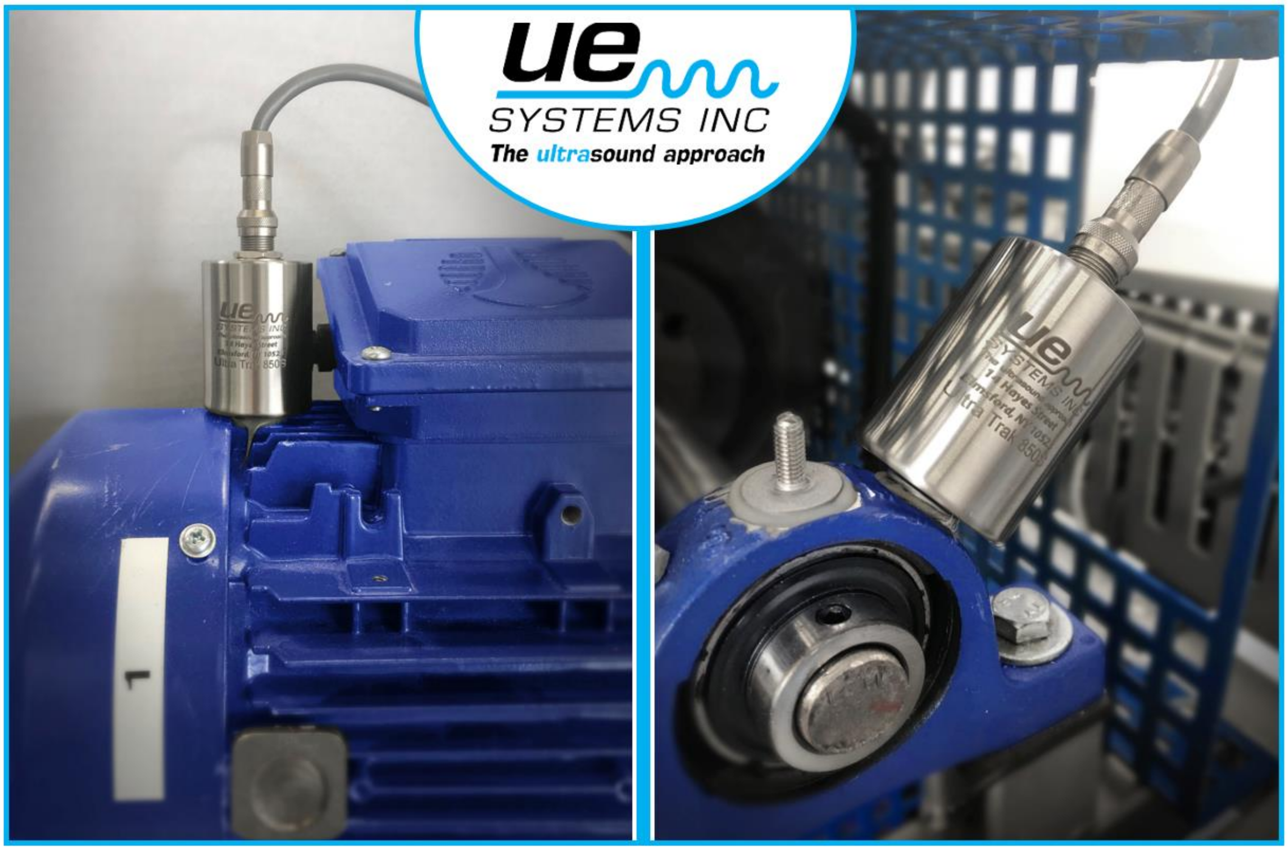
UltraTrak 850S

Smart Analog Sensor



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Patents

The product(s) described in this manual may be covered under existing and pending patents.

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IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS BEFORE USE

For your safety, the information in this manual must be followed to minimize the risk of fire, explosion, electric shock, and to prevent property damage, personal injury, or death.

