Strain Gage Installations with EPY-500 Adhesive

Description

EPY-500 is a two-part, heat curing, epoxy system that is specially formulated for Micro-Measurements. This adhesive has reduced particle size, allowing a much thinner glue line. This adhesive is compatible with all epoxy-phenolic and polyimide strain gages.

Installation Accessories

For proper results, the procedures and techniques presented in this bulletin should be used with qualified Vishay Micro-Measurements installation accessory products. M-LINE accessories used in this procedure are:

- CSM Degreaser or GC-6 Isopropyl Alcohol
- Silicon Carbide Paper (SCP-1, SCP-2, SCP-3)
- M-Prep Conditioner A
- M-Prep Neutralizer 5A
- GSP-1 Gauze Sponges
- CSP-1 Cotton Applicators
- MJG-2 Mylar Tape
- GT-14 Pressure Pads and Backup Plates
- HSC-1, HSC-2, HSC-3 Spring Clamps

Handling Precautions

While this material is considered relatively safe to handle, contact with skin and inhalation of vapors should be avoided. Immediate washing with ordinary soap and water is effective in cleansing should skin contact occur. For eye contact, rinse thoroughly with a copious amount of water and consult a physician. For additional health and safety information, consult the Material Safety Data Sheet, which is available upon request.

Mixing Adhesive

1. Release the clamp, which separates the hardener from the resin.

2. Knead the bag until thoroughly mixed and of a uniform color. Do not forget the corners and edges when mixing. Complete blending typically requires 3 minutes.

3. The pot life after mixing is approximately 24 hours depending on ambient conditions. The pot life may be extended to one month if stored below +32° F (0° C). If stored at cold temperatures, the package should be elevated to room temperature before opening to avoid moisture contamination from condensation.

4. The viscosity of the adhesive may be lowered to facilitate mixing and application by heating. Immersion of the package in warm water [+120 to +140° F (+49 to +60° C)] prior to mixing or exposure to a heat lamp at the same temperature after mixing and removal from the package will yield the desired viscosity. Be sure to wipe the package free of moisture before opening if immersed.

Getting Started

The installation procedure presented here is somewhat abbreviated and is intended only as a guide in achieving proper gage installation with EPY-500 Adhesive. Vishay Micro-Measurements Instruction Bulletin B-129*, Surface Preparation for Strain Gage Bonding*, presents recommended procedures for surface preparation, and lists specific considerations that are helpful when working with most common structural materials.

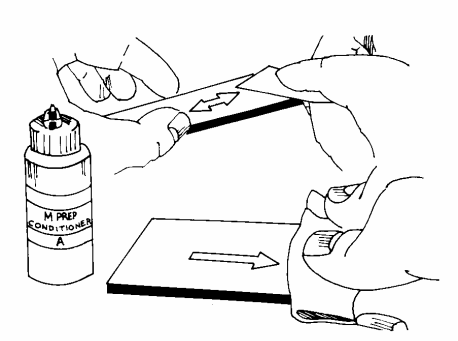
Step 1

The surface preparation technique used is the same basic cleaning procedure described in Vishay Micro-Measurements Instruction Bulletin B-129, "*Surface Preparation for Strain Gage Bonding*". The initial step is to thoroughly degrease with solvents such as CSM Degreaser or GC-6 Isopropyl Alcohol. CSM Degreaser is preferred whenever possible since this is a very active degreaser. The substitution of GC-6 as a degreasing agent should be considered for

materials that may be sensitive to strong solvents.

Any degreasing should be done with clean solvents. Thus the use of a "one-way" container, such as the aerosol can, is highly advisable.

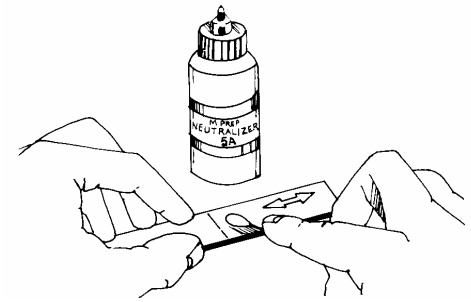
Step 2



Dry-abrade the gaging area with 220- or 320-grit silicon-carbide paper to remove any scale or oxides on the base material. Apply M-Prep Conditioner A and wet-abrade the gage area. Keep the surface wet while abrading. Remove the residue and Conditioner by slowly wiping through the gaging area with a gauze sponge. The wet-abrade and wiping procedure should then be repeated with 400-grit silicon-carbide paper.

