User Manual

Allen-Bradley

Dynamix 1443 Series Sensors

Catalog Numbers 1443-ACC, 1443-CL, 1443-CON, 1443-MAG, 1443-STD, 1443-BLT, 1443-PRB, 1443-PAD, 1443-SFT, and 1443-KIT

Allen-Bradley • Rockwell Software

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Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Notes:

This manual explains how to install Dynamix™ 1443 Series sensors from Rockwell Automation. It is intended for anyone who installs or maintains a condition monitoring system with permanently mounted sensors.

Overview

Dynamix™ 1443 Series sensors are a family of industrial accelerometers and the various cables and mounting accessories that are required to install the sensors.

Industrial accelerometers are rugged, precision sensors that are used to make vibration measurements on industrial machinery such as motors, pumps, fans, gears, and other machines that, typically, are fitted with anti-friction (rolling element) bearings.

Accelerometers measure the absolute vibration, relative to free space, of the structure that it is mounted on. When rolling element bearings are monitored, if the sensor is mounted on the bearing surface, then it is reasonable to infer that the shaft vibration is the same as that measured on the external surface of the bearing. Note though, that if mounted on a fluid film (journal) bearing that the shaft vibration can be different than that measured on the surface of the bearing.

Several factors must be considered when selecting the specific sensor required for an application.

Environment and Location

- Is the environment that the sensor is mounted in hazardous? If so, then hazardous area approved accelerometers must be used.
- Is the location commonly wet or dirty, for example, dirt and dust? If so, then consider sensors with integral cables or use cables with protective boots.
- Is there sufficient clearance at the mounting location for a top exit sensor (about 6 inches / 15 centimeters from the surface of the machine)? If not, then consider using a side exit sensor.

Performance and Measurement

- Is the operating speed of the machine slow (less than about 700 RPM)? If so, then use low frequency sensors.
- Must the sensor measure exceptionally high frequencies (greater than 15 kHz)? If so, then use a High Frequency sensor.
  - kHz, a common requirement for monitoring a speed increasing or reduction gearbox when driven by high speed turbo machinery or when driving high speed compressors.
- Does the application require that the sensor output velocity (rather than acceleration)? If so, then consider using a velocity output sensor.

  In most cases, at least one level of integration can be performed in the monitor that the sensor is connected to. However, there are a few cases where velocity output is necessary.

- Consider using a velocity output accelerometer when double integration (displacement output) is required. If any low frequency noise is present, it is dramatically amplified if double integrated. You can prevent some of this noise when you perform integration at the sensor. Integration at the sensor is where the noise is introduced by the wiring or other electronics.

- When used for Shaft Absolute measurements.

- When machine specifications require velocity output, such as for GE LM2500 engines.

  – Does the application require a sensor that also outputs temperature? If so then consider using a dual acceleration / temperature output sensor.

  The temperature output is a separate, proportional voltage, signal that must be wired to its own measurement channel. Another channel can perform the measurement on the same monitor that the acceleration signal is wired to, or it can be wired to a common process-measurement input module, as appropriate.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Dynamix™ 1443 Sensors Technical Data, publication 1443-TD001	Provides general guidelines for installing a Rockwell Automation industrial system.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Installation

Sensor Mounting

Dynamix™ 1443 Series accelerometers are mounted using a stud that threads into the base of all top exit sensors, or a bolt that passes through the body of all side exit sensors. For most permanent installations the stud or bolt is threaded directly into the surface that the sensor is mounted to. However, for portable or temporary applications, magnetic mounts and pads, which are typically epoxied to a surface, are available.

Types of Sensor Mounting

The actual frequency range of a sensor depends on how well it is attached to the machine. The following are the mounting types available for the sensors.

- Mount the sensor directly on the case
  - Stud mounting
  - Screw mounting
- Mount the sensor with adhesive
- Mount the sensor with a bracket
- Mount the sensor with a magnet

Mount the Sensors Directly on the Case

All Dynamix™ 1443 Series sensors are designed for mounting directly on the machine case. Each sensor base is drilled and tapped for that purpose. There are two common methods to mount sensor, stud mounting and screw mounting. In both cases, it is crucial to prepare a flat, smooth, and clean area at least as large as the base of the sensor.

