

SGA2

Strain Gauge Amplifier



The SGA-2 strain gauge amplifier is designed as a differential front-end amplifier for connecting full, half or ¼ bridge strain gauges with internal bridge termination. The SGA-2 is designed for connection to a high-precision Elsys transient recorder, but is also suitable for any other data acquisition system.

The amplifier is available as a 2-channel boxed version or modular from 2 to 24 channels as a rack system. The amplifier can be configured either via the USB interface or on the hardware itself. Each channel can be configured individually. There are 3 amplifier stages with an

amplification factor of 1, 10 and 100 to choose from. At gain 1 and 10, a bandwidth of 1.5 MHz is achieved, making the amplifier ideal for highly dynamic applications.

For ¼-bridge applications, the measuring bridge must be supplemented with an internal resistor that matches the sensor. This means that the amplifier can be used with all common strain gages.

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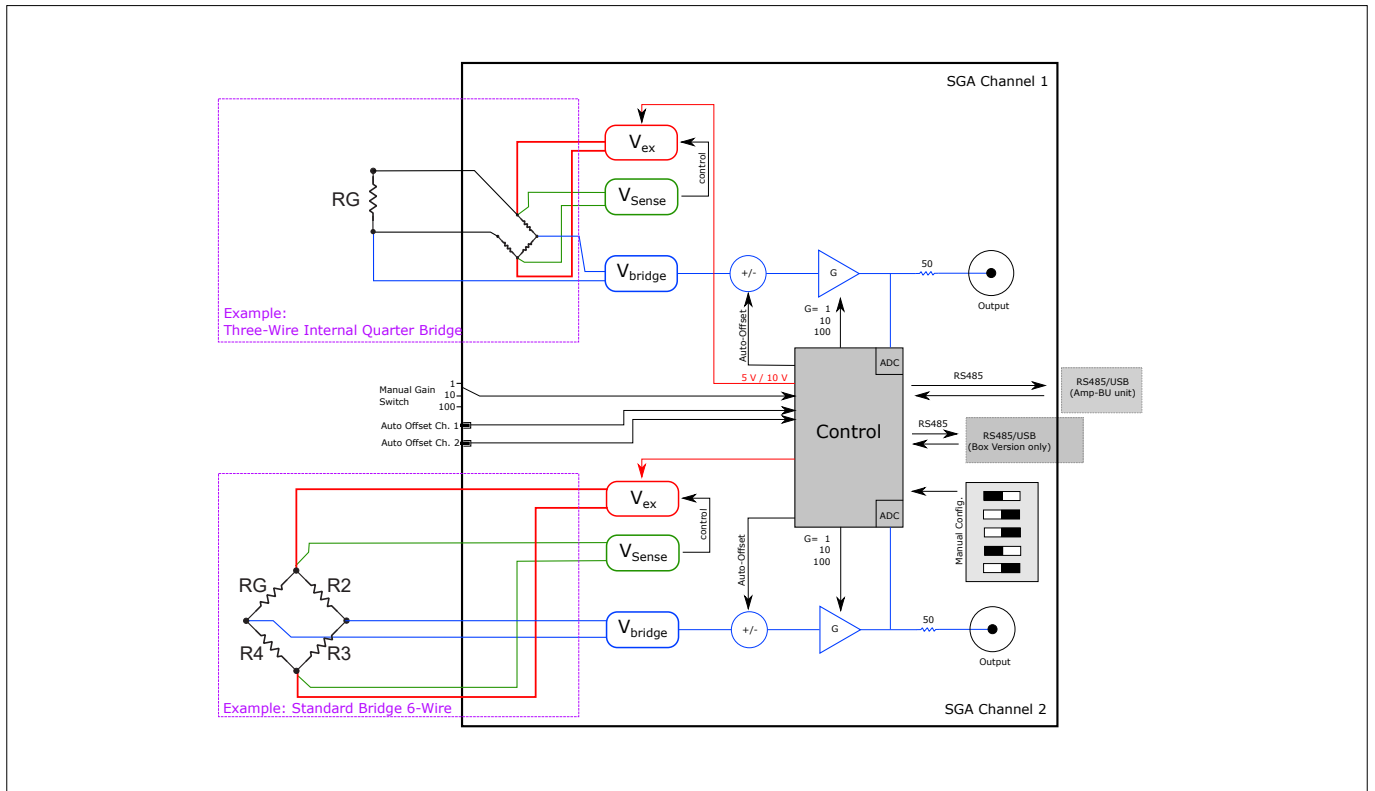
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SGA-2 Strain Gauge Amplifier

Key Capabilities

- 4-wire and 6-wire configuration
- Internal 1/2- and 3/4 bridge completion
- 2 independent channels per module
- Gain x1, x10, x100
- 1.5 MHz bandwidth with gain x1 and x10
- Low offset voltage drift
- Low output noise
- Auto-Offset compensation
- USB or RS485 interface for configuring all settings and read back of the actual output signal.



