

Highlights

- High-density, compact (1U) precision data acquisition instruments
- LXITM Class A LAN connectivity
- Fully integrated signal conditioning maximizes performance and accuracy
- Easily integrate thermocouples, voltages, RTDs, thermistors, frequency, strain and pressure on an per-channel basis
- Distributed, synchronized measurements over the wire
- Scalable architecture easily expands from tens to thousands of channels
- End-to-end self-calibration ensures optimum runtime performance
- Web-based access for monitoring and control
- DAC Express turnkey software for simplified setup, control and data display

EX1000 Series

EX1000A • EX1000A-TC • EX1016A EX1032A • EX1048A • EX10SC

Accurate. Powerful. Easy to Use.

The EX1000 family of LXI[™] Class A instruments are the most advanced, full-featured data acquisition solutions available on the market today. These scalable, standalone instruments provide superior measurement accuracy and repeatability thanks to fully integrated signal conditioning, advanced cold junction compensation (CJC), and end-to-end self-calibration.

The EX1000 family of data acquisition instruments addresses your most demanding distributed measurement applications in one easy-to-use package.

Flexible Channel Configuration

A wide range of transducer types, including pressure, strain, temperature, position and voltage, can be combined in this flexible solution. Each input incorporates an independent signal conditioning path with software selectable filters for maximum flexibility. Complete channel independence ensures data integrity regardless of sample speed or input overload conditions.

End-to-End Self-Calibration

Complete end-to-end self-calibration is provided for each signal path on a programmable basis. A highly accurate calibration source provides reference signals that are applied prior to analog filtering and gain circuits to compensate for drift, aging, or temperature variations. Self-calibration is simple and quick, and can be performed as often as desired.

Scalable for Synchronized High-Speed, High Channel Count

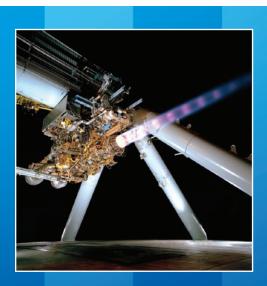
With LXI Class A-compliant features like a built-in Trigger Bus™ hardware trigger subsystem, the EX1000 family supports easy integration and synchronization of multiple devices including existing VXIbus instrumentation.

Open Transducer Detection

Each channel is configured with open transducer detection functionality, providing a continuous indication of the channel's status. Open transducer detection can be activated or deactivated on a per-channel basis. The detection mechanism is embedded in the signal conditioning circuitry and accurately provides an open circuit indication in the event of a broken or intermittent transducer. The open transducer detection applies a nominal bias current of +/- 7.5 nanoamps to each channel.

Cold Junction Compensation

The heart of any truly accurate thermocouple measurement system is the CJC implementation. These instruments combine multiple precision thermistors, a significant thermal mass, and careful parts placement to provide world-class measurement performance.



EX10SC Highlights

- 16-Channel capacity
- Mix and match transducer types on a per-channel basis
- Seamless integration with the EX1000A, EX1016A and EX1032A
- Simplified, reliable field terminations
- Turnkey DAC Express support
- 1500Vrms isolation (module)
- 300V isolation (input to chassis)
- Input protection to 240VAC continuous
- ANSI/IEEE C37.90.1 transient protection

EX1000 Series

Unmatched signal conditioning flexibility to meet your most demanding needs

The EX10SC modular signal conditioning platform expands measurement capabilities to address the most demanding industrial signal acquisition challenges. This extension of the EX1000 family is designed to ensure seamless integration and connectivity, with exceptional measurement flexibility. Signals from a wide variety of transducer types can be mixed and matched, on a per-channel basis, ensuring complete coverage from a single, high-performance measurement platform.

Isolation and Protection

A wide range of signal types are supported. Transducer types can be mixed and matched on an individual channel basis.

- Thermocouple
- RTD
- Thermistor
- Potentiometer
- Strain gage
- Pressure
- High-level voltage
- Frequency
- Current

Challenging measurement environments, such as areas with high levels of electrical noise or transient power surges, require unique protection capabilities. The EX10SC signal conditioning platform provides exceptional input protection and isolation across a wide range of operating conditions, protecting valuable instrumentation and ensuring measurement integrity.

Simply match the signal characteristics with the appropriate signal conditioning module, make connections with the easy-to-use termination access points, and start collecting data.

