StrainSmart® Data Acquisition System

FEATURES

- From 5 to 1200 input channels—can be configured as needed at any time
- Inputs accepted from strain gages and strain-gage-based transducers (Model 5110A), thermocouples (Model 5120A), sensors with high-level voltage output (Model 5130B), and LVDTs (Model 5140A)
- Built-in bridge completion for 120-, 350-, and 1000-ohm strain gages
- Scanning and recording intervals as short as 0.02 seconds for up to 1200 inputs
- Stable, accurate, low-noise signal conditioning
- Available with PCI and PCIe hardware Interface

DESCRIPTION

System 5000's Model 5100B Scanners acquire test data within 1 millisecond from up to 1200 channels at scan intervals as short as 0.02 seconds. This translates into more accurate test results, and the ability to capture data under static loading conditions immediately before failure.

Sensor connections are quickly made to the cards at the rear of each scanner in System 5000. Strain gage cards include built-in bridge completion for quarter and half bridges, and a constant voltage power supply for 0, 0.5, 1, 2, 5, and 10 VDC bridge excitation.

System 5000's instrumentation hardware is designed to incorporate all the features required for precision strain measurement under static loading conditions, while maintaining flexibility and ease of use. A system can be configured with as few as 5, and as many as 1200, sensors. Since each Model 5100B Scanner can function independently, your System 5000 components can easily be configured with StrainSmart software for each test requirement.

MODEL 5100B SCANNER SPECIFICATIONS

The Model 5100B Scanner is sized for standard 19-in (483-mm) instrumentation racks. Cabinets are available for various system configurations for bench-top or field use.

Since each Model 5100B Scanner can function independently, your System 5000 components can be easily configured for each test requirement. A 100-channel system, for example, can be used as five independent 20-channel systems simply by purchasing additional interface hardware installations.

INPUTS

Accepts up to four cards (five channels per card and up to 20 channels per scanner).

A/D CONVERTER

16-bit (15-bit plus sign) successive approximation converter. Usable resolution is typically 15 bits. 40 µs total conversion time per reading.

SCAN RATE

1 ms per scan. Fifty complete scans per second typical usage. Concurrent scanning for all scanners.

Input channels in each single scanner are scanned sequentially at 0.04-ms intervals and stored in random access memory within a 1-ms window.

DIGITAL OUTPUT

NO and NC relay contacts (500 mA at 30 VDC into a resistive load)

OPERATIONAL ENVIRONMENT

Temperature
−10° to +50°C

Humidity
Up to 90% RH, non-condensing
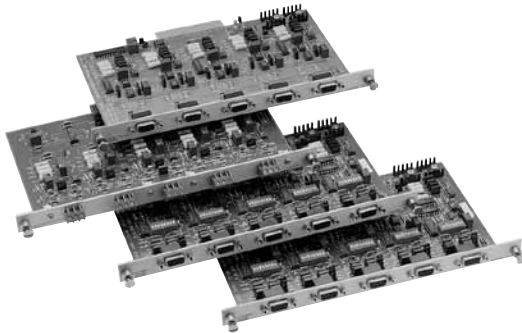
SIZE

3.5 H x 19 W x 16 D in (89 x 483 x 381 mm)

WEIGHT

16 lb (7.25 kg)

POWER

115 or 230 VAC user-selectable
±10% of setting; 50/60 Hz; 140W max

System 5000

Micro-Measurements

StrainSmart® Data Acquisition System

SENSOR CARD SPECIFICATIONS

Strain gages, strain-gage-based transducers, thermo-couples, LVDTs, potentiometers and other transducers can be intermixed in multiples of 5 by choosing the appropriate sensor card.

MODEL 5110A STRAIN GAGE CARD

CHANNELS
Five per card

INPUTS

Strain Gages

120Ω, 350Ω,1000Ω quarter bridges; 60Ω to 5000Ω half and full bridges

Jumper-selectable completion resistors
(0.02% ±3 ppm/°C typ)

Measurement Range

Normal range mode: ±16,380 με

High range mode: ±163,800 με

Low range mode: ±1638 με

Resolution

Normal range mode: 1 με

High range mode: 10 με

Low range mode: 0.1 με

Strain Gage Based Transducers

60Ω to 5000Ω impedance

Measurement Range

Normal range mode: ±8 mV/V

High range mode: ±80 mV/V

Low range mode: ±0.8 mV/V

Resolution

Normal range mode: 0.5 µV/V

High range mode: 5.0 µV/V

Low range mode: 0.05 µV/V

Input Impedance

220 MΩ each input

Input Protection

±40V

Source Current

±25 nA max.

Input Connector

Nine-pin D-sub style

AMPLIFIER

Zero Temperature Stability

±1.2 µV/°C RTI, ±100 µV/°C RTO, after 30-minute warm-up

Gain Accuracy and Stability

±0.1% at +23°C; ±100 ppm/°C

Common-Mode Voltage

±10V

Common-Mode Rejection (DC to 5 Hz)

100 dB typical

System Noise (Normal Mode Operation)

±2 με typical (±4 ADC counts)

System Coarse Balance Range

±100% of measurement range (typically ±16,383 με)

CALIBRATION

Two shunt calibration points are available on each channel

Switch-selectable

Calibration switches, A and B, are software selectable

EXCITATION

0.0, 0.5, 1.0, 2.0, 5.0, and 10.0 VDC

Software-programmable

Accuracy

±5 mV typical

Current

250 mA max. (50 mA per channel)

Over-current protected

Load Regulation

<0.05% of full scale for a load variation of 10% to 100% of full load

Temperature Stability

Better than ±0.005%/°C

FILTER

Type

Four-pole Butterworth

Cutoff Frequency (–3 dB)

