Technical Note – TN-6
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Installation of RSGH Strain Gage Rosettes with Two-Part Epoxy

Introduction

These instructions establish the procedure for installing Piezo-Metrics' semiconductor strain gage rosettes to metallic surfaces using a two-part epoxy.[1]

Required Materials

1 – fine-tipped tweezers, e.g. Excelta 3C-SA
1 – bottle of mixed two-part epoxy with brush, e.g. M-Bond 610
1 – pack of lint-free wipes
1 – bottle of isopropyl alcohol (IPA)
1 – 600 micro-grit sandblaster or 600 grit wet-dry sandpaper
1 – fine-tipped marker
1 – glass plate
1 – roll of Kapton Tape or equivalent
1 – silicone pad, 25 mm W x 40 mm L x 3 mm T
1 – 1400 g weight, 25 mm W x 40 mm L
1 – roll of 1 mm dia. solder with flux
1 – 18 W soldering iron, e.g. Antex Model 3/GU
1 – 1.0 mm dia. solder tip, e.g. Antex Model 6-NS
1 – bottle/tube of silicone rubber, e.g. M-Coat C
1 – 10X stereo microscope

A. Surface Preparation[2]

A.1 Lightly sandblast the gaging area with 600 micro-grit to remove surface oxides. The surface should have a uniform, velvety texture at the completion of sandblasting. Alternatively, 600 grit or finer wet-dry sandpaper can be used.

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[1] **Important Note**
The following information is provided strictly as a general guideline for installing Piezo-Metrics semiconductor strain gage rosettes to metallic surfaces.
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[2] Content has been adapted from Micro-Measurements Instruction Bulletin B-130.

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A.2 Thoroughly clean the gaging area with IPA. All degreasing should be done with uncontaminated solvents and lint-free wipes. First, scrub surface with IPA-soaked wipes. Continue scrubbing with new IPA-soaked wipes until the wipes remain clean. Then, with a new IPA-soaked wipe, sweep the gaging area in one direction only so that contaminants are not re-deposited in the gaging area.

A.3 Allow the gaging area to dry thoroughly.

A.4 Mark reference lines on the structure to be gaged with a fine-tipped marker to show where the rosette will be bonded. The references lines should be drawn so that they aid in determining both the position and orientation of the rosette during its installation.

B. Rosette Bonding[3]

B.1 Bond the rosette with the aid of a 10X stereo microscope.

B.2 Place the structure under the microscope and secure it temporarily so that it does not move during the rosette installation.

B.3 Open the bottle of two-part epoxy. Good ventilation of the room is recommended.

B.4 Take the rosette out of its shipping package using a fine-tipped tweezer. Be careful not to grab onto the strain gages on the rosette.

B.5 Place the rosette face up on the glass plate.

B.6 Center and then gently lay a 50 mm (2 inch) long piece of Kapton Tape to cover only a portion of the four (4) solder tabs on the rosette. See Figure B1.

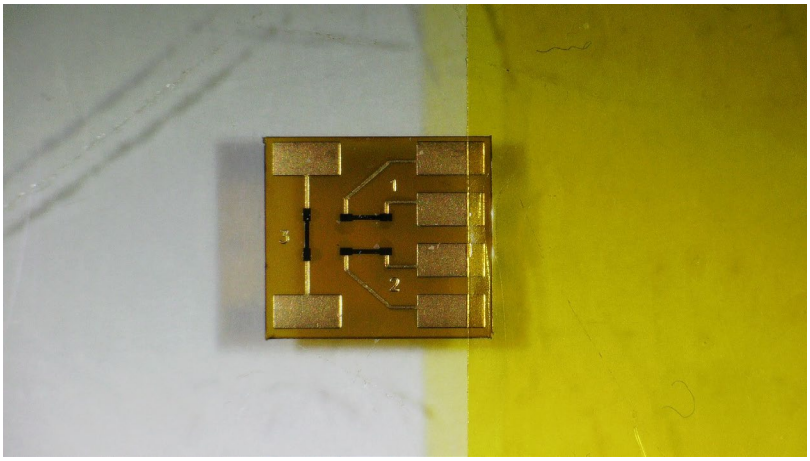

Figure B1 – Laying Kapton Tape on Rosette.

B. 7 Lift the tape at a shallow angle, about 30 to 45 degrees to the plate surface, to lift the rosette off the plate.

[3] Content has been adapted from Micro-Measurements Instruction Bulletin B-130.

B.8 Center the rosette over the reference marks on the structure and then lay the free end of the tape on the structure. Afterwards, bend the Tape backwards to expose the back of the Rosette. See Figure B2.

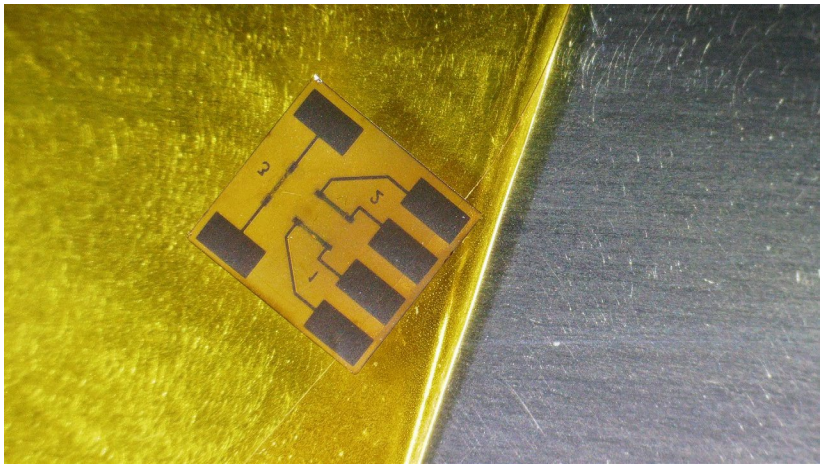

Figure B2 – Positioning Rosette on Structure.

