Strain Gage Application Requires Quality Control Surface Preparation and Application Steps

TYPES OF STRAIN MEASUREMENT GAGES

OMEGA Engineering offers four types of strain gages:

1. The Karma Grid or K-Series:

- Tee rosettes are for axial strain transducer designs, precision Karma materials perform with good linearity in temperatures from -75 to 200°C (-100 to 392°F), they have a longer fatigue life

K-Series Styles Include:

- Two separate gages with a single carrier, perpendicular grids
- Half bridge tee rosette for column load cell design, high accuracy, transverse grids, used for bending strain or off-axis loading
- Half bridge design with 2-strain gages, a common lead pad on a single carrier

2. Precision Strain Gages:

- General purpose, flexible, mechanically strong, small bending radius, clear alignment markings, ribbon leads or solder termination, can apply with cold or hot adhesive; for highly accurate static or dynamic strain measurements

3. Pre-Wired Gages:

- Skip the soldering step at the measuring point with pre-wired gages, linear gages of 0.3 to 20 mm grids
- Tee rosettes
- 0°, 45°, or 90° Planar rosettes
- Fully encapsulated gages to protect device from environmental conditions

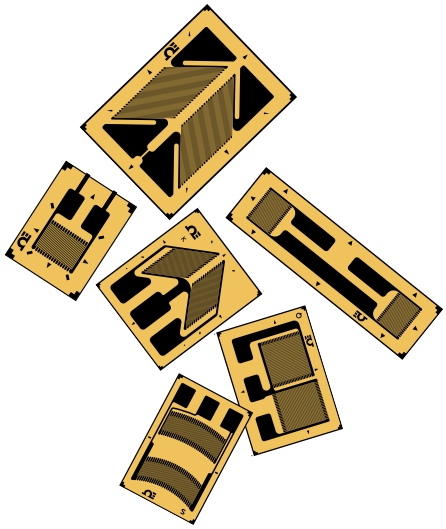
4. Transducer Quality:

- The SGT series of transducer quality strain gages have duel parallel grids, for bending or axial tension
- Shear or torque applications
- Double-bend custom transducer applications

Strain measurement gages can have 1-4 measuring grids. Various temperature compensation using aluminum, steel, or uncompensated materials.

There are Ten Grid Description Styles:

1. General Purpose
2. Full Bridge
3. Half Bridge
4. High Resistance
5. Narrow Patterns
6. Miniature Patterns
7. Delta
8. Planar
9. Stacked
10. Tee



STRAIN GAGE APPLICATIONS

All strain gages are engineered for the conversion of mechanical motion into measureable electronic signals. The strain experienced by a sensor is proportional to the resistance, capacitance, or inductance.

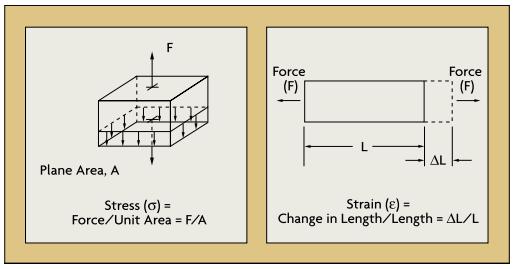
Wire that is held under constant tension gets longer, its cross-sectional area is reduced as well.

Resistance = R, R changes in proportion to strain sensitivity, (S), of the wire's resistance.

The Gage Factor = GF, which is another term for strain sensitivity.

This formula calculates gage factor:

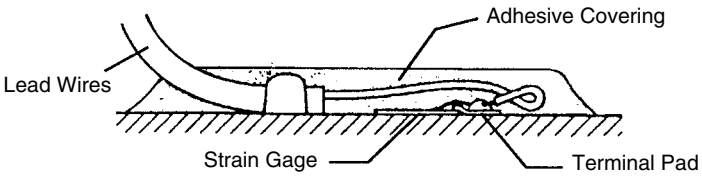
$$F = (\Delta R/R)/(\Delta L/L) = (\Delta R/R)/\text{Strain}$$



To find the ideal strain gage in manufacturing settings consider the size for each application, cost, ease of applying, temperature sensitivity variants, and sensitivity to measurable

strain. There are several strain gage sensor designs that can be used in laboratory settings, but for the industrial environment requiring constant, repetitive use, a bonded resistance gage is most popular for its reliability in accurate measurement of operational strain.

