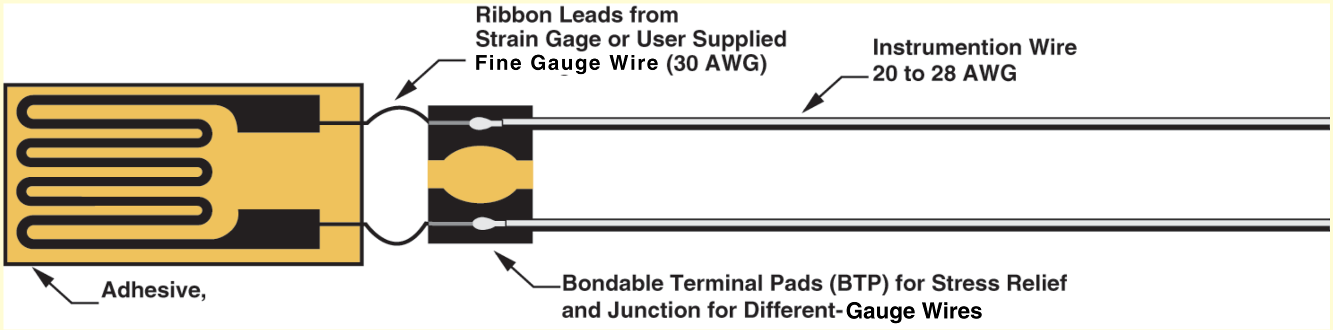
STRAIN GAUGE INSTALLATIONS
BASICS

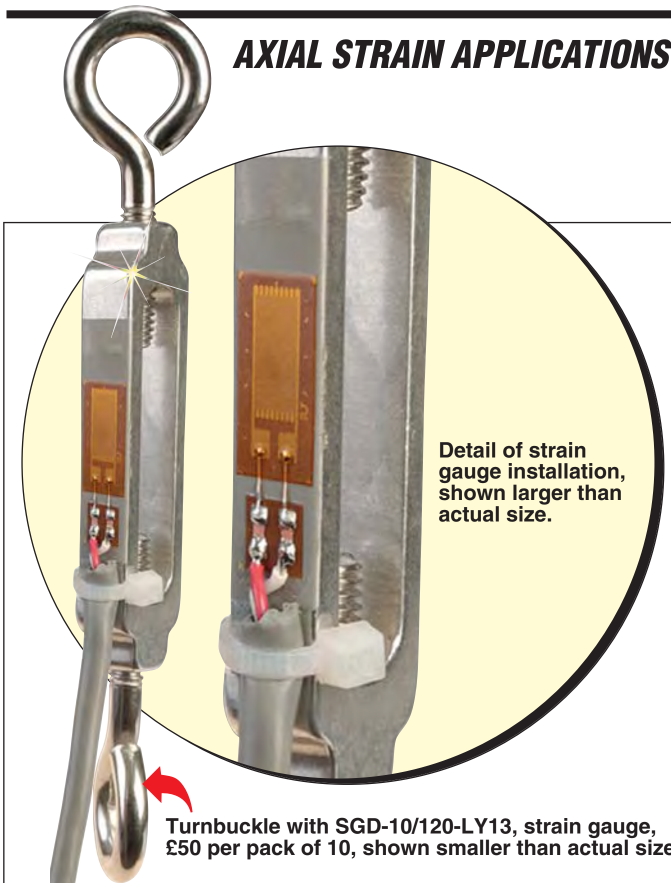


Strain Gauge Basics, Axial Strain Application, Material/Steel, Long Term Use

Adhesive: TT300, page E-67
30 AWG Wire: TFCP-010-50, page E-69
Strain Gauge Linear:
1-Axis, SGD-7/350-LY41, page E-18

Considerations for force sensor design. Look up the modulus of elasticity and the yield strength of the material that has been selected. Determine the estimated load or force that will be applied. Design the spring element so that you are working in the linear portion of the stress strain curve. Modify the dimensions of the component part as required so that there will be enough strain in the component part so that it can be measured. Determine how the component part will be loaded, as in axially, bending, shear, or torsion. Select your strain gauges. Correctly position and install your strain gages. Calibrate you new force sensor using a known applied load.