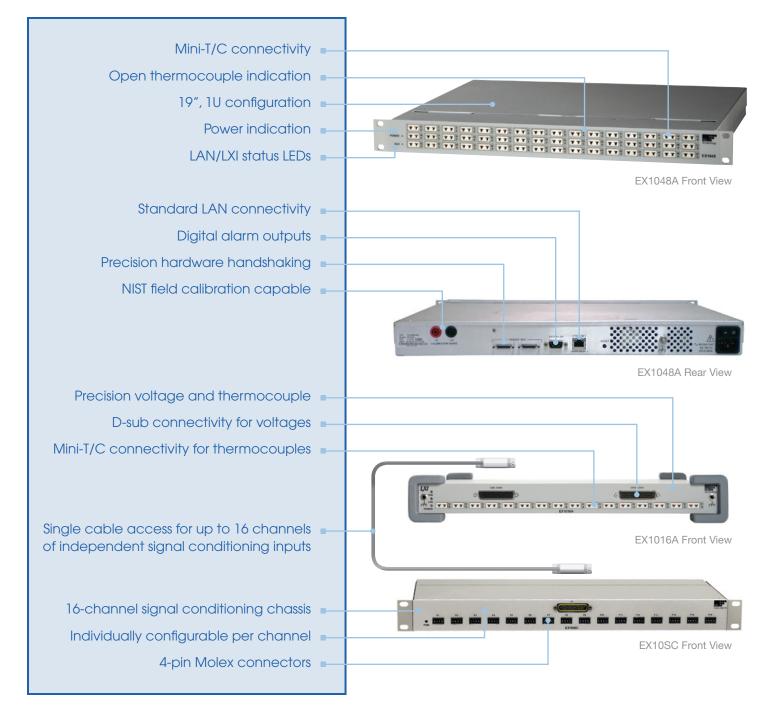
Simplified Installation, Setup and Control

Full LXI[™] Class A compliance makes the EX1000 family of instruments ideal for distributed measurements throughout your facility by reducing cabling and installation expenses. Connect directly to your LAN network using industry standard Ethernet cable and connections.

An onboard, web-accessible user interface allows you to instantly verify communications and instrument functionality. IVI and VXI Plug and Play drivers provide a familiar application programming interface to further reduce integration and program development time.

DAC Express provides intuitive, programming-free instrument setup, data logging, and measurement display. This turn-key software solution provides out-of-the-box operation across the entire product family, resulting in faster time to test.

Precision, Scalable Measurement Instruments LXI Class A Synchronization Technology



Model Selection

Model	Thermocouple Channels 0.667 mV max	Voltage Channels 10 V max	Connector Style	EX10SC Compatible
EX1000A	*	48	D-sub	Yes
EX1000A/TC	48	**	mini-TC	No
EX1016A	16	32	mini-TC / D-sub	Yes
EX1032A	32	16	mini-TC / D-sub	Yes
EX1048A	48	0	mini-TC	No

