating conditions, piezoelectric sensors are extremely stable, and their calibrated performance characteristics do not change over time. However, harsh environments or other unusual conditions that cause the sensor to experience dynamic phenomena outside of its specified operating range may temporarily or permanently affect the sensor.

For these reasons, it is recommended that a recalibration cycle be established for each accelerometer. This schedule is unique and is based on a variety of factors, such as extent of use, environmental conditions, accuracy requirements, trend information obtained from previous calibration records, contractual regulations, frequency of "cross-checking" against other equipment, manufacturer recommendation, and any risk associated with incorrect readings. International standards, such as ISO 10012-1, provide insight and suggested methods for determining recalibration intervals for most measuring equipment.

Note: *It is good measurement practice to verify the performance of each accelerometer with a Handheld Shaker or other calibration device before and after each measurement. The PCB Model 394C06 Handheld Shaker operates at a fixed frequency and known amplitude (1.0 g) to provide a quick check of sensor sensitivity.*

Accelerometer recalibration services are typically performed by PCB's internal metrology laboratory. (Other international and private laboratories are also available.) The PCB laboratory is certified to ISO 9001, accredited by A2LA to ISO 17025, complies with ISO 10012-1 (and former MIL-STD-45662A), and uses equipment directly traceable to N.I.S.T. This assures an accurate calibration of relevant specifications.

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IMI SENSORS
A PCB DIVISION

IO-LINK PARAMETER DATASHEET

- IMI Vibration Sensor
- Piezo Vibration Transmitter

GENERAL INFORMATION

DEVICE IDENTIFICATION	
Vendor ID	1666 (0x0682)
Device ID	1 (0x000001)

COMMUNICATION CHARACTERISTICS	
Data storage	
IO-Link revision	V1.1 (specification V1.1.3)
Data transmission rate	COM3 (230,4 kbit/s)
Min. cycle time	12 ms
Process data input	24 byte
Process data output	n/a

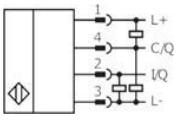
FEATURES	
Data storage	Yes
Block parameterization	Yes

DEVICE PROFILE	
Firmware Update	49 (0x0031)
Identification and Diagnosis	16384 (0x4000)

SUPPORTED PRODUCT VARIANTS

Product ID	Product Name	Description	Connector
674A91	Piezo Vibration Transmitter with IO-Link protocol	Vibration Sensor, 1 ... 10000 Hz, Vibration velocity (rms) + Vibration acceleration (rms) + Vibration acceleration (peak) + Vibration velocity (peak) + temperature (°C, °F) + Vibration acceleration (crest factor),	Plug, M12, 4-pole

SUPPORTED PRODUCT VARIANTS

Connection Diagram	Description
	Piezo Vibration Transmitter with IO-Link protocol

PROCESS DATA

PROCESS DATA INPUT							
Sub	**Name**	**Data type**	**Length**	**Bitoffs.**	**Value**	**Unit**	**Description**
.1	Measurement Value Velocity Peak - vPeak	Float32	32 bit	160	32760 = Over Level 32764 = NoData 0..76.2	mm/s	Indicates the current velocity peak measurement value of measurement data channel 1 - vPeak.
.2	Measurement Value Velocity RMS - vRMS	Float32	32 bit	128	32760 = Over Level 32764 = NoData 0..53.9	mm/s	Indicates the current velocity RMS measurement value of measurement data channel 1 - vRMS.
.3	Measurement Value Acceleration Peak - aPeak	Float32	32 bit	96	32760 = Over Level 32764 = NoData 0..50.014	g	Indicates the current acceleration peak measurement value of measurement data channel 2 - aPeak.
.4	Measurement Value Acceleration RMS - aRMS	Float32	32 bit	64	32760 = Over Level 32764 = NoData 0..36.372	g	Indicates the current acceleration RMS measurement value of measurement data channel 2 - aRMS.
.5	Measurement Value Crest Factor - CF	Float32	32 bit	32	-32760 = Under Level, 32760 = No Data 0..50		Indicates the current measurement value of crest factor calculated from acceleration
.6	Measurement Value Temperature	Integer	16 bit	16	-32760 = No data 32760 = Out of range -40..85	°C	Indicates the current measurement value of tempera- ture
.7	Device Status	UInteger	8 bit	8	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure		Current device status, a copy of the parameter [Device Status, Index 36] in the process data channel
.8	Output 1	Boolean	1 bit	1	false = Off, true = On		Current status of the digital signal [Output 1]
.9	Output 2	Boolean	1 bit	0	false = Off, true = On		Current status of the digital signal [Output 2]
NOTE: The process data input content can be accessed in addition over parameter ‘Process Data Input’ at index 40 (0x28)							

