

# *Basics of Accelerometer Mounting and Installation*



A CTC hivatalos magyarországi képviselőt a Delta-3N Kft. látja el.  
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VIBRATION ANALYSIS HARDWARE

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# About this Presentation

We are glad that you have taken the time to view this self-paced training module on the *Basics of Accelerometer Mounting and Installation*.

This is a narrated slide show. The narration can be played through the speakers on your computer, or, if you do not have speakers or wish not to disturb others around you, the entire narration for each slide will be displayed on the screen in a blue box such as this one.

We hope you enjoy the training.

*“Basics of Accelerometer Mounting and Installation,”* was created and presented by **CTC** (Connection Technology Center, Inc.)

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# Objectives

By the end of this training module, you should understand the advantages and disadvantages inherent in the various mounting methods for your accelerometer or Piezo-velocity sensor. By better understanding these basic principals, you will be better able to decide which hardware and technique to utilize depending on the type of data you require for a given application.

We will review the following installation techniques:

- Stud mount
- Adhesive mount
- Portable mount



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# 4 Mounting Styles



There are 4 general categories of mounting styles which we will focus on:

- Magnet mount with a curved surface magnet.
- Specialty mounting pads, such as motor fin mount pads.
- Epoxy Pads; including Quick Connect studs, targets for flat magnets, and permanent mounting pads.
- Stud mount

To compare the advantages and disadvantages of these various mounting methods, we have grouped them by their use in portable and permanent mounting.










# Advantages & Limitations

Portable Measurement

Portable or Permanent

Permanent Mount

<p><b>Mounting Method</b></p>	 <p>Curved Surface Magnet</p>	 <p>Quick Connect</p>	 <p>Flat Magnet w/ Target</p>	 <p>Grease Mount</p>	 <p>Fin Mount Pad</p>	 <p>Epoxy Pad</p>	 <p>Stud Mount</p>
<p><b>Frequency Response</b></p>	<p>There are advantages and disadvantages to each method of sensor mounting. Generally speaking an analyst will capture better data when the mounting method adds minimal “mass” (or weight), maximizes surface area contact, maximizes “stiffness” (how firmly the sensor is attached to machinery) and is located closer to the source of the vibration.</p>						
<p><b>Ease of Installation</b></p>							
<p><b>Repeatable Data</b></p>							

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The next few slides will use a “Fair” to “Best” rating system to compare some of the more desirable mounting methods.

● Fair




★ Good

★★ Better

★★★ Best

# Advantages & Limitations

Portable Measurement

Mounting Method	 Curved Surface Magnet	 Quick Connect	 Flat Magnet w/ Target
Frequency Response	●	★	★★
Ease of Installation	★★★	★	★
Repeatable Data	●	★★	★★

The contact area of a curved surface (or “2-bar”) magnet is not as good as a Quick Connect system or a flat magnet with a target, and it’s mass tends to be higher; therefore analysts should not depend on data above 2 kHz (120,000 CPM); whereas a Flat Magnet on a well installed target can yield reliable data up to 8 kHz and possibly 10 kHz (600,000 CPM)!

Similarly, because the Quick Connect System, and the Flat Magnet with Target System both utilize a component which stays attached to the machinery between route collections, the data is very repeatable: same point, same angle.

Any analyst who has used one, knows that a Curved Surface Magnet is among the easiest methods of data collection there is.

● Fair

★ Good

★★ Better

★★★ Best





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# Advantages & Limitations

Portable or Permanent

Mounting Method	 Grease Mount	 Fin Mount Pad
Frequency Response	★	★
Ease of Installation	★★★	★
Repeatable Data	★★★	★★★

Specialty mounts such as Grease Fitting Mounts (or “Zerk Adapters”), and Motor Fin Mount Pads tend to add a bit of mass, and lack some stiffness. Yet they tend to provide good data -- usually in the 2 kHz (120,000 CPM) to 5 kHz (300,000 CPM) range -- because they are positioned in good proximity to the source of bearing vibration.

This method also tends to be very repeatable since the accelerometer mounting area on top of the pad will either attract a magnet for repeatable measurements, or will accept a stud for permanent mounting.

Ease of installation can vary.