* Thermocouple measurements require external CJC signal

** All channels capable of Thermocouple or 10V max operation

EX1000A/16A/32A/48A/TC

Specifications

Channels	48 differential inputs
Channel Types	Thermocouple inputs: J, K, T, E, S, R, B, N (EX1000A/TC, EX1016A, EX1032A, EX1048A)
	Voltage inputs: mV, V (EX1000A/TC, EX1016A, EX1032A)
Sampling Rate	1000 Sa/sec/ch maximum
Temperature Resolution	0.1 °C
Temperature Accuracy	See Thermocouple Accuracy table on page 5
Temperature Noise, Peak-to-Peak	0.08 °Cpp typical (J, K, T, E)
Programmable Filters	
Bessel (2 pole)	4 Hz, 15 Hz, 40 Hz, 100 Hz, 500 Hz (-3 dB cutoff frequency)
Butterworth (1 pole)	1000 Hz (-3 dB cutoff frequency)
Voltage Input Range	±0.01 V, ±0.066V*, ±0.1 V, ±1.0 V, ±10.0 V (*Thermocouple Input Range)
Input voltage/frequency	90 V AC – 264 V AC*, 50 Hz/60 Hz (nominal AC)
Power	47 VA
*Note: fluctuations for main voltage to the pow- supply not exceeding 10% of the nominal volta	
Voltage Resolution	
±10.0 V	300 µV
±1.0 V	30 μV
±0.1 V	3.0 µV
±0.067 V	2.0 μV
±0.01 V	0.3 µV
Voltage Accuracy	
±10.0 V	±(0.025% + 500 μV) with self-cal, ±(0.05% + 1 mV) without self-cal
±1.0 V	\pm (0.025% + 50 µV) with self-cal, \pm (0.05% + 100 µV) without self-cal
±0.1 V	$\pm (0.025\% + 10 \mu\text{V})$ with self-cal, $\pm (0.05\% + 20 \mu\text{V})$ without self-cal
±0.067 V	$\pm (0.025\% + 10 \mu\text{V})$ with self-cal, $\pm (0.05\% + 20 \mu\text{V})$ without self-cal
±0.01 V	\pm (0.050% + 10 µV) with self-cal, \pm (0.10% + 20 µV) without self-cal
Voltage Offset Stability	
±10.0 V	±20 μV/°C typical
±1.0 V	$\pm 10 \ \mu V/^{\circ}C$ typical
±0.1 V	±5 μV/°C typical
±0.067 V	±2 μV/°C typical
±0.01 V	±2 μV/°C typical
Voltage Gain Stability	
Voltage input channels (all ranges)	±25 ppm/°C without self-cal (typical)
and thermocouple input channels	±5 ppm/°C with self-cal at any operating temperature (typical)
Input Impedance	$40 M\Omega$ differential
Input Bias Current	5 nA typical
Common Mode Input Range	
	±10 V
Common Mode Rejection Ratio (CMRR) 4 Hz filter	Do: 100 dD minimum (50/60) Ltr. 140 dD tunical 100 dD minimum
	DC: 100 dB minimum; (50/60) Hz: 140 dB typical, 120 dB minimum
1 kHz filter	DC: 100 dB minimum; (50/60) Hz: 100 dB typical, 80 dB minimum
Input Protection	±35 V 10/100 Dece T
Network Connection	10/100 Base-T
Input Connector	Cu-Cu mini-TC Jack
	50-pin D-sub (EX1000A, EX1016A, EX1032A)
Power Input	(90-264) V AC, (50/60) Hz, 25 VA maximum
Dimensions	1.75" H x 17.5" W x 13.6" D

EX1000A/16A/32A/48A/TC

LXI Specifications

LXI Class Compliance	LXI Class A		
Clock Specifications			
Clock oscillator accuracy	±50 ppm		
Synchronization accuracy	Reports "synchronized" when < $\pm 200~\mu s$ of the 1588 master clock		
Timestamp			
Accuracy	As good as time synchronization down to 50 ns		
Resolution	25 ns		
IEEE 1588-Based Trigger Timing			
Alarm			
Trigger time accuracy	As good as time synchronization down to 50 ns		
Time to trigger delay	50 ns		
Receive LAN[0-7] Event			
Trigger time accuracy	As good as time synchronization down to 50 ns		
Time to trigger delay			
Future timestamp	50 ns typical		
Past/zero timestamp	1 ms maximum		
Hardware Trigger Timing			
LXI Trigger Bus			
Time to trigger delay	55 ns typical		
DIO Bus			
Time to trigger delay	57 ns typical		

Environmental Specifications

0 °C to +50 °C
-40 °C to +70 °C
5% – 95% (non-condensing)
Up to 3000 m
Conforms to MIL-PRF-28800F
10 Min per Axis, MIL-PRF-2880F Class 3
5 to 55hz Resonance Search per MIL-PRF-2880F Class 3, each Axis
30g/Axis, 11mS half Sine pulse per MIL-PRF-2880F Class 3

Thermocouple Accuracy (Typical)

Value	s in ⁰C										
Туре	Min	Max	-100	0	100	300	500	700	900	1100	1400
J	-200	1200	±0.25	±0.20	±0.20	±0.25	±0.30	±0.30	±0.35	±0.45	
Κ	-200	1372	±0.25	±0.20	±0.20	±0.20	±0.35	±0.35	±0.45	±0.55	±0.50
Т	-200	400	±0.25	±0.20	±0.20	±0.20	±0.25				
Е	-200	900	±0.25	±0.20	±0.20	±0.20	±0.25	±0.30	±0.35		
S	-50	1768		±1.00	±0.75	±0.65	±0.65	±0.65	±0.70	±0.70	±0.75
R	-50	1768	±1.00	±0.75	±0.60	±0.60	±0.60	±0.60	±0.65	±0.70	
В	250	1820				±1.65	±1.10	±0.80	±0.70	±0.65	±0.65
Ν	-200	1300	±0.40	±0.25	±0.25	±0.25	±0.30	±0.35	±0.40	±0.40	