AXIAL STRAIN APPLICATIONS



Detail of strain gauge installation, shown larger than actual size.

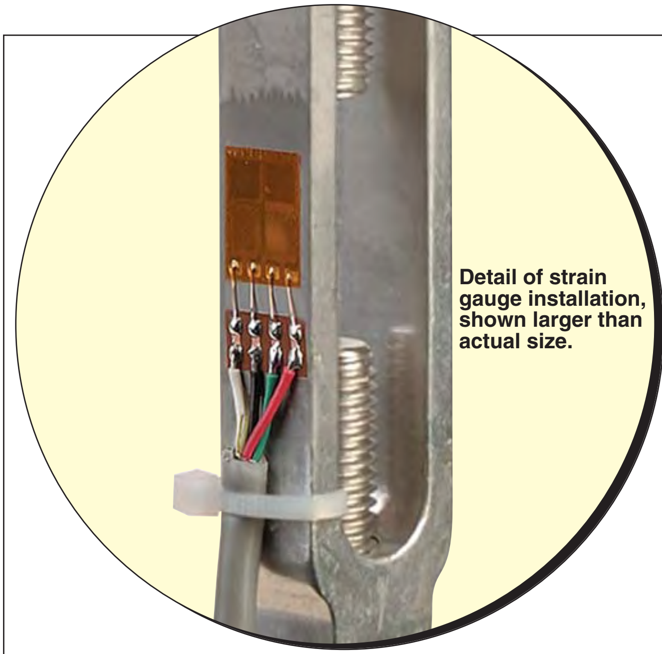
Turnbuckle with SGD-10/120-LY13, strain gauge, £50 per pack of 10, shown smaller than actual size.

Axial strain measurement in a small eye-to-eye turnbuckle; size is 6.35 x 133.53 mm (¼ x 5¼"), and the safe working load specified is 68.04 kg (150 lbs). The eye-hooks are stainless steel and the turnbuckle body is aluminium. Application using a linear uniaxial strain gauge pattern.

Strain Gauge: SGD-10/120-LY13, page E-18
Bondable Terminal Pad: BTP-4, page E-63
Adhesive: SG496, page E-67
Cable: TX4-100, page E-69

Installation using standard surface preparation per page E-66. One strain gauge has been installed in the principal stress direction. The strain gauge selected has temperature characteristics matched to aluminium, and has ribbon leads. The bondable terminal pad has been placed close by, and the ribbon leads have been brought over, leaving small flex loops, and soldered in place. Any excess lead has been trimmed away. TX4 cable has been used, and 2-leads have been soldered in place to bring the ¼ bridge strain gauge out to instrumentation. The BCM-1, page E-70 can be used to complete the Wheatstone bridge.

STRAIN GAUGE INSTALLATIONS
AXIAL FULL BRIDGE STRAIN APPLICATIONS



Detail of strain gauge installation, shown larger than actual size.

Turnbuckle with SGT-4/1000-FB13, strain gauge, £71 per pack of 5, shown smaller than actual size.

Axial strain measurement in a large hook-to-eye turnbuckle; size is 9.525 x 203.2 mm (⅜ x 8"), and the safe working load specified is 158.75 kg (350 lb). The eye-hooks are stainless steel and the turnbuckle body is aluminium. Application using a full wheatstone bridge pattern which has 4 strain gauges on one carrier piece, with 2 strain gauges that are perpendicular to the other two.