Applications

- Deformation testing for material characterization
- High speed dynamic material deformation
- Load Cell measurements

Mode of Operation

Gain

The amplification of the signal can be 1, 10 or 100 and is selectable manual per module (2-Channel) or per channel over the software interface (USB or RS485).

Offset

Offsets due unbalanced bridges can be compensated by the amplifier. The SGA-2 MK2 has a build-in auto-offset calibration.

Voltage Excitation

The SGA-2 provides a precision voltage excitation (V_{ex}). As there could be a voltage drop between the power output of the SGA-2 and the bridge, a 2-wire sense signal is feed back to the power supply for precise voltage control. The precision of the excitation voltage is import-

ant as it influence directly the output signal. There are two excitation voltages available which are switchable over the software interface or manually.

Output

The output voltage of the amplifier is given by:

Load Cell:

$$V_{out} [mV] = G * V_{ex} [V] * Sensitivity [mV/V] * Load / Rated Load$$

Single Micro Strain Sensor (approx.) :

$$V_{out} = G * V_{ex} * \Delta R_g / R_g * 1/4$$

$$V_{out} = G * V_{ex} * G_f * \epsilon * 1/4$$

$$V_{out} = G * V_{ex} * G_f * \Delta L / L * 1/4$$

where G_f = Gage Factor

The bridge must be fully compensated.

Specification

SGA-2-P/7 MK2	Module with 2 channels as plug-in to a 19" Rack chassis
SGA-2-Box/7 MK2	Alu-box ca. 104 x 165 x 35 mm
Configurable Modes	6-Wire, 4-Wire, Internal ½ Bridge, Internal ¾ Bridge
Gain (switch selectable)	x1, x10, x100
Input stage	Differential Amplifier
Bandwidth	1.5 MHz (G=1, 10), 600 kHz (G=100)
Input Impedance	2 x 1 MΩ ca. 25 pF to GND
Input Bias Current	< ±60 nA
Offset Voltage (related to output, *1)	< ± 2.5 mV
Offset Voltage Drift (related to output)	< ± (30 + 1 * Gain) μV/°C
Gain Error	< ± 0.1% (G = 1, 10), < ± 0.5 % (G = 100)
Output Impedance	50 Ω ±0.5%
Max. Output Voltage Swing	±10 V (no Load) ±5 V (Load = 50 Ω)
Max. Input Voltage (Protected Input Range)	max. ±42 V (Signal Inputs) max. ±2 V (Excitation Voltage Pins)
Excitation Voltage	10 V or 5 V, ±0.1% Configurable by Dip-Switches or Software

Note: *1) after 1 h Warm-Up Time at Tamb = 25°C

Max. Load of Excitation Voltage	90 mA
Asymmetry of internal ½ Bridge	max. ±0.1% (= 5 mV @ 10 V)
Power Supply	12 VDC ± 10%, max. 6 W per 2 Ch
Operating Temperature	0 to 45 °C
Storage Temperature	-20 to 60 °C
Rel. Humidity	< 80 % (up to 31 °C) decreasing to < 50% at 31 to 45 °C
Max. Operating Altitude	2'000 m
Input Connector Type	Lemo 7-pol. or 16-pol Lemo
Output	BNC

Output Noise				
Gain	Int. ½ Bridge Off		Int. ½ Bridge On	
	Bandwidth		Bandwidth	
	100 kHz	Full	100 kHz	Full
1	0.03 mVrms 0.3 mVpp	0.3 mVrms 2.0 mVpp	0.05 mVrms 0.8 mVpp	0.4 mVrms 6 mVpp
10	0.08 mVrms 0.6 mVpp	0.5 mVrms 5 mVpp	0.3 mVrms 2.5 mVpp	2.5 mVrms 40 mVpp
100	0.6 mVrms 4 mVpp	1.5 mVrms 15 mVpp	3 mVrms 20 mVpp	20 mVrms 150 mVpp

Variants

Rack-Version

- 2-Channel Rack-Modules SGA-P/7 or SGA-P/16
- Amp-BU-10 (for up to 5 modules / 10 channels)
- Amp-BU-24 (for up to 12 modules / 24 channels)
- USB interface (emulated COM port) for accessing all installed amplifier. (Internally over RS485)



Boxed Version

- 2-Channel Modules SGA-Box/7 or SGA-Box/16
- USB interface (emulated COM port)
- External power supply



Strain Gauge Amplifier Order Information

Model Unit	Description	Interface
Amp-BU-10 MK2	Rack Case for max. 5 SGA-2 modules (10 channels)	USB
Amp-BU-24 MK2	Rack Case for max. 12 SGA-2 modules (24 channels), USB Interface	USB
SGA2-P/7 MK2	2-channel strain gauge amplifier module, input connector 7-pol Lemo, rack-mount	RS485
SGA2-P/16 MK2	2-channel strain gauge amplifier module, input connector 16-pol Lemo, rack-mount	RS485
SGA2-Box/7 MK2	2-channel strain gauge amplifier in external box, input connector 7-pol Lemo	USB
SGA2-Box/16 MK2	2-channel strain gauge amplifier in external box, input connector 16-pol Lemo	USB