Strain Gage Installations with M-Bond 300 Adhesive

INTRODUCTION

Micro-Measurements M-Bond 300 is a special-purpose, two-component polyester adhesive specially selected for strain gage bonding. It possesses the unusual ability of curing at temperatures as low as +40°F [+5°C], yet is operational at temperatures as high as +300°F [+150°C] without post curing. This is a major advantage in stress analysis applications where the temperature of the component to be gaged cannot easily be raised to the cure temperature required for conventional adhesives.

M-Bond 300 is not recommended as a general-purpose strain gage adhesive. While possessing high shear strength, which is the primary requirement for a good strain gage adhesive, M-Bond 300 has relatively low peel strength and should not be used in high-elongation strain measurements, impact strain measurements, or to secure leadwires.

***Operating Temperature Range*:**
-40° to +300°F [-40° to +150°C].

***Elongation Capabilities*:**
1 to 2%.

***Mixed Pot Life*:**
15-20 min at +40°F [+5°C],5-8 min at +75°F [+24°C].

***Shelf Life*:**
Minimum: 4 months at +75°F [+24°C].

SURFACE PREPARATION

The extensive subject of surface preparation is presented in detail in Micro-Measurements Instruction Bulletin B-129.

The most common surface preparation techniques used for M-Bond 300 on metals are illustrated in Steps 1, 2, and 3 of Instruction Bulletin B-137.

MIXING INSTRUCTIONS

Due to the relatively short pot life of M-Bond 300, all surface preparation should be completed before mixing the adhesive.

1. Using the pipette supplied, dispense 8 drops (or quantity otherwise specified in kit) of catalyst into the center of a resin container when at +72°F (+22°C) or 12 drops when at +40°F (+4°C). Mixing smaller quantities than those supplied is not recommended.

2. Mix the catalyst and resin for two minutes with a clean plastic stirring rod. The color of the mixture should change from pink to light amber during this period.

HANDLING PRECAUTIONS

M-Bond 300 catalyst and resin may cause skin irritation. Prolonged contact of 300 catalyst with eyes can cause permanent damage. If contact occurs, immediately rinse eyes thoroughly with copious amounts of water and consult a physician. Wash materials from skin with soap and water.

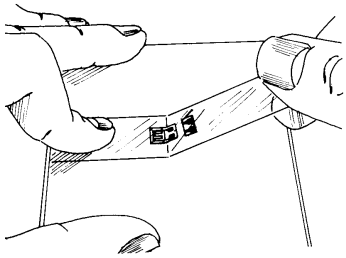
Flammable materials: Keep away from open flame, heat, or direct sunlight.

Do not store above +80°F [+27°C].

Refer to the Safety Data Sheet for additional health and safety information.

GAGE INSTALLATION

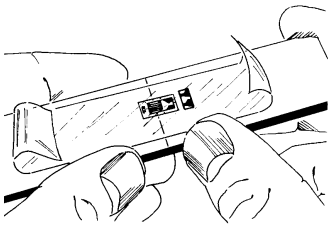
Step 1



Note: Micro-Measurements PCT gage installation tape must be used if tape is employed to position the gage. Other tapes may react with uncured adhesive.

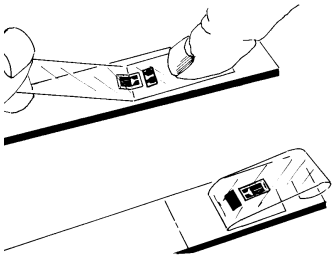
Remove the gage from its transparent envelope by grasping the edge of the gage backing with tweezers, and place bonding side down on a chemically clean glass plate or empty gage box. If a solder terminal is to be incorporated, position it on the plate adjacent to the gage as shown. A space of approximately 1/16 in [1.6 mm] should be left between the gage backing and terminal. Use 4 to 6 in [100 to 150 mm] of PCT Gage Installation tape as a carrier to aid in positioning the strain gage and terminal. Tack one end of the tape 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 the glass plate), bringing the gage up with it.