⚠WARNING

Improper use of your ultrasonic detector may result in death or serious injury. Observe all safety precautions. Do not attempt to make any repairs or adjustments while the equipment is operating. Be sure to turn off and LOCK OUT all electrical and mechanical sources before performing any corrective maintenance. Always refer to local guidelines for appropriate lockout and maintenance procedures.

Getting Started

1.1 Product Overview

About The 850S

The 850s is a modern ultrasound sensor and transmitter with state-of-the-art onboard data processing designed to detect early onset failures in industrial equipment. The 850s works in tandem with existing plant automation and measurement applications, providing the hardware required to detect changes in ultrasonic amplitude resulting from the degradation of equipment. The 850s can be used for a wide range of applications, including ultrasound condition-based lubrication, bearing fault detection, valve leakage and steam trap issues with your existing measurement systems.

Quick Facts

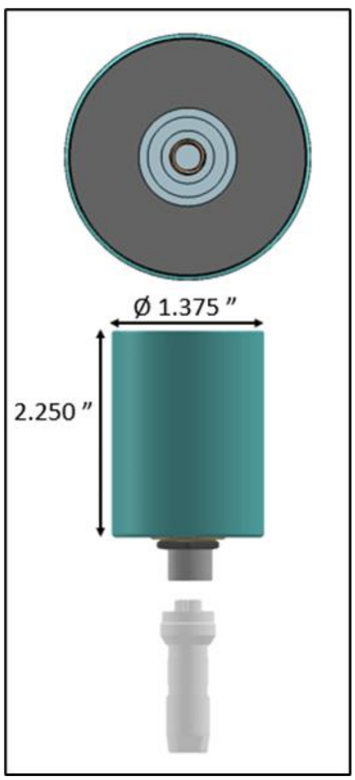
1. Continuously monitors friction, impacting and turbulence.
2. Connects to existing monitoring systems (PLC, SCADA, DCS, etc.).
3. Issues automated warnings in the event of bearing or lubrication failure.
4. Identifies steam trap issues and valve leakage
5. Includes patented Auto-Sensitivity Adjustment

Why invest in the 850S?

The 850s gives maintenance and reliability teams an easy way to incorporate the power of Ultrasound into their existing monitoring technology.

The sensors can be installed and connected within 10 minutes – giving teams a reliable and ultra-fast way to start analyzing trends and making better sense of their application.

1.2 Product Dimensions



1.3 Product Specifications

Sensor Parameter	Parameter Description
Power Supply Voltage	23 VDC to 26 VDC
Power Supply Current Draw	30mA DC Max, Typical
Current Output Type	Milliamp DC, Demodulated/Heterodyned
Current Output Response	Linear, Proportional to 0 dB to 100 dB of Change in Detected Ultrasonic Signal
Current Output Range	0.500 mA DC to 16.280 mA DC @ 0.158 mA/dB of Change in Detected Ultrasonic Signal (Typical)
Current Output Compliance Voltage	3.3 VDC
dB Output Transfer Function	dB Output = + 6.321 x (Current Output Reading), mA DC - 2.917 Db
Current Output Accuracy	Less Than ±1 dB of Reading, Typical
Ambient Operating Temperature Range	Standard Range = -20 °C to +60 °C Extended Range = -30 °C to +80 °C (Requires High Temp Cable)
Δ Current Output (Temperature)	+2 dB @ - 20 °C -2 dB @ +60 °C +3 dB @ -30 °C -4 dB @ +80 °C
Sensitivity Adjustment	Automatic, Thru the 0 dB to 100 dB Output Range
Connection Cable	3 Wire with Shield, Removable
Cable lengths	3 meters (10 ft.) 10 meters (33 ft.) 20 meters (66 ft.) 30 meters (100 ft.)
Cable/Housing Connector	Harsh Environment, Meets or Exceeds IP67 and NEMA 6P
Cable/Housing Shielding	RF Shielded
Housing	Stainless Steel, Water Resistant and Dust Proof, Meets IP67 and NEMA 6P
Transducer	Piezoelectric
Method of Attachment	10/32 UNF Mounting Hole
Firmware	Upgradable

*Note: Specifications are subject to change without notice.

