

Considerations for Instrument Selection

STRAIN INDICATORS AND CALIBRATORS



Basic instrumentation requirements call for stability, accuracy and high resolution when making measurements under static loading conditions, and particularly where measurements are to be taken over long periods of time. Micro-Measurements offers our Model P3 Strain Indicator and D4 Data Acquisition Conditioner to meet these demanding criteria.

The Model P3 Strain Indicator and Recorder is a portable, battery-operated instrument while our D4 is a USB-powered instrument that connects to a personal computer. Both are capable of simultaneously accepting four inputs from quarter-, half-, and full-bridge strain-gage circuits, including strain-gage-based transducers. A highly stable measurement circuit, regulated bridge excitation supply, and precisely settable gage factor enable measurements of $\pm 0.1\%$ accuracy and 1 microstrain resolution. The P3 can also be configured and operated directly from your PC with a separate software application included with each instrument. The D4 also has a separate software application and is programmable for custom applications.

SIGNAL CONDITIONING AMPLIFIERS



When signals are produced by dynamically applied loads at frequencies above 0.1 Hz, or are transients, measuring instrumentation requires adequate frequency response, and a wide amplifier gain range for output to the appropriate recording or display device. Such an instrument consists of an amplifier and signal conditioner with a built-in or shared power supply. Individual units are normally required for each channel when simultaneous recording or multiple channels are needed. With the output sent to a suitable display device, signal conditioning amplifiers can be used for making long-term measurements under static loading conditions, when maximum stability and accuracy are not primary considerations.

The 2100, 2200, and 2300 Systems accept low-level signals, and condition and amplify them into high-level

outputs suitable for multiple channel, simultaneous, dynamic recording. All of these systems can be used in conjunction with a variety of recording devices.

DIGITAL DATA SYSTEMS



Depending on their design, digital data systems can be used for measurement of static, dynamic, or both kinds of signals. Micro-Measurements offers three digital data systems, each controlled with StrainSmart® software and other third-party software.

System 7000 is a high performance dynamic data acquisition instrument with measurement accuracy of $\pm 0.05\%$ of full scale. Each sensor card employs a 24-bit analog to digital converter enabling 0.5 microstrain resolution. Scan rates up to 2048 samples per second are available for simultaneous reading of all sensor inputs. A combination of analog and flexible Finite Impulse Response (FIR) filters are available to provide adequate anti-alias filtering at all scanning rates. Electronically selectable bridge completion resistors allow the user to choose between 120-, 350-, and 1000-ohm strain gages through software selection. System 7000 is capable of self-calibration with a removable calibration reference.

System 8000 is a versatile, precision data acquisition instrument system intended for static and dynamic test and measurement applications. The system includes a scanner with 8 channels of data acquisition. A 10-foot crossover Ethernet cable is also included. The scanners may be used separately or up to 16 scanners can be used concurrently for a maximum of 128 channels. Each channel can be configured, via software, to accept signals from strain gages or strain-gage-based transducers, thermocouples, or high level voltage sensors. Strain gage channels accept full-, half-, or quarter-bridge configurations and have the required bridge completion components for 120-, 350-, and 1000-ohm bridges. Each scanner operates independently; multiple scanners are not synchronized. The data is processed in a modern 24-bit digital signal processor and filtering is performed using Finite Impulse Response (FIR), multi-stage filters. This provides excellent noise rejection and stability and unsurpassed measurement accuracy.

System 9000 from Micro-Measurements is a versatile, precision data acquisition instrument system intended for dynamic test and measurement applications. The system includes a scanner with 12 channels of strain gage (strain gauge) data acquisition and 4 configurable slots for high level voltage sensors, thermocouples, and piezoelectric transducers (charge mode and voltage mode). Strain gage (strain gauge) channels accept full-, half-, or

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quarter-bridge configurations and have the required bridge completion components for 120-, 350-, and 1000- ohm bridges. Three scanners can be connected concurrently, providing 48 fully synchronized channels of data acquisition (36 strain gage and 12 configurable). The data is processed in a modern 24-bit digital signal processor and filtering is performed using Finite Impulse Response (FIR), multi-stage filters. This provides

excellent noise rejection and stability and unsurpassed measurement accuracy. The Model 9000-16-SM Scanner communicates with a host personal computer (PC) via a DHCP auto configured Ethernet connection. Micro-Measurements StrainSmart® software is optimal for configuring, controlling, and acquiring data from the System 9000.

INSTRUMENT SELECTION GUIDE

STRAIN INDICATORS AND CALIBRATORS						
Instrument	Display	Operation	Bridge Excitation	Input Power	Multi-Channel	Remarks
P3	Digital	Manual, Direct-Reading	1.5 VDC	Battery, USB, or AC Adapter	Selectable	Portable, 4-Channel, 0.1% Accuracy
D4	Host PC	PC Controlled via USB	1.5 VDC	USB	Selectable	4-Channel, 0.1% Accuracy

SIGNAL CONDITIONING AMPLIFIERS						
Instrument	Frequency Response ⁽¹⁾	Output (±)	Amplifier Gain	Bridge Excitation	Input Power	Remarks
2100	DC 15 kHz -3 dB	10 V at 100 mA	Continuously Variable 1-2100	DC 0.5-12 V	AC	High Performance Amplifier for Simultaneous Dynamic Recording
2200	DC 50 kHz -0.5 dB DC 100 kHz -3 dB	10 V at 10 mA and 1 VRMS at 10 mA	Continuously Variable 1-3300	DC: 0.5-15 V or 0.5-30 mA	AC	High Performance, for Demanding Environments
2300	DC 60 kHz -0.5 dB DC 145 kHz -3 dB	10 V	Continuously Variable 1-11,000	DC: 0.7-15 V (11 steps) 0.2-7 V Variable	AC	High-Frequency Response Multi-Feature Signal Conditioner

⁽¹⁾ Typical—see specific product bulletin and/or instruction manual for detailed performance specifications.

DIGITAL DATA SYSTEMS						
Instrument	Operating Mode ⁽²⁾	Channels	Scanning Rate	Bridge Excitation ⁽³⁾	Input Power	Remarks
7000	Stationary, Online	Unlimited (in increments of 8)	10-2048 Samples/Sec/ Channel	0-10 VDC Programmable	DC (AC Optional)	Programmable Digital Filters to 800 Hz
8000	Stationary, Online	1-128 (in increments of 8)	10-1000 Samples/Sec	0-10 VDC Programmable	DC (AC Optional)	Anti-Alias Low-Pass Filter
9000	Stationary, Online	1-48 (in increments of 16) ⁽⁴⁾	5-50,000 Samples/Sec/ Channel	0-10 VDC Programmable	DC (AC Optional)	Anti-Alias Low-Pass Filter

⁽²⁾ All systems can be operated with StrainSmart software for data acquisition, storage, reduction, and presentation, or with other third-party software.

⁽³⁾ Strain gage cards only.

⁽⁴⁾ System 9000, up to 12 of the 16 channels per unit can be strain gage inputs.

Considerations for instrument selection are provided on the previous page for all general-purpose instrumentation and data systems produced by Micro-Measurements. Additionally, our Applications Engineering staff is always available to assist you in selecting the right instrument for your specific applications.



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