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3178/3278/3378

AC STRAIN GAGE PANEL INSTRUMENT
[3000 SERIES]

PROVEN PANEL METER FOR SIGNAL CONDITIONING OF AC STRAIN GAGE SENSORS - COMBINES TRANSDUCER SIGNAL CONDITIONER (3178) WITH DISPLAY (3278) & LIMIT CONTROL (3378)

Being phase-sensitive carrierdemodulator instruments (rather than fully DC), the Models **3178**, **3278**, and **3378** AC Strain Gage Conditioners are intended for applications involving transformer coupling to the transducer bridge (as with rotary-transformer torque sensors) and for applications requiring high sensitivity with optimum signal-to-noise characteristics— as, for example, where the electrical environment is especially noisy and there is a need for high amplification of low signal levels. The Model **3178** Strain Gage Conditioner is the basic Form 1 instrument. The Model **3278** Strain Gage Conditioner/Indicator is the Form 2 instrument, providing vivid frontpanel digital indication of measured values, scalable in desired engineering units. The Model **3378** Strain Gage Conditioner/Indicator/Controller is the Form 3 instrument, and includes HI/LO limit detection with control output.

Other important features include:

- remote sensing and regulation of bridge excitation—eliminates errors from temperature effects on cable resistance
- seven-wire calibration circuitry—applies the internal shunt calibration resistor at the transducer terminals, thereby eliminating significant calibration transfer error in long-cable installations
- true differential input, with better than 80 dB of common-mode rejection—eliminates errors from common-mode pickup and possible “ground-loop” coupling
- input impedance in excess of 100 megohms preserves the validity of factory calibration, prevents conversion of commonmode to normal-mode signals, and eliminates remaining errors attributable to cable resistance. Allowable cable length has virtually no practical limits.
- elimination of both short-term and long-term drift through an advanced solid-state chopper stabilization technique, while preserving the full frequency passband, free of chopper noise; the rated accuracy is obtained without “warm-up” period or periodic “tweaking” of controls
- active low-pass filtering smooths unwanted dynamic signal components arising from vibration, power impulses, etc., that might prevent stable digital conversion or control action

For conditioning inputs from DC-excited strain gage transducers, see the Models **3170**, **3270**, and **3370**.

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SPECIFICATIONS

Input Type: Conventional 4-arm strain gage bridge, nominal 90 to 1000 Ohm
Input Range (full-scale): Nominal sensitivity 0.5 to 5 mV/V, full scale*
Excitation Supplied: 2 V-AC (rms) at 3.28 kHz
Analog Outputs: Two outputs, each ±5 V full-scale with 50% overrange, 5 mA max.; low-pass corner frequencies of 2 Hz and 400 Hz, respectively
Common-Mode Rejection: Greater than 80 dB
Input Impedance: Greater than 100 M½
Analog Filtering: Active low-pass filters provide -60 dB per decade above cutoff frequency ("f"); full-scale slew time is 1.4/f sec
Output Ripple and Noise: 0.15% of full scale (rms) max. for 400-Hz output; 0.02% of full scale (rms) max. for 2-Hz output
Accuracy (typical, following Calibration): 0.05% of full scale
Display Resolution (Models 3278 and 3378): 0.02% of full scale**

Physical / Environmental
Case: Each unit is housed in a single piece of heavy gage aluminum (1.7" H x 4.41" W x 7.0" D); a simple reassembly procedure allows mounting in the user's precut panel; the Model 3004 Rackmount Adaptor permits secure mounting of up to four units in a standard 19-inch rack

Operating Temperature Range: 0° F to +130° F (-18°C to +55° C); assumes dry, noncondensing ambient atmosphere

Weight: Instrument: approximately 2.0 lb (0.9 kg) maximum; Shipping: approximately 3.5 lb (1.6 kg) maximum

***** Ten-turn coarse and fine front-panel controls will balance 1.5 mV/V initial unbalance and allow span adjustment over the stated full-scale sensitivity.

****** Includes the combined effects of nonlinearity, random noise, line-voltage variation between 105 and 130 volts, ambient temperature variation of ±20° F about starting value, and sixmonths drift of zero and span. Errors attributable to the transducer are not included.

Power Voltage: 105-135 V-AC; 210-260 V-AC optional (add suffix "F" to model number); any model not employing the solid-state relay ("S") option may be powered by battery (11.5-15 V-DC, 500 mA max.; add suffix "B" to model number)

Frequency: 50-400 Hz

Consumption: 5 W max. (for Form 1 instruments), 8 W max. (for Form 2 instruments), or 9 W max. (for Form 3 instruments) Display (Form 2 and Form 3 instruments only)

Display: Orange LED's, six digits with polarity sign, 0.4" (1.0 cm) height; Most Significant Digit of display is either unlit or reads "1," and in either case contains polarity sign; Least Significant Digit is a dummy zero which may be lit or unlit, as desired

Scaling: Selectable at rear panel; full-scale values of ±5000 counted by "1's," ±10000 counted by "2's," or ±20000 counted by "5's," with selectable decimalpoint locations (along with dummy zero) to give decade multiplier factors of 10, 1.0, 0.1, 0.01, 0.001, or 0.0001

Display Sampling Update Rate: 3 samples per second

Limit Logic Outputs (Form 3 instruments only) Both true and complement available for each limit condition (LOW, OK, HIGH); TTL-compatible, wire- ORable; 10-mA sink, 0.5-mA source (max.); normally nonlatching, but latching outputs are also available

3000 Series options applying to the DC Strain Gage instruments include

- Analog Peak Capture (Models 3278 and 3378)
- 4-20 mA Current Output (Models 3178, 3278, and 3378)
- 0-10 V-DC Dual Galvanic Isolated Outputs (Models 3178 and 3278)
- Internal Electromechanical Relays (Model 3378)
- Internal Solid-State Relays (Model 3378)
- 12 V-DC Battery-Powered Operation or Nominal 230 V-AC Operation (Models 3178, 3278, and 3378)