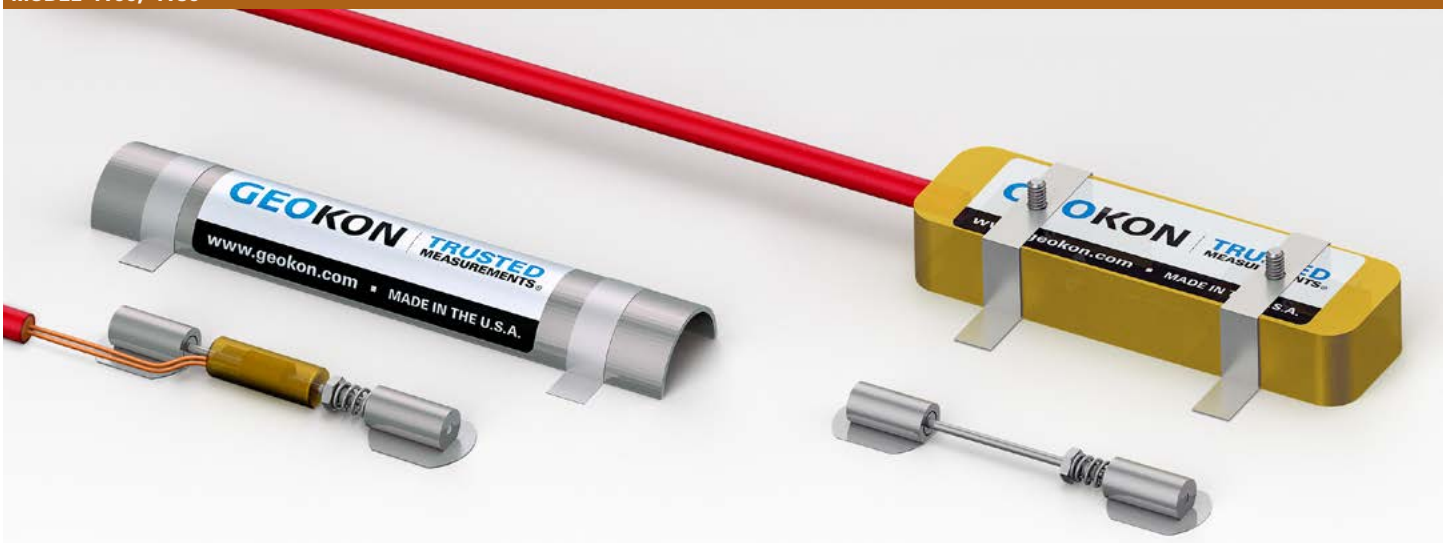
SPOT-WELDABLE STRAIN GAUGES

GEOKON®

MODEL 4100, 4150



Model 4150 Strain Gauge and Model 4150-1 Cover (left). Model 4100 Strain Gauge and Model 4100-2 Plucking Coil (right).

APPLICATIONS

Spot-Weldable Vibrating Wire Strain gauges are designed to measure strains in or on:

- Pipelines
- Bridges
- Buildings
- Tunnel linings
- Piles
- Reinforcement bars

OPERATING PRINCIPLE

The Model 4100 and 4150 Vibrating Wire Strain Gauges are designed primarily to measure strains on the surface of steel structures, although they may also be used to measure strains in other materials. Essentially, the gauges consist of a steel wire tensioned between two mounting blocks. These blocks are attached to stainless steel shim-stock tabs, which can be either spot-welded or epoxy bonded to the surface in question. Also available is the Model 4151 Strain Gauge with groutable pins welded to the end-blocks.

Deformation of the structure under load causes the end blocks to move relative to one another resulting in a change in the wire tension and a corresponding change in the fundamental, resonant frequency of vibration of the wire.

The wire is plucked by means of an electronic coil and permanent magnet connected by a signal cable to a readout, which sends voltage pulses to the coil. The vibration of the wire so produced induces an alternating current in the coil—the frequency of which is the same as the vibrational frequency of the wire and is measured using the same electronic coil and a readout. The frequency value is squared and multiplied by a constant so that the values displayed by the readout are directly in microstrain.