Fair



Good



Better



Best



# Advantages & Limitations



Assuming proper techniques have been employed to mill the surface and affix the sensor, permanent mounting options will tend to produce good results at higher frequency ranges (up to the full useful range of the sensor). The data in general will be cleaner, more accurate, and highly repeatable.

To achieve these results the initial installation requires more care, and more time compared to some portable methods. Permanent Mount installations initially also tend to be more expensive due to dedicating a sensor to each monitoring point. It is worth noting that the additional investment can easily be made up when analysts are able to gather better data more efficiently. This will result in making better “calls” and result in less downtime.

All of the methods discussed so far have their place in a vibration monitoring program. It is up to the analyst to choose the method which is best suited for a given application.



## Permanent Mount

Mounting Method		
Frequency Response	★★	★★★
Ease of Installation	★	●
Repeatable Data	★★★	★★★

● Fair

★ Good

★★ Better

★★★ Best










Portable/Permanent  
Mounting

# Advantages & Limitations

Portable Measurement

Portable or Permanent

Permanent Mount

Mounting Method	 Curved Surface Magnet	 Quick Connect	 Flat Magnet w/ Target	 Grease Mount	 Fin Mount Pad	 Epoxy Pad	 Stud Mount
Frequency Response	●	★	★★	★	★	★★	★★★
Ease of Installation	★★★	★	★	★★	★	★	●
Repeatable Data	●	★★	★★	★★	★★	★★★	★★★

● Fair

★ Good

★★ Better

★★★ Best

In summary: there is no “one right answer” for which method is “best.”



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# Installation & Mounting Technique



After an analyst decides which mounting hardware is best for the particular application, it is important that the proper technique for mounting the sensor and/or pad is used. Proper technique in mounting the hardware will ensure that the analyst is able to get the most out of the data collected.

Likewise, improper technique in mounting the hardware will result in data which is unclear, or possibly only a partial indication of what is actually happening with the application. Sometimes, improper technique can even damage the sensors or cables, leading to eventual loss of good, consistent data all together.

The rest of this training module will focus on the proper techniques for the most common mounting options.



# When Installing Sensors Remember

Proper permanent installation of mounting hardware or sensors on an application seeks to accomplish several things, including: maximizing frequency response & data quality and ensuring long-term adhesion.

To maximize frequency response & data quality, an analyst should:

- Maximize Stiffness
- Limit additional mass
- Maximize surface area contact
- Locate sensors close to vibration source

To ensure long-term adhesion, an analyst should:

