User's Guide

SG401

SG496

SG401 and SG496
Rapid Cure Strain Gauge Adhesives

SECTION 1 - INTRODUCTION

OMEGA's Rapid Cure Adhesives, SG401 and SG496 are modified versions of a solvent-free cyanide-acrylate adhesive specially developed to apply strain gauges of the bonded-resistance type. They are suitable for all series of strain gauges and compatible with most metals of common use and with most synthetic materials. They are not suitable, however, for use with porous materials such as concrete, wood, foam plastic, etc.

This series of Strain Gauge Adhesives is supplied in three different packages. Their part numbers and weights are listed below:

Part Number	Net Weight
SG401	0.10 oz.
SG496	1.00 oz.

SECTION 2 - SETTING AND CURING NOTES

Polymerization (setting) of cyanide-acrylate adhesives occurs by the catalytic reaction of moisture absorbed from the air. The most favorable conditions are given by a relative humidity (RH) between 40% and 70%. In the case of RH less than 30%, the reaction is noticeably retarded and in extreme cases, completely stopped. More than 80% RH causes shock setting. Internal stresses in the adhesive layer caused by shock setting reduce the maximum extensibility of the bond. One should, therefore, always ensure that the limit values of 30% and 80% RH are not exceeded.

Complete setting in the given time is achieved only with thin films. Thick layers of adhesive set very slowly and incompletely; therefore, extremely rough contact surfaces are unsuitable.

The setting speed depends on the chemical condition of the components to be bonded. Alkaline materials accelerate polymerization, whereas acid materials not only retard but can completely prevent setting. (In the latter case, a neutralizer should be used.) Representative figures for the setting time and its dependence upon the quoted materials at a temperature of 20°C (68°F) and an RH of 65% are given in Table 2-1. At the end of these periods, the adhesive will have set sufficiently to allow cable connection to be initiated. **Ultimate curing is achieved after some 24 hours.** However, measurements can be taken after the periods quoted in Table 2-2.

TABLE 2-1
MINIMUM SETTING TIME FOR BONDING

Material	Setting Time
Steel	60 to 120 sec.
Aluminum	50 to 100 sec.
Plastics	10 to 60 sec.

TABLE 2-2
MINIMUM CURING TIME FOR MEASUREMENT

Type of Measurement	Curing Time	
	At 5°C (41°F)	20°C (68°F)
Dynamic	90 min.	10 min.
Static	120 min.	15 min.

SECTION 3 - PREPARING THE SURFACE

The object of preparation is to create a smooth surface that can be wetted. The following steps, which require attention or can be bypassed, depends on the condition of the test piece.

3.1 Coarse Cleaning

Rust, scale, paint, and other such contaminants must be removed from the test area and its surroundings.

3.2 Smoothing Surface

Pitting, protrusions, scratches, and other such imperfections must be removed by grinding, filing, or other suitable methods.

3.3 De-greasing

The choice of a cleaning agent depends on the nature of the contamination and whether the surface is adversely affected by a given cleanser. Powerful grease solvents such as Freon TF, Chlorothene NU, methyl-ethyl-ketone, acetone, and trichlorethylene are normally used. Wax and similar substances dissolve in toluene.

The surface to be cleaned should be washed with gauze pads soaked in solvent. Initial treatment should cover a somewhat larger area than that which is ultimately required. As each new pad of gauze is taken, the zone that receives attention should be progressively reduced to minimize the possibility of continually introducing new particles of dirt from the edges of the zone. Large areas can be brushed with water and an abrasive powder (e.g. AJAX, COMET, etc.). After rinsing, there should remain a surface which is completely wetted with an unbroken film of water. The surface is then dried with a clean cloth (paper towel) or by heat. Ultrasonic cleaning baths or steam degreasing apparatuses can also be used with good effect.

NOTE

The solvent must be chemically clean and should leave no residue. It should never be used directly from the container in which it is stored. A quantity should be transferred to a clean bowl and used from there. Unused fluid in the bowl should never be returned to stock! Use pads of gauze just once and then dispose of them. Never dip a used pad into the solution a second time!

