SensorsX

SX-FSINC Series

Foil Resistance Strain Gauges

Force & Strain | Uniaxial Foil Resistance Strain Gauges (Solder-Free, Pre-Wired)



120 / 350 / 1,000 Ω Resistance	**2.0 ±1%** Gauge Factor (Sensitivity)	**2%** Strain Limit
1–100 mm Grid Length	**−30 to +80 °C** Operating Temp. (−22 to +176 °F)	**Constantan / Modified Phenolic** Grid / Base Material

■ PRODUCT OVERVIEW

The SX-FSINC Series comprises pre-wired, uniaxial metal foil strain gauges for surface strain measurement on structural and mechanical components. When bonded to a test surface, each gauge converts strain along its sensing axis into a change in electrical resistance. The gauges feature constantan sensing grids on modified phenolic backings and are available with nominal resistances of 120, 350, and 1,000 Ω. They are suitable for static and dynamic strain measurements, with pre-attached lead wires that eliminate the need to solder directly to the gauge during installation.



■ KEY FEATURES

- ◆ Stable Performance for Long-Term Strain Measurement
- ◆ Uniaxial Metal Foil Sensing Element
- ◆ Pre-Attached Lead Wires for No Soldering Required at the Gauge
- ◆ Suitable for Static and Dynamic Strain Measurement

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.

■ TYPICAL APPLICATIONS

Application Fields

- Structural Health Monitoring
- Machinery and Mechanical Components
- Automotive and Transportation Testing
- Bridges, Dams, and Tunnels
- Electrical Equipment and Motors
- Civil Engineering and Geotechnical Testing
- Medical and Food Processing Equipment Testing

Strain Gauge Selection

Strain gauges should be selected based on the measurement environment, strain characteristics, strain gradient, available bonding area, and required accuracy. For static measurements, low transverse sensitivity is desirable, while dynamic measurements require good fatigue resistance. Shorter grid lengths are generally preferred where strain gradients are high or bonding space is limited. The nominal resistance, grid dimensions, and thermal-expansion compensation characteristics should be matched to the test material and application. Verify that the selected gauge meets its specified resistance tolerance and is free from visible defects.

■ PERFORMANCE SPECIFICATIONS

Measurement	
Type	Uniaxial foil resistance strain gauge, solder-free with pre-wired leads
Strain Limit	2%
Gauge Factor (Sensitivity)	2.0 ±1%
Materials & Compensation	
Base Material	Modified phenolic
Grid Material	Constantan
Temperature / Elastic-Modulus Self-Compensation Code	11
Creep Compensation Code	N0

Strain Gauge Models

Model	Type	Grid Size L × W mm (in)	Base Size L × W mm (in)	Resistance (Ω)	Strain Limit / Gauge Factor
SX-FSINC-01111	Uniaxial	1.0 × 1.0 (0.04 × 0.04)	3.0 × 2.5 (0.12 × 0.10)	120 ± 0.1	2% / 2.0 ±1%
SX-FSINC-02111	Uniaxial	2.0 × 2.0 (0.08 × 0.08)	6.0 × 4.0 (0.24 × 0.16)	120 ± 0.1	2% / 2.0 ±1%
SX-FSINC-03111	Uniaxial	3.0 × 2.3 (0.12 × 0.09)	6.6 × 3.2 (0.26 × 0.13)	120 ± 0.1	2% / 2.0 ±1%
SX-FSINC-04111	Uniaxial	5.0 × 2.6 (0.20 × 0.10)	8.5 × 3.6 (0.33 × 0.14)	120 ± 0.1	2% / 2.0 ±1%
SX-FSINC-05111	Uniaxial	6.0 × 2.8 (0.24 × 0.11)	10.0 × 3.8 (0.39 × 0.15)	120 ± 0.1	2% / 2.0 ±1%
SX-FSINC-06111	Uniaxial	10.0 × 5.0 (0.39 × 0.20)	15.0 × 9.0 (0.59 × 0.35)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-07111	Uniaxial	15.0 × 3.0 (0.59 × 0.12)	20.0 × 6.0 (0.79 × 0.24)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-08111	Uniaxial	20.0 × 3.0 (0.79 × 0.12)	26.0 × 6.0 (1.02 × 0.24)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-09111	Uniaxial	30.0 × 3.0 (1.18 × 0.12)	34.5 × 4.5 (1.36 × 0.18)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-0A111	Uniaxial	50.0 × 4.0 (1.97 × 0.16)	55.0 × 8.0 (2.17 × 0.31)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-0B111	Uniaxial	80.0 × 2.5 (3.15 × 0.10)	86.0 × 6.0 (3.39 × 0.24)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-0C111	Uniaxial	100.0 × 3.0 (3.94 × 0.12)	108 × 7.0 (4.25 × 0.28)	120 ± 1.0	2% / 2.0 ±1%
SX-FSINC-0D211	Uniaxial	2.0 × 1.0 (0.08 × 0.04)	3.6 × 3.1 (0.14 × 0.12)	350 ± 0.1	2% / 2.0 ±1%
SX-FSINC-0E211	Uniaxial	3.0 × 3.1 (0.12 × 0.12)	7.3 × 4.1 (0.29 × 0.16)	350 ± 0.1	2% / 2.0 ±1%
SX-FSINC-0F211	Uniaxial	6.0 × 2.9 (0.24 × 0.11)	10.3 × 3.9 (0.41 × 0.15)	350 ± 0.1	2% / 2.0 ±1%
SX-FSINC-0G311	Uniaxial	3.2 × 3.7 (0.13 × 0.15)	6.9 × 4.6 (0.27 × 0.18)	1000 ± 0.1	2% / 2.0 ±1%