1.4 Product Operation

1.4.1 Power Requirements

The UE 850S requires a 23 to 26 V, DC power source @ 30 mA total. The power connections are to be made via the cable connections on the sensor (refer to the connection diagram below). Note: The sensor requires +23 VDC Minimum at the sensor after any voltage drops in the power supply loop.

1.4.2 Sensitivity Control

The UE 850S features automatic sensitivity control. The 850S adjusts sensitivity automatically which gives the 850S hands-free measurement range of 100dB. Simply connect the sensor to a monitoring stud/point, connect power, ground/shield, and current output to their appropriate connections.

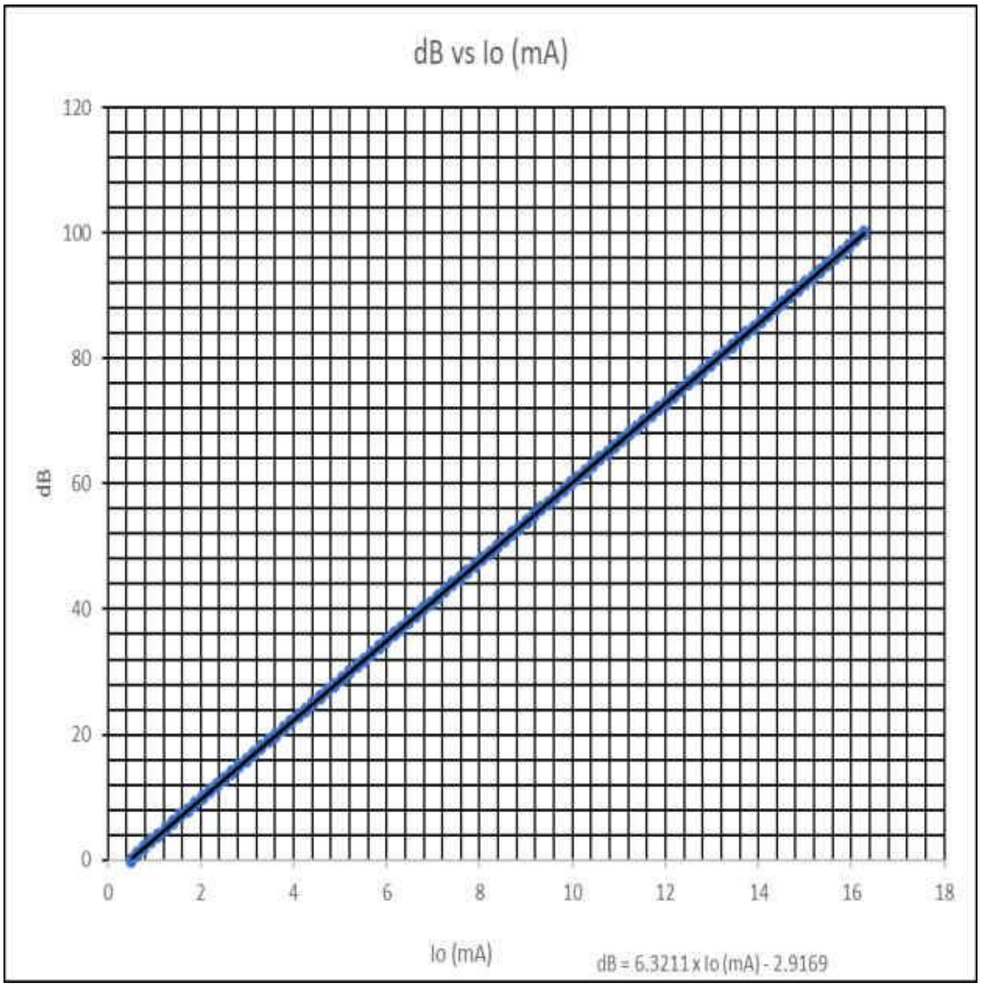
1.4.3 Wiring Connections

Wire Colour	Function
Black	Ground
Red	Power Supply ($V_{\_supply}$) +24 VDC Nominal +23 to +26 Typical
Clear	Current Output 16.3 mA Max
Green	RF Shield

1.4.4 Current Output & Power Supply Current Draw

The 850S's quiescent power supply current draw is approximately 12mA. In sensing mode add the current output to the quiescent power supply current draw to obtain the operational power supply current draw (30mA maximum typical).