ADVANTAGES AND LIMITATIONS

The Model 4100 and 4150 strain gauges are small so that they can be used in confined spaces. They are particularly useful for spot-welding to steel reinforcement bars and rock bolts and for spot welding to pipelines and other sensitive structures where arc welding is prohibited, or where the services of an arc welder are unavailable.

All components are made from stainless steel for corrosion protection and the gauges are waterproof.

The Model 4100 and 4150 enjoy all the advantages of vibrating wire sensors: i.e., excellent long term stability, maximum resistance to the effects of water and a frequency output suitable for transmission over very long cables.

Each gauge also incorporates a thermistor so that the temperature can be read and displayed by the readout.
An external spring holds the wire in initial tension thus greatly simplifying the installation procedure.

Gauges are certified by MSHA for use in explosive atmospheres when used with certified readouts.

Special 5,000 and 10,000 με extended range version are also available. These gauges are particularly useful for measurements in high strain regimes such as on plastic pipes or piles and on fiberglass structural members and rebar.

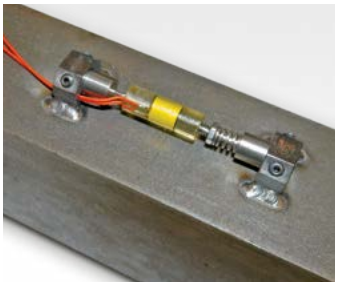
SYSTEM COMPONENTS

The Model 4100 consists of two main components: the gauge itself and a separate plucking coil housing. The stainless steel tube around the wire is O-ring sealed so that the gauges are waterproof. This tube floats free and thus does not impede the free movement of the end blocks. The coil housing contains a thermistor and fits loosely over the gauge. It is secured in place by means of stainless steel straps. It also serves as a measure of protection from mechanical damage.

The model 4150 consists of only one component since the coil housing is encapsulated around the stainless steel tube that protects the wire. The Instrument cable is connected to the coil housing through small diameter lead wires. A thermistor, contained in a small encapsulation, is provided at the end of the cable. A separate cover plate protects the gauge from mechanical damage. Stainless steel straps hold the cable and cover plate firmly to the structure.

The model 4151 is a modification of the 4150 strain gauge in which the spot-weldable tabs have been replaced by pins welded to the end blocks and designed to be grouted into two short holes drilled into the material under test.

Accessories include setting tools, capacitive discharge welder (for spot welding) and epoxy kits (for bonded applications).