Step 2



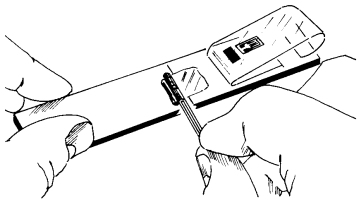
Position the gage/tape assembly so the triangle alignment marks on the gage are over the layout lines on the specimen. Holding the tape at a shallow angle, wipe the assembly onto the specimen surface. If the assembly appears to be misaligned, lift one end of the tape at a shallow angle until the assembly is free of the specimen. Realign properly and firmly anchor down at least one end of the tape to the specimen. This realignment can be done without fear of contamination by the tape mastic if the recommended gage installation tape is used. This tape will retain the mastic when removed.

Step 3



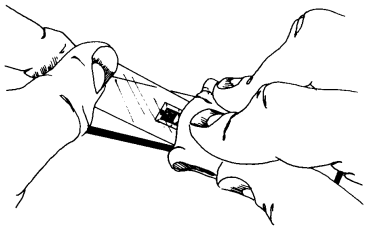
Lift one end of the tape at a shallow angle to surface (about 45 degrees) until gage and terminal are free of specimen surface. Tuck the loose end of the tape under and press to the surface so the gage lies flat with the bonding side exposed. In some cases this may be difficult because of space limitations. If this situation occurs, leave enough slack in the tape to allow a finger to be slipped behind the gage to support it while applying the adhesive.

Step 4



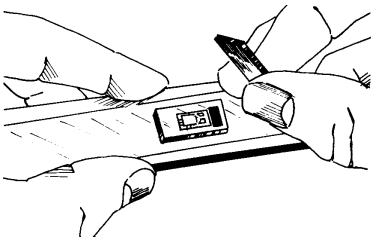
Coat the specimen, back of the gage, and terminal strip with the prepared adhesive. The mixing rod can be used to apply a thin layer of adhesive over each surface. Be careful not to pick up any unmixed components of the adhesive. To ensure this, it is advisable to wipe the mixing rod clean and then pick up a very small amount of the adhesive from the center area of the adhesive jar. Immediately after coating the gage and specimen with adhesive, proceed without delay to Step 5. This will limit the absorption of moisture by the uncured adhesive, and the gage installation tape will serve as a temporary moisture barrier during curing.

Step 5



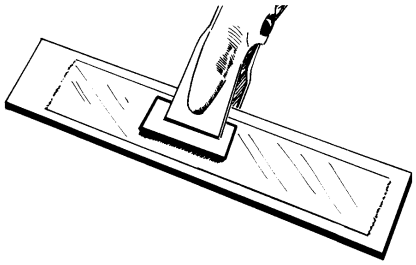
Lift the tucked-over end of tape and bridge it over the adhesive at approximately a 30-degree angle. With a piece of gauze, slowly make a single wiping stroke over the gage/tape assembly, bringing the gage back down over the alignment marks on the specimen. Use a firm pressure with your fingers when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

Step 6



Place a silicone gum pad and backup plate (GT-14) over the gage installation. The silicone gum should be soft (Durometer A40-60) and at least 3/32 in [2.5 mm] thick. This will allow the clamping force to be exerted evenly over the gage. The area of the silicone gum pad should be used to compute the final clamping pressure.

Step 7



Apply force by spring clamp or dead weight until a clamping pressure of 5 to 20 psi [35 to 135 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 glueline. Take steps to ensure that the clamps will not slide out of position during cure. A few strips of tape to assist in holding the clamps or backup plate in place during cure may be helpful. Cure the installation in accordance with the recommended cure schedule below.

Proper curing of M-Bond 300 can be obtained by following one of these schedules:

- 24 hours at +40°F [+5°C]
- 18 hours at +60°F [+15°C]
- 12 hours at +75°F [+24°C]

Step 8

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 of otherwise damaging the installation. It is not necessary to remove this 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.

Do not attempt to test the cured adhesive by probing the gage bond line with tools. The mixed jar of adhesive should be kept in the cure environment as a later check on proper adhesive polymerization.

Note: At cure temperatures below +60°F [+15°C], M-Bond 300 is sensitive to prolonged contact with many solvents. Care should be taken to promptly remove all soldering flux and rosin solvent. Solvent-thinned protective coatings should not be applied over installations that have been cured at low temperatures. Micro-Measurements M-Coat F or Barrier E will provide the necessary protection in most applications.