3.4 Surface Roughening

The adhesion between bonded parts depends on the adhesion of the cement with the surfaces wetted by it. Roughening of the surface on the specimen will improve the adhesion by increasing the active surface. Emery paper or cloth should be moved in circles in order to avoid any preferred direction of grooves. Make sure to use only fresh emery paper of a grade that matches the hardness of the specimen material (e.g., for steel use grade 80 to 180; for aluminum use grade 220 to 360). If the roughness becomes too great, air bubbles might form which would prevent effective bonding. The material must be absolutely free of oil and grease. Any surface grooving that might have resulted from the foregoing process must be removed.

If one is familiar with etching processes, this too is possible. If no interference with the surface finish of the test piece is acceptable, the adhesives can be used on smooth or polished surfaces, although its maximum extensibility is then reduced.

3.5 Fine Cleaning

All dirt and dust resulting from the roughening process should be removed carefully. This is achieved with gauze pads soaked in one of the solvents noted in section 3.3. Each pad should be held with clean tweezers and passed over the surface only once. The process should be repeated until the pads show no trace of discoloration. Possible remaining lint should be removed with clean tissue paper. Keep the cleaned area dry! Do not blow with breath or touch with fingers!

To avoid the incidence of new oxidation, the mechanical or chemical treatment of the surface should occur just before adhesion.

SECTION 4 - PREPARATION OF THE STRAIN GAUGE

Prior to attaching the gauge, some users prefer to solder the connections between the gauge and terminal pad, while others prefer to solder after attaching the gauge.

The bonding side of the strain gauge should be carefully cleaned with a gauze pad soaked in Freon, Frigen, or carbon-tetrachloride. Residual moisture must be dried by a radiant heater or a hot-air blower. During this procedure, the strain gauge must be held by tweezers.

SECTION 5 - ATTACHING THE STRAIN GAUGE

Because of the short curing time, it is not possible to readjust the position of the strain gauge once the adhesion process has been initiated.

The gauge width should be extended with a short length of adhesive tape affixed to the upper surface of the gauge, away from the connections. If soldering is to be done after attaching the gauge, protect the solder terminals with tape.

The strain gauge is laid onto the cleaned area of the test piece, and after careful alignment, the protruding part of the adhesive tape is pressed onto the surface (use tweezers). This results in a hinge-like fixture that allows the strain gauge to flap up and down without changing its alignment (see Figure 5-1).

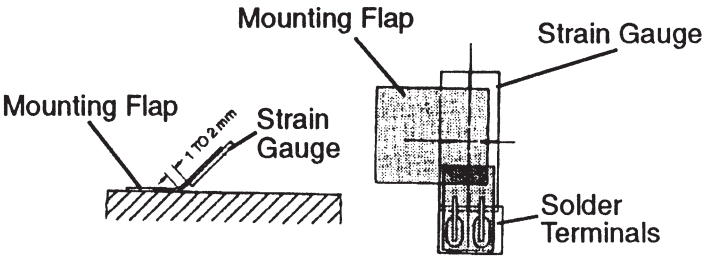

Figure 5-1: Strain Gauge and Mounting Flap

Flip the strain gauge up to expose the adhesion area. Cut off a length of the Teflon® film. If the adhesion area is more than 15 mm (0.6 inch) wide, cut the Teflon strip diagonally. Place one drop of the adhesive onto the adhesion area. Using the Teflon film, distribute the adhesive into a uniformly thin layer by brushing over it just once and lightly pressing the Teflon film downwards. Use as little pressure as possible (see Figure 5-2) because the adhesive will cure immediately if the pressure is too great.

Acid materials delay or inhibit setting of the adhesive. If the bonding surface is acidic, apply a thin coat of neutralizer onto the bonding side of the strain gauge, just enough to wet it. Allow this to dry.