An improperly prepared surface or improperly mounted sensor could result in:

- Attenuated measurements that results in lower than actual-vibration amplitudes

- Reduced frequency response that results in an inability to measure high frequency signals

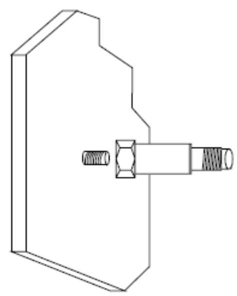
- Possible introduction of erroneous/false signals that could be misinterpreted as actual machine vibration or that could mask actual vibration.

IMPORTANT	We recommend following the API 670 requirements for surface finish and flatness, even for the non-API installations.

Stud Mounting

Stud and screw mounting are the most secure, and recommended, methods of attaching a sensor to a machine.

Figure 1 - Stud Mounting



Follow these steps to mount the sensor.

1. Spot-face the surface.
2. Drill and tap a hole in the machine case or bearing housing where you want to install the sensor.

   The surface finish must be within 0.8 micrometers (0.032 mm, or 32 μinches) and the flatness must be below 25 micrometers (1 mil). These requirements are listed in the publication, API 670 Appendix C.

TIP	For 0.9525 cm (0.375 or 3/8 in.) deep holes, make sure 0.635 cm (.25 or 1/4 in.) of the stud engages the base of the sensor. If you screw a 1.27 cm (0.5 or 1/2 in.) stud fully into a 0.9525 cm (0.375 or 3/8 in.) inch deep hole, which leaves only 0.3175 cm (0.125 or 1/8 in.) of stud to hold the sensor, which is not sufficient.

3. To remove any rust, dirt, paint, or grease, clean the finished area.
4. To attach the sensor, insert a set screw and leave enough of the screw above the case, typically 0.635 cm (.25 in)

   Some sensors come with captive mounting screw and do not need a separate set screw.
5. Apply a thin coating of grease or silicone lubricant to the surface.
6. Attach the sensor by using a torque wrench.

TIP	All 1443 Series sensors are torqued to 8 N•m (6 ft•lb).

Screw Mounting

Stud and screw mounting are the most secure, and recommended, methods of attaching a sensor to a machine. For screw mounting, the preparation process differs slightly from stud mounting.

Follow these steps to use the stud mounting method.

1. Drill through the machine case or housing.

   Use a machine screw to secure the sensor.

2. Spot-face the surface, then drill the hole in the machine case or bearing housing where you want to install the sensor.

   Be sure to follow the sensor guidelines for the dimensions of the hole, the type of machine screw, and the torque for attaching the sensor.

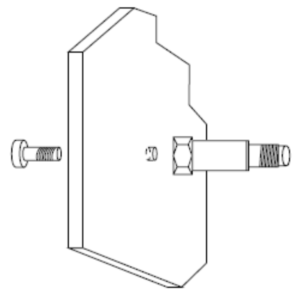
   TIP All 1443 Series sensors are torqued to 8 N•m (6 ft•lb).

Mounting Sensors with Adhesive

Stud mounting is recommended, but if a mounting hole cannot be drilled into the machine surface, you can mount the sensor using adhesive. There are two ways to mount a sensor by using adhesive.

- Mount the sensor directly to the machine.
- Mount a flat plate with a threaded stud, and attach the sensor to the stud.

Figure 2 - Flat Plate with a Threaded Stud



When you mount the sensor by using adhesive, the adhesive can limit the detection of high frequencies. Suitable adhesives are widely available. When selecting an adhesive, make sure to consider temperature, water resistance, and any other environmental or chemical requirements or restrictions.

IMPORTANT	Rockwell Automation recommends following the API 670 requirements for surface finish and flatness, even for the non-API installations.

Follow these steps for mounting a sensor using adhesive.

1. Spot-face the surface on the machine case or bearing housing where you want to install the sensor.

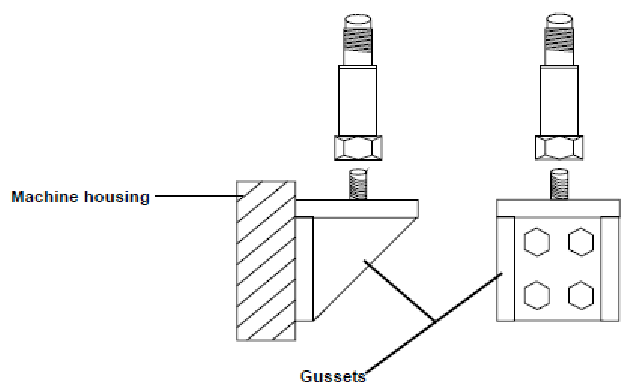
   The surface finish must be within 0.8 micrometers (0.032 mil, or 32 µinches) and the flatness must be below 25 µm (1 mil). These requirements are listed in the publication, API 670 Appendix C.
2. Prepare the surface following standard-adhesive bonding practice.
3. Abrade and then thoroughly clean the spot on the machine with solvent.
4. Mix the adhesive according to its directions.
5. Attach the sensor or plate to the machine.
6. To cure the adhesive, make sure to allow the recommended time.
7. Make sure that the sensor is grounded through the cable shield to a good electrical ground.