1.4.5 Typical Transfer Curve



1.5 Common Applications

Bearing Condition Monitoring & Lubrication

Ultrasound provides a mechanism for detecting early warnings of bearing or lubrication failure. The 850s' patented Auto-Sensitivity Adjustment feature enables users to automatically tune into bearing sound and clearly identify lubrication and health issues at speeds as low as 1 RPM.	60%-80% of bearing failures are lubrication-related. The 850s creates the ability to quickly Identify a lack of lubrication and prevent over lubrication by providing real-time bearing friction data while greasing is being performed.

There are ultrasonic components in practically all forms of friction. As an example, if one were to rub the sensor probe with a finger, an ultrasonic signal will be generated. Although there might be some audible components to this friction, the sensor will only sense the ultrasonic components which, in this example, will be considered a gross signal that is also amplified. In fact, due to the comparative low amplitude nature of ultrasound, amplification is a very important feature.

Although there are obvious audible sounds emitted by most operating equipment, is the ultrasonic elements of the acoustic emissions that are generally the most important. Ultrasound offers a predictable diagnostic capacity. When changes begin to occur in the ultrasonic range, there is still time to plan appropriate maintenance. According to NASA research, when a bearing enters the beginning stages of failure, there is an amplitude increase of from 12 to 50 times over a set baseline. Not only can the early stage of bearing failure be monitored and detected, but other warning signs can also be noted such as: lack of lubrication, early failure, and catastrophic failure.

The levels of change are as follows:

Alarm Indication	dB Value
Alarm 1: Requires Lubrication	**Baseline + 8 dB**
Alarm 2: Early Onset of Bearing Failure	**Baseline + 16 dB**
Alarm 3: Catastrophic Bearing Failure	**Baseline + 35 dB**

1.5 Common Applications

Valve and Steam Trap Monitoring

Inspect and Type of Steam Trap & Valve	Emphasis on Safety	Process Efficiency & Cost Reduction
Inverted bucket, thermostatic, thermodynamic, float & thermostatic traps, and one-way valves.	Avoid the dangers of failing steam traps - water hammer can cause serious damage to your equipment & people	Maintain correct temperatures in your process and preserve the lifespan of condensate return lines (water in pipes will cause rusting).

When valves or steam traps leak or fail, it can be extremely costly in terms of product quality, safety, and energy loss. The 850s Auto-Sensitivity Adjustment feature enables users to automatically tune into the trap sound and clearly identify leaking or blowing traps and valves.

Cavitation

As air enters a valve or pump, the dynamics of the pressure within can create cavitation: the forming and explosion of bubbles. Although cavitation may be present, it does not necessarily create a problem. It becomes a maintenance problem only when the process increases to produce conditions that will cause internal damage. By setting a baseline, the increase in cavitation activity can be monitored to a point where an alarm can be set, and preventive measures can be taken.

Monitoring: Flow/No flow & Leakage

Valves control fluid flow. Whether the valve’s function is to provide a simple flow/no flow operation (on/off) or to regulate the amount of flow, a malfunction can be critical. Changes in amplitude related to these conditions can be monitored and alarm levels may be set to note or control these changes.

When leak occurs, the fluid will move from high pressure (upstream), through the valve seat, to the low pressure (downstream) side. As it reaches the low-pressure side, it expands briefly, producing a turbulent flow. This turbulence has strong ultrasound components. The amplitude of the turbulence is related to a few basics:

1. Fluid Viscosity

Under identical environments, pressures, leak size, etc.; a lighter fluid, such as air will produce more turbulence than a heavier fluid, such as oil.