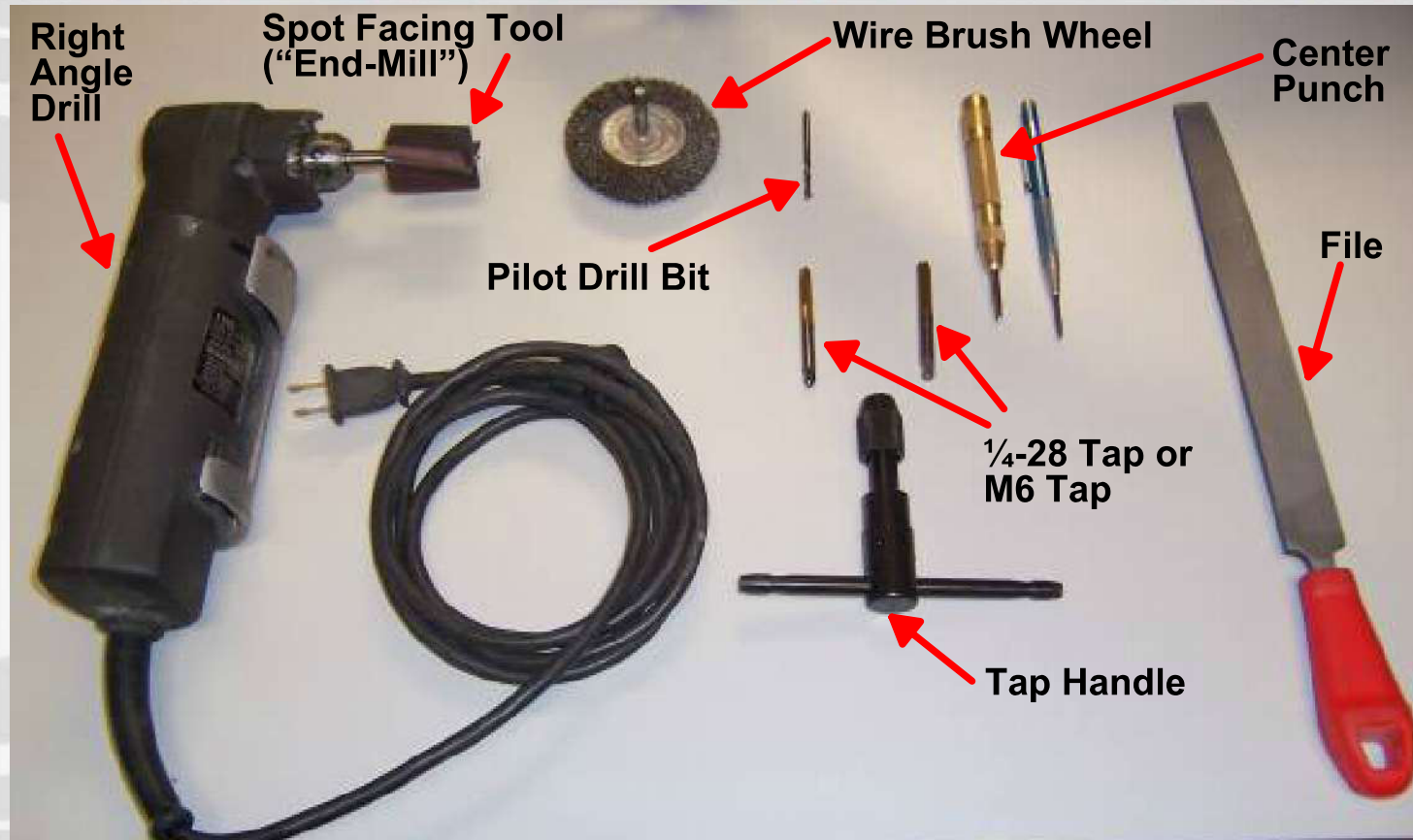
- Use proper surface preparation
- Use materials compatible with the environment in which the application is running



# Tools Used for Installation

As with most jobs, the right tools will make a difference in the quality of your installations.

Lets take a moment to review the tools you may need:



# Stud Mounting

**Stud mounting your sensors directly to the machinery will provide several advantages:**

- Stud mounting provides the best transmission of the broadest range of frequencies (when properly installed), and should allow the analyst to use the full frequency range of the sensor.
- Stud mounting will also provide the most reliable and resilient installation.
- And it meets Intrinsic Safety requirements since the case of the sensor must be grounded to the machinery when used in an explosive environment. (Note: special sensors and barriers must be utilized in such applications.)



# Stud Mounting

Before you begin, consult the engineering drawings of your spec-sheet. Select an end-mill the same diameter as the mounting surface of the sensor. Also note the pilot hole depth and pilot hole diameter that fit the sensor you will be installing.

- Use a right angle drill with an end-mill bit (such as the MH117 series sensor installation kit), to create a flat spot on the surface of the machinery.
- Make sure that the pilot bit in the center of the end-mill is slightly deeper than the exposed length of the stud you will be using.
- Apply even pressure to ensure flatness.
  - Surface finish - 63 or better.
  - Surface Flatness - .001 inches.
- Mill and drill the pilot hole perpendicular to the surface.
- Tap pilot hole with appropriate tap sets.
  - Start tap using the “Starter Tap.”
  - Finish using a “Bottom Tap” which will cut threads all of the way to the bottom of the hole.
- Clean surface, and tighten sensor into hole to roughly 2 to 5 foot pounds (2.7 to 6.8 Nm).
- Paint any exposed metal on the surface to prevent corrosion.



# Epoxy Pads



Epoxy pads are a good solution where a magnet target is desired. Magnet targets are used to improve the consistency of data being analyzed by ensuring that data is taken from the same point on each “route” regardless of who is collecting the data.

Targets are also useful for analysts who are using flat magnets to collect higher frequency data. The polished, flat surface of the target provides better transmission of data over 5 kHz (300,000 CPM).



Epoxy pads are also frequently used for permanent mounting of sensors where drilling and tapping are not permitted or possible.

Properly installed epoxy pads can transmit high frequency data (10 kHz or 600,000 CPM) very well, and therefore can be used effectively for monitoring many gearbox and bearing faults.