PARAMETER DATA

IDENTIFICATION								
Index	**Parameter**	**Access**	**Data type**	**Length**	**Default**	**Description**	**DS**	**R**
16 (0x10)	Vendor Name	ro	String	max. 64 byte	PCB Piezotronics, Inc.	The vendor name that is assigned to a Vendor ID.		
17 (0x11)	Vendor Text	ro	String	max. 64 byte	www.pcb.com	Additional information about the vendor.		
18 (0x12)	Product Name	ro	String	max. 64 byte	Piezo Vibration Transmitter	Complete product name.		
19 (0x13)	Product ID	ro	String	max. 64 byte	674A91	Vendor-specific product or type identification (e.g., item number or model number).		
20 (0x14)	Product Text	ro	String	max. 64 byte	Condition Monitoring Sensor	Additional product information for the device.		
21 (0x15)	Serial Number	ro	String	max. 16 byte	(16 octets)	Unique, vendor-specific identifier of the individual device.		
22 (0x16)	Hardware Revision	ro	String	3 byte		Unique, vendor-specific identifier of the hardware revision of the individual device.		
23 (0x17)	Firmware Revision	ro	String	15 byte		Unique, vendor-specific identifier of the firmware revision of the individual device.		
24 (0x18)	Application Specific Tag	rw	String	max. 32 byte	***	Possibility to mark a device with user- or applica-tion-specific information.	Y	B
25 (0x19)	Function Tag	rw	String	max. 32 byte	***	Possibility to mark a device with function-specific information.	Y	B
26 (0x1A)	Location Tag	rw	String	max. 32 byte	***	Possibility to mark a device with location-specific information.	Y	B

DIAGNOSIS											
Index .sub	**Parameter**	**Access**	**Data type**	**Length**	**Bitoffs.**	**Default**	**Value**	**Unit**	**Description**	**DS**	**R**
32 (0x20)	Error Count	ro	UInteger	16 bit			0..65535		Count of errors occurred		B A
36 (0x24)	Device Status	ro	UInteger	8 bit			0 1 2 3 4		Indicator for the current device condition and diagnosis state Device is OK Maintenance required Out of Specification Functional check Failure		
37 (0x25)	Detailed Device Status	ro	Array	12 byte					List of all currently pending events in the device.		B A
0.1	Element 1		Octetstr	3 byte	72						B A
0.2	Element 2		Octetstr	3 byte	48						B A
0.3	Element 3		Octetstr	3 byte	24						B A
0.4	Element 4		Octetstr	3 byte	0						B A
74 (0x4A)	Temperature	ro	Integer	16 bit		0	-40..85	°C	Device temperature		
75 (0x4B)	Operating Hours	rw	Integer	32 bit		0	0..2147482888	h	Shows the overall hours of operation since initial commissioning.		

