Technical Data Sheet

M-Bond 43-B, M-Bond 600 and M-Bond 610

Catalog #50410-10 - #50410-30

Introduction

Micro-measurements M-Bond 43-B, M-Bond 600 and M-Bond 610 adhesives are high-performance epoxy resins, formulated specifically for bonding strain gages and special-purpose sensors. When properly cured, these adhesives are useful for temperatures ranging from -452° to +350°F (-269° to +175°C) with M-Bond 43-B and to +700°F (+370°C) for short periods with M-Bond 60 and 610. In common with other organic materials, life is limited by oxidation and sublimation effects at elevated temperatures. M-Bond 43-B is particularly recommended for transducer applications up to +250°F (+120°C), and M-Bond 610 for transducers up to +450°F (+230°C).

For proper results, the procedures and techniques presented in this bulletin should be used with qualified Micro-Measurements installation accessory products.

Mixing Instructions

Since M-Bond 43-B is a solvent thinned, precatalyzed epoxy mixture, it is applied at room temperature directly as received. The M-Bond 600 and 610 on the other hand, are two-component systems. These must be mixed as follows:

1. Resin and curing agent bottles must be at room temperature before opening.
2. Using the disposable plastic funnel, empty contents of bottle labeled "Curing agent" into bottle of resin labeled "adhesive". Discard funnel.
3. After tightening the brush cap (included separately), thoroughly mix contents of this "adhesive" bottle by vigorously shaking it for 10 seconds.
4. Mark bottle with date mixed in space proved on the label.
   Allow this freshly mixed adhesive to stand for at least one hour before using.

Surface Preparation

Metal surface cleaning procedures usually involve solvent degreasing with either CSM Degreaser or GC-6 Isopropyl Alcohol, abrading, and cleaning with M-prep conditioner A, followed by application of M=prep neutralizer 5A. When practical, these preparation procedures should be applied to an area significantly larger than that occupied by the gage. Surfaces should be free from pits and irregularities. Porous surfaces may be precoated with a filled epoxy, such as M-Bond GA-61, which is then cured and abraded.

Shelf Life And Pot Life

At room temperature, M-Bond 600 has a useful storage life of approximately three months, while M-bond 43-B and M-Bond 610 will last about nine months.

Once opened and mixed, M-Bond 600 and 610 have room temperature pot lives of two weeks and six weeks, respectively. Since M-Bond 43-B is supplied already mixed, its pot life is about the same as its shelf life when kept in a tightly closed container.

These periods of adhesive usefulness can often be doubled by refrigeration at +30° to +40°F (0° to +5°C). Never open a refrigerated bottle until it has reached room temperature.

**** Handling Precautions ****

Epoxy resins and hardeners may cause dermatitis or other allergic reactions, particularly in sensitive persons. The user is cautioned to: (1) avoid contact with ether the resin or hardener; (2) avoid prolonged or repeated breathing of the vapors; and (3) use these materials only in well-ventilated arrears. If skin contact occurs, thoroughly wash the contaminated area with soap and water immediately. In case of eye contact, flush immediately and secure medical attention. Rubber gloves and aprons are recommend, and care should be taken not contaminate working surfaces, tools, container handles, etc. Spills should be cleaned up immediately. For additional health and safety information, consult the Material safety data Sheet, which is available upon request.

Strain Gage Installations With M-Bond 43-B, 600 & 610 Adhesive Systems

Step 1:

Thoroughly degrease the gaging area with solvent, such as CSM Degreaser or GC-6 Isopropyl Alcohol (Figure 1). The former is preferred, but there are some materials (e.g. titanium and many plastics) that react with CSM. In these cases, GC-6 Isopropyl Alcohol should be considered. All degreasing should be done with uncontaminated solvents - thus the use of "one-way" containers, such as aerosol cans, is highly advisable.

Step 2:

Preliminary dry abrading with 220 or 320 grit silicon-carbide paper (figure 2a) is generally required if there is any surface scale or oxide. Final abrading is done by using 320 or 400 grit silicon-carbide paper on surfaces thoroughly wetted with M-prep Conditioner A; this is followed by wiping dry with a gauze sponge, as in figure 2b.

With a 4H pencil (on aluminum) or a ballpoint pen (on steel) burnish (do not scribe) whatever alignment marks are needed on the specimen. Repeatedly apply Conditioner A and scrub with cotton-tipped applicators until a clean tip is no longer discolored. Remove all residue and Conditioner by again slowly wiping through with a gauze sponge. Never allow any solution to dry on the surface because this invariably leaves a contaminating film and reduces chances of a good bond.

Step 3:

Now apply a liberal amount of M-prep Neutralizer 5A and scrub with a cotton tipped applicator, as illustrate din Figure 3. With a single, slow wiping motion of a gauze sponge, carefully dry this surface. Do not wipe back and forth because this may allow contaminants to be redeposited on the cleaned surface.

Step 4:

Remove a gage from its Mylar envelope with tweezers, making certain not to touch any exposed foil. Please the gage, bonding side down, onto a chemically clean glass plate or empty gage box. If a solder terminal is to be incorporated, position it next to the gage. While holding the gage in position with a mylar envelope, place a short length of MJG-2 mylar tape down over about half of the gage tabs and the entire terminals (figure 4).