Avoid using them in cooling towers or other aggressive environments that could interfere with the bonding of adhesive.



# Mounting Pads on Milled Surface

For high frequency response and to limit or eliminate additional peaks, we suggest spot facing the surface and applying your mounting pads with a thin film adhesive:

- Similar to the preparation of a stud mounted sensor, mill a flat surface the same diameter as the pad using a right angle drill with end-mill bit, or using a grinding tool.
  - Use even pressure.
  - Unlike with the stud mounting preparation, the pilot drill bit in the end-mill should only be set slightly below the mill – just enough to catch the surface and prevent the mill from “skating” sideways.
- Clean the target surface area *and* that of the pad with an acceptable, residue free solution (such as Windex).
  - Be sure to wear clean rubber (surgical) gloves to ensure that the oils and other contaminants from your hands do not contaminate the surfaces you will be cleaning.
- Apply a thin film of adhesive (such as Loctite 330) to the pad.
  - Be sure that the adhesive is compatible with environmental factors (such as chemicals, moisture and heat).
  - Hold pad in place for 30 seconds, and tape in place for 15 minutes while adhesive cures.
  - Touch up with paint to prevent corrosion.





# Mounting Pads on Un-Milled Surface



**Mounting on an un-milled surface will cause a loss of some of the higher frequency signals, however it is sometimes the only choice:**

When applying a mounting pad with epoxy, it is important that you first, thoroughly clean the surfaces of the target and pad:

- Remove paint from area with end of file or wire wheel to expose bare metal.
- Properly clean the target surface area and that of the pad while wearing gloves as in the previous slide.

Since your mounting surface is un-milled, and therefore uneven, be sure to use a gap filling epoxy, such as Devcon Plastic Welder.

- Mix your Epoxy on a clean surface, or use an applicator “gun.”
- Make sure that your adhesive is compatible with environmental factors (chemicals, moisture, heat).



# Mounting Pads on Un-Milled Surface

Spread a thick film of epoxy on the mounting surface of the pad.

Push the pad onto the mounting surface of your application, and hold in place for 30 seconds to allow epoxy to begin to set. Do not twist the pad as this will eliminate much of the epoxy from the mounting surface and adversely effect the adhesion of the pad to the mounting surface.

Tape pad in place while adhesive sets.

Touch up any bare metal with paint to prevent corrosion.



# Installing Motor Fin Mounts

To monitor outboard bearings which are covered by an end-bell, analysts should consider using Motor Fin Mounts. They will deliver the vibration signal from the bearing(s) through the housing of the motor, avoiding resonant frequencies which would be encountered if collecting data from the end-bell or top of motor fins:

Scrape fins and valley with end of file and/or wire wheel to bear metal; then clean surface with an acceptable residue free solution (such as Windex.)

Choose the correct size fin mount so that the bottom of the probe will be seated in the valley of the fin, while the pad remains clear of the top of the motor fin.

While wearing disposable gloves, apply a generous amount of epoxy to pad. Be sure to use an epoxy which sets up hard, with good gap filling properties, and fast setting time (such as Devcon Plastic Welder.)



# Installing Motor Fin Mount

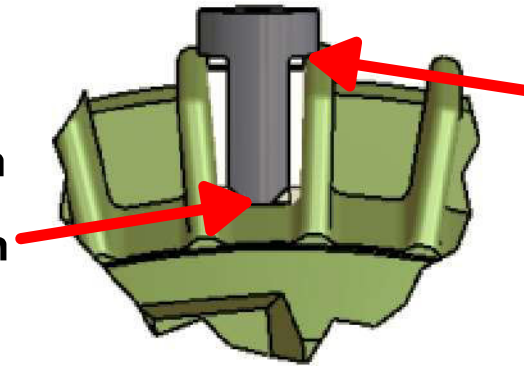
Insert the probe portion of the fin mount pad between fins, close to the source of the vibration you are targeting (typically as close to bearing race as possible without touching the end-bell.)

Be sure to seat the bottom of the probe in the valley of the motor fin. It is important that the probe base maintains contact with the motor fin valley otherwise you will notice a lack of medium and high frequency data.

Note that the pad section should *not* touch the top of the fin, otherwise data will include additional resonances from the fins.

Tape the pad in place while epoxy sets.

