

SG-16 Series Strain Gage Conditioners



DESCRIPTION

The Model SG-16 series Signal Conditioning System is an ideal "front end" for data acquisition systems. It solves problems commonly encountered in many data acquisition systems by providing excellent channel to channel isolation, combined with extremely low noise instrumentation amplifiers having gains up to 11,000. The system consists of ten plug-in modules in a 19-inch relay-rack-mounting cabinet. Systems are available in single-dual-four, and ten-channel cabinets. Each module contains an extremely stable, low-noise, individual power supply for resistive and other transducers. It features precision adjustable gain, wide-band differential amplifiers with balance, calibration, and monitoring circuits for use with 1, 2, or 4 arm strain gauge and RTD transducers and potentiometers. Because of its outstanding instrumentation amplifier characteristics, it is also ideal for use as a precision low level input amplifier. The ten-channel system shown above is 7 inches high, 19" wide, and 17" deep. All modules slide in from the front on guides, mate with rear inside connectors, and are locked into place. Each module is in a shielded enclosure, and insulated from the cabinet. Operating temperature is 0 to 50 degrees C, at relative humidity up to 95% (non-condensing).

EXCITATION

Excitation may be set to either constant-voltage or constant-current. In the constant-voltage mode, the output is continuously adjustable from 0.5 to +15 VDC, with a resolution of .01% of full scale and is capable of delivering 100 mA. In the constant-current mode, the output is continuously adjustable from 1 to 100 mA, with a resolution of .01%, full scale, and 15 volts compliance. Local or remote sensing is selectable via rear panel connections. Excitation may be shut off by local or remote control.

AMPLIFIER

The amplifier input is differential, and may be set to either AC or DC coupling. Gain is selectable in steps, from 1 to 1,000, with intermediate (fine gain) from 1 to 11X via a ten turn front panel precision counting dial, yielding a total gain range from 1 to 11,000. A six-pole low-pass filter provides choices of 10, 100, 1000 and 10,000 Hz corner frequencies, as well as wide-band. Two independent outputs are provided, each of which may either connect to or bypass the filter. The amplifier is non-inverting. The amplifier features an auto-zero circuit accessible through the front panel via push button switch. The rear amplifier output connectors are D-shell 9 pin.

SIGNAL CONDITIONING

Turret lugs on each signal conditioner's main board provide up to three bridge-completion resistors and two bipolar shunt calibration resistor sets. Calibration is under remote and front-panel control. Balance is automatic with front panel and remote capability and is retained in nonvolatile memory. Excessive imbalance is indicated via a front panel LED. Individual 15-pin D shell connectors are wired to complete each module's connections for excitation and sense, signal input, bridge completion and calibration resistors. All connections to the bridge are made through individual 16-pin D-shell connectors. Output signals are via individual D-9 connectors.



SPECIFICATIONS

One hour warmup.

SPECIFICATION	UNITS	SPECIFIED PERFORMANCE
General		
Operating Voltage	VAC @ Frequency	120 or 240 VAC $\pm 10\%$ @ 50/60 Hz
External Control Signals (Customer supplied contact closure for control functions)	Low Voltage DC	<10 VDC Unregulated
Environmental		
Temperature	$^{\circ}\text{C}$	0 – 55 $^{\circ}\text{C}$
Humidity	% non-condensing	< 95%
Physical Dimensions SG-16-3	Inches/MM (H X W X D)	1.75/44 X 6.875/175 X 13.25/337
Physical Dimensions SG-16-RCX	Inches/MM (H X W X D)	19/483 X 7/178 X 16.625/422
Weight SG 16-3	Pounds/Grams	4.56/708
Weight SG-16-3 RCX (Full)	Pounds/KG	57/25.8
Excitation		
Constant Voltage Mode		
Range	Volts $\pm 1\%$	0.5 – 15 V
Supply Capability	Milli-amperes	0 – 100 mA
Supply Current Limit	Milli-amperes	< 175 mA
Resolution	% of full scale	0.01%
Noise & Ripple	μVolts peak-to-peak	<250 μV
Temperature Stability	% of setting / $^{\circ}\text{C}$	0.02%
Regulation Power Line / Load	% of output for $\pm 10\%$ line % of output for 100% load	< 0.01% < 0.01%
Constant Current Mode		
Range	Milli-amperes	1 – 100 mA
Resolution	% of full scale	0.01%
Compliance	Volts	0 – 15 V
Noise & Ripple	mV or μA	5 mV (p-p) or 1 μA
Temperature Stability	\pm % of setting / $^{\circ}\text{C}$	$\pm 0.02\%$ / $^{\circ}\text{C}$
Regulation Line/Load	% of output for $\pm 10\%$ line % of output for 100% load	0.01% or 1 μA 0.01% or 1 μA
Remote Sense	% of output / Ω of lead resistance	0.0005%
Excitation Features		
Modes	Constant Voltage/Current	
Isolation	Ω pF	> 100 M Ω 100 pF
Level Control	10-Turn Potentiometer	
Monitor Jacks	Front Panel + and -	



SG16-3 Signal Conditioner
Shown Above.



SPECIFICATION	UNITS	SPECIFIED PERFORMANCE
Amplifier		
Gains		
Fixed	Ratio of output/input	X1, X10, X100, X1,000
Variable	Ratio of output/input	1 – 11
Outputs		
STANDARD	Volts at Milli-amperes Equivalent Load k Ω Maximum Load Capacitance pF	± 10 V @ 5 mA 2 k Ω 400 pF
TAPE	Volts at Milli-amperes Equivalent Load k Ω Maximum Load Capacitance pF	± 1 V @ 5 mA 2 k Ω 400 pF
Protection		Protected against short circuit
Bandwidth		
Wideband	kHz for -3dB response	DC - 25 kHz (DC) 5Hz – 25 kHz (AC)
Filtered		
Response shaping	Butterworth, 6-pole	
Selectable cutoff frequencies	Hz for -3dB response	10 Hz, 100 Hz, 1 kHz, 10 kHz
Common Mode Rejection		
DC	dB relative to full scale input signal—shorted input	>100 dB
DC – 1 kHz	dB relative to full scale input signal—shorted input	>90 dB
DC – 1 kHz	dB relative to full scale—350 Ω source unbalance	90 dB Typical
Input Impedance	Megohms	10 M Ω
Input Bias Current	Nano-Amperes	± 5 nA Max
Zero Stability (vs. Temperature)	μ V/ $^{\circ}$ C RTI*	<1 μ V/ $^{\circ}$ C
Zero Stability (vs. Time)	μ V/8-hour period RTI* at constant temperature	5 μ V / 8-hours
Noise (DC – 10 Hz)	μ V rms RTI*	< 1 μ V p-p
Noise (5 Hz – 50 kHz)	μ V rms RTI*	< 15 μ V p-p
Autobalance	Equivalent input unbalance offset $\pm \mu$ Strain	$\pm 25,000$
Bridge Signal Conditioning		
Bridge Completion Resistors for 1, 2 or 4 Arm Bridge	Use with Full, Half or Quarter Bridge	
120 Ohm Precision/Stability	\pm % \pm ppm/ $^{\circ}$ C	0.1% 25 ppm/ $^{\circ}$ C
350 Ohm Precision/Stability	\pm % \pm ppm/ $^{\circ}$ C	0.1% 25 ppm/ $^{\circ}$ C
Resolution	% of full scale	0.01%

* RTI (Referred To Input)