Step 5:

Remove the gage/tape/terminal assembly by peeling tape at a shallow angle (about 30°) and transferring it onto the specimen. Make sure gage alignment marks coincide with specimen layout lines. If misalignment does occur, lift the end of the tape at a shallow angle until assembly is free. Realign and replace (figure 5). Use of a pair of tweezers often facilitates this handling. Note: a "hot-tack" method of positioning can be used, which eliminates need for taping. This method is explained after step 9.

Step 6:

Now, by lifting at a shallow angle, peel back one end of the taped assembly so as to raise both gage and terminal. By curling this mylar tape back upon itself, it will remain in position, ready to be accurately repositioned after application of adhesive, as shown in figure 6.

Coat the gage backing, terminal and specimen surface with a thin layer of adhesive. Also coat the foil side of open-faced gages. Do not allow the adhesive applicator to touch the tape mastic. Permit adhesive to air dry, by solvent evaporation for five to 30 minutes at +75°F (+24°c) and 50% relative humidity. Longer air drying times are required at lower temperatures and/or higher humidities. Note: an additional drying step with 43-b is beneficial for large gages. Place the unclamped installation in an oven for 30 minutes at +175°F (+85°C) following the air-dry step above.

Step 7:

Return the gage/terminal assembly to its original position over the layout marks. Use only enough pressure to allow the assembly to be tacked down. Overlay the gage/terminal area with a piece of thin "PTFE" sheet (TFE-1). If necessary, anchor the "PTFE" in position across one end with a piece of mylar tape.

Cut a 3/332" (2.5mm) thick silicone gum pad and a metal back up plate (GT-14) to a size slightly larger than the gage/terminal areas, and carefully center these as shown in figure 7. Larger pads may restrict proper spreading of adhesive, and entrap residual solvents during cure process

Note: Steps 6, 7 and 8 must be completed within 30 minutes with M-Bond 600, 4hours with M-Bond 610 and 24 hours with M-bond 43-B

Step 8:

Either spring clamps, as in figure 8, or deadweight can be used to apply pressure during the curing cycle. For transducers, 40 to 50 psi (275 to 350 kN/m2) is recommended and 10 to 70 psi (70to 480 kN/m2) for general work. Place the clamped gage/specimen into a cool oven and raise temperature to the desired curing level at a rate of 5° to 20°F (3° to 11°C) per minute. Air bubbles trapped in the adhesive, uneven glue

lines, and high adhesive film stresses often result from starting with a hot oven. Time-versus-temperature recommendations for curing each adhesive are given below.

Step 9:

Upon completion of the curing cycle, allow oven temperature to drop to at least 100°F(55°C) before removing the specimen. Remove clamping pieces and mylar tape. It is advisable to wash of the entire gage area with either RSK Rosin Solvent or toluene. This should remove all residual mastic and other contamination. Blot dry with a gauze sponge.

"Hot Tack" Method of Gage Installation

This procedure eliminates all need for taping to prevent movement of the gauge during mounting, and is especially suited to M-Bond 43-B and M-Bond 600.

1. After completing the preceding steps 1,2 and 3 remove gage from its mylar envelope using clean tweezers.
2. Coat the bonding side of gage and gaging area of the specimen with adhesive, and set each aside to air dry for at least 15 minutes. M-Bond 43-B may dry for up to 24 hours.
3. Using tweezers, position gage onto the specimen. A properly cleaned dental probe may help.
4. To anchor the gage, use a 15 to 24 watt soldering iron with a new conical tip. This is usually done by to tack setting the adhesive at two spots (such as opposite gage-alignment marks) while temporarily holding the gage down with a mylar envelope. A little experimentation may be required to learn the correct iron temperature and hot tip contact time. These depend upon type of adhesive used and thermal conductivity of the base material.
5. If the gage is open faced, apply a thin coating of adhesive to its face and allow to dry for at least five minutes before overlaying with a "PTFE" sheet (as described in step 7). Proceed with steps 8 and 9.

Recommended Cure Schedule

It should be noted that the following curves represent a range of time versus temperature; however, the upper limits of both time and temperature should be employed whenever possible, while keeping in mind the possible effect on the heat treat condition of the substrate material.

M-Bond 43B: 2 hours at +375°F (+190°C)

M-Bond 600: Cure at temperature for time period specified by graph below:

M-Bond 610: Cure at temperature for time period specified by graph below:

Postcuring

Postcures with the clamping fixture removed are usually required for stable transducer applications. Postcuring can be done following step 9 above, or after wiring the transducer (subject to temperature limits of solder and wire insulation).

M-Bond 43-B: 2 hours at +400°F (+205°C)

M-Bond 600: one to two hours at 50°F (30°C) above maximum operating or curing temperature, whichever is greater.

M-Bond 610: two hours at 50°F to 75°F (30 to 40°C) above maximum operating or curing temperature, whichever is greater.

Final Installation Procedures

1. Be sure to remove solder flux with Rosin solvent. Gage tabs and terminals can be cleaned prior to soldering by light abrading with pumice to remove the adhesive film. This pumicing is not required with gages having integral leads (options l and LE) or preattached solder dots.

Elongation Capabilities

M-Bond 43-B: 1% at -452°F (-269°C); 4% at _+75°F (+254°C); 2% at +300°F (+150°C)
M-Bond 600 & 610: 1% at -452°F (-269°C); 3% from room temperature to 500°F (+260°C)