2. Orifice Size
The more the restriction of a fluid, less amplitude generated. A smaller diameter hole will not produce as much sound as a larger hole under similar flow conditions.

3. Pressure Differential
Given identical leak sizes, when there is a greater pressure difference between the upstream and downstream sides, the leak with the greater difference will produce a louder signal.

1.6 Ultrasound Technology

The Ultrasound Technology utilized by this system is generally referred to as "Airborne Ultrasound". Airborne Ultrasound is concerned with the transmission and reception of ultrasound signals through the atmosphere without the need of sound conductive interface gels. It incorporates methods of receiving signals generated through one or more media via wave signals. When it is used to detect/monitor problems within a specific media, the technology may be referred to as Airborne/ Structure borne Ultrasound (A/B Ultrasound).

A/B Ultrasound is concerned with sound waves that occur above human perception. The normal "audible" environment in which the human ear is capable of sensing is 20 Hertz to 20 kHz (1,000 Hertz is 1 kilohertz or 1 kHz). The average threshold of human perception is 16.5 kHz. These audible wavelengths range in size from as small as 3/4 inch (1.9 cm) to as large as 56 feet (17 m). The frequencies sensed by airborne ultrasound instruments are above 20 kHz to 100 kHz. The wavelengths are magnitudes smaller than the audible, ranging from 1/8 inch (0.3 cm) to 5.8 inch (1.6 cm). The short-wave nature of the ultrasonic signal provides many advantages over lower frequencies.

Advantages:

1. High frequency amplitudes drop off quickly as they move from the source of emission.

2. The signals tend to radiate in straight paths providing relative ease of detection.

3. Since the signal strength diminishes rapidly, the sound source is easily separated from background noise.

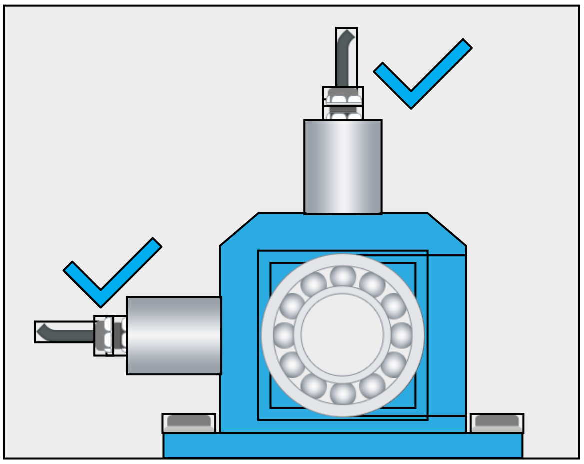
4. Subtle changes are detected before a major failure occurs.