Mount the Sensors with a Bracket

Sometimes a sensor does not fit at the desired location on or near the bearing housing because of an obstruction or because a suitable flat surface is not available. In these cases, use a bracket that extends from the desired measurement point to an area where the sensor can be mounted properly.

Make sure that the bracket itself does not introduce any extraneous vibrations. The bracket must not bend or flex. Even if the bracket bends or flexes a small amount, the reading can be unreliable. Only a stiff bracket is able to transfer the vibration from the machine to the sensor without additional vibration due to the natural resonance frequency of the bracket. As a rule, even the shortest bracket requires fabrication from 1/2-inch steel plate.

Figure 3 - Mount the Sensor with a Bracket



You must test all brackets for resonance in the frequencies that the sensors monitor.

Mount the Sensors with Magnets

IMPORTANT	Do not permanently mount a sensor with a magnet. Magnet mounts must be used only for attended, immediate measurements such as when you use a portable data collector.

Notes:

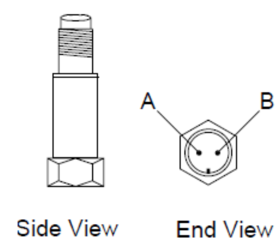
Cables and Cable Guidelines

This chapter describes some common cable guidelines to get the signal from the sensor to the monitoring device.

Sensor Connections and Power

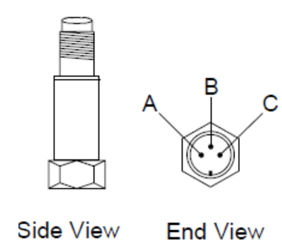
Most of the Dynamix™ 1443 Series sensors are two-wire, IEPE (Integrated Electronic Piezoelectric) accelerometers. There are Dynamix 1443 sensors that have a built-in integrator to produce a velocity signal and combination accelerometer/temperature sensors. The pin connections on two- and three-pin connections are shown in Figure 4 and Figure 5.

Figure 4 - Sensor Two-pin Connections



Connector Pin	Function
Shell	Ground, which is connected to cable shield
A	IEPE sensor power and signal
B	IEPE sensor signal return (signal common) and temperature common

Figure 5 - Three-pin combination Accelerometer/temperature Sensor



Connector Pin	Function
Shell	Ground, which is connected to cable shield
A	IEPE sensor power and signal
B	IEPE sensor signal return (signal common) and temperature common
C	Temperature sensor signal and power

Cable Installation

While the finished and bulk cable solutions that are referenced in Table 1 are recommended, quality accelerometer cable is widely available. In cases where other cabling is provided, particularly in long lengths, consider the following guidelines.

Table 1 - Cable Installation Guidelines

Cable Run at 10 kHz	Maximum Attenuation	No. of Channels/Cables	Cable Diameter	Belden No.	Max Temp.	Alpha No.
Up to 152 m (500 ft)	6 dB (2:1)	1	4.27 mm (0.168 in)	8641	60° C (140° F)	2400C
Up to 152 m (500 ft)	12 dB (4:1)	1	4.45 mm (0.175 in)	8761	60° C (140° F)	2401C
		3	7.87 mm (0.310 in)	8777	80° C (176° F)	6010C
		6	9.91 mm (0.390 in)	8778	80° C (176° F)	6012C
		12	12.2 mm (0.480 in)	9768	80° C (176° F)	6017C
Up to 1000 ft (304 m)	6 dB (2:1)	3	9.40 mm (0.370 in)	9730	60° C (140° F)	6073C
		6	12.12 mm (0.480 in)	9731	60° C (140° F)	6076C
Up to 1500 ft (457 m)	12 dB (4:1)	12	16.7 mm (0.660 in)	9734	60° C (140° F)	6079/12C
Up to 4000 ft (1219 m)	6 dB (2:1)	1	5.18 mm (0.204 in)	8762	60° C (140° F)	2411C
		3	8.64 mm (0.340 in)	9873	80° C (176° F)	6033C
		6	10.9 mm (0.430 in)	9874	80° C (176° F)	6036C
		12	15.0 mm (0.590 in)	9877	80° C (176° F)	6042C