The strain gauge is then carefully flapped over to meet the adhesive surface and covered with Teflon film. Press the Teflon film covering the

adhesive tape and strain gauge until the adhesive has set (see Table 2-1). After a few minutes, remove the Teflon film and carefully release the strain gauge connections from the adhesive. The thickness of the adhesive film in a correctly adhered gauge is 8 micrometers ± 20%. After curing, remove the alignment adhesive tape by peeling it back onto itself at an acute angle.

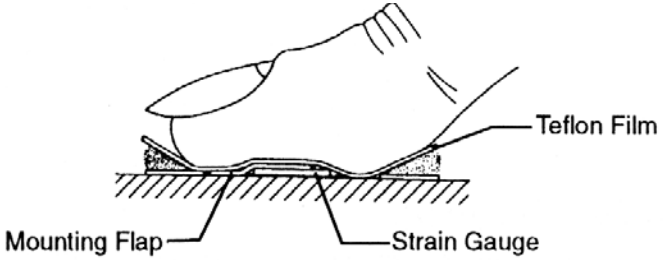

Figure 5-2 : Affixing the Strain Gauge

CAUTION

Experience has shown that problems with the setting of cyanide-acrylates are due mainly to layers of adhesive that are too thick. Therefore, a neutralizer should be used only if a very thin adhesive layer can be guaranteed. The measuring point should be protected against damp chemicals and mechanical damage.

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SECTION 6 - ATTACHING THE LEAD WIRES

Solder all terminals and secure the instrumentation wire in place, either with adhesive or by mechanical means (see Figure 6-1). After soldering, it is imperative that all soldering points are cleaned of flux residues (even non-corrosive fluxes are hygroscopic and require cleaning).

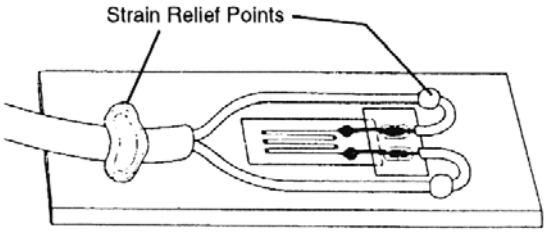

Figure 6-1: Strain Gauge and Lead Wires

A covering should be used to protect the strain gauge from environmental effects. De-grease the entire area and apply the covering (a layer of adhesive) over the strain gauge and lead wire assembly, as shown in Figure 6-2. Cover at least 20 mm (0.8 inch) of the lead wire.

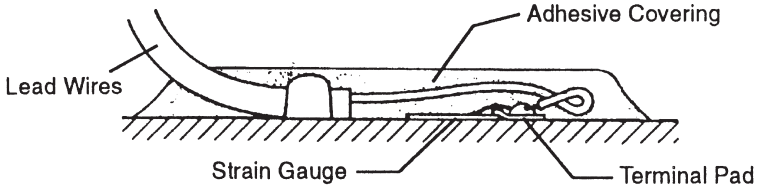

Figure 6-2: Covered Strain Gauge

SECTION 7 - STORAGE

Keep the bottle (or tube) in an upright position, to prevent the adhesive from dripping out and hardening at the drip nozzle and on the screw cap thread. If the adhesive has not been used for a long time, it will harden and seal the tip. Once the tip has been cleaned or cut, the adhesive can be reused.

Protect the adhesive from heat, sunlight, and humidity. Store it in a cool, dry place. The adhesive can be used until its viscosity rises considerably.

A virtually unlimited storage life can be achieved if the adhesive is kept frozen at -15°C (5°F). Before use, defrost the adhesive, making sure it has reached ambient temperature. Repeated freezing does not affect the adhesive.

SECTION 8 - SAFETY MEASURES

Observe the safety regulations, valid in your country, which are designed to avoid accidents associated with the use of adhesives and solvents.

The adhesive itself can do no serious physiological harm. Since it clings to the skin, however, contact should be avoided. Protective goggles should be used. Should, however, the adhesive come into contact with the eyes, rinsing thoroughly with water or boracic solution is necessary. A doctor should be consulted immediately. From previous experience, it has been found that corneal damage heals within a few days and sight remains unimpaired.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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