Strain Gauge: SGT-4/1000-FB13, page E-45
Bondable Terminal Pad: BTP-4, page E-63
Adhesive: SG496, page E-67
Cable: TX4-100, page E-69

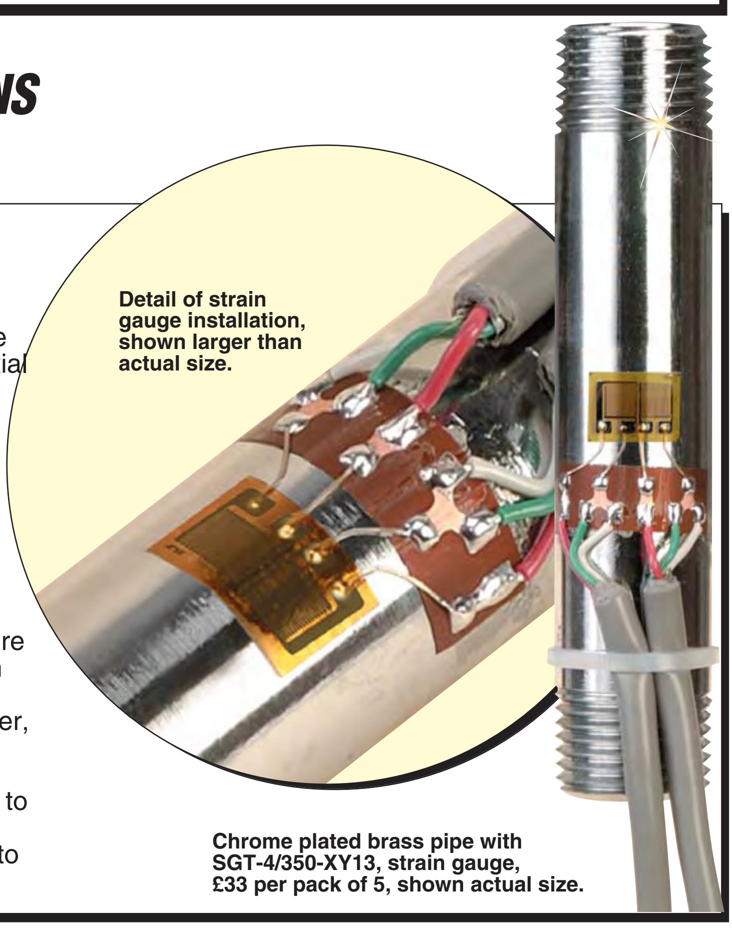
Installation using standard surface preparation per page E-66. Installation will be a full Wheatstone bridge with 2 fully active strain gauges in the axial direction, and 2 that will see the effect of Poisson's ratio. The strain gauge selected has temperature characteristics matched to aluminium, and has ribbon leads. The bondable terminal pad has been placed close by, and the ribbon leads have been brought over, leaving small flex loops, and soldered in place. Any excess lead has been trimmed away. TX4 cable has been used, and 4-leads have been soldered in place to bring the full Wheatstone bridge out to instrumentation.

PIPE PRESSURE APPLICATIONS

Pressure application, using a ½ male NPT by 101.6 mm (4"), chrome plated brass pipe nipple. Application used a tee rosette. One carrier piece has 2 electrically independent strain gauges which are perpendicular to each other. The installation will have two separate strain gauges, to measure hoop and axial strain, here wired using three-wire method. This method compensates for the effect of temperature on the lead wires.

Strain Gauge: SGT-4/350-XY13, page E-36
Bondable Terminal Pad: BTPC-4, page E-63
Adhesive: SG496, page E-67
Cable: TX4-100, page E-69

Installation using standard surface preparation per page E-66. The strain gauge selected has temperature characteristics matched to aluminum, and has ribbon leads. The bondable terminal pad has been placed close by, and the ribbon leads have been brought over, leaving small flex loops, and soldered in place. Any excess lead has been trimmed away. TX4 cable has been used, and 3-leads have been soldered in place to bring the two ¼ bridge strain gauges out to instrumentation. The BCM-1 page E-70 can be used to complete the Wheatstone bridge.

