CONNECTION TECHNOLOGY CENTER, INC.

LEVEL 3 – LESSON 4

APPLICATION OF CONDUCTIVE MOUNTING PADS FOR VIBRATION ANALYSIS IN INTRINSICALLY SAFE ENVIRONMENTS

INTRODUCTION

Welcome to **Level 3, Lesson 4** of CTC's free online vibration analysis training. We're glad you have taken the time to view this self-paced lesson on bump testing. We hope you enjoy the training and will continue to build your vibration analysis knowledge as you progress through Level 3.

OBJECTIVES

Upon completing the following lesson, you will understand the benefits and disadvantages of the various methods used for mounting accelerometers in intrinsically safe (IS) environments.

INSTALLATION REQUIREMENTS

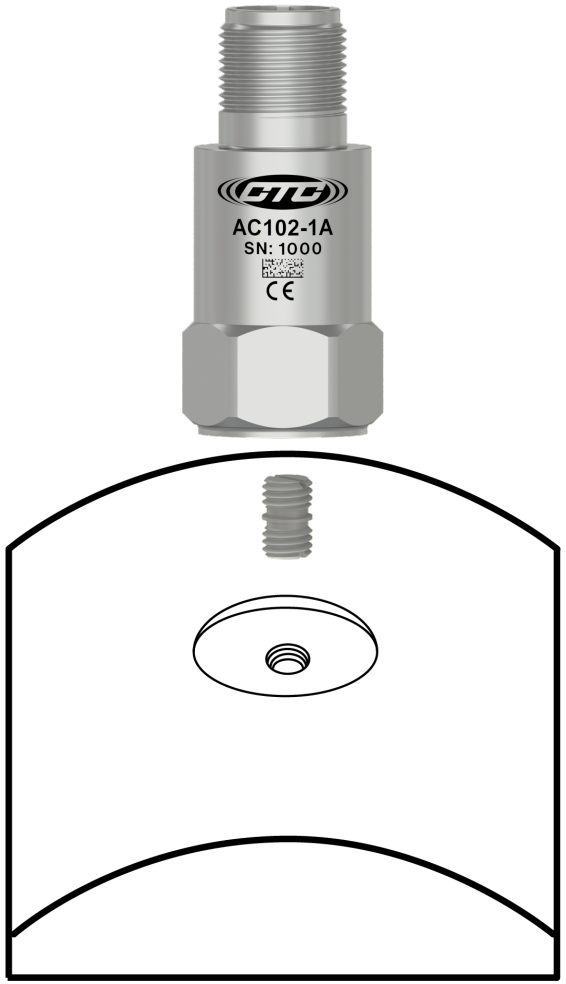
The installation of accelerometers to measure machine vibration in an intrinsically safe (IS) environment **requires that the case of the accelerometer be at the same electrical potential as the machine to which it is mounted**. Typically, this is earth ground.

STUD MOUNTING

The normal method of mounting accelerometers in intrinsically safe (IS) environments is to **drill, spot face, and tap a threaded hole in the machine**.

This allows the accelerometer to be stud mounted and have direct metal-to-metal contact, **ensuring conductivity between the sensor and the machine**.

The figure on the right shows a small, circular flat machined on the surface of the machine. A hole is drilled and tapped (1/4-28) in the center of the machined surface. The accelerometer is then attached to the machine by a threaded stud and tightened with a mounting torque of 2 to 5 ft lbs.