Maintain Contact Between Probe & Motor



Need Gap Between Pad & Fin



Tape



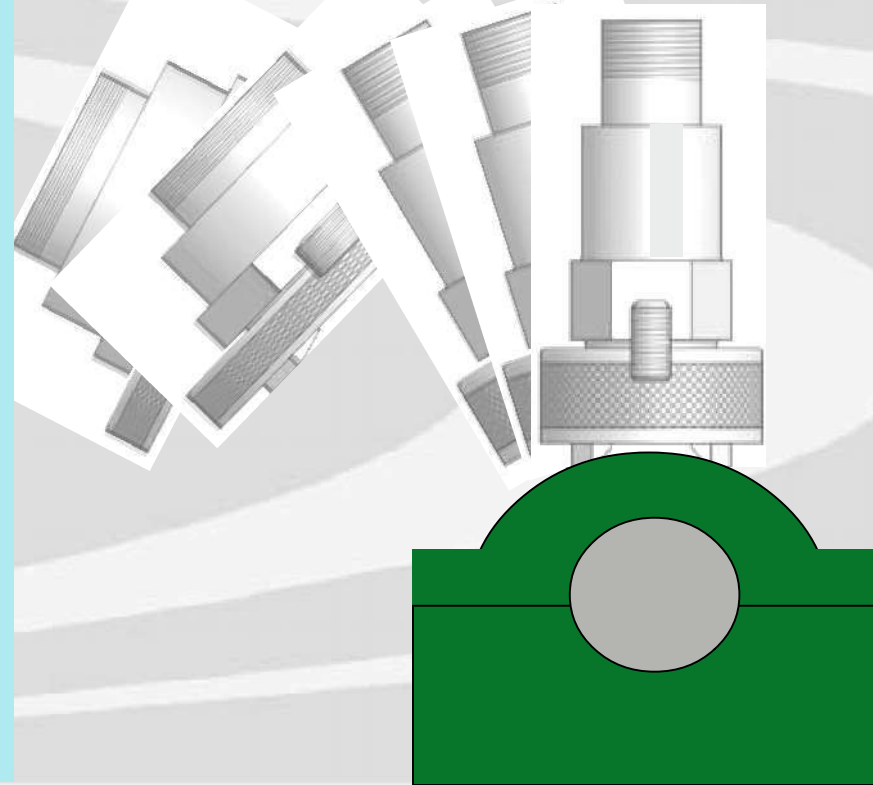
# Curved Surface Magnet Mounting

When using a magnet for portable data collection, the proper technique is to rock the magnet onto, and off of, the mounting surface.

Failure to rock the sensor onto the surface can produce very high g levels in the sensor. These high g levels can overload the amplifier in the sensor, causing the sensor to overload or saturate, resulting in data which is commonly referred to as a “ski slope.” Ski sloping causes the low frequency data to register such high amplitudes that no other data is visible on the analyzer.

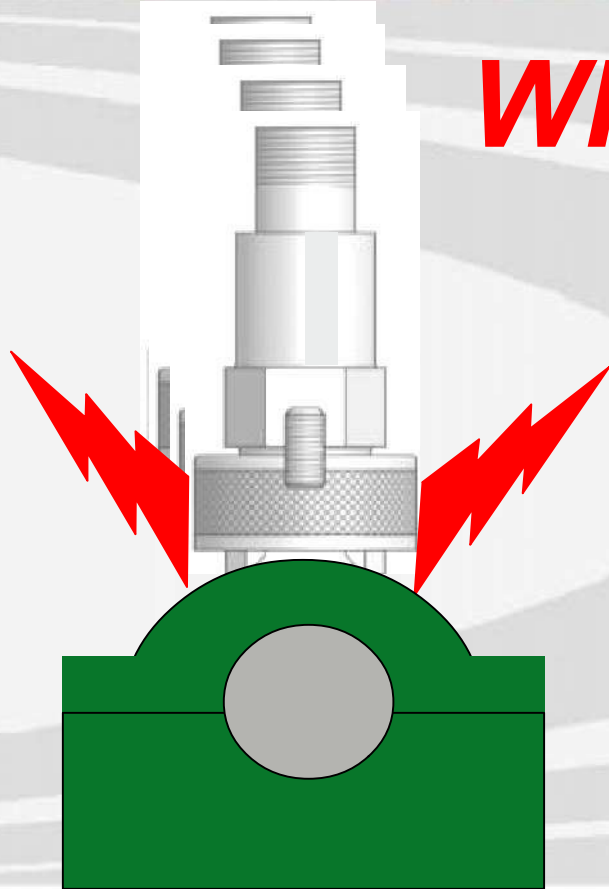
Gently rocking the sensor onto the mounting surface prevents this sudden shock to the sensor and allows the sensor and analyzer to “settle” more quickly, so that accurate data can be obtained.