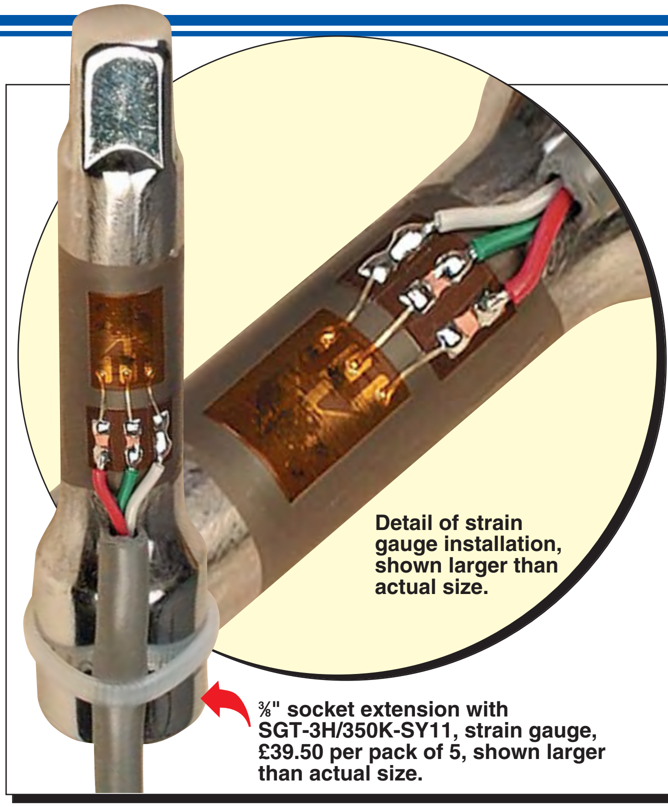


Detail of strain gauge installation, shown larger than actual size.

Chrome plated brass pipe with SGT-4/350-XY13, strain gauge, £33 per pack of 5, shown actual size.

STRAIN GAUGE INSTALLATIONS

TORQUE APPLICATIONS



Detail of strain gauge installation, shown larger than actual size.

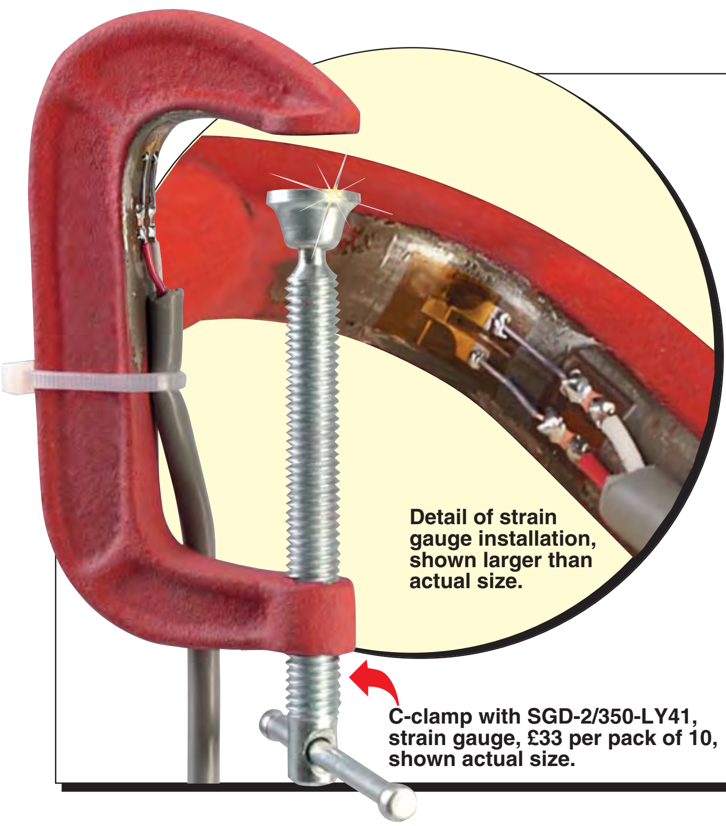
⅜" socket extension with SGT-3H/350K-SY11, strain gauge, £39.50 per pack of 5, shown larger than actual size.

