

Strain Gage Installations with H-Ceramic Cement

INTRODUCTION

H-Cement is a single-component cement. This cement requires a final cure of +600 °F [+316 °C]. Temperature range -452 °F to +1600 °F [-269 °C to +871 °C]. Short term (less than one hour) -452 °F to +1800 °F [-269 °C to +982 °C].

SURFACE PREPARATION

Thoroughly degrease the specimen with acetone, MEK, or alcohol. M-Prep Conditioner A and Neutralizer 5 should be used on metallic surfaces to promote adhesion and allow the cement to flow easily. Surfaces should be sandblasted if at all possible. Sandblasting with coarse grit sand promotes the most tenacious bond, since the bond is primarily mechanical and not chemical.

HANDLING PRECAUTIONS

While this cement 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.

BASE COAT INSTALLATION

H-Cement must be thoroughly mixed using a clean spatula or glass stirring rod.

The base coat consists of a layer of cement approximately 0.003 in [0.08mm] thick when the cement is wet and uncured. This is determined by using a layer of 0.003 in [0.08mm] mylar tape, which is laid parallel to, and slightly overlapping, each side of the roughened area.

A strip of mylar tape can be placed across each end of the gage area to restrict the cement.

Apply a liberal amount of cement at one end of the gage area. Spread smoothly by resting a straight-edge spatula on the tape on each side of the gage area, and

slowly drawing it across the gage area in one movement.

NOTE: If the surface the strain gage is to be installed on is flat in only one axis, such as a cylinder, the two layers of tape must be applied on the curved surface so that the spatula will be drawn along the flat axis.

Allow the cement to cure for 30 minutes at room temperature⁽¹⁾ and then carefully remove the mylar tape.

Cure the base coat at +200 °F [+93 °C] for 30 minutes and then +350 °F [+177 °C] for 30 minutes.

GAGE INSTALLATION

The ZC-Series free filament foil gage is attached to a Teflon® backing with strips of fiberglass tape. These gages are very thin, typically 0.0005 in to 0.00075 in [0.013mm to 0.019mm], and very fragile.

Using a razor blade, lift the tape from the Teflon backing so that the gage and tape together can be removed from the backing.

Place the gage in position on the base coat using the fiberglass tape to hold it in place.

Using a GT-11 camel hair brush, apply a coat of cement over the gage grid, being sure to cover the junction of the strain gage tab with the foil leads. Thorough wetting is obtained by “wiggling” the brush over the gage foil.

Air dry for 30 minutes,⁽¹⁾ 30 minutes at +200 °F [+93 °C], and then 30 minutes at +350 °F [+177 °C].

Allow to cool, then remove the fiberglass tape using a dental pick and tweezers.

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⁽¹⁾ If the relative humidity exceeds 40%, 6 to 8 hours of drying time at room temperature may be required.

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Micro-Measurements

After the tape has been removed, apply cement over the exposed areas of the strain gage grid.

Air dry for 30 minutes⁽¹⁾, 30 minutes at +200°F [+93°C], and then 30 minutes at +350°F [+177°C].

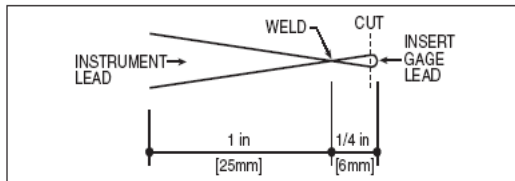
LEADWIRE ATTACHMENT

A high-temperature wire suitable for high temperature and welding must be used for the leadwire. There are a number of leadwires that can be used.

- Stainless steel sheath with a variety of leadwires (Ni-clad copper, Ni-clad silver, chromel, alumel, Nichrome)
- Nextel-insulated leadwires
- Ceramic-coated leadwires

Put uncoated fiberglass sleeving over the leadwire on the end near the gage to keep the leadwire from shorting to the specimen.

Cut two lengths 2-1/2 in [62mm] of Nichrome V 1/32 in x 0.002 in [0.8mm x 0.05mm] and fold in half. Spot weld three times, 0.25 in [6mm] from the folded end, then trim off the tip of the fold (see sketch).



Insert the gage lead between the two 0.25 in [6mm] ends of the transition ribbons, and spot weld at a minimum of three points using the Micro-Measurements Model 700 spot welder and tweezer handpiece. Repeat for the second lead.

Strip insulation from the end of the leadwire and place this wire between the two free ends of Nichrome (which have not been welded) on the gage leads. For the three-wire method, put two leadwires between the other Nichrome ribbons.

All exposed leads and ribbons should then be coated with H Cement.

NOTE: “Repeat” and “Strip” steps above may be reversed depending on the type of installation.

CURE

The following cure cycle is used:

- 30 minutes at room temperature(1)
- 30 minutes at +200°F [+93°C]
- 30 minutes at +350°F [+177°C]
- 1 hour at +600°F [+316°C]

SHELF LIFE

Minimum: 1 year at +75°F [+24°C]

PRECAUTIONS

Never leave the H-Cement bottle uncovered except during the actual operation of inserting the brush into the bottle. Do not contaminate the cement with water in any form. Clean the bottle cap and bottle neck of cement periodically and replace the cap tightly after use.