5 Hz

VISHAY PRECISION GROUP

StrainSmart® Data Acquisition System

MODEL 5120A THERMOCOUPLE CARD

CHANNELS

Five per card

INPUTS

Thermocouple types J, K, T, E, R, S, and B
Built-in electronic cold-junction compensation
Software-selectable

Open sensor detection:

Input Impedance: 22 MΩ each input
Input Protection: ±40V
Source Current: ±0.5 nA typical; ±5 nA max

Input Connector

Removable three-position screw terminal

AMPLIFIER

Zero Temperature Stability

±1.2 µV/°C RTI, ±100 µV/°C RTO, after 30-minute warm-up

Gain Accuracy and Stability

0.1% ±100 ppm/°C

Common-Mode Rejection (DC to 5 Hz)

100 dB typical

Common-Mode Voltage

±10V

System Noise (Normal Mode Operation)

±10 µV typical (±4 ADC counts)

MEASUREMENT RANGE

±81.9 mV

RESOLUTION

2.5 µV

FILTER

Type

Four-pole Butterworth

Cutoff Frequency (–3 dB)

5 Hz

MODEL 5130B HIGH-LEVEL INPUT CARD

CHANNELS

Five per card

INPUTS

DC volts (differential)

Input Impedance

22 MΩ each input

Input Protection

±40V

Source Current

±0.5 nA typical; ±5 nA max

Input Connector

Nine-pin D-sub style

AMPLIFIER

Zero Temperature Stability

±1.2 µV/°C RTI, ±100 µV/°C RTO, after 30-minute warm-up

Gain Accuracy and Stability

0.1% ±100 ppm/°C

Common-Mode Rejection (DC to 5 Hz)

100 dB typical

Common-Mode Voltage

±10V

System Noise (Normal Mode Operation)

± 4 ADC counts typical (0 to 15V excitation)
±10 ADC counts typical (20 to 30V excitation)

MEASUREMENT RANGES

±1, ±2, ±5, ±10 VDC

RESOLUTION

30.5, 61, 152.5, 305 µV

EXCITATION

0, 0.5, 1.0, 2.0, 5.0, 10.0, 15.0, 20.0, 25.0 and 30.0 VDC

Accuracy

±10 mV typical

Current

250 mA max (50 mA per channel) at 1 to 15V
200 mA max (40 mA per channel) at 20V
150 mA max (30 mA per channel) at 25 to 30V
Over-current protected
Max current limit selected by jumpers

Load Regulation

<0.05% of full scale for a load variation of 10% to 100% of full load

Temperature Stability

Better than ±0.005%/°C

FILTER

Type

Four-pole Butterworth

Cutoff Frequency (–3 dB)

5 Hz

StrainSmart® Data Acquisition System

MODEL 5140A LVDT INPUT CARD

CHANNELS

Five per card

INPUTS

Three- to six-wire transducers

Input Impedance
10 MΩ each input

Input Protection
±40V

Source Current
±0.5 nA typical; ±5 nA max

Input Connector
Nine-pin D-sub style

AMPLIFIER

Zero Temperature Stability
±1.2 µV/°C RTI, ±100 µV/°C RTO, after 30-minute warm-up

Gain Accuracy
0.25% typical

Common-Mode Rejection (DC to 5 Hz)
100 dB typical

Common-Mode Voltage
±10V

System Noise (Normal Mode Operation)
±4 ADC counts typical

Measurement Ranges
±0.5, ±1, ±2.5, ±5 VRMS

RESOLUTION

15.25, 30.5, 76.2, 152.5 µVRMS

CALIBRATION

Excitation sample

EXCITIATION

3.0 VRMS, 5000 Hz or 2500 Hz sine wave
Software-selectable

Accuracy
±5 mVRMS typical

Current
±250 mA max (±50 mA per channel)
Over-current protected

Load Regulation
<0.1% of full scale for a load variation of 10% to 100% of full load

Temperature Stability
Better than ±0.05%/°C

FILTER

Type
Four-pole Butterworth

Cutoff Frequency (–3 dB)
5 Hz

CONFIGURATIONS

StrainSmart Data Systems can be configured in a variety of ways to meet the specific requirements of each user. Each system consists of (1) software, (2) instrumentation hardware, and (3) personal computer.

SOFTWARE

It is strongly recommended that StrainSmart Software be installed on a Windows-based personal computer for data acquisition, reduction, display, and storage.

While the hardware for StrainSmart Data Systems may be used with third-party data acquisition software, total system operation becomes the user's responsibility when third-party software is used.

INSTRUMENTATION HARDWARE

In addition to a one-time purchase of StrainSmart Software, the initial purchase for each system would normally include one of the following:

System 5000 with PCI or PCIe Interface:

Model 5101 PCI or PCIe Interface Card; one or more Model 5100 Scanners; and one or more Model 5110, 5120, 5130, or 5140 Input Cards

PERSONAL COMPUTER REQUIREMENTS

In addition to StrainSmart Software and Hardware purchased from Micro-Measurements, the system requires access to a properly configured personal computer. The hardware requirements for StrainSmart are:

• Fast Intel Core-2 Duo or better
• 4 GB of memory or better
• 20 GB of available free space or better
• XGA (1024 x 768) or better

STRAINSMART SOFTWARE

StrainSmart Software is designed to function with all System 5000, 6000, and 7000 hardware. It contains everything needed to acquire, reduce, display, and store measurement data, including:

• StrainSmart Main Operating Program
• Offline Data Presentation Program
• Interactive Help System

All components are supplied on CD-ROM along with a utility for installing them.

An unlimited number of installations can be made within your facility with the one-time purchase of a single copy of StrainSmart.

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