Special Use Sensors - Weldable Strain Gages

Micro-Measurements Standard Weldable Strain Gages and Temperature Sensors are specially designed for spot welding to structures and components. They are ideal for applications where test or environmental conditions preclude clamping and curing an adhesively bonded gage installation. These gages are equally advantageous when strain measurements must be made at an elevated temperature, but the nature of the test object does not permit the use of an elevated-temperature-curing adhesive.

Surface preparation requirements are minimal; only an appropriate solvent cleaning and abrasion of the test part surface with silicon-carbide paper or a small, hand-held grinder is needed. Spot welding is accomplished with a portable stored-energy hand-probe spot welder, such as the Model 700. Environmental protection is as easily applied to a welded gage installation as to an adhesively bonded gage.

Refer to Instruction Bulletin B-131 and Catalog A-110 for further information on installation and protective coatings, and to Bulletin 302 for specifications on the Model 700 Welding/Soldering Unit.

DESCRIPTION AND PERFORMANCE

General — All sensors are laboratory-prebonded, with a high-performance adhesive, to thin (0.005 in [0.13 mm]) metal carriers. Sensor grids are fully encapsulated for protection against handling and installation damage. Standard weldable strain gages are offered in two series to meet differing performance requirements. Both series are available in either 06 or 09 self-temperature compensation. Strain gages with 06 S-T-C have Inconel carriers, while S-T-C 09 gages and temperature sensors are mounted on 300-series stainless steel.

CEA-Series Weldable Strain Gage — Polyimide-encapsulated constantan foil grid, with large, rugged, copper-coated tabs. In most cases, the carrier can be contoured to a radius as small as 1/2in [13mm]. The CEA Series is ideal for direct leadwire attachment, before or after installation.

Strain range is ±5000µin/in [±5000µm/m], and normal operating temperature range is –100° to +200°F [–75° to +95°C]. Short-term maximum temperature is +300°F [+150°C].

LWK-Series Weldable Strain Gage — Nickel-chromium alloy grid, encapsulated in fiberglass-reinforced epoxy phenolic. The LWK gage is provided with a three-wire lead system with 10 in [250 mm] of Teflon®-insulated leadwire.

This construction simplifies leadwire temperature compensation and provides for easy connection of the lead system to the instrumentation cable. Minimum installation radius is generally limited to 2in [50 mm].

Strain range is ±5000µin/in [±5000µm/m], and normal operating temperature range is –320° to +500°F [–195° to +260°C]. Short-term maximum temperature is +550°F [+290°C].

WWT-Series Temperature Sensor — High-purity nickel foil grid encapsulated in fiberglass-reinforced epoxy-phenolic, and equipped with integral three-tab terminal to facilitate leadwire attachment. The temperature sensor is normally installed on a flat surface of the workpiece, but, in any case, should always be oriented with the gridlines in the direction of minimum strain to avoid strain-induced errors (see Micro-Measurements Tech Note TN-506, Bondable Resistance Temperature Sensors and Associated Circuitry). With an appropriate LST Matching Network, the temperature response characteristic of the nickel can be linearized and scaled for direct readout (in degrees) with any strain indicator.

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MEASUREMENT CONSIDERATIONS

It is important to note that operating characteristics of weldable strain gages (gage factor, transverse sensitivity, and thermal output) are specified for the basic strain gage itself — without the metal carrier. Thus, the properties are measured by bonding a conventional strain gage directly to an appropriate calibration specimen, following standard methods specified for all Micro-Measurements strain gages. This procedure assures the most accurate results, independent of the variables introduced by welding. In particular, the user should be aware that the gage factor specified on the engineering data sheet accompanying the gage applies only to the basic strain gage, without the shim. The effective gage factor of the weldable assembly (after welding to the test member) is commonly 5 to 10% lower than this, due primarily to the stiffness of the shim. The reduction in gage factor is not subject to quantitative generalization, because it depends on the cross-sectional properties of the test specimen, and on the mode of loading (e.g., bending versus direct stress). It has been demonstrated, however, that for a group of like specimens, loaded in the same manner, the weldable gages exhibit very good repeatability and uniformity of response. Therefore, when test requirements dictate greatest accuracy, the weldable gages should be calibrated on a specimen of the same material and cross section as the test part, and under the same mode of loading.

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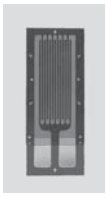
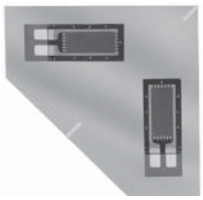
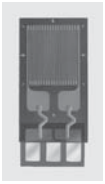
GAGE PATTERN AND DESIGNATION Insert Desired S-T-C No. in Spaces Marked XX. See Note 1		RES. IN OHMS.	DIMENSIONS						
			CARRIER			ACTIVE GRID		MATRIX	
			Length	Width	Thick	Length	Width	Length	Width
CEA-XX-W250A-120 CEA-XX-W250A-350		120 ± 0.4% 350 ± 0.4%	0.63 16.0	0.34 8.6	0.005 0.13	0.230 5.84	0.125 3.18	0.44 11.2	0.17 4.3
			Most flexible and conformable pattern. Type 326-DFV and 330-DFV flat three-conductor cable typically used to solder directly to copper-coated tabs.						
CEA-XX-W250C-120 CEA-XX-W250C-350		120 ± 0.4% 350 ± 0.4%	0.90 22.9	0.90 22.9	0.005 0.13	0.230 5.84	0.125 3.18	0.44 11.2	0.17 4.3
			Tee rosette, used in biaxial stress states where directions of principal stresses are known. See W250A pattern for typical leadwire recommendations.						
LWK-XX-W250B-350		350 ± 0.4%	0.88 22.4	0.32 8.1	0.005 0.13	0.250 6.35	0.125 3.18	0.62 15.7	0.17 4.3
			Wide-temperature-range linear pattern with 10 in [250 mm] pre-attached leads. Teflon insulation is pretreated for best bond to protective coatings.						
LWK-XX-W250D-350		350 ± 0.4%	1.15 29.2	1.15 29.2	0.005 0.13	0.250 6.35	0.125 3.18	0.62 15.7	0.17 4.3
			Tee rosette, used in biaxial stress states where directions of principal stresses are known and a wide operating temperature range is required.						
WWT-TG-W200B-050		50 ± 0.4% @ +75°F [+24°C]	0.71 18.0	0.43 10.9	0.005 0.13	0.200 5.08	0.200 5.08	0.52 13.1	0.26 6.6
			Easy-to-use temperature sensor that can be welded or adhesively bonded to the test structure. For standard bondable temperature sensors, see Document Number 11522, “Temperature Sensors and LST Networks.”						

Note 1: Products with designations and options shown in bold are not RoHS compliant.

Disclaimer

All product specifications and data are subject to change without notice.

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