**Rock On!**



# Curved Surface Magnet Mounting

**WRONG !**



Don't allow your sensor to be **SLAMMED** onto the mounting surface.

The resulting ski slope or overload condition which may be caused by the shock to the sensor will yield erroneous data, and will prolong your route collection time.

Repeated shock to the sensor could also permanently damage your sensor. Remember that your sensor and data collector are precision tools which must be handled with care to ensure that your data is consistently accurate.



# Examples

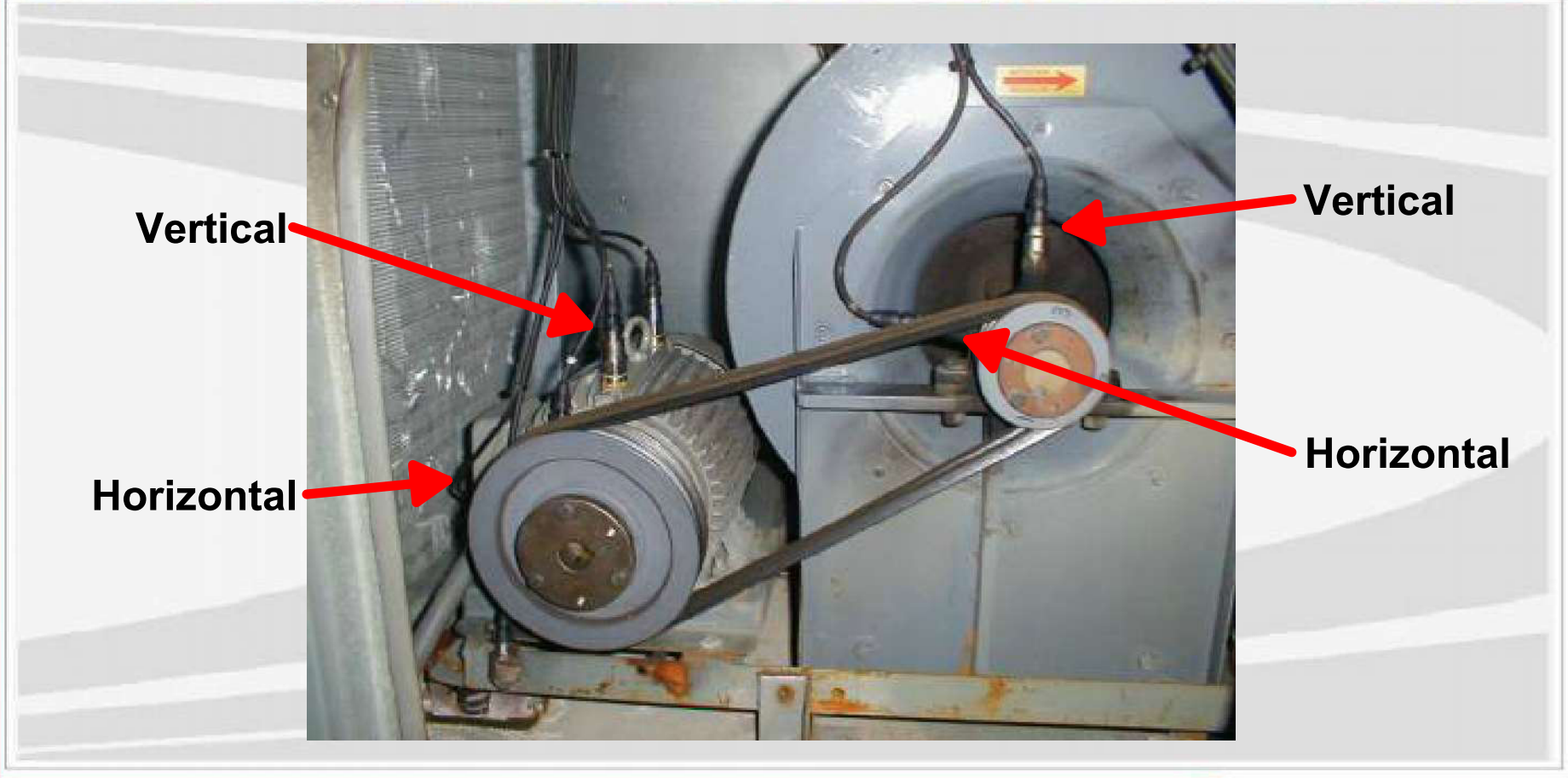
Please take a moment to review the following examples of mounting techniques and positions.