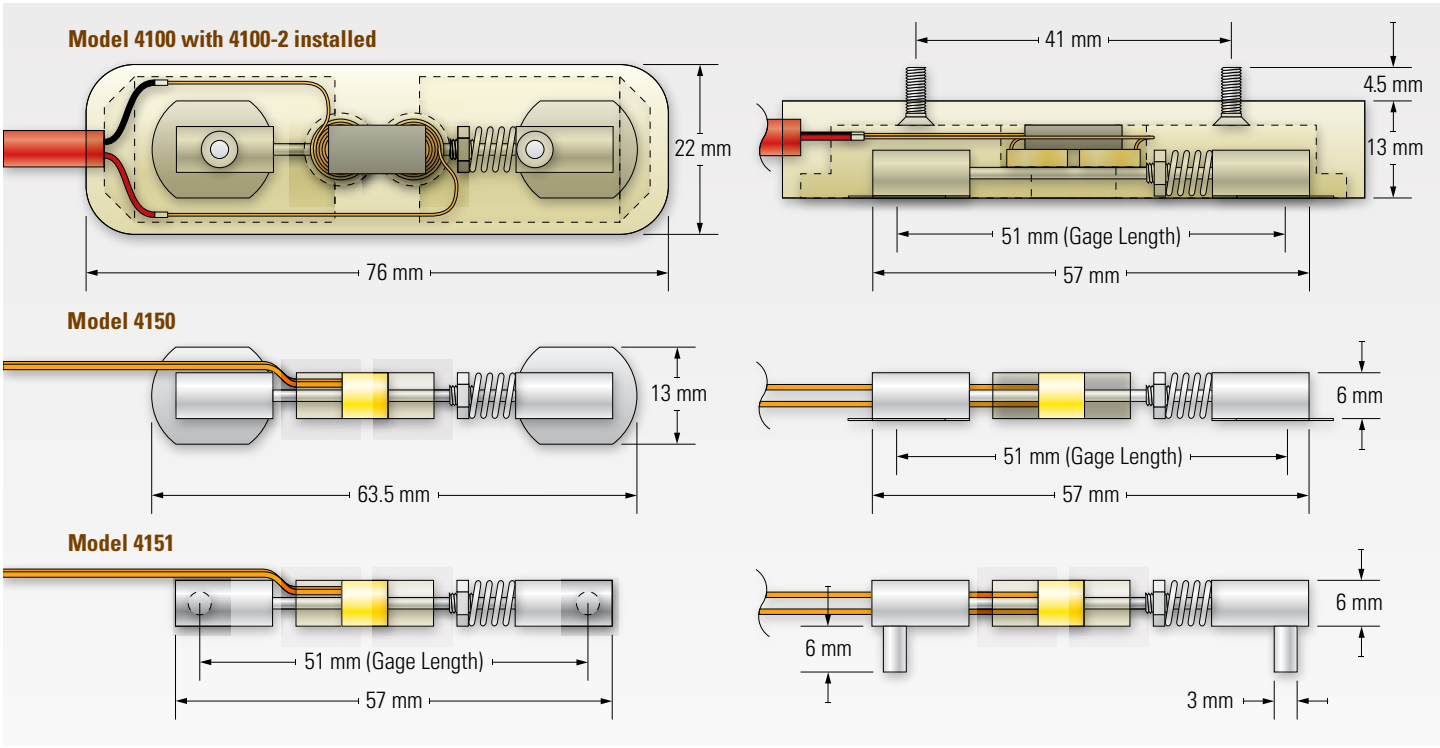
Model 4150 shown with optional arc-weldable mounting blocks.

Model 4151 Strain Gauge mounted to a fiberglass rebar.

TECHNICAL SPECIFICATIONS

	4100, 4150, 4151	4100-8, 4150-4, 4151-1	4100-9, 4150-5, 4151-2
Standard Range	3,000 με	5,000 με	10,000 με
Resolution	0.4 με	1.0 με	2.0 με
Accuracy [1]	±0.5% F.S.	±0.5% F.S.	±0.5% F.S.
Nonlinearity	< 0.5% F.S.	< 0.5% F.S.	< 0.5% F.S.
Temperature Range[2]	–20 °C to +80 °C	–20 °C to +80 °C	–20 °C to +80 °C
Active Gauge Length	51 mm	51 mm	51 mm

[1] ±0.1% F.S. with individual calibration for 3,000 με-range gauges. Accuracy established under laboratory conditions.
[2] Other ranges available on request.



Dimensions of the Models 4100, 4150 and 4151 strain gauges.

Model 4150 under the Model 4150-1 protective cover plate, with dimensions.

Model 4100-WLD Stinger spot welding kit.