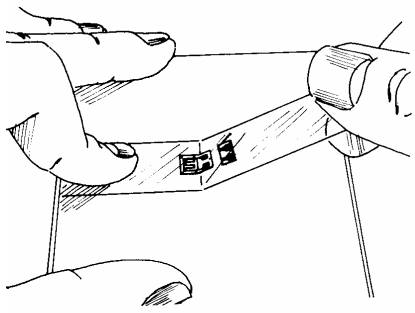
With a 4H (hard) drafting pencil on aluminum or a ball-point pen on steel, burnish whatever alignment marks are needed on the specimen. Rewet the surface with Conditioner A and scrub with cotton-tipped applicators until a clean applicator is no longer discolored by the scrubbing. Remove the residue and Conditioner by slowly wiping through the gaging area with a gauze sponge. Do not wipe back and forth over the gage area since this may allow contaminants to be re-deposited on the cleaned area.

Step 3



Apply a liberal amount of M-Prep Neutralizer 5A to the gage area. Keeping the surface wet, scrub with cotton-tipped applicators. Do not allow evaporation of the cleaning material on the specimen surface since this would leave a thin, unwanted film between the adhesive and the specimen. Remove the Neutralizer by slowly wiping through the gage area, allowing the gauze sponge to absorb the Neutralizer. Do not wipe back and forth over the gage area since this may allow contaminants to be re-deposited on the cleaned area.

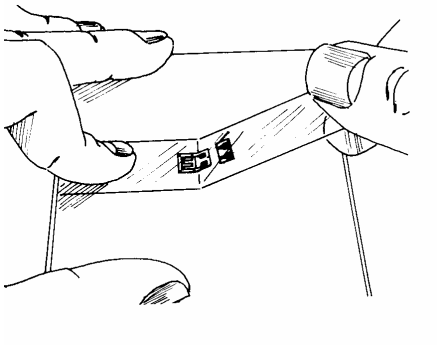
Step 4



Remove the gage from the Mylar envelope by grasping the edge of the gage backing with tweezers , and place on a chemically clean glass plate or empty gage box, with the bonding side of the gage down. If a solder terminal is to be incorporated, position it on the plate adjacent to the gage as shown. A space of approximately 1/16 in (1.6 mm) should be left between the gage backing and terminal. Using 4 to 6 in (100 to 150 mm) of MJG-2 mylar tape , tack one end to the glass plate behind the gage and terminal, and wipe forward onto the terminal and gage. Carefully lift the tape at a shallow angle (about 45 degrees to work surface), bringing the gage up with it.

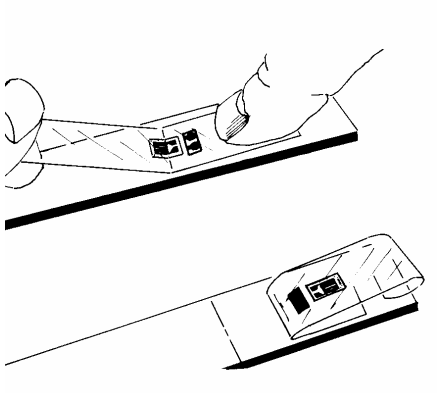
NOTE: To avoid excessive stretching of the Mylar tape, which could result in resistance offsets in an unbonded gage (Steps 4 and 6), use only enough force to lift the tape from the specimen surface.

Step 5



Remove the gage/tape/terminal assembly by peeling tape at a shallow angle (about 45 deg) and transferring it onto the specimen. Make sure gage alignment marks coincide with specimen layout lines. If misalignment does occur, lift end of tape at a shallow angle until assembly is free. Realign and replace. Use of a pair of tweezers often facilitates this handling.

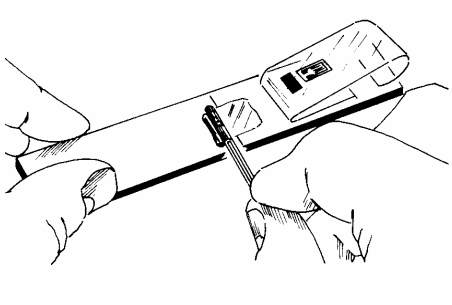
Step 6



Lift one end of the tape at a shallow angle to surface (about 45 degrees) until the gage and terminal are free of the specimen surface. Tuck loose end of the tape under and press to surface so the gage lies flat with the bonding side exposed.