STUD MOUNTING - DISADVANTAGES

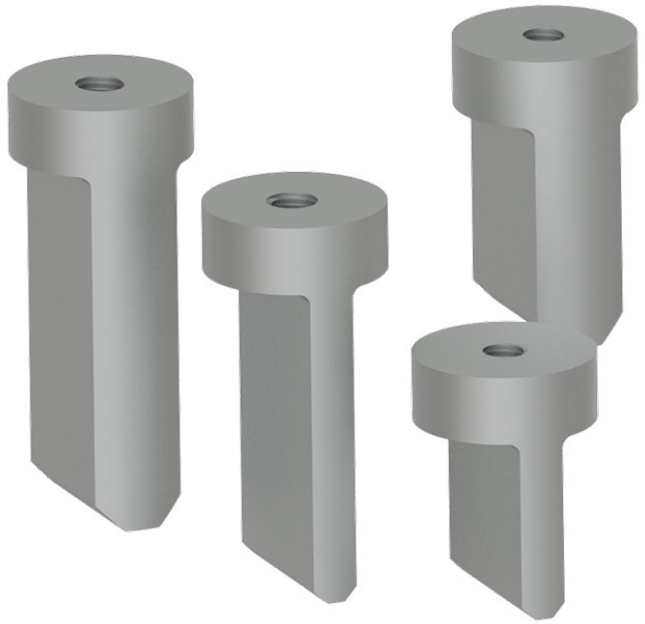
Unfortunately, some motor manufacturers are objecting to the modification of the motor case on an explosion-proof motor.

The motor manufacturers feel that the small spot-faced surface and tapped hole may create a potential failure in the motor case.

Since the motor manufacturers also need to meet rigid intrinsic safety (IS) requirements, but also understand the benefits of monitoring machine vibrations, **an alternate mounting method is required**.

The following slides will explain one such method.

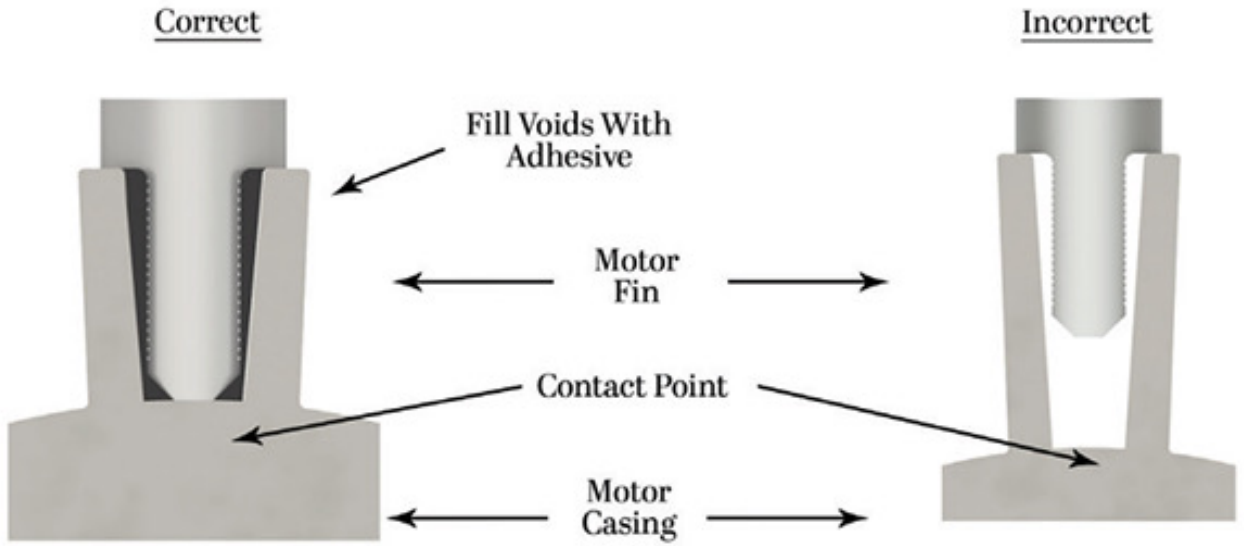
FIN MOUNT PADS



The **fin mount pad is a universally accepted method of mounting accelerometers on motors**, and is available in various sizes.

FIN MOUNT PADS

The **fin mount pad is seated in the valley between two cooling fins on the motor**, and is held in place with epoxy.



FIN MOUNT PADS

The **accelerometer is then stud mounted or magnet mounted to the fin mount pad** to measure the vibration of the motor.