Sensor Placement and Installation

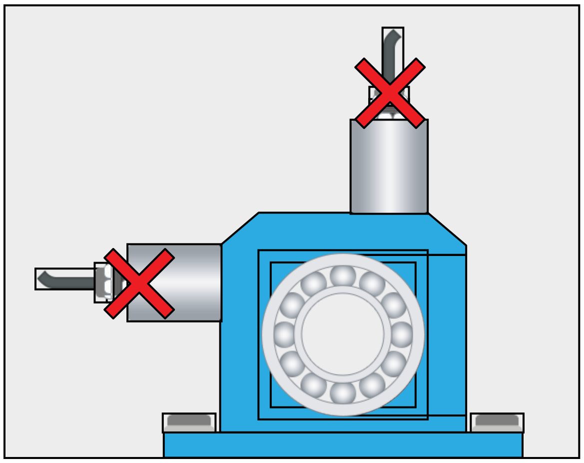
2.1 Primary Considerations

Bearing Proximity

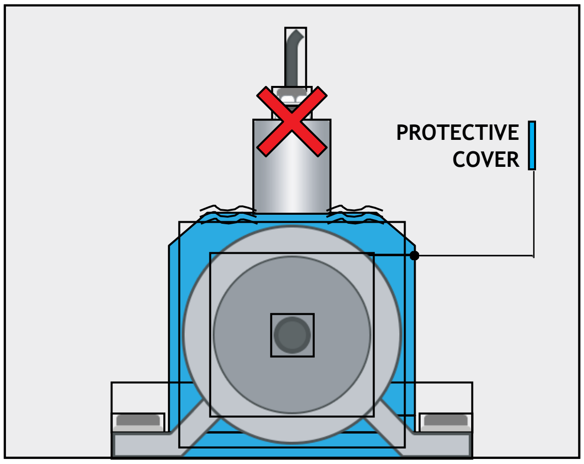
Place the sensor directly on the machine housing as close as possible to where the bearing is located for the most direct path of sound and vibration transmission. Placing the sensor as close as possible to the centerline of the bearing can also be considered to further optimize the signal coming directly from the bearings and avoid any potential distortion.



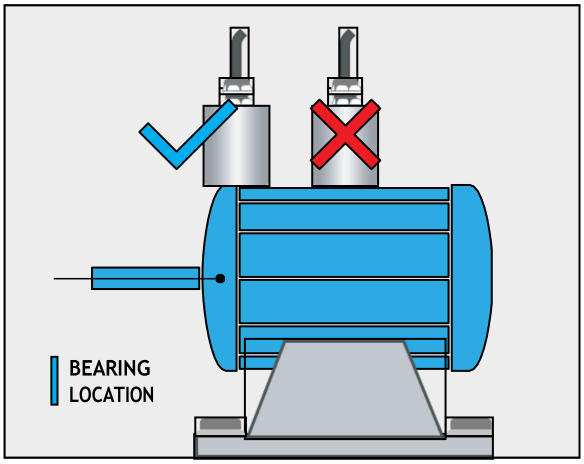
Both sensors are placed directly in line with the center of the bearing and are the shortest distanceto it. Both the horizontal and vertical locations areacceptable, and either location can be used.



Both sensors are placed in locations furthest away from the centerline of the bearing and are not optimal for data collection



This sensor is placed on the protective cover and should not be used. It should be moved to a location on the machine housing that would allow for the most direct path of sound transmission from the bearing to the sensor.



Both sensors are mount vertically but the right sensor is not mounted as close as possible to the bearing and should not be used. The left sensor on the other hand is mounted in an acceptable location on the machine housing that is closest to the bearing.

2.2 Additional Considerations

Competing Sounds

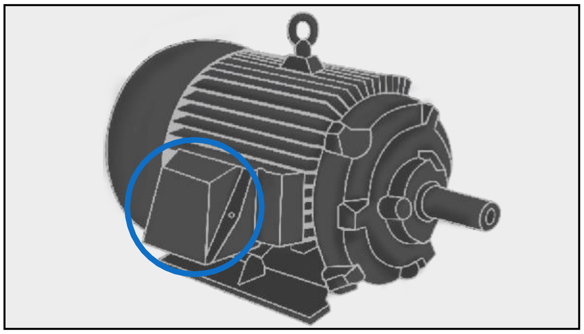


*Image showing an electric motor's wire termination junction box

Whenever possible the sensor should be placed in locations that best isolate it from other sounds, both internal and external to the machine, that could hamper consistent monitoring of the bearing. A common example would be the increased electrical related sounds that can be heard the closer the sensor is placed to an electric motor's wire termination junction box.

