Overview of Mounting Techniques

The purpose of this document will be to cover various techniques used when mounting sensors, and key things to consider before utilizing any certain method. One of the more pertinent things to consider when working with accelerometer mounting is the effect that the technique employed will have on the accuracy of the usable frequency response. The accelerometer's operating frequency range is typically determined by securely stud mounting the test sensor directly to the reference standard accelerometer. Direct coupling with a stud mounted to a very smooth surface generally yields the highest mechanical resonant frequency and broadest usable frequency range. Although this practice yields the best usable frequency response, it is not always applicable to the current setup. The addition of any mass to the accelerometer, such as an adhesive or magnetic mounting base, lowers the resonant frequency of the sensing system and may affect the accuracy and limits of the accelerometer's usable frequency range. Also compliant materials such as a rubber interface pad can create a mechanical filtering effect by isolating and damping high-frequency transmissibility.

Surface Preparation:

The mounting of the sensor is as significant as the selection of the sensor itself in many applications. The mounting technique and surface preparation can affect the frequency response of the measurement, particularly at high frequencies.

Special attention should always be taken to ensure a flush mating between the sensor and surface. Nicks, divots, scratches or other deformations of the mounting surface or the sensor surface will affect the frequency response produced by the sensor.

A thin application of a light lubricant compound will improve transmissibility, filling voids with nearly incompressible fluid and thereby increasing compressive stiffness of the joint. This is specifically relevant when measuring at frequencies above 2 kHz, at which any changes in resonance have a significant effect on measurements.

Stud Mounting:

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 higher frequencies.

> NOTE Do NOT attempt stud 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.

STEP 1: Prepare a smooth, flat mounting surface, then drill and tap a mounting hole in the center of the area in accordance with the mounting face of the sensor. A precision-machined mounting surface is recommended. If machining the surface is not possible to properly prepare the test structure mounting surface, consider adhesive mounting as a possible alternative. Inspect the area to make sure that there are no burrs or other foreign particles interfering with the contact surface.