A typical epoxy used in this case is **Devcon Plastic Welder**. Although it has very good adhesive properties, and a shore D hardness of 78 providing good transmission of vibrations, it is an insulator and **will not meet the requirements for intrinsic safety** (**IS**).

FIN MOUNT PADS – USING A CONDUCTIVE EPOXY

MH109-2A
DEVCON PLASTIC WELDER

Since the typical **Devcon Plastic Welder is an insulating epoxy**, **it is not possible to maintain a conductive bond** between the accelerometer, fin mount pad, and motor.

The issue of conductive mounting can be solved through the use of a conductive epoxy.

FIN MOUNT PADS – USING A CONDUCTIVE EPOXY

An example of a **conductive epoxy** was provided by Resin Technology Group, LLC, 28 Norfolk Avenue, Easton Industrial Park, South Easton, Massachusetts 02375. The product, known as **TIGA 901** is described as:

> "an **electrically conductive**, **silver-filled epoxy adhesive** recommended for electronics bonding and sealing applications that require a combination of good mechanical and electrical properties.
>
> This two-part smooth paste formulation of refined pure silver and epoxy is free of solvents and copper or carbon additives. It develops **strong**, **durable**, **electrically and thermally conducting bonds and coating between many different and dissimilar materials** such as metals, ceramics, glass, and plastic laminates. TIGA 901 **cures at room temperature** and can be used as a 'cold solder' for heat-sensitive components where hot soldering is impractical."

The TIGA 901 was provided in a 2.5 gram burst pack that made for very easy mixing of the two parts. Although the required cure time at room temperature is 24 hours, **it has a shore D hardness of 85** and should be excellent for the transmission of vibration.

FIN MOUNT PADS – CONDUCTIVE EPOXY MOUNTING PROCEDURE

Once the location on the motor has been identified to place the fin mount pad, **the valley between the motor fins needs to have the paint removed** so that there is a bare metal surface to work with.

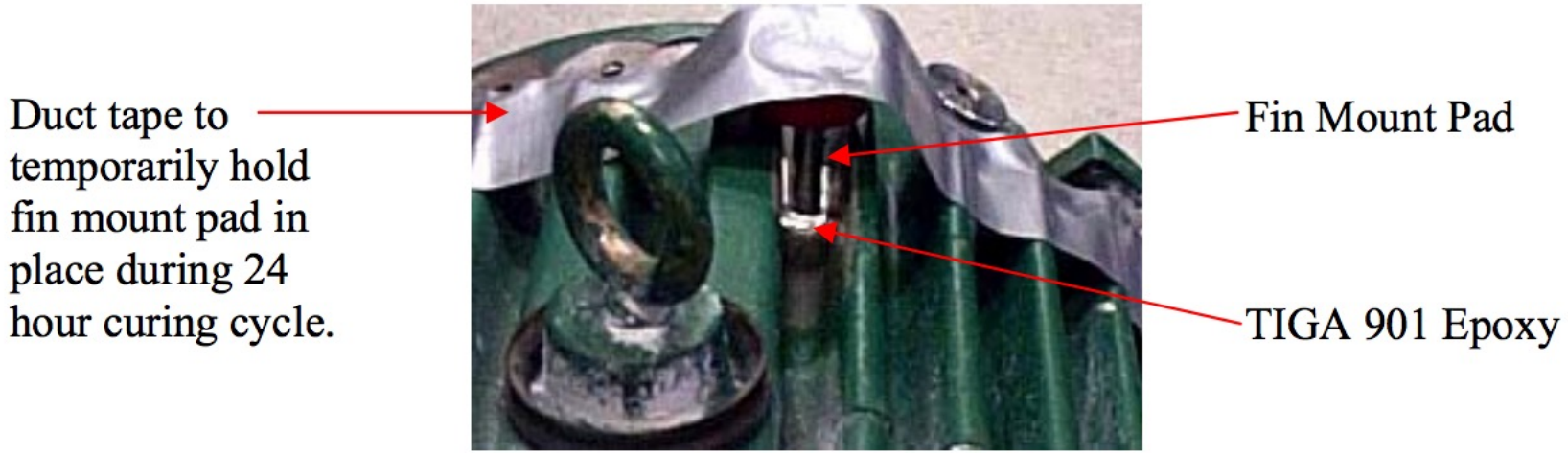
This **surface preparation must include the valley between the fins and both inside walls** of the fins.

