MICRO MEASUREMENTS
A VPG Brand

Strain Gage Installation Checklist
Steel

Strain Measurements on Steel

Strain gage applications on steel can be exposed to a wide variety of environments and temperature conditions, so attention to the variables related to these two conditions is important. This guide will lead you through the selection process for the strain gage, adhesive, wire and solder, and protective coatings to ensure the most successful results when measuring strain on steel.

Step 1
Define the Test Conditions

Conditions to Consider	Your Test Conditions
Static measurement One sample per second or less, steady loading	
Dynamic measurement Cyclical or impact loading, high frequency Event duration Anticipated frequency	
Installation longevity Short Term: Hours, days, weeks Long Term: Months, years	
Environment Maximum temperature Minimum temperature Exposure (outdoors, oil, chemicals)	

Step 2
Ensure Appropriate Surface Preparation Materials Are On Hand

Use the recommended **surface preparation materials** for steel:

CSM degreaser
GSP-1 gauze sponge
220-grit SCP-1 silicon carbide paper
320-grit SCP-2 silicon carbide paper
CSP-1 cotton-tipped applicator
M-Prep Neutralizer 5A
M-Prep Conditioner A
PCT-3M gage installation tape
PDT-3 drafting tape

Reference **Instruction Bulletin B-129**: SEARCH our website using the document number **11129**.

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Step 3
Select the Strain Sensor

Consult the Micro-Measurements team and/or review our **Tech Note TN-505**, "Strain Gage Selection – Criteria, Procedures, Recommendations" for detailed information about the strain gage selection process.

Step 3A: Select the Gage Series for the Temperature Range

Consider the temperature range that will be encountered during the strain measurements and select a **Gage Series** that meets your requirements.

Gage Series	Temperature Range	Features
CEA	–100°F to +350°F (–75°C to +175°C)	Universal, general-purpose strain gages. Large, easily soldered tabs. Precabled (Option P2) available. Weldable gages are also available.
C2A	–60° to +180°F (–50° to +80°C)	Precabled, general-purpose strain gages.
EA	–100° to +350°F (–75° to +175°C)	Widest range of available patterns, sizes and optional features.
WK	–452° to +550°F (–269° to 290°C)	Widest temperature range and most extreme environmental capability of any general-purpose gage when self-temperature compensation is required. High fatigue-endurance leadwires. Weldable gages are also available.
WD	–320° to +500°F (–195° to 260°C)	Highest fatigue life, for dynamic applications only. High endurance leadwires and wide temperature range.

Step 3B: Choose the STC for Your Material

When temperature changes will occur during the course of strain measurements, **self-temperature-compensation (STC) 06** is specified for mild and carbon steel alloys.

Step 3C: Consider the Geometry

If your specialized measurement requires a unique strain gage, Micro-Measurements has hundreds of strain gage geometries available. Check **Super Stock** for gages that are available to ship promptly.

Strain Gage Pattern	Stress State	Where Directions of Principal Stresses Are
Linear	Uniaxial	Known
0° to 90° (T-Rosette)	Biaxial	Known
Triaxial (Rectangular or Delta Rosette)	Unknown	Both the principal stresses need to be determined along with their direction
Dual-Shear	Typically used when a measurement of shear strain is required	

Step 3D: Other Considerations

Consider the available area to fit the strain gage, strain gradient and gage length required. Refer to the matrix dimensions, given in the strain gage datasheet, which define the "footprint" of the strain gage.

There are some advantages to higher resistance, but many of the smallest strain gages are available only in lower resistance. The most common general-purpose strain gage resistances are 120 Ω, 350 Ω, and 1000 Ω.

Consider compatibility with instrumentation as well.

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Step 4
Select the Adhesive

Adhesive	Conditions to Consider
M-Bond 200 Kit	The most frequently used adhesive for short-term room temperature testing, with fast installation
M-Bond AE-10	Long-term testing where room temperature cure is required
M-Bond 600 or **M-Bond 610**	Wide temperature range testing; elevated temperature cure required

Follow the instructions included with the adhesive for application and cure requirements.

Application Kits contain specific adhesives, surface preparation materials, and in some cases wire and coatings necessary for a successful strain gage installation on steel.

- **BAK-200 Kit**
  Contains M-Bond 200 adhesive and basic materials for surface preparation (does not include GC-6 Alcohol). Excellent for use with pre-cabled gages.
- **GAK-2-200, GAK-2-AE-10, and GAK-2-610 Kits**
  Contain all materials needed to install strain gages on steel, including solder and cable.

Step 5
Select Cable and Solder Terminals

Micro-Measurements offers a variety of **cable types** for gage installation on steel. For ease of installation, consider pre-cabled gages (**C2A-Series**, **Option P2, Option P, Option SP35**); no additional cable is required unless length needs to be extended.

Cable	Conditions to Consider
Vinyl Insulated	Room temperature testing
Teflon Insulated	Wide temperature range testing, high moisture or water immersion, and chemical resistance

Solder Terminals	Conditions to Consider
Bondable Terminals	For use with small gages or those with short pre-attached wires, such as WK- and WD-Series gages.

Step 6
Select a Solder

Micro-Measurements has a wide selection of **solder** for strain gage applications. Solder melt point should be at least 50°F (28°C) above the maximum operating temperature. Solder is not needed when using pre-cabled gages.

Step 7
Select a Protective Coating

Consider the environmental conditions that the coating will need to resist and any application issues, such as:

Environmental Conditions	Application Issues
• Temperature range • Humidity • Chemical exposure • Localized reinforcement concerns	• Vertical surface • Horizontal surface • Component sensitivity

For room temperature testing in a laboratory environment, the most popular coating is **M-Coat A**. For field testing, **M-Coat JA**, **M-Coat F**, and **Barrier E** are rugged and waterproof.

For testing in other environments and temperatures, refer to the **Protective Coating Selection Guide** to select the proper coating.

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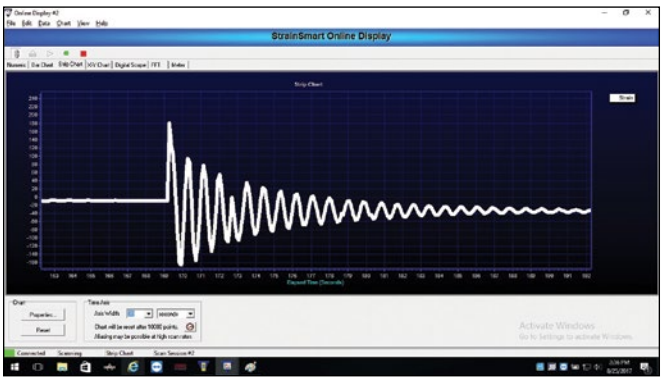
Step 8
Select the Measurement Instrumentation

Micro-Measurements offers a wide variety of **instrumentation** specifically designed and optimized for strain measurement. Simple Strain Indicators are available for high-accuracy static measurements. Signal Conditioning Amplifiers accept direct strain gage input and provide a conditioned signal output in the ±10 V range. Data Systems accept direct strain gage input and provide reduced data, already in engineering units of strain and/or stress.

P3
Strain Indicator

StudentDAQ

D4 Data Acquisition
Conditioner



StrainSmart® Data Acquisition Software

System 8000 Data Acquisition

System 9000 Data Acquisition

Pacific Instruments
Series 6000 Data Acquisition System