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.

■ ELECTRICAL SPECIFICATIONS

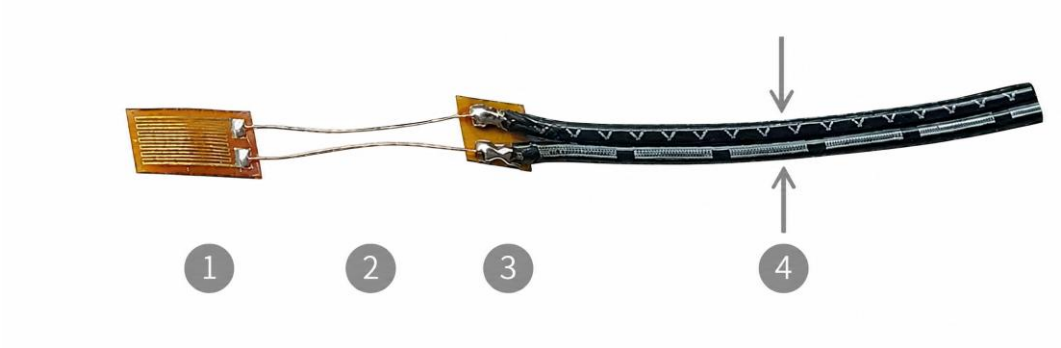
Resistance	
Nominal Resistance	120 Ω, 350 Ω, 1,000 Ω (see model table for tolerance)
Bridge Excitation	
Recommended Excitation Voltage	120 Ω: 2–4 V; 350 Ω: 5–10 V
Excitation Current	Max. 20 mA when bonded to metal; 10–15 mA recommended for zero stability
Note	For thin objects or poorly heat-conducting materials (plastics, ceramics), use a lower excitation voltage
Electrical Connection	
Leads	Pre-soldered insulated enameled wires, bondable terminal and extension cable (customizable length)

■ ENVIRONMENTAL SPECIFICATIONS

Temperature	
Limit Operating Temperature Range	−30 to +80 °C (−22 to +176 °F)

■ MECHANICAL DIMENSIONS

Components of the Solder-Free Strain Gauge Assembly



① Strain gauge ② Insulated enameled wire ③ Terminal (bondable) ④ Extension cable (customizable length)

Grid and Base Dimensions

Grid and base dimensions of each model are listed in the Strain Gauge Models table under Performance Specifications.

Note: All dimensions are in millimeters, with inch equivalents in parentheses, unless otherwise specified.

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.

■ Measurement System Configurations

Measurement Chain 1

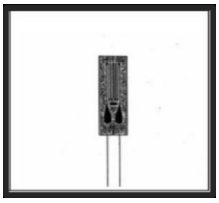
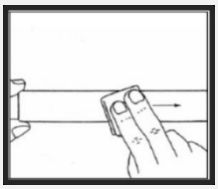
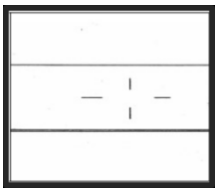
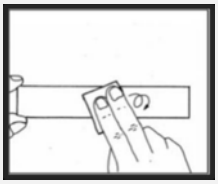
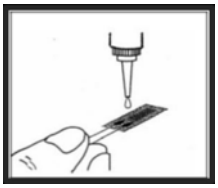
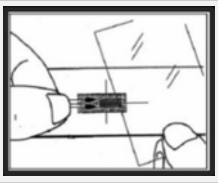
Strain gauge	→ Strain signal conditioning equipment	→ Data acquisition equipment	→ PC-Based Strain Measurement Software

Measurement Chain 2

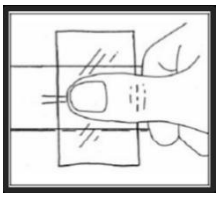
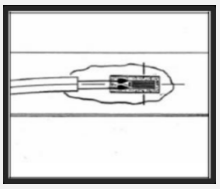
Strain gauge	→ Dynamic / static strain meter	→ PC-Based Strain Measurement Software

Strain Gauge Bonding Procedure

The bonding method depends on the strain gauge, adhesive, and environmental conditions. The following procedure describes a typical room-temperature installation using a solder-free, pre-wired strain gauge, a suitable adhesive, and a low-carbon steel test piece.