A **sharp bladed scraper or a wire wheel in a drill motor** will assist with the surface preparation.

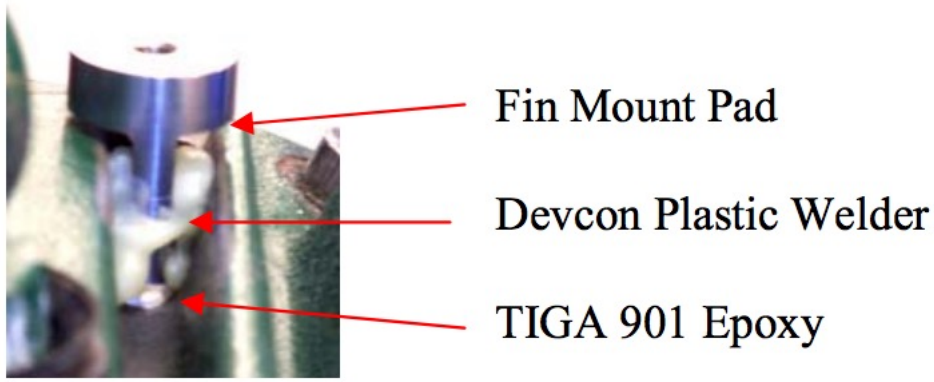
FIN MOUNT PADS – CONDUCTIVE EPOXY MOUNTING PROCEDURE

Mix the TIGA 901 and apply it into the valley between the two motor fins. Set the tip of the fin mount pad in the TIGA 901 and temporarily fix it in place for the 24 hour curing cycle.

Make sure that only the tip of the fin mount pad is touching the motor case, and that clear space exists on the sides and top of the fin mount pad. An example is shown below:



FIN MOUNT PADS – CONDUCTIVE EPOXY MOUNTING PROCEDURE



After the 24 hour curing cycle, the **Devcon Plastic Welder can be added to fill the voids** between the walls of the motor fins and the fin mount pad.

This provides added strength to the mounting, but **does not compromise the conducive bond** that was established with the TIGA 901.

This **secondary epoxy fill will reduce the mounting costs and provide side wall support**, as shown to the left.

FIN MOUNT PADS – CONDUCTIVE EPOXY MOUNTING PROCEDURE

In tight locations the Devcon Plastic Welder could be applied with a syringe and taper tip to facilitate filling the voids between the walls of the motor fins and the fin mount pad.

Once the Devcon Plastic Welder has cured (approximately 5-10 minutes), any bare metal may be painted, and the accelerometer may be mounted.

Below are **examples of mounting a top exit or side exit accelerometer on the motor fin mount pad**:

CONCLUSION

A successful accelerometer mounting has been achieved without altering the physical structure of the motor.

Utilizing TIGA 901 and Devcon Plastic Welder has provided a conductive mounting method at the lowest possible cost with added strength to support the fin mount pad.

The actual measured resistance between the fin mount pad and the motor case ranged from 0.1 to 0.2 ohms, and provides safe mounting of the accelerometer in an intrinsically safe (IS) environment.

SUMMARY

Thank you for taking the time to review this training lesson.

CTC prides itself on the industry's best customer service and technical support. CTC is proud to employ Vibration Institute Certified Analysts as 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**.

SUMMARY

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- ❑ **Accuracy and performance**
- ❑ **Quick service (shipping most orders in 3 days)**
- ❑ **Knowledgeable support staff**
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