The accuracy of bonded resistance gages is better than ±0.10%, available in short gage length, quite small in size, moderately sensitive to changes in temperature, while highly sensitive to strain.



Covered Strain Gage

HOW TO APPLY STRAIN GAGES

A first class strain measurement system is dependent in the specific quality control steps of the actual strain gage installation, bonding to the surface that will be used in strain measurements. Cleaning this surface where the gage will be applied is the first critical step. Strain gages can be bonded to nearly any solid material once its surface is prepared properly.

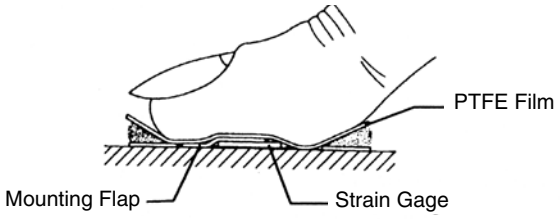
- Brush the surface to remove loose contaminants like dust, soil, mildew or chemicals; perhaps a mild detergent is advisable to remove more firmly attached contaminants
- Before grinding or sanding to remove coatings like paint or metal plating, be sure to use a degreaser or solvent to remove oils or grease; if you do not remove oily substances first, rubbing the surface with sand paper could rub grease or oil more deeply into the surface
- Silicone substances work against the proper adhesion required for good strain gage bonding; the best solution is to not use a material that has even a slight amount of silicone contamination
- Plastics or composites affected by a strong solvent must be thoroughly cleansed with isopropyl alcohol
- Most surfaces must be abraded and then cleaned to remove residue dust

If you have further questions about the process of preparing the bonding surface for strain gage application, contact the staff at OMEGA Engineering for advice.

It is important to select resins specifically designed for strain gage bonding to avoid degradation creep that often happens with glues and epoxy resins.

THE STRAIN GAGE APPLICATION PROCESS

After completion of surface preparation, use disposable gloves and tweezers to handle the strain measurement gage. Use pre-wired gage or carefully solder wires to the strain gage pad. Place the gage in position on the clean surface. Use clear tape to hold gage in place. Make sure to press out all air bubbles between surface and gage. Carefully lift tape with gage adhered bonding side down, as one assembly.



Affixing the Strain Gage

Apply a thin coat of bonding catalyst to bottom surface of gage. Add a small amount to the surface. Wait one minute to set the catalyst. Add a layer of gage bonding adhesive to the underside of the gage. Press the tape back down into position on the surface. Smooth the bond and press finger on the gage to warm the adhesive for two minutes.

Carefully peel the tape back onto itself to remove, leaving the bonded gage adhered to the surface. Add clear coating over the strain gage. Finally, wrap electrical tape around the strain gage to protect it from being damaged.

Note: Refer to the OMEGA strain gage application manual for other details when using various gages and surfaces.

THE OMEGA ENGINEERING ADVANTAGE

In an impressive example of customer service priority planning, the engineering design team at OMEGA put together a comprehensive strain gage application kit that includes all the tools, strain accessories, adhesives, and coatings that a strain gage designer, or strain gage manufacturer would use when applying a strain gage to most solid surfaces. Visit our OMEGA Engineering website to purchase your Strain Gage Application Kit (model number SG1-KIT) with complete instructions and details, or call our expert staff for more strain gage information and accessories at 1 (888) 826-6342.

Source

1. *http://www.omega.com/literature/transactions/volume3/strain2.html*
2. *file:///C:/Users/Deborah-Lynn/Downloads/assets-AMA-Conferences-AMA-Conferences-2013-Proceedings-2013-SENSOR-2013-A1.3-SENSOR2013.pdf*
3. *http://www.omega.com/manuals/manualpdf/M1270.pdf*
4. *assets-AMA-Conferences-AMA-Conferences-2013-Proceedings-2013-SENSOR-2013-A1.3-SENSOR2013*
5. *http://www.omega.com/pptst/SG1-KIT.html*