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# Example #1 – Motor & Fan





# Example #2 – Fan



Vertical

Axial



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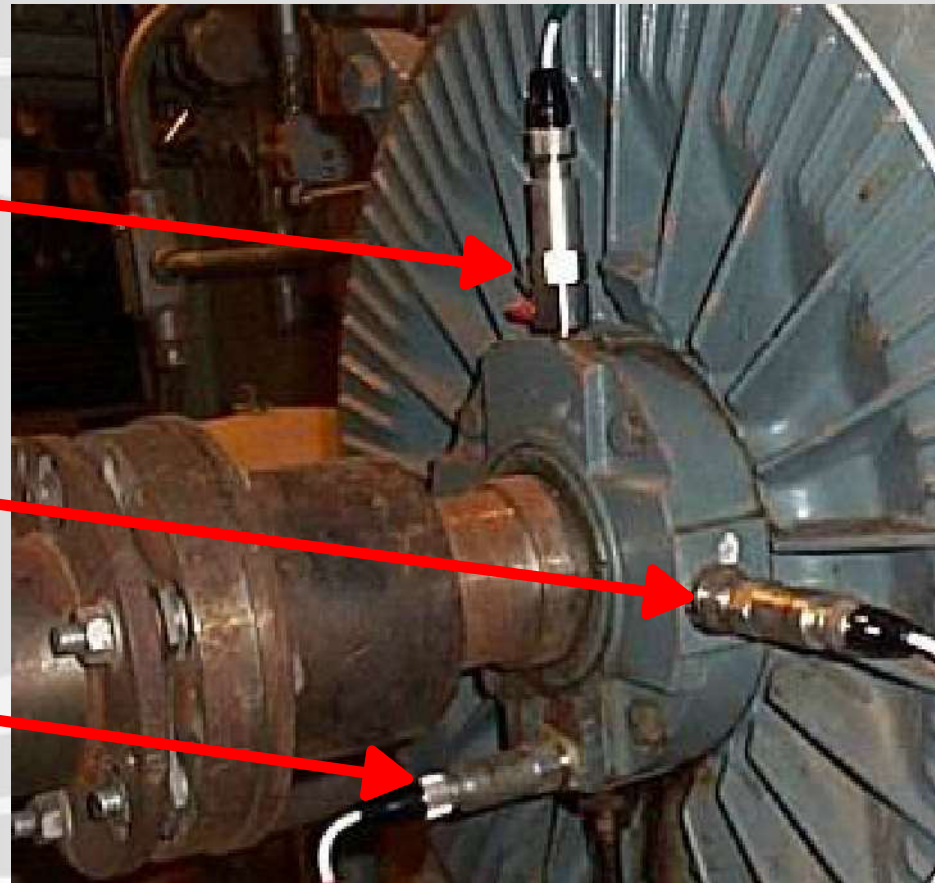