Bearing Load Zone

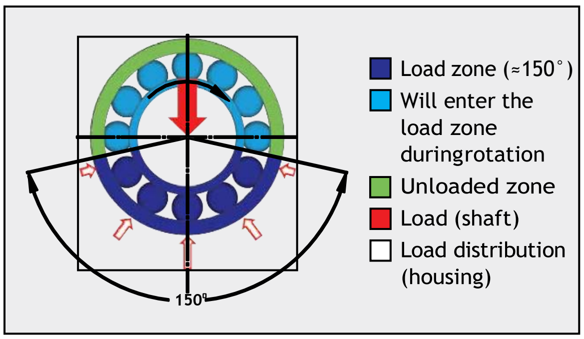
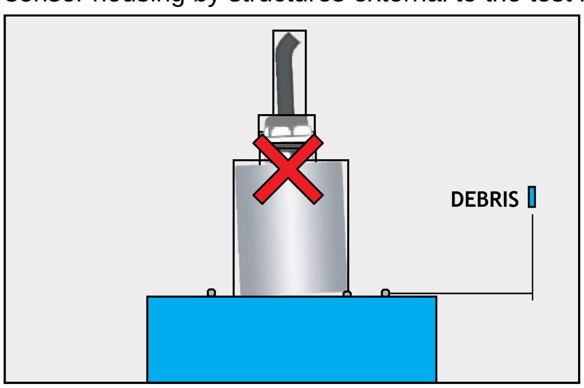


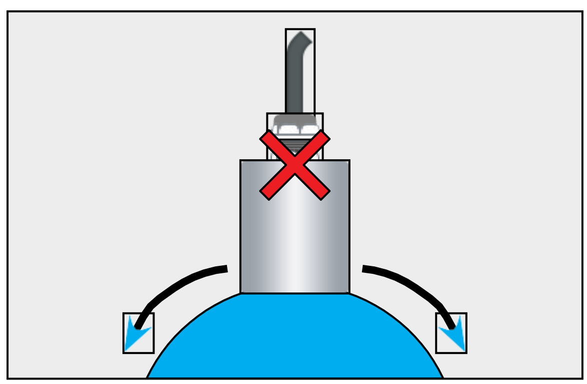
*Image showing the bearing load zone for a typical radial load on a horizontally mounted machine.

The region of the bearing that is involved in the load transmission is referred to as the load zone. This area can potentially yield the highest readings, but it is often not feasible for most machine types.

2.3 Proper Mounting

Ensure the sensor can be firmly attached to the machine housing and is free of debris and obstructions that would impede its ability to maintain consistent and stable contact. Eliminating any contact with the sensor housing by structures external to the test location should also be considered.



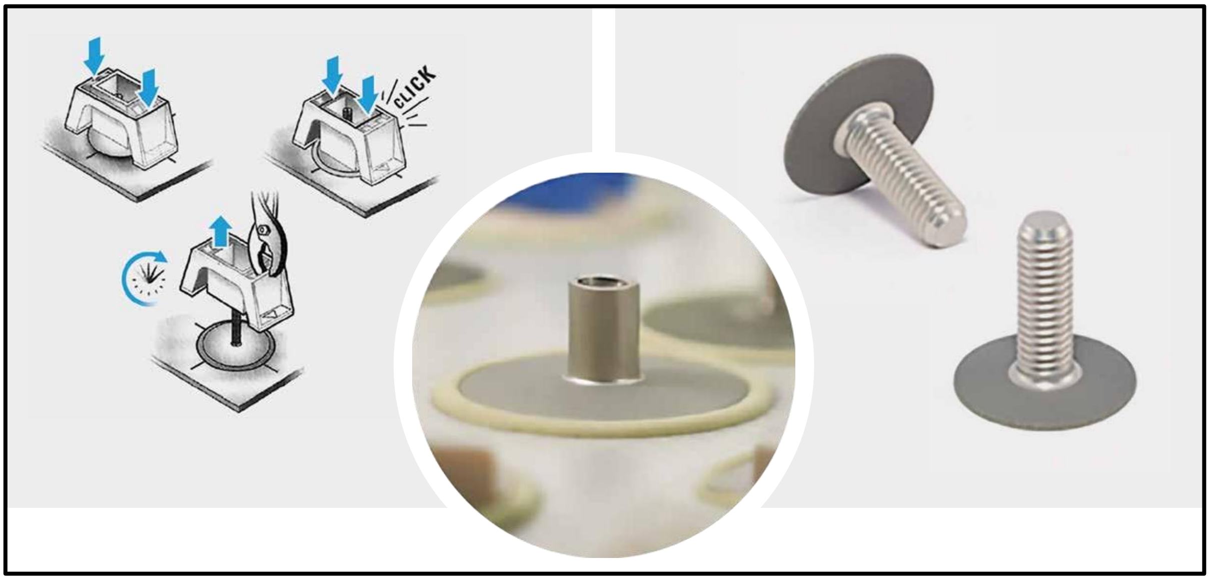


The sensor is placed at a location where it has limited surface contact area and is prone to rocking and movement side to side. This lack of stability will cause the readings to be inconsistent and potentially erroneous in nature and should not be used.