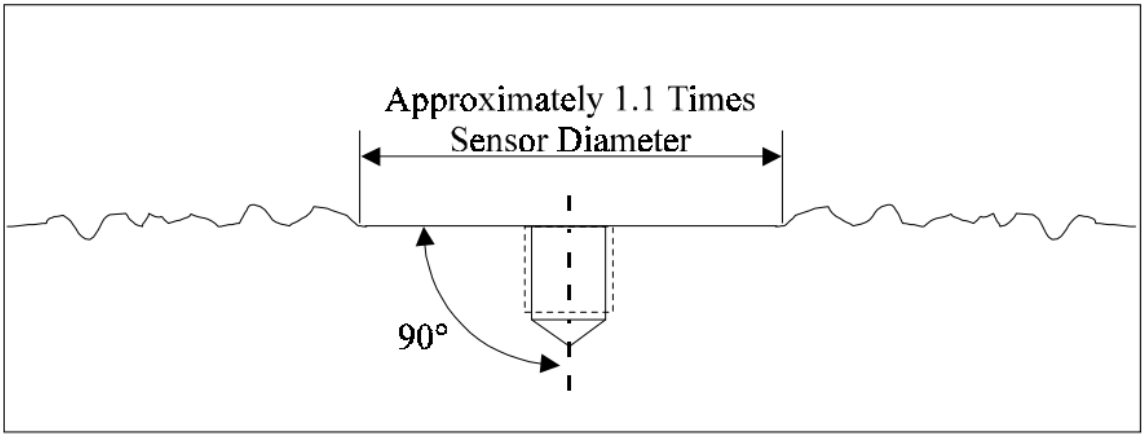

Figure 1: Mounting Surface Preparation

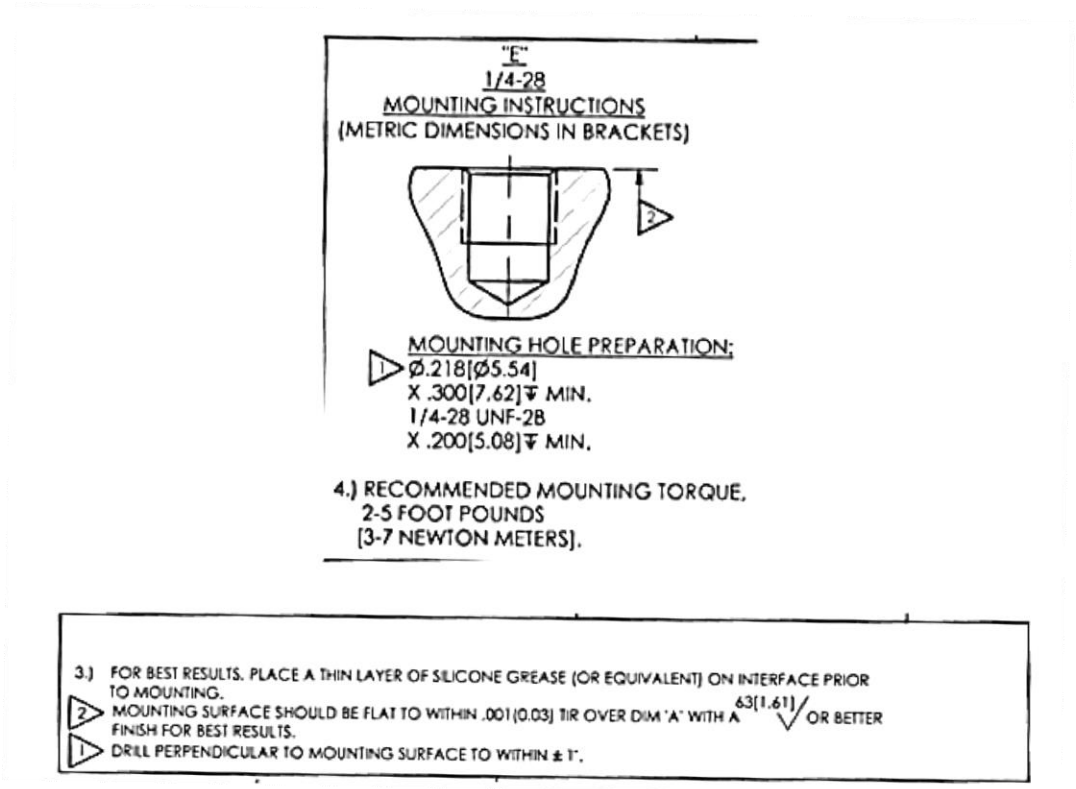

Figure 2: Mounting Surface Installation Drawing

STEP 2: Wipe the mounting surface clean and spread on a light film of grease, oil, or similar coupling fluid prior to installation. Adding a coupling fluid improves vibration transmissibility by filling small voids in the mounting surface and increasing mounting stiffness. For semi-permanent mounting substitute epoxy or another type of adhesive.

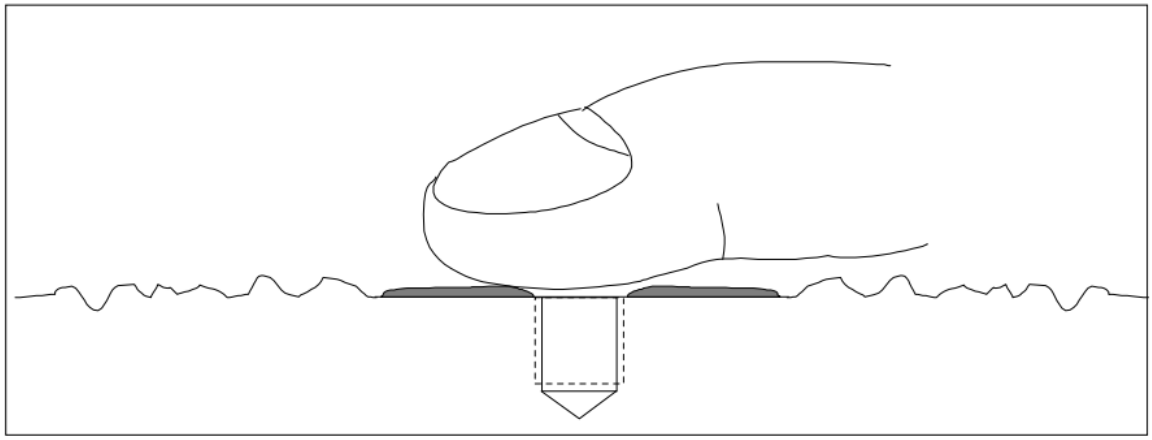

Figure 3: Mounting Surface Lubrication

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 datasheet.

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

Adhesive Mounting:

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 (super glue) 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.*

STEP 1: Prepare a smooth, flat mounting surface.

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. Be aware that excessive amounts of adhesive can make the sensor removal difficult, however, too little adhesive won't create a cohesive joint for the sensor to stay mounted. Also, adhesive that may invade the tapped mounting hole in the base of the sensor will compromise future ability to stud-mount the unit.

Magnetic Mounting:

Magnetic mounting provides a convenient means for making quick, portable measurements and is commonly used for machinery condition monitoring, predictive maintenance, spot checks, and vibration trending applications.

> **NOTE** *The correct magnet choice and an adequately prepared mounting surface are 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 such as motor housings and pipes. 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 location for mounting and a target to insure that subsequent measurements for trending purposes are taken at the same location.