PARAMETERIZATION & CONFIGURATION

Index	Parameter	Access	Data type	Length	Default	Value	Unit	Description	DS	R
500 (0x1f4)	Switch Type	rw	UInteger	8 bit	0	0 = Active High 1 = Active Low		Defines the outputs active state	Y	B A
520 (0x208)	Selected measurement 1	rw	UInteger	8 bit	0	0 = RMS Velocity 1 = Peak Velocity 2 = Peak Acceleration 3 = RMS Acceleration 4 = Crest Factor 5 = Temperature		Defines measurement used to control output 1	Y	B A
521 (0x209)	Selected measurement 2	rw	UInteger	8 bit	0	0 = RMS Velocity 1 = Peak Velocity 2 = Peak Acceleration 3 = RMS Acceleration 4 = Crest Factor 5 = Temperature		Defines measurement used to control output 2	Y	B A
531 (0x213)	Fault out 1	rw	UInteger	8 bit	2	1 = On 2 = OFF		Defines output 1 behavior in case of error	Y	B A
532 (0x214)	Fault out 2	rw	UInteger	8 bit	2	1 = On 2 = OFF		Defines output 2 behavior in case of error	Y	B A
573 (0x23d)	Output 1	rw	UInteger	8 bit	1	0 = Hno / Hysteresis normally open 1 = Hnc / Hysteresis normally closed 2 = Wno / Window normally open 3 = Wnc / Window normally closed 4 = OFF / Output Off		Defines output 1 control function	Y	B A
574 (0x23e)	Set delay 1	rw	UInteger	16 bit	0	0..500	0,1 s	Defines delay in seconds before output 1 set	Y	B A
575 (0x23f)	Reset delay 1	rw	UInteger	16 bit	0	0..500	0,1 s	Defines delay in seconds before output 1 reset	Y	B A
576 (0x240)	Switch point 1 - Vel-Peak	rw	Float32	32 bit	4.5	2..76.20	1 mm/s	Defines the output 1 switch point value for velocity peak	Y	B A
577 (0x241)	Reset point 1 - Vel-Peak	rw	Float32	32 bit	4.3	0..75.1	1 mm/s	Defines the output 1 reset point value for velocity peak	Y	B A
578 (0x242)	Switch point 1 - Vel-RMS	rw	Float32	32 bit	4.5	2..53.9	1 mm/s	Defines the output 1 switch point value for velocity RMS	Y	B A
579 (0x243)	Reset point 1 - Vel-RMS	rw	Float32	32 bit	4.3	0..53.0	1 mm/s	Defines the output 1 reset point value for velocity RMS	Y	B A
580 (0x244)	Switch point 1 - Accel-Peak	rw	Float32	32 bit	19.6	2..490.5	1 m/s^2	Defines the output 1 switch point value for acceleration peak	Y	B A
581 (0x245)	Reset point 1 - Accel-Peak	rw	Float32	32 bit	17.6	0..488.5	1 m/s^2	Defines the output 1 reset point value for acceleration peak	Y	B A
582 (0x246)	Switch point 1 - Accel-RMS	rw	Float32	32 bit	9.8	2..346.9	1 m/s^2	Defines the output 1 switch point value for acceleration RMS	Y	B A
583 (0x247)	Reset point 1 - Accel-RMS	rw	Float32	32 bit	7.8	0..345.5	1 m/s^2	Defines the output 1 reset point value for acceleration RMS	Y	B A
584 (0x248)	Switch point 1 - Crest	rw	Float32	32 bit	5	2..50		Defines the output 1 switch point value for acceleration crest factor	Y	B A
585 (0x249)	Reset point 1 - Crest	rw	Float32	32 bit	4	0..49		Defines the output 1 reset point value for acceleration crest factor	Y	B A