4150 ORDERING INFORMATION[1]

4100: Spot Weldable Vibrating Wire Strain Gauge, 51 mm active gauge length, standard 3,000 microstrain range, with spot weldable shims. (Strain gauge only.)
4100-1: Plucking coil for the above, with thermistor and mountings straps. Cable sold separately.
4100-2: Plucking coil for the above, with thermistor and mounting straps, 3 m cable length.
4100A-1: Model 4100 Strain Gauge, complete with plucking coil, thermistor, mountings straps, and 3 m cable.
4100A-2: Model 4100 Strain Gauge, complete with plucking coil, thermistor, and mountings straps. Cable sold separately.
4100-8: Model 4100 Strain Gauge, extended 5,000 microstrain range, complete with plucking coil, thermistor, and mountings straps. Includes individual calibration. Cable sold separately.
4100-9: Model 4100 Strain Gauge, extended 10,000 microstrain range, complete with plucking coil, thermistor, and mountings straps. Includes individual calibration. Cable sold separately.
02-187V3: Red PVC Cable, 4.75 mm (±0.25 mm) [0.187"] Ø, 2 twisted pairs, for the above.
4150-3: Gauge Positioning Tool.
4100-4: 3/16" Combination Wrench, for adjusting gauge tension.
4100-5: Weldable Cover Plate, 51 mm channel × 151 mm long, with mounting bolts.
4100-10: Gauge Protection Kit, comprises RTV, Superglue and Mastic Tape. (Sufficient for approximately 25 gauges).
4100-10A: Gauge Protection Kit, comprises RTV and Superglue. (Sufficient for approximately 25 gauges).
4100-15: Adhesive Kit. Loctite 410 adhesive and Loctite 712 accelerator. (Sufficient for up to 50 gauges.)
4100-WLD-110: Stinger spot welder, 110VAC, includes charger, two Li-ion batteries, bonding tips, requisite cables, nylon carrying bag, and plastic transit case.
4100-WLD-220: Stinger spot welder, 220VAC, includes charger, two Li-ion batteries, bonding tips, requisite cables, nylon carrying bag, and plastic transit case.
4100-WLD-TIP: Replacement bonding tip kit, includes 2 straight tips, 2 curved tips, and 1 extension rod.
4100-WLD-CHG-110: Replacement 110VAC battery charger for Model 4100-WLD-110.
4100-WLD-CHG-220: Replacement 220VAC battery charger for Model 4100-WLD-220.
4100-WLD-BAT: Replacement Li-ion battery for Model 4100-WLD-110 and 4100-WLD-220
4150: Spot Weldable Vibrating Wire Strain Gauge, low profile, 51 mm active gauge length, standard 3,000 microstrain range, with spot weldable shims, integral plucking coil, thermistor, and cover plate. Cable sold separately.
4150-4: Model 4150 Strain Gauge with extended 5,000 microstrain range. Includes individual calibration. Cable sold separately.
4150-5: Model 4150 Strain Gauge with extended 10,000 microstrain range. Includes individual calibration. Cable sold separately.
4150A: Spot Weldable Vibrating Wire Strain Gauge, low profile, 51 mm active gauge length, standard 3,000 microstrain range, without spot weldable shims, integral plucking coil, thermistor, and cover plate. Cable sold separately.
4150A-4: Model 4150A Strain Gauge with extended 5,000 microstrain range. Includes individual calibration. Cable sold separately.
4150A-5: Model 4150A Strain Gauge with extended 10,000 microstrain range. Includes individual calibration. Cable sold separately.
02-187V3: Red PVC Cable, 4.75 mm (±0.25 mm) [0.187"] Ø, 2 twisted pairs, for the above.
4150-1: Gauge Cover Plate with welding straps.
4150-3: Gauge Positioning Tool.
4150A-1: Mounting blocks for Model 4150A series gauges.
4150A-2: Protective Cover Plate with welding straps, for use with 4150A-1 Mounting Blocks.
4150A-3: Spacer Bar, for use with 4150A-1 Mounting Blocks.
4151: Surface Mount Vibrating Wire Strain Gauge, end blocks include pins for grouting, 51 mm active gauge length, standard 3,000 microstrain range, with integral plucking coil, thermistor, and cover plate. Cable sold separately.
4151-1: Model 4151 Strain Gauge with extended 5,000 microstrain range. Includes individual calibration. Cable sold separately.
4151-2: Model 4151 Strain Gauge with extended 10,000 microstrain range. Includes individual calibration. Cable sold separately.
02-187V3-M: Red PVC Cable, 4.75 mm (±0.25 mm) [0.187"] Ø, 2 twisted pairs, for the above.
4151-3: Drilling Template for 4151.

Compatible Readouts and Dataloggers
GK-404: Handheld Readout
GK-406: Vibrating Wire Analyzer
Model 8600 Series: Multi-Channel Dataloggers
Model 8800/8900 Series: GeoNet Wireless Dataloggers and Data Hosting System

[1] *Unless otherwise specified, Strain Gauges are batch calibrated. Individual calibrations are available upon request for an additional fee.*

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