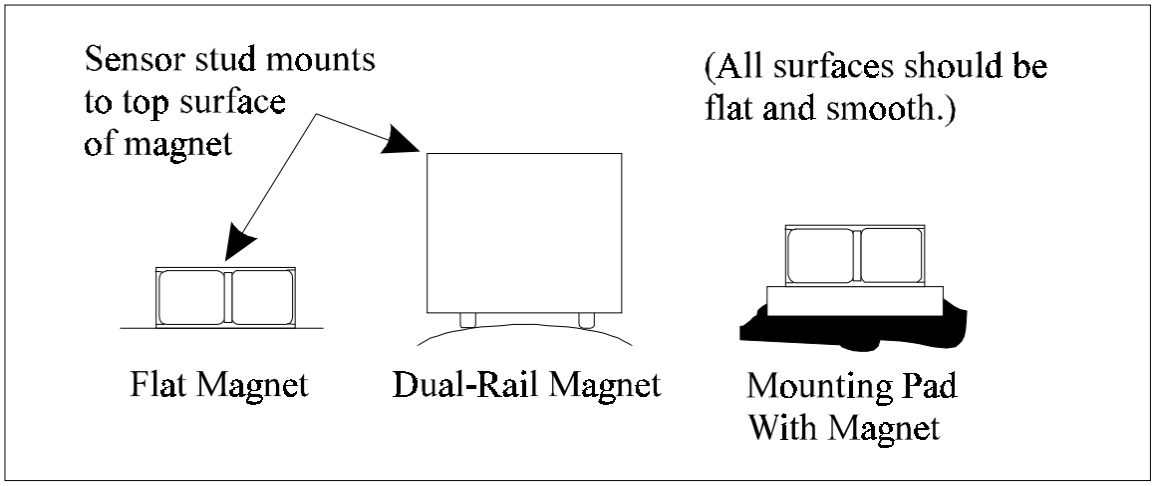

Figure 4: Magnet Types

STEP 1: Prepare a smooth, flat mounting surface.

STEP 2: Ensure that the mounting surface is clean and free of defects.

STEP 3: After checking the surface, apply a light film of silicone grease, machine oil, or similar-type coupling fluid.

STEP 4: 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 datasheet.

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

STEP 5: To avoid damage to the sensor, install the magnet/sensor assembly to the prepared test surface by gently "rocking" or "sliding" it into place.

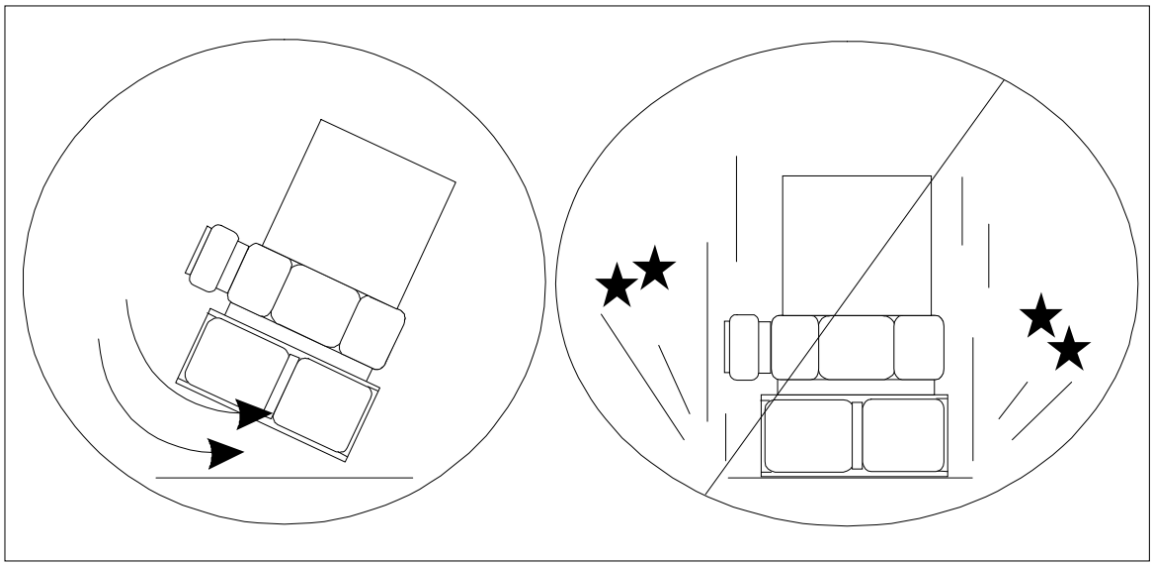

Figure 5: Magnet Mounting

CAUTION Magnetically mounting of an accelerometer has the potential to generate very high, damaging acceleration (g) levels. To prevent from incurring damage, exercise extreme circumspection and install the assembly gently by rocking it into place. If shock is expected to be a particular concern, use a sensor with built-in shock protection. For further assistance, contact a factory representative.