PARAMETERIZATION & CONFIGURATION										
586 (0x24a)	Switch point 1 - Temperature	rw	Integer	16 bit	65	-38..85	1 °C	Defines the output 1 switch point value for temperature	Y	B A
587 (0x24b)	Reset point 1 - Temperature	rw	Integer	16 bit	5	-40..83	1 °C	Defines the output 1 reset point value for temperature	Y	B A
588 (0x24c)	Output 2	rw	UInteger	8 bit	1	0 = Hno / Hysteresis normally open 1 = Hnc / Hysteresis normally closed 2 = Wno / Window normally open 3 = Wnc / Window normally closed 4 = OFF / Output Off		Defines output 2 control function	Y	B A
589 (0x24d)	Set delay 2	rw	UInteger	16 bit	0	0..500	0,1 s	Defines delay in seconds before output 2 set	Y	B A
590 (0x24e)	Reset delay 2	rw	UInteger	16 bit	0	0..500	0,1 s	Defines delay in seconds before output 2 reset	Y	B A
591 (0x24f)	Switch point 2 - Vel-Peak	rw	Float32	32 bit	4.5	2..76.20	1 mm/s	Defines the output 2 switch point value for velocity peak	Y	B A
592 (0x250)	Reset point 2 - Vel-Peak	rw	Float32	32 bit	4.3	0..75.1	1 mm/s	Defines the output 2 reset point value for velocity peak	Y	B A
593 (0x251)	Switch point 2 - Vel-RMS	rw	Float32	32 bit	7.1	2..53.9	1 mm/s	Defines the output 2 switch point value for velocity RMS	Y	B A
594 (0x252)	Reset point 2 - Vel-RMS	rw	Float32	32 bit	6.9	0..53.0	1 mm/s	Defines the output 2 reset point value for velocity RMS	Y	B A
595 (0x253)	Switch point 2 - Accel-Peak	rw	Float32	32 bit	29.4	2..490.5	1 m/s^2	Defines the output 2 switch point value for acceleration peak	Y	B A
596 (0x254)	Reset point 2 - Accel-Peak	rw	Float32	32 bit	27.4	0..488.5	1 m/s^2	Defines the output 2 reset point value for acceleration peak	Y	B A
597 (0x255)	Switch point 2 - Accel-RMS	rw	Float32	32 bit	19.6	2..346.9	1 m/s^2	Defines the output 2 switch point value for acceleration RMS	Y	B A
598 (0x256)	Reset point 2 - Accel-RMS	rw	Float32	32 bit	17.6	0..345.5	1 m/s^2	Defines the output 2 reset point value for acceleration RMS	Y	B A
599 (0x257)	Switch point 2 - Crest	rw	Float32	32 bit	7	2..50		Defines the output 2 switch point value for acceleration crest factor	Y	B A
600 (0x258)	Reset point 2 - Crest	rw	Float32	32 bit	6	0..49		Defines the output 2 reset point value for acceleration crest factor	Y	B A
601 (0x259)	Switch point 2 - Temperature	rw	Integer	16 bit	55	-38..85	1 °C	Defines the output 2 switch point value for temperature	Y	B A
602 (0x25a)	Reset point 2 - Temperature	rw	Integer	16 bit	0	-40..83	1 °C	Defines the output 2 reset point value for temperature	Y	B A
841 (0x349)	Acceleration unit	rw	UInteger	8 bit	1	0 = m/s^2 1 = g 2 = mg		Defines units for acceleration observation	Y	B A
842 (0x34a)	Velocity unit	rw	UInteger	8 bit	1	0 = m/s 1 = mm/s 2 = in/s		Defines units for velocity observation	Y	B A
843 (0x34b)	Temperature unit	rw	UInteger	8 bit	0	0 = °C 1 = °F		Defines units for temperature observation	Y	B A
844 (0x34c)	Start-up Delay	rw	UInteger	16 bit	0	0..600	0,1 s	Defines delay before start measurements after power-up	Y	B A
900 (0x384)	Self-test Result	ro	UInteger	8 bit	252	0 = Fail 7 = OK 252 = NoData		Returns self-test result	Y	B A

PARAMETERIZATION & CONFIGURATION

932 (0x3a4)	High-pass filter	rw	UInteger	8 bit	0	0 = OFF 1 = 1 kHz 2 = 5 kHz		Defines high-pass filter used in postprocessing	Y	B A
933 (0x3a5)	DC filter	rw	UInteger	8 bit	1	0 = 1 Hz 1 = 10 Hz		Defines low-pass filter used in preprocessing	Y	B A
17342 (0x43be)	Hardware Identifi-cation Key	ro	String	max. 64 byte	674A91 _HW1			Unique ID key for hardware identification	Y	B A
17343 (0x43bf)	Bootmode status	ro	UInteger	8 bit	252	0 = Bootloader is inactive 1 = Bootloader is active		Status of bootloader state, used in firmware update		

NOTE 1: The parameter data provide the attributes DS (Data Storage) and R (Reset behavior). The following rules apply: DS: Parameter marked with 'Y' (yes) are exchanged
with the master via the data storage mechanism.
R: Parameter marked with 'B' are reset to the default value upon reception of the command 'Back-to-Box'.
R: Parameter marked with 'A' are reset to the default value upon reception of the command 'Application Reset'.