Conditions

• 60-minute warm-up

- Guaranteed maximum limits are two times (2x) the typical values
- 7 days, ±5 °C from last self-calibration
- 20 °C to 30 °C, 1 year from full calibration
- Exclusive of thermocouple errors
- Exclusive of noise

• Common mode voltage = 0 Note for K type: 1400 accuracy is for 1372 °C

Note for T type: 500 accuracy is for 400 $^\circ\mathrm{C}$

EX10SC

Signal Conditioning Module Specifications

EX10SC-8B32-02

0 to 20mA Input

Input Range

Input Resistance Normal Power Off **Input Protection** Continuous Transient **CMV**, Input to Output Transient, Input to Output CMR (50Hz or 60Hz) NMR Accuracy Linearity Stability Offset Gain Noise Output Bandwidth, -3dB **Response Time, 90% Span**

4mA to 20mA <50Ω <500 40VAC ANSI/IEEE C37.90.1 1500Vrms max ANSI/IEEE C37.90.1 120dB 70dB at 60Hz ±0.05% Span . ±0.02% Span

0mA to 20mA or

±25ppm/°C ±50ppm/°C

100kHz 250µVrms 3Hz 150ms

EX10SC-8B33-03 0 to 10V RMS

Frequency Range

Accuracy Isolation **Input Overload Protected**

Transient Protection CMR

45Hz to 1000Hz (Extended Range to 10kHz) Compatible with Standard Current and Potential Transformers ±0.25% Factory 1500Vrms Transformer 350Vrms Max (Peak AC & DC) or 2Arms Continuous ANSI/IEEE C37.90.1 120dB

EX10SC-8B34-04

2&3W 100 Ohm RTD (0 to 600 deg C)

Input Range

Accuracy

Normal

Input Resistance

Power Off

Overload

Input Protection

Input Range Limits

50MQ $200 k\Omega$ $200k\Omega$

Continuous Transient Sensor Excitation Current Lead Resistance Effect CMV. Input to Output Transient, Input to Output CMR (50 or 60Hz) NMR

Accuracy Stability

Offset Gain

Noise Output, 100kHz Bandwidth, -3dB **Response Time, 90% Span RTD Standards 100**Ω Pt

Alpha Coefficient DIN JIS IEC

±50ppm/°C 200µVrms 3Hz 150ms 0.00385 DIN 43760 JIS C 1604-1989

EX10SC-8B35-04 4W 100 Ohm RTD (0 to 600 deg C)

Input Range Limits

Input Resistance Normal

Power Off Overload Input Protection Continuous Transient Sensor Excitation Current Lead Resistance Effect **CMV. Input to Output** Transient, Input to Output CMR (50 or 60Hz) NMR Stability Offset Gain Noise Output, 100kHz Bandwidth, -3dB **Response Time, 90% Span** . 100Ω Pt

Input Range

Accuracy **RTD Standards 100**Ω Pt

Alpha Coefficient DIN .IIS IEC

240VAC ANSI/IEEE C37.90.1 0.25mA ±0.02°C/Ω 1500Vrms max ANSI/IEEE C37.90.1 120dB 70dB at 60Hz See Ordering Information ±20ppm/°C

0°Cto+600°C

±0.45°C

(+32°Fto+1112°F)

IEC 751

-200°C to +850°C

ANSI/IEEE C37.90.1

(100Ω Pt)

 $50M\Omega$

 $200k\Omega$

200kQ

240VAC

0.25mA

120dB

+0.005°C/Ω

1500Vrms max

70dB at 60Hz

±20ppm/°C

±50ppm/°C

200µVrms

0°C t o +600°C

(+32°F t o +1112°F)

3Hz

150ms

±0.45°C

0.00385

IEC 751

DIN 43760

JIS C 1604-1989

ANSI/IEEE C37.90.1

EX10SC-8B36-04

Potentiometer Input (0 to 10K Ohms)

Input Range

Input Resistance Normal Power Off Overload Input Protection Continuous Transient Sensor Excitation Current

Lead Resistance Effect

CMV. Input to Output Transient, Input to Output CMR (50 or 60Hz) NMR Accuracy Linearity Stability Offset Gain Noise Output, 100kHz Bandwidth, -3dB Response Time, 90% Span 50MΩ $200k\Omega$ 200kQ