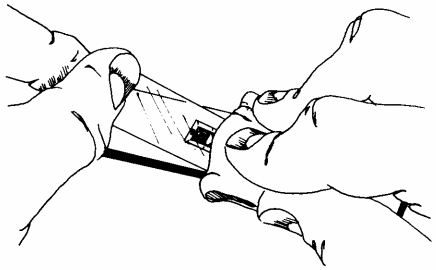
Leave enough slack in the tape to allow a finger to be slipped behind the gage to support it while applying the adhesive (Step 7).

Step 7



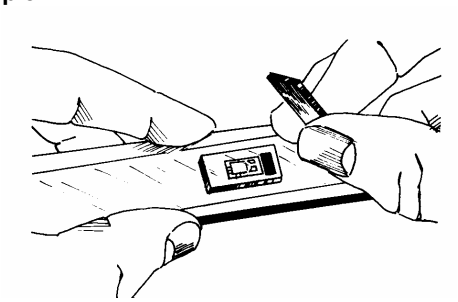
After mixing the adhesive in accordance with this bulletin, use scissors to snip off one corner of the bag. Squeeze the adhesive out of the package onto a cleaned surface, preferably a glass plate. Apply a liberal coating of the adhesive to the specimen or the gage backing using a glass or plastic stirring rod. Smooth to a uniform thickness over the desired area. The adhesive film should be just thick enough to cover the gaging area without bubbles or voids.

Step 8



Lift the tucked-over end of tape and bridge it over the adhesive at approximately a 30-degree angle. With a piece of gauze, slowly make a single wiping stroke over the gage/tape assembly, bringing the gage back down over the alignment marks on the specimen. Use a firm pressure with your fingers when wiping over the gage, since the adhesive is quite viscous. A very thin layer of adhesive is desired for optimum bond performance.

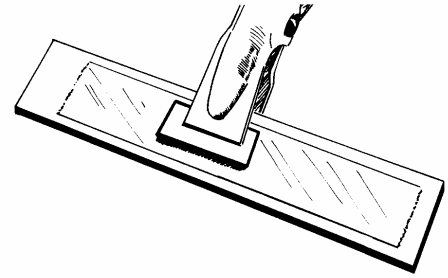
Step 9



Overlay gage/terminal area with a piece of thin Teflon sheet (TFE-1). If necessary, anchor Teflon in position with a piece of Mylar tape across one end.

Cut a 3/32-in (2.5-mm) thick silicone-gum pad and a metal backup plate (GT-14) to a size slightly larger than the gage/terminal area, and carefully center these as shown above. Larger pads may restrict proper spreading of adhesive.

Step 10



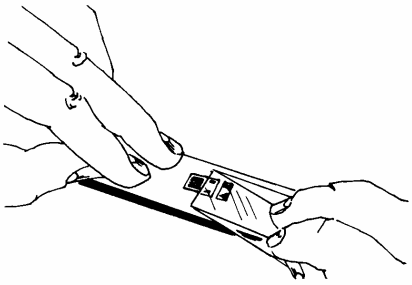
Apply force by spring clamp or dead weight until a clamping pressure of 15 psi (105 kN/m2) is attained. Take special care in making sure the clamping pressure is equal over the entire gage. Unequal clamping pressure may result in an irregular glue line. Take steps to ensure that the clamps will not slide out of position during cure. A few strips of MJG-2 Mylar tape to assist in holding the clamps or backup plate in place during cure may be helpful.

This adhesive requires an elevated temperature cure. Place the clamped gage/specimen into a cool oven and raise the temperature at a rate of +5 to +20° F (+3° to +11°C). Cure the installation using any of the following:

- 26 Hours at +200° F (+93° C)
- 4 Hours at +250° F (+121 °C)
- 1 Hour at +350° F (+177° C)
- ½ Hour at +400° F (+204° C)

The recommended Post Cure is 1 hour at +450°F (+232° C) for applications above +450°F (+232°C).

Step 11



The gage and terminal strip are now solidly bonded in place. To remove the tape, pull it back directly over itself, peeling it slowly and steadily off the surfaces.

This technique will prevent possible lifting of the foil on open-faced gages or other damage to the installation. It is not necessary to remove the tape immediately after gage installation. The tape will offer mechanical protection for the grid surface and may be left in place until it is removed for gage wiring.

Final Installation Procedure

Select appropriate solder and attach leadwires.
Remove solder flux with RSK Rosin Solvent.
Select and apply protective coating.
Vishay Micro-Measurements gages have been treated for optimum bonding conditions and require no pre-cleaning before use unless contaminated during handling. If contaminated, the back of any gage may be cleaned with a CSP-1 Cotton Applicator slightly moistened with M-Prep Neutralizer 5A.