ERROR CODES

Code	Additional code	Name	Description
128 (0x80)	17 (0x11)	Index not available	Read or write access attempt to a non-existing index.
128 (0x80)	18 (0x12)	Subindex not available	Read or write access attempt to a non-existing subindex of an existing index.
128 (0x80)	32 (0x20)	Service temporarily not available	Parameter not accessible due to the current state of the technology- specific application.
128 (0x80)	33 (0x21)	Service temporarily not available - local control	Parameter not accessible. The device is currently in an ongoing, locally controlled operation.
128 (0x80)	34 (0x22)	Service temporarily not available - device control	Parameter not accessible. The technology-specific application is currently in a remotely triggered operation.
128 (0x80)	35 (0x23)	Access denied	Write access to a read-only parameter or read access to write-only parameter.
128 (0x80)	48 (0x30)	Parameter value out of range	Written parameter value is outside of the permitted value range.
128 (0x80)	49 (0x31)	Parameter value above limit	Written parameter value is above its specified value range.
128 (0x80)	50 (0x32)	Parameter value below limit	Written parameter value is below its specified value range.
128 (0x80)	51 (0x33)	Parameter length overrun	Written parameter is longer than specified.
128 (0x80)	52 (0x34)	Parameter length underrun	Written parameter is shorter than specified.
128 (0x80)	53 (0x35)	Function not available	Written command is not supported by the technology-specific application.
128 (0x80)	54 (0x36)	Function temporarily unavailable	Written command is unavailable due to the current state of the technology-specific application.
128 (0x80)	64 (0x40)	Invalid parameter set	Written single parameter value collides with other existing parameter settings.
128 (0x80)	65 (0x41)	Inconsistent parameter set	Parameter set inconsistencies at the end of block parameter transfer. Device plausibility check failed.
128 (0x80)	130 (0x82)	Application not ready	Read or write access denied. The technology-specific application is temporarily unavailable.

EVENT CODES			
Code	**Type**	**Name**	**Description**
6200 (0x1838)	Error	Event 1	Used in IO-Link test
6201 (0x1839)	Error	Event 2	Used in IO-Link test
6202 (0x183a)	Error	IO-Link fault	Check installation
6203 (0x183b)	Error	IO-Link under voltage	
6204 (0x183c)	Warning	IO-Link low voltage	
6205 (0x183d)	Error	Hardware initialization failed	
6207 (0x183f)	Error	Memory write failed	
6208 (0x1840)	Error	Memory read failed	
6209 (0x1841)	Notification	Calibration start	
6210 (0x1842)	Notification	Calibration step 1 done	
6211 (0x1843)	Notification	Calibration done	
6212 (0x1844)	Error	Calibration error	
6213 (0x1845)	Notification	Self-test start	
6214 (0x1846)	Notification	Self-test end	
20480 (0x5000)	Error	Device hardware fault	Exchange device
25376 (0x6320)	Error	Parameter error	Check datasheet and values

IMI SENSORS
A PCB DIVISION

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Model Number 674A91	IO-LINK® VIBRATION SENSOR	Revision: NR ECN #: 54712