Cable Length

Operation over long cables can affect frequency response and introduce noise and distortion when an insufficient current is available to drive cable capacitance. Generally, this signal distortion is not a problem when you test at a lower frequency within a range up to 10,000 Hz. However, when you test for higher frequency vibration, shock, or transient over cables longer than 30 m (100 ft), the possibility of signal distortion exists.

The maximum frequency that can be transmitted over a given cable length is a function of both the cable capacitance and the ratio of the peak signal voltage to the current available from the signal conditioner, according to the following equation.

Figure 6 - Cable Length Equation

$$f_{max} = \frac{10^9}{2\pi CV/(I_c - 1)}$$

where,

fmax = maximum frequency (hertz)

C = cable capacitance (picofarads)

V = maximum peak output from sensor (volts)

lc = constant current from signal conditioner (mA)

109 = scaling factor to equate units

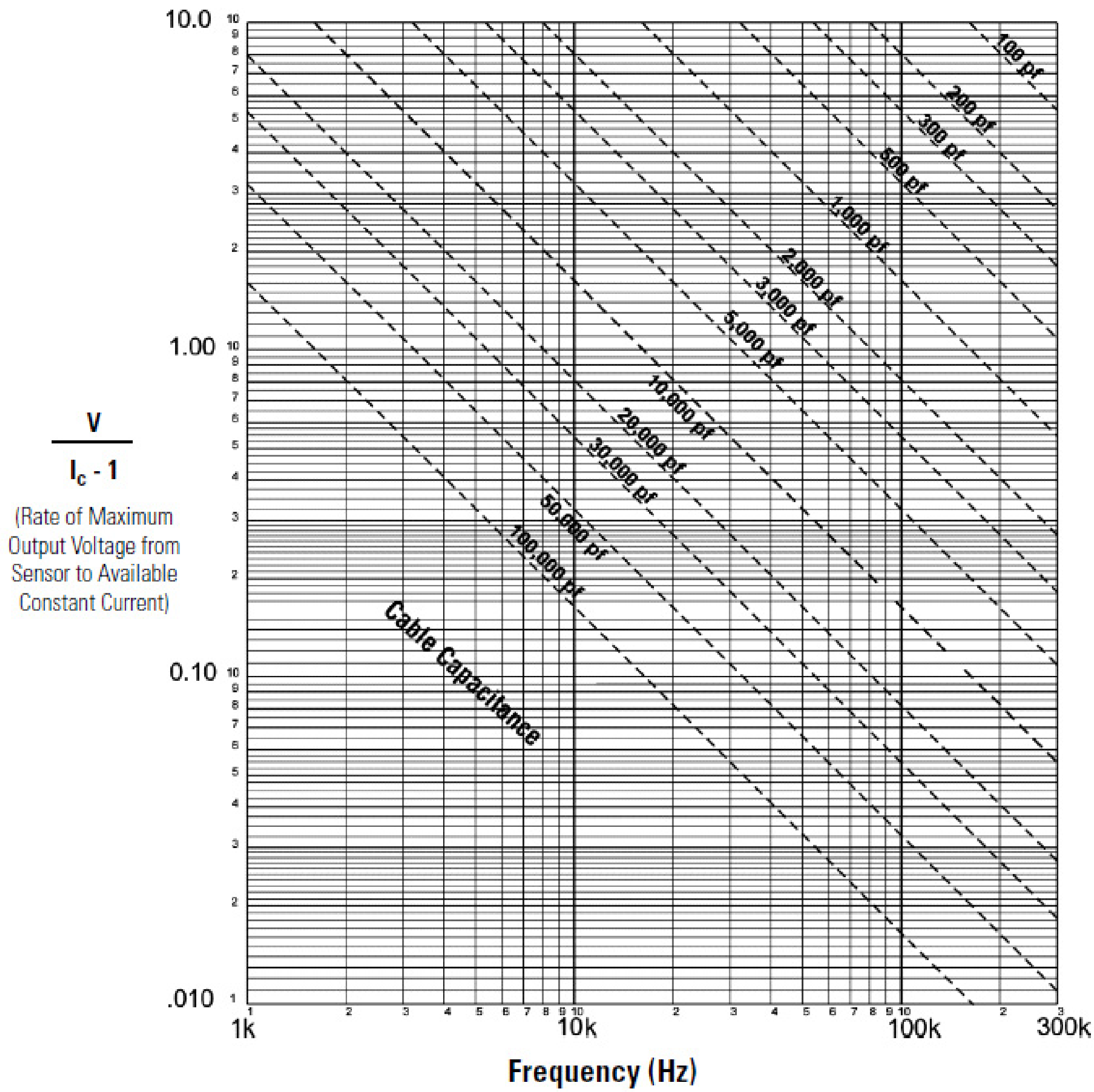
In the equation, 1 mA is subtracted from the total current that is supplied to the sensor (1c).