# Example #3 - Motor

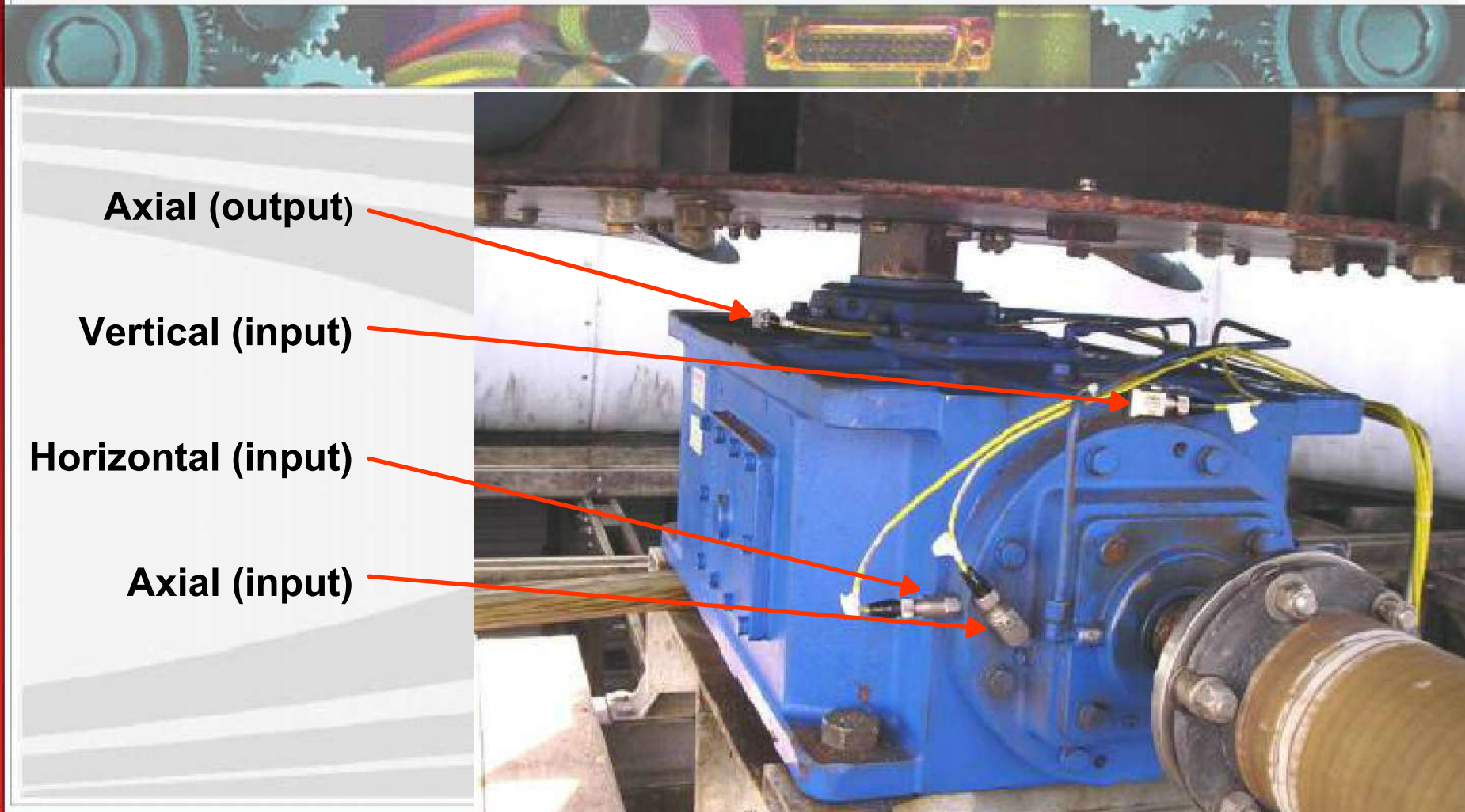
Vertical mount  
on a Grease  
Fitting Adapter

Horizontal mount  
on an Quick  
Connect

Axial mount on  
an epoxy pad



# Example #4 - Cooling Tower Gearbox



# Thank You!

Thank you for taking the time to review this training module. We hope that you learned something that will help you to collect more accurate and quicker data, to allow you to make better “calls.”

CTC prides itself on its customer and technical support. Did you know that CTC employ several Vibration Institute Certified **Category 2** and **Category 3** Analysts, and one **Category 4** Analyst who also trains for the Vibration Institute? It is all part of our commitment to providing the industry's best service and support.

For more technical information, additional white papers, and training materials, we invite you to visit our website at [www.ctconline.com](http://www.ctconline.com), or contact one of our Analysts at (800) 999-5290 (in the US and Canada); or at +1-585-924-5900 (international).



# Thank You !

Next time you need Sensors, Cables, Junction Boxes or Mounting Hardware and accessories, we would appreciate it if you would keep us in mind.

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- Quick Service (shipping most orders in 3 days)
- Knowledgeable support staff
- Industry's only ***UNCONDITIONAL LIFETIME WARRANTY***

Thanks again for your time.

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