Performance	ENGLISH	SI	
Frequency Range(+/- 3 dB)(Acceleration)	1 to 10,000 Hz	1 to 10,000 Hz	[1][2]
Frequency Range(+/- 3 dB)(Acceleration)	10 to 10,000 Hz	10 to 10,000 Hz	[3][1]
Frequency Range(+/- 3 dB)(Acceleration)	1,000 to 10,000 Hz	1,000 to 10,000 Hz	[4][1]
Frequency Range(+/- 3 dB)(Acceleration)	5,000 to 10,000 Hz	5,000 to 10,000 Hz	[5][1]
Frequency Range(+/- 3 dB)(Velocity)	2 to 10,000 Hz	2 to 10,000 Hz	[2][1]
Frequency Range(+/- 3 dB)(Velocity)	10 to 10,000 Hz	10 to 10,000 Hz	[3][1]
Acceleration Range	50 g pk	490.5 m/s² pk	[6]
Velocity Range	3 in/sec pk	76.2 mm/s pk	
Transverse Sensitivity	7 %	7 %	
Linearity	≤ 1 %	≤ 1 %	[7]
Set/Reset Delay	0 to 50 sec	0 to 50 sec	
Start Up Delay	0 to 50 sec	0 to 50 sec	
Transmission Type	COM3: 230.4 kbaud	COM3: 230.4 kbaud	
Io-Link Revision	1.1	1.1	
SIO Mode	Yes	Yes	
Required Master Port Class	A, B	A, B	
Minimum Cycle Time	12 mS	12 mS	
Output(Out1/Out2)	Normally Open/Normally Closed	Normally Open/Normally Closed	
Environmental			
Overload Limit(shock)	5,000 g pk	49,050 m/s² pk	
Temperature Range	-40 to +185 °F	-40 to +85 °C	
Enclosure Rating	IP68	IP68	
Electrical			
Current Consumption(mA)	50 mA	50 mA	[1]
Interface	IO-Link	IO-Link	
Electrical Isolation	> 10^8 Ohm	> 10^8 Ohm	
External DC Power(24 VDC)	24 VDC	24 VDC	[1]
Physical			
Size (Hex x Height)	1.0 x 2.6 in	25.4 mm x 66 mm	
Weight	5.2 oz	148 g	
Mounting Thread	1/4-28 Female	No Metric Equivalent	[8]
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Mounting Torque	3 to 5 ft-lb	4 to 7 Nm	
Sealing	Welded Hermetic	Welded Hermetic	
Electrical Connector	M12, 4-Pin	M12, 4-Pin	
Electrical Connection Position	Top	Top	
Electrical Connections(Pin 1)	L+	L+	
Electrical Connections(Pin 2)	Out 2	Out 2	
Electrical Connections(Pin 3)	L-	L-	
Electrical Connections(Pin 4)	Out 1	Out 1	

CE

UK CA [9]

All specifications are at room temperature unless otherwise specified.
In the interest of constant product improvement, we reserve the right to change specifications without notice.
This model, designated with an RH prefix, is RoHS compliant. For further details, and to obtain PCB's RoHS Statement of Conformance, please visit http://www.pcb.com

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

M - Metric Mount
Optional Accessory: Model M081A61 Mounting Stud 1/4-28 to M6 X 1 (1)

NOTES:

[1]Typical.
[2]High Pass Analog Filter set to 1Hz
[3]High Pass Analog Filter set to 10Hz
[4]Digital High Pass Filter set to 1kHz
[5]Digital High Pass Filter Set to 5kHz
[6]Conversion Factor 1 g = 9.81 m/s^2
[7]Zero-based, least squares, straight line method
[8]1/4-28 has no equivalent in S.I. units.
[9]See PCB Declaration of Conformance PS_____ for details.

SUPPLIED ACCESSORIES:

Model 081A40 Mounting Stud

Entered: ND	Engineer: JJD	Sales: JL	Approved: NJF	Spec Number:
Date: 04/26/2024	Date: 04/26/2024	Date: 04/26/2024	Date: 04/26/2024	77181