B.9 Apply even amounts of M-Bond 610 in strips with the brush. Apply ONE layer of epoxy to the structure and ONE layer of epoxy to the back of the Rosette. Sweep through the bond area only once. If multiple passes are made, the epoxy will clump up causing an uneven bed of epoxy. Allow the epoxy to air dry for 5 to 10 minutes.

B.10 Roll the Tape downwards onto the surface of the structure and ensure the Rosette lies flat on the structure.

B.11 Place the silicone pad on top of the Rosette.

B.12 Place the structure, Rosette and silicone pad in the curing oven. Place the weight on top of the silicone pad. The weight applies approximately 13.6kN/m2 (2.0 psi) on the Rosette.

B.13 Turn the oven ON and set the cure temperature to 100C. Let the oven heat up naturally to 100C.

B.14 Once the oven has reached 100C, cure the M-Bond 610 for a minimum of 4 hours.

B.15 At the end of the cure time, turn the oven OFF. Take the weight off the Rosette and take the gaged structure out of the oven to cool naturally.

B.16 When the structure has reached room temperature, remove the silicone pad. Fold one edge of the Tape back over itself 180 degrees so that the adhesive side is facing upwards. Slowly peel the Tape back over itself to complete the bonding procedure.

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C. Instrumentation Cable Soldering

C.1 The instrumentation cable conductors should be 26 AWG or smaller.

C.2 Strip 2 mm or 1/16 inch of insulation off the conductor.

C.3 Allow the soldering tip to reach operating temperature.

C.4 Ensure that the tip is tinned and extremely clean and free from carbon residue.

C.5 Tin the ends of the cable conductors.

C.6 Melt a very small quantity of solder onto the solder tip.

C.7 Place the solder tip on the rosette's solder pad and sweep the tip the length of the solder pad. The solder should flow freely and result in a thin layer of solder on the pad. See Figure C1.

C.8 If too much heat is applied to the rosette's copper pad, the pad will debond from the rosette substrate and render the strain gage inoperable.

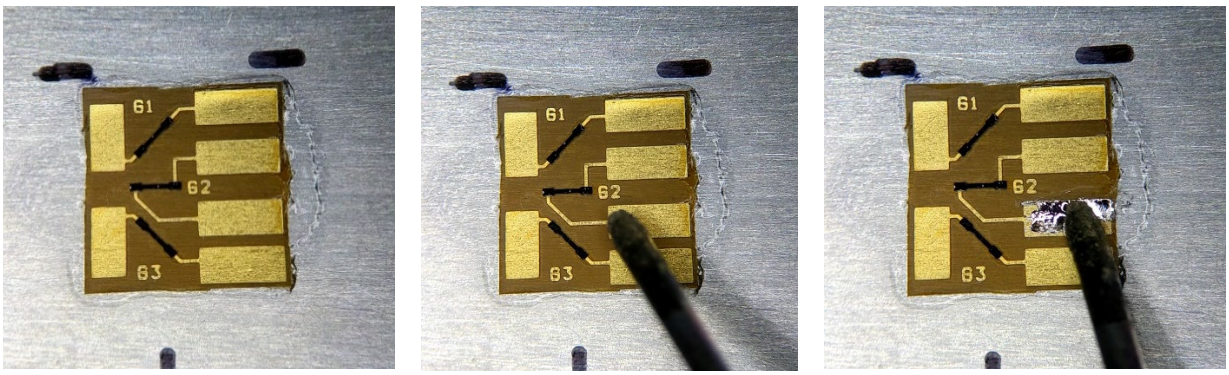

Figure C1 – Applying solder to solder pad.

C.9 Position the conductor so that it is in direct contact with the pre-tinned copper pad on the rosette. Ensure that the conductor is secured to structure so that it does not move.

C.10 Apply just enough heat to melt the solder on the conductor and the solder on the copper pad.

C.11 CAUTION: If too much heat is applied to the conductor, the copper pad will debond from the rosette substrate and render the strain gage inoperable.

C.12 Verify the resistance of each strain gage on the rosette. The gage resistances should be within 5% of the average rosette gage resistance.

C.13 CAUTION: Avoid pulling on or lifting up the conductor afterwards. These forces may cause the solder pad to peel off and render the strain gage inoperable.

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D. Application of Protective Coating

D.1 Gently clean any solder flux residue from the conductors with IPA and a lint-free wipe.

D.2 Apply a protective coating over the entire rosette and solder joints in thin layers. Allow sufficient time dry between layers.

D.3 Secure the conductors to the structure with a tie-wrap strap or similar for strain relief.

E. Operating Temperature

Rosettes bonded with M-Bond 610 can operate in temperatures between –54C and +77C.

F. Additional Information

For more information about any of the topics discussed in this Technical Note, please visit the Piezo-Metrics website at www.piezo-metrics.com and enter questions into the Customer Service Agent. Questions can be similar to:

‘tell me more about semiconductor strain gage rosettes’

‘tell me more about semiconductor strain gages’

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