The sensor is placed at a location with debris that is not allowing the sensor to fully contact that machine housing and/or firmly attach to it. The surface should be cleaned of all debris before placing the sensor to ensure there is instability or weakness in the readings coming from the bearing.

2.4 Mounting Options

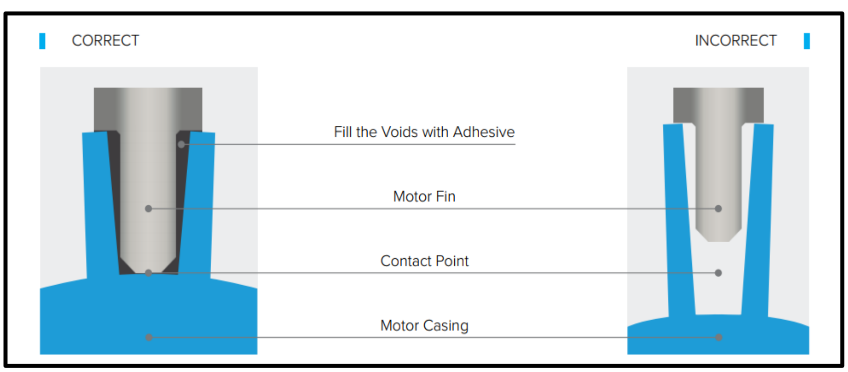
2.4.1 Recommended: Adhesive Stud Mount



- Prepare the mounting surface.
- Mix the 2-part epoxy included with the kit and apply.
- Press on the plastic piece of the mounting kit until it clicks.
- Wait 10 – 15 minutes.
- Remove the plastic mounting kit from the stud.
- Thread the sensor onto the stud.

2.4.2 Alternative: Fin Mount

When a good spot to mount the sensor is not available, UE systems' Motor Fin Mounts may be the perfect solution. selecting the proper Motor Fin Mount is accomplished by measuring the depth and width of the cooling fins where you want to locate the remote ultrasound sensor. The Motor Fin Mount needs to be long enough to directly contact the motor case between the fins. Loctite AA H3300 adhesive is then used to hold the Motor Fin Mount in place. The thickness of the Motor Fin Mount should allow contact at the bottom and minimize the amount of adhesive needed.



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The ultrasound approach

2.5 Accessories

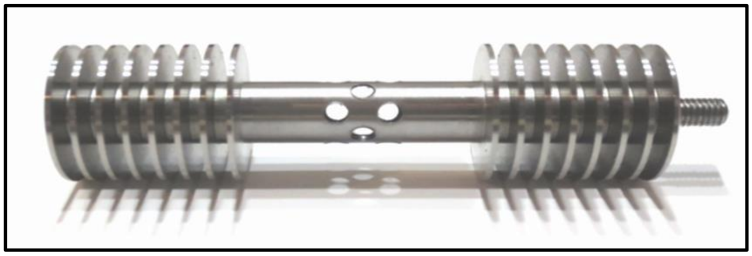
Looking For More?

UE Systems offers a variety of accessories to accommodate all your application needs!

Thermo Isolation Yoke

Mounting kit for thermal isolation.

Used in application where mounting location is above the rated temperature of the sensor. The thermo isolation yoke uses the ambient air to significantly reduce the temperature to the sensor.



Customer Support

Have a question or need assistance with your sensor?

Want more information regarding products or training?

Contact Us

UE Systems Inc.

Toll Free – **800.223.1325**

Phone – **914.592.1220**

Fax – **914.347.2181**

Email – info@uesystems.com

OR Visit – www.uesystems.com