IMI SENSORS
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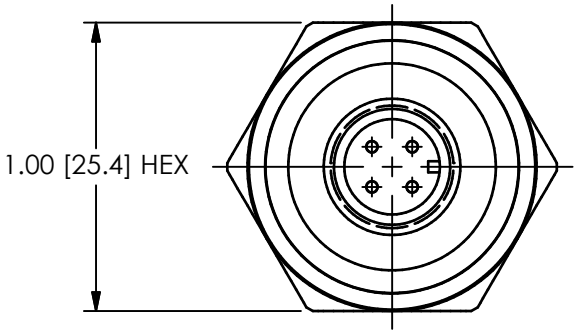
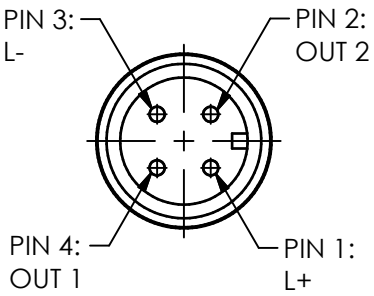
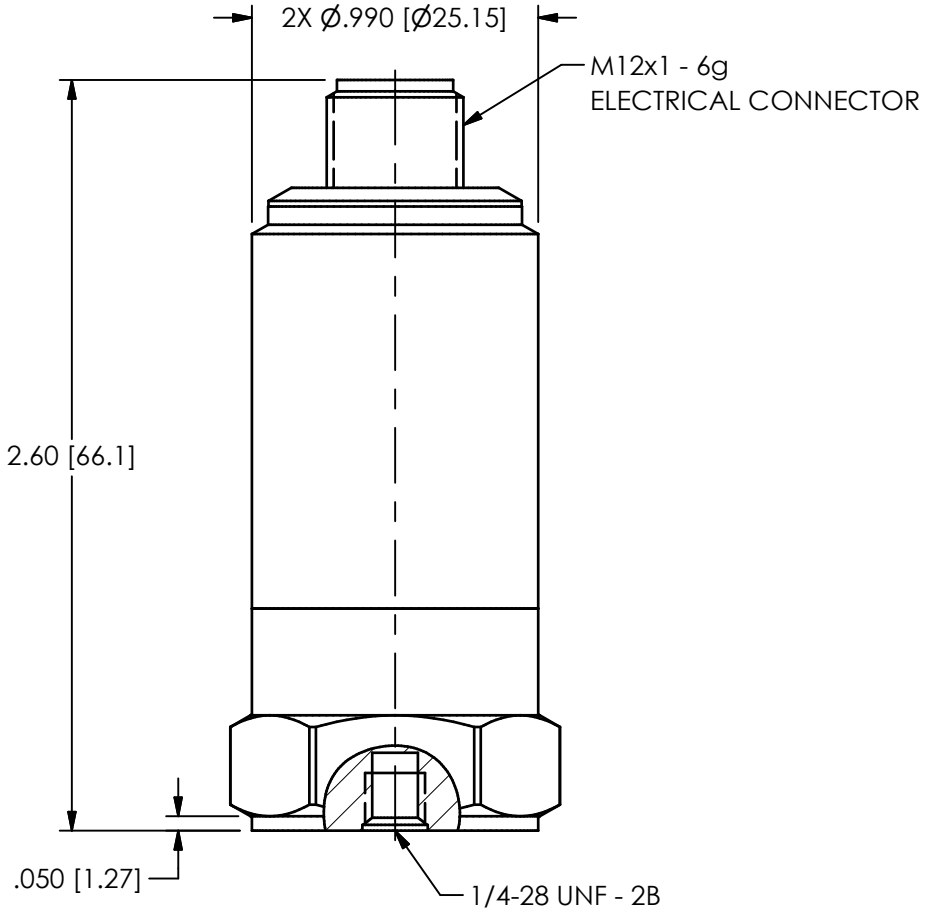
77039

REVISIONS		
REV	DESCRIPTION	DIN
NR	RELEASED TO DRAFTING	54712





PINOUT
SCALE 2X



UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:		DRAWN		CHECKED		ENGINEER		PCB PIEZOTRONICS AN AMPHENOL COMPANY
DIMENSIONS IN INCHES DECIMALS XX ±.03 XXX ±.010 ANGLES ± 2 DEGREES	DIMENSIONS IN MILLIMETERS [IN BRACKETS] DECIMALS X ± 0.8 XX ± 0.25 ANGLES ± 2 DEGREES	KSR	4/26/24	KSR	4/26/24	JJD	4/26/24	3425 WALDEN AVE. DEPEW, NY 14043 (716) 684-0001 E-MAIL: sales@pcb.com
CABLE TOLERANCES IN ENGLISH 1"≤ LENGTH < 1' = +1"/ - 0 1'≤ LENGTH < 5' = +2"/ - 0 5'≤ LENGTH < 100' = +6"/ - 0 100'≤ LENGTH = +1'/ - 0	CABLE TOLERANCES IN METRIC 2.54cm ≤ LENGTH < 30.5cm = +2.54cm/ - 0 30.5cm ≤ LENGTH < 1.5m = +5.1cm/ - 0 1.5m ≤ LENGTH < 30.5m = +15.2cm/ - 0 30.5m ≤ LENGTH = +30.5cm/ - 0	TITLE OUTLINE DRAWING MODEL 674A91 IO-LINK						CODE IDENT. NO. 52681 / SIZE A / DWG. NO. 77039
FILLETS AND RADII .003 - .005	FILLETS AND RADII 0.07 - 0.13							SCALE: 1.5X / SHEET 1 OF 1

Repair and Maintenance

PCB guarantees Total Customer Satisfaction through its "Lifetime Warranty Plus" on all Platinum Stock Products sold by PCB and through its limited warranties on all other PCB Stock, Standard and Special products. Due to the sophisticated nature of our sensors and associated instrumentation, **field servicing and repair is not recommended and, if attempted, will void the factory warranty**.