Torque strain measurement in a 9.5 mm (⅜") socket extension, material is carbon steel. Application using a shear ½ bridge pattern with a common lead. The one carrier piece has two reversed grids, at 45° with respect to the center line.

Strain Gauge: SGT-3H/350K-SY11, page E-43
Bondable Terminal Pad: BTP-4, page E-63
Adhesive: SG496, page E-67
Cable: TX4-100, page E-69

Installation using standard surface preparation per page E-66. One carrier piece has been installed, which will have two fully active strain gauges. The strain gauge selected has temperature characteristics matched to steel and has ribbon leads. The bondable terminal pad has been placed close by, and the ribbon leads have been brought over, leaving small flex loops, and soldered in place. Any excess lead has been trimmed away. TX4 cable has been used, and 3-leads have been soldered in place to bring the ½ bridge strain gauge out to instrumentation. The BCM-1 page E-70 can be used to complete the Wheatstone bridge.

AXIAL STRESS APPLICATIONS



Detail of strain gauge installation, shown larger than actual size.

C-clamp with SGD-2/350-LY41, strain gauge, £33 per pack of 10, shown actual size.

Experiment using a 50.8 mm (2") C-clamp, material is carbon steel. Application using a linear uniaxial strain gauge pattern.

Strain Gauge: SGD-2/350-LY41, page E-16
Bondable Terminal Pad: BTP-4, page E-63
Adhesive: SG496, page E-67
Jumper Wire: TFCP-010-50, page E-69
Cable: TX4-100, page E-69

Installation using standard surface preparation per page E-66. One strain gauge has been installed in the principal stress direction at the fillet. The strain gauge selected has temperature characteristics matched to steel, and has solder pads. The bondable terminal pad has been placed close by. Small jumper wires were made using the TFCP-010-50 and were soldered onto the strain gauge solder pads. The jumper leads have been brought over, leaving small flex loops, and soldered in place. TX4 cable has been used, and 2-leads have been soldered in place to bring the ¼ bridge strain gauge out to instrumentation. The BCM-1 page E-70 can be used to complete the Wheatstone bridge.

STRAIN GAUGE INSTALLATIONS
APPLICATION CONSIDERATIONS WHEN SELECTING STRAIN GAUGES

- Is the strain gauge application feasible?
- Will there be enough strain in the component part so that it can be measured?
- What type of material will be strain gauged?
- Do you know where the high stress location will be?
- Do you know what the principal stress direction is?
- Is the stress consistent over a large area?
- Is there a stress concentration?
- Will you be installing a ¼ of a Wheatstone bridge, or a single strain gauge?
- How will you complete the Wheatstone bridge?
- Will you use a ½ Wheatstone bridge or a full Wheatstone bridge?
- Have you selected your strain gauges?
- Have you selected your adhesive?
- Will this strain gauge be used for a short term or long term use?
- Have you selected your bondable terminal pads and your wiring?
- What is the environment like where the strain gauge will be used?
- What is the temperature in the environment?
- Is the environment electrically noisy?

CONSIDERATIONS FOR LOAD CELL DESIGN

- Look up the Modulus of Elasticity and the Yield strength of the material that has been selected
- Determine the estimated load or force that will be applied
- Design the spring element so that you are working in the linear portion of the stress strain curve
- Modify the dimensions of the component part as required so that there will be enough strain for it to be measured
- Determine how the component part will be loaded as in axially, bending, shear, or torsion
- Select your strain gauges
- Correctly position and install your strain gauges
- Calibrate your new load cell using a known applied load

Detail of strain gauge installation, shown smaller than actual size.

SG1-KIT, £399, shown smaller than actual size, contains all the necessary tools to apply strain gauges plus an assortment of popular strain gauges. See page E-68.

TT300, complete strain gage adhesive kit, £127, shown smaller than actual size. See page E-67.

Sensor and transducer wire and cable, convenient pre-spooled lengths. See page E-69.

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