By using this equation, you can compensate for powering the internal electronics. Some specialty sensor electronics can consume more or less current. Contact the manufacturer to determine the correct supply current.

When driving long cables, the equation in Figure 6 shows that as the length of cable, peak voltage output, or maximum frequency of interest increases, a greater constant current is required to drive the signal.

The nomograph in Figure 7 on page 14 provides a simple, graphical method for obtaining the expected maximum frequency capability of an IEPE measurement system. The maximum-peak signal voltage amplitude, cable capacitance, and supplied constant current must be known or presumed.

Figure 7 - Expected Maximum Frequency



f_{max} = Maximum frequency given the following characteristics

C = Cable capacitance (pF)

I_c = Constant current level from power unit (mA)

V = Maximum output voltage from sensor (volts

10^9 = Scale factor to equate units

For example, when running a 30 m (100 ft) cable with a capacitance of 30 pF/ft, the total capacitance is 3000 pF. This value can be found along the diagonal-cable capacitance lines. Assuming the sensor operates at a maximum output range of 5 volts and the constance current-signal conditioner is set at 2 mA, the ratio on the vertical axis can be calculated to equal 5. The intersection of the total cable capacitance and this ratio result in a maximum frequency of approximately 10.2 kHz.

The nomograph does not indicate whether the frequency amplitude response at a point is flat, rising, or falling. For precautionary reasons, it is good practice to increase the constant current (if possible) to the sensor (within its maximum limit) so that the frequency that is determined from the nomograph is approximately 1.5…2 times greater than the maximum frequency of interest.

Reducing Electrical Interference

Electrical interference can affect the small electrical signal that comes from a sensor. Make every effort to reduce the electrical interference in cables to the lowest acceptable levels. Interference can come from many sources, including power cables, switching devices, motor controllers, two-way radios, robot transmitters, arc welders, induction heating equipment, motors, and high-voltage ignition systems. The following methods are effective for minimizing electrical interference:

Use twisted-pair wires in each cable.

Use individual foil shields around each pair, with a shield drain wire grounded at only one point for each shield. Do not ground the shield at both ends of the cable. When you ground the cable shield at both ends it causes a 'ground loop.' A ground loop can cause interference because in most cases the ground potential differs at the two ends.

- Electrically isolate (insulate) each sensor circuit from all others.
- Surround all cables with grounded steel conduit where possible.
- Do not use conduits that contain sensor cables for any other circuits.
- Avoid running 1443 Series sensor cables parallel to other cables, such as non-1443 Series sensor, or communication cables.
- Avoid running sensor cables parallel to power wiring.

  When you cannot avoid running sensor cables parallel to power wiring, make sure that sensor cables are at least 12 inches away from all power wiring that carry 120V or less.

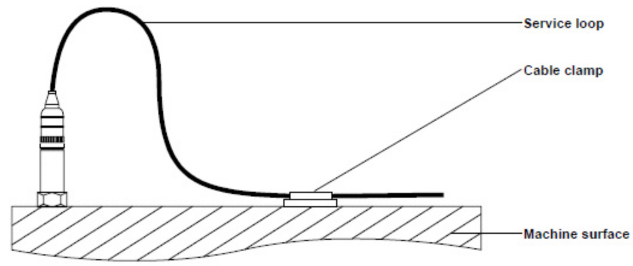
  For power circuits of 120…240V, the minimum spacing is 24 inches. For circuits of 480V or higher, the minimum spacing is 48 inches.

If the cable must cross power wiring, maintain the minimum spacing between the wires. Cross the wires at a right angle (90°) to minimize interference.