Beyond routine calibration and battery replacements where applicable, our products require no user maintenance. Clean electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the material of construction. Observe caution when using liquids near devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth—never saturated or submerged.

In the event that equipment becomes damaged or ceases to operate, our Application Engineers are here to support your troubleshooting efforts 24 hours a day, 7 days a week. Call or email with model and serial number as well as a brief description of the problem.

Calibration

Routine calibration of sensors and associated instrumentation is necessary to maintain measurement accuracy. We recommend calibrating on an annual basis, after exposure to any extreme environmental influence, or prior to any critical test.

PCB Piezotronics is an ISO-9001 certified company whose calibration services are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to our standard calibration services, we also offer specialized tests, including: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For more information, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment

If factory repair is required, our representatives will provide you with a Return Material Authorization (RMA) number, which we use to reference any information you have already provided and expedite the repair process. This number should be clearly marked on the outside of all returned package(s) and on any packing list(s) accompanying the shipment.

Contact Information

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine: (716) 684-0001
General inquiries: info@pcb.com
Repair inquiries: rma@pcb.com

For a complete list of distributors, global offices and sales representatives, visit our website, www.pcb.com.

Safety Considerations

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the precautions required to avoid injury. While our equipment is designed with user safety in mind, the protection provided by the equipment may be impaired if equipment is used in a manner not specified by this manual.

Discontinue use and contact our 24-Hour Sensorline if:

- Assistance is needed to safely operate equipment
- Damage is visible or suspected
- Equipment fails or malfunctions

For complete equipment ratings, refer to the enclosed specification sheet for your product.

Definition of Terms and Symbols

The following symbols may be used in this manual:

DANGER
Indicates an immediate hazardous situation, which, if not avoided, may result in death or serious injury.

CAUTION
Refers to hazards that could damage the instrument.

NOTE
Indicates tips, recommendations and important information. The notes simplify processes and contain additional information on particular operating steps.

The following symbols may be found on the equipment described in this manual:

This symbol on the unit indicates that high voltage may be present. Use standard safety precautions to avoid personal contact with this voltage.

This symbol on the unit indicates that the user should refer to the operating instructions located in the manual.

This symbol indicates safety, earth ground.

PCB- PCB工业监测和测量设备 - 中国RoHS 公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS Disclosure Table

部件名称 Part Name	有毒和危险品 Toxic and Hazardous Substances or Elements									
Part	铅 (Pb)	水银 (Hg)	镉 (Cd)	六价 铬 (Cr(VI)	多溴化 苯 (PBB)	多溴化二苯 醚 (PBDE)	邻苯二甲酸 二(2-乙基) 己酯 (DEHP)	邻苯二甲丁 基苄酯 (BBP)	邻苯二甲酸 二酸正丁酯 (DBP)	邻苯二甲酸 二异丁酯 (DIBP)
电气外壳 (Electrical Enclosures)	X	O	O	O	O	O	O	O	O	O
紧固件和弹簧 (Fasteners)	X	O	O	O	O	O	O	O	O	O
电缆组件 (Cable Assembly)	X	O	O	O	O	O	O	O	O	O
印刷电路板组装 (PCBAs)	X	O	O	O	O	O	O	O	O	O
机械零件(Mechanical Parts)	O	O	O	O	O	O	O	O	O	O
塑料和橡胶零件 (Plastic & Rubber Parts)	O	O	O	O	O	O	O	O	O	O
金属零件 (Metal Parts)	X	O	O	O	O	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制

O =表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下 (indicates that the content of the toxic and hazardous substance in all the Homogeneous Materials of the part is below the concentration limit requirement as described in GB/T 26572).

X =表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求 (indicates that the content of the toxic and hazardous substance in at least one Homogeneous Material of the part exceeds the concentration limit requirement as described in GB/T 26572).