0 to $10k\Omega$

240VAC ANSI/IEEE C37.90.1 0.25mA; 100Ω, 500Ω, 1kΩ Sensor 0.10mA; $10k\Omega$ Sensor $\pm 0.01 \Omega / \Omega; 100 \Omega, 500 \Omega,$ 1k Ω Sensor, ±0.02 Ω/Ω ; 10kΩ Sensor 1500Vrms max ANSI/IEEE C37.90.1 120dB 70dB at 60Hz ±0.05% Span ±0.02% Span

±20ppm/°C ±50ppm/°C

200µVrms 3Hz 150ms

EX10SC-8B38-01 Full Bridge Strain (3.33V Excitation) EX10SC-8B38-02

Full Bridge Strain (10V Excitation)

Input Range **Input Bias Current** Input Resistance Normal Power Off Overload Input Protection Continuous Transient Excitation Output (-x1) Load Resistance Excitation Output (-x2,-x5) Load Resistance **Excitation Load Regulation Excitation Stability** Excitation Protection **CMV**, Input to Output Transient, Input to Output CMR (50Hz or 60Hz) NMR

Accuracy Linearity Stability Offset Gain Noise Output, 100kHz Bandwidth, -3dB **Response Time, 90% Span**

. Model 01 Bandwidth Input Range Exc. Sens. Model 02 Bandwidth Input Range Exc. Sens

 $100k\Omega$ 240VAC ANSI/IEEE C37.90.1 +3.333V ±2mV 100 Ω to 2k Ω +10V ±5mV 300Ω to $2k\Omega$ 15ppm/mA 50ppm/°C 120VAC 1500Vrms max ANSI/IEEE C37.90.1

±10mV to ±100mV

±0.5nA

50MΩ

100kQ

100dB 100dB per decade above 8kHz ±0.05% Span ±0.02% Span

±25ppm/°C ±100ppm/°C

1500µVrms 8kHz 70µs

8kHz -10mV to +10mV +3.333V 3mV/V

8kHz -30mV to +30mV +10.0V 3mV/V

EX10SC

Signal Conditioning Module Specifications

EX10SC-8B41-01

+/-1V Input with 1Khz Bandwidth EX10SC-8B41-03

+/-10V Input with 1Khz Bandwidth

EX10SC-8B41-07 +/-20V Input with 1Khz Bandwidth

EX10SC-8B41-09 +/-40V Input with 1Khz Bandwidth

EX10SC-8B41-12

+/-60V Input with 1Khz Bandwidth

Input Range Input Bias Current Input Resistance

Normal Power Off Overload Input Protection Continuous Transient CMV, Input to Output Transient, Input to Output CMR (50Hz or 60Hz) NMR (-3dB at 1kHz)

Accuracy Linearity Stability Offset Gain Noise Output, 100kHz Bandwidth, –3dB Response Time, 90% Span ±1V to ±60V ±0.05nA

500kΩ (minimum) 500kΩ (minimum) 500kΩ (minimum)

240VAC ANSI/IEEE C37.90.1 1500Vrms max ANSI/IEEE C37.90.1 100dB 100dB per decade above 1KHz ±0.05% Span ±0.02% Span

±10ppm/°C ±75ppm/°C 500µVrms 1kHz

550µs

EX10SC-8B45-02

Frequency Input (0 to 1 KHz)

EX10SC-8B45-05

Frequency Input (0 to 10KHz) EX10SC-8B45-08

Frequency Input (0 to 100KHz)

Input Range Input Threshold

Minimum Input Maximum Input Minimum Pulse Width TTI Input I ow TTL Input High **Input Hysteresis** Zero Crossing TTI **Input Resistance** Normal Power Off Overload Input Protection Continuous Transient Excitation CMV. Input to Output Continuous Transient CMR (50 or 60Hz) Accuracy Linearity Stability

Offset

Output Ripple

Response Time (0 to 90%)

8B45-01, -02, -03

8B45-04, -05, -06

8B45-07, -08

Gain

Noise

0.8V max 2.4V min ±50mV 1.5V 68kΩ 68kΩ 68kΩ 240Vrms max ANSI/IEEE C37.90.1

4us

0Hz to 100kHz

Zero Crossina

350Vp-p TTL

170Vp-p Zero Crossing

100mVp-p

+5V at 8mA max 1500Vrms max ANSI/IEEE C37.90.1 100dB ±0.05% Span

±25ppm/°C ±100ppm/°C

±0.02% Span

<10mVp-p at Input >2% span

> 160ms, 80ms, 35ms 16ms, 8.5ms, 3.4ms 1.6ms, 0.8ms

EX10SC-8B47J-12 Linearized TC