TIP Make sure that the cable is securely fastened to reduce low frequency noise from cable movement. This is important at the sensor end of the cable.

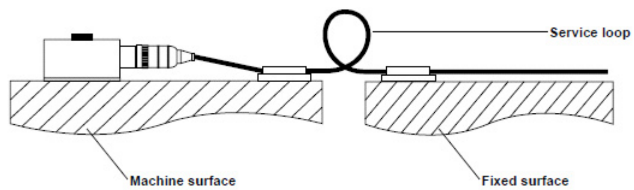
For a sensor with a top-exit cable connection, make sure that there is at least 6 inches of clearance above the machine surface to allow for movement of the sensor and cable. Clamp the cable within 6 inches of the sensor and allow enough room for the cable to bend without damage. Clamp the cable at intervals to prevent movement.

Figure 8 - Allow For Movement of the Sensor



For sensors with a side exit cable connection, clamp the cable 3-4 inches from the sensor. Clamp the cable at intervals to prevent movement.

Figure 9 - Clamp the Cable at Intervals



Shield Isolated versus Shield Case Grounded Cables

As the previous section discusses, it is essential to take appropriate actions to mitigate possible interference when running sensor cables. There are two options for cables to use when connecting an accelerometer to a vibration monitoring module: a shield isolated cable and a shield case grounded cable.

A shield isolated cable means that the shield wire is not connected to the accelerometer casing and is typically only grounded to a clean earth on the vibration module end of the cable. The biggest reason for this setup is to prevent 'Ground Loops' which occur when the potential between grounds in the circuit differ. This causes improper current flow which introduces interference and skew data collection. However, since the cable is not grounded at the sensor, it is also susceptible to outside interference such as radio frequencies from two-way radio on that end of the cable.

A shield case grounded cable means that the shield wire is grounded at both ends of the cable. Being grounded at both ends is the best way to minimize outside interference issues. 'Ground Loops' can come into play much more easily in this setup, as it is likely that the ground potential at the machine differs from the ground at the vibration monitor. However, if it can be confirmed that there is no potential difference between grounds (such as when the vibration module is mounted on the skid with the machine), then this is a better option for interference protection.

In summary, a shield isolated cable is usually the standard solution for most applications, but if there can be confirmed no difference in ground potential, then a shield case grounded cable is more effective in preventing interference.

Cable Construction

The sensor cable must be twisted pair with its own foil shield. Do not ground the cable-shield drain wire at both ends. The shield connections must be carried through any junction boxes without connecting to a ground or other shields.

If the end of the sensor cable is in a location where it is splashed or hosed down, coat it with RTV silicone rubber sealant to prevent fluids from entering the cable.

- At the sensor end, use RTV in and around the connector and cable entry to the connector.
- At the opposite end to the sensor, terminate the cable in a NEMA housing by using proper cable entry connectors that create a tight seal around the cable and the entry hole of the housing.

Splicing Cables

Splices in cables are acceptable if the connections are soldered. Splices must be located in a junction or conduit box for access. Coil any excess cable in the junction or conduit box, making sure that any exposed (bare) cable shield is taped off so it cannot touch the junction or conduit box. If necessary, you can shorten the armored cable from an accelerometer or velocity sensor by carefully cutting away the armor. Grind or file the cut armor to remove all sharp edges.

Cable Conduit Guidelines

Run signal wire through grounded conduit, where it is protected from damage and external influences. The conduit must be installed with proper drain points so that water from condensation and other sources does not build up around the cable.

Cables in Conduit

When cables are run in steel conduit, the conduit must be grounded per NEC and local code requirements. Where necessary, flexible interlocked steel conduit can be used.

TIP Flexible conduit is not as effective against RF/EM interference as solid conduit. No wires or cables other than sensor wires or cables should be run in the same conduit.

In high humidity areas, outdoors, or where the sensor can get wet, protect the conduit to prevent water from entering. If the conditions could cause condensation in the conduit, use rigid metallic conduit or liquid-tight flexible conduit with suitable fittings.

Protect the conduit at the ‘far’ end to prevent water from entering. Provide appropriate condensate drains at low points in the conduit runs to allow condensation to escape.

If a water-resistant seal is required, you can also use pipe joint sealing compound on fittings before you screw the connectors to the sensor body. Coat the terminal strip inside the junction box with RTV silicone rubber after the cables are connected. Do not use sealant on the gasket surfaces.