	1. Select the strain gauge — Select the type and length of strain gauge according to the test object and purpose. Choose a gauge whose thermal-expansion self-compensation suits the test object (see Materials & Compensation).
	2. Remove rust and protective film — Sand the bonding position (an area larger than the gauge) with abrasive cloth (#200 – 300) until paint, rust and plating are removed.
	3. Determine the bonding position — Mark the measuring position along the strain direction with a 4H or harder pencil or a scriber. When using a scriber, do not leave deep scratches.
	4. Degrease and clean the bonding surface — Clean the bonding area with industrial tissue moistened with acetone. Wipe firmly in one direction, then wipe again in the same direction. Wiping back and forth re-deposits contaminants and the surface cannot be cleaned.
	5. Apply adhesive — First confirm the front and back of the gauge. Apply a drop of the selected adhesive to the back of the strain gauge. If the adhesive is spread, part of it hardens and adhesion decreases — therefore do not spread it.
	6. Bond — Immediately place the gauge with adhesive at the center of the marked position.

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.

	7. Press — Cover the gauge with a polyethylene sheet and press with a finger. Steps 5, 6 and 7 must be carried out continuously and quickly. Removing the gauge to reposition it greatly reduces adhesion.
	8. Complete — Press for about one minute, remove the polyethylene sheet and check that the gauge is firmly bonded. The bonding process is complete. For best results, leave the gauge for about 60 minutes until the adhesive has fully cured before use.

Precautions and FAQ

1. Abnormal resistance after bonding

The resistance of a strain gauge changes slightly after bonding; a large change is abnormal and the gauge must be removed and re-bonded. The main causes are:

(1) Uneven pressure during curing deforms the sensitive grid; use suitable clamps and fixtures so that the force is uniform.

(2) Excessive pressure during curing; the recommended pressure is 0.15–0.3 MPa (22–44 psi).

(3) Resistance changes after a period of operation — possibly due to adhesive layer peeling, voids in bonding or unreliable soldering; improve the bonding and soldering process. After removing a gauge, clean and sand the surface.

2. What bridge excitation voltage is suitable for 120 Ω and 350 Ω gauges?

The excitation current must take into account the balance between Joule heating and heat dissipation. When bonded to metal, the maximum is 20 mA; for zero-point stability, 10–15 mA is used in practice. Standard bridge excitation voltage: 120 Ω: 2–4 V; 350 Ω: 5–10 V. For thin objects, or plastics, ceramics and other materials with poor heat dissipation, use a lower voltage.

3. How does bonding on a curved surface affect the gauge?

When bonded on a surface with a small radius of curvature, the resistance change caused by bonding may hinder normal measurement:

(1) The strain instrument cannot reach initial balance.

(2) The allowable strain may be reduced.

(3) The apparent strain characteristic changes with temperature.

(4) Insufficient pressure on the adhesive during bonding and uneven adhesive thickness reduce service life and performance.

4. What is the strain gauge resolution?

Resolution depends on the strain instrument; with a 24-bit strain instrument, a resolution of 0.1 microstrain can be achieved.

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.

■ ORDERING INFORMATION

Complete model number example: SX-FSINC-01111

Grid Size	
01	1×1 mm (0.04 × 0.04 in)
02	2×2 mm (0.08 × 0.08 in)
03	3×2.3 mm (0.12 × 0.09 in)
04	5×2.6 mm (0.20 × 0.10 in)
05	6×2.8 mm (0.24 × 0.11 in)
06	10×5 mm (0.39 × 0.20 in)
07	15×3 mm (0.59 × 0.12 in)
08	20×3 mm (0.79 × 0.12 in)
09	30×3 mm (1.18 × 0.12 in)
0A	50×4 mm (1.97 × 0.16 in)
0B	80×2.5 mm (3.15 × 0.10 in)
0C	100×3 mm (3.94 × 0.12 in)
0D	2×1 mm (0.08 × 0.04 in)
0E	3×3.1 mm (0.12 × 0.12 in)
0F	6×2.9 mm (0.24 × 0.11 in)
0G	3.2×3.7 mm (0.13 × 0.15 in)
Resistance Value	
1	120 Ω *[Available with Grid Size = 01 – 0C]*
2	350 Ω *[Available with Grid Size = 0D, 0E or 0F]*
3	1,000 Ω *[Available with Grid Size = 0G]*
Strain Limit	
1	2%
Sensitivity (Gauge Factor)	
1	2.0 ±1%
Customization Options	
D	Custom configuration — specify requirements when ordering

Example: SX-FSINC-01111D — SX-FSINC Series, 1 × 1 mm grid size, 120 Ω nominal resistance, 2% strain limit, gauge factor of 2.0 ±1%, and custom configuration.
Note: The standard product is supplied without lead wires. Please contact us if pre-attached lead wires are required.

The information in this document is subject to change without notice. SensorsX Technology Inc. assumes no responsibility for errors or omissions.