Cables Runs to Panels

Make sure that the conduits are large enough to accommodate the signal cables plus space for servicing. The maximum acceptable cable length from sensor to monitoring device depends on the type of sensor, the frequencies of interest, the grade of cable, and the monitoring device.

Follow the guidelines in Table 1 on page 12 or see the manufacturer's specifications for cable length and grade.

Cables Boxes

Use a conduit or junction box to help protect any connections or splices in the sensor cable.

- In wet areas, use NEMA-4X rated box. You can also use a 1/2 or 3/4-inch trade-size conduit body with gasketed cover, mounted vertically to prevent water entry into the box.
- Locate the conduit box so that 1…2 inches of cable from the sensor extend into the box.
- Use rigid thin-wall conduit or liquid-tight flexible conduit on the output cable.
- Ground the box and conduit to avoid electrical and radio frequency interference.

Notes:

Maintenance and Inspection

This chapter describes the maintenance and inspection procedures for the sensor.

Periodic Inspection Intervals

To maintain performance and secure system stability of the sensor, inspect the system, how it is mounted as instructed in Installation on page 5, and check the cables as instructed in Cables and Cable Guidelines on page 11.

Good practice, especially if local maintenance is being implemented, such as visual inspection of the unit around the machine where the sensor is mounted.

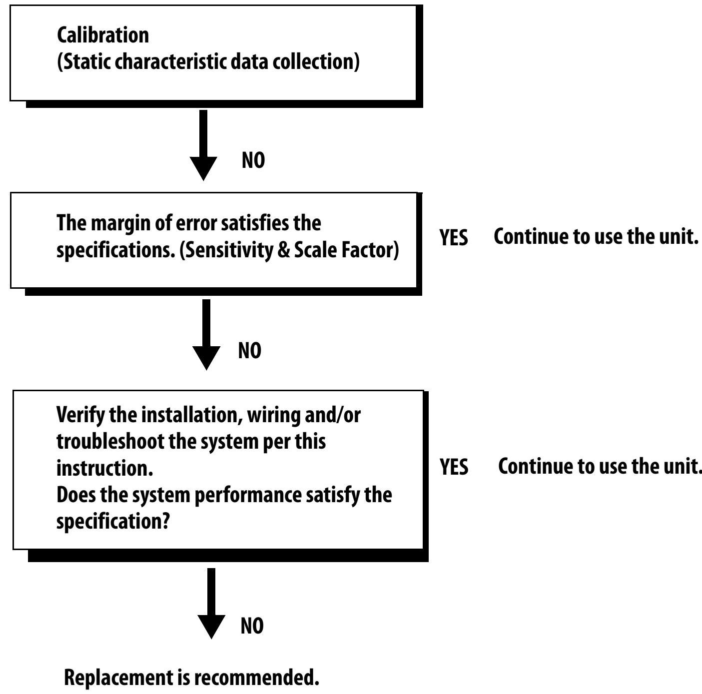
Unit Life

Plan to replace the sensor approximately every 10 years.

IMPORTANT	Ten years is a general guideline for replacement. However, if the sensor and/or cable is damaged due to maltreatment and/or extreme environmental conditions, then the life of the sensor/cable can be reduced.

Use this flowchart to determine when a replacement sensor is required.

Figure 10 - Determine When to Replace a Sensor



Use table Table 2 to troubleshoot problems with the unit.

Table 2 - Troubleshoot the Sensor

Symptom	Possible Cause	Recommended Action
Output is 24 volt bias	Sensor that is not connected properly.	Connect the sensor.
	Open circuit	Check wiring and terminations. See 17 for proper wiring.
	Faulty Sensor	Replace the sensor.
Output is 0 volts bias	Short circuit cable	Check cabling and terminations. See 17 for proper wiring.
	Faulty sensor	Replace the sensor.
Output outside acceptable bias levels	Sensor that is not connected properly.	Connect the sensor.
	Cable is not connected.	Check wiring and terminations. See 17 for proper wiring.
	Faulty sensor	Replace the sensor.
High 50Hz Signals	Improper ground	Verify that machine is properly grounded.
	Improper cable termination	Check sensor installation, wiring and termination. See 17 for proper wiring.
	Faulty sensor	Replace the sensor.
Large ski slope	Poor or loose mounting	Verify that the sensor is properly mounted on the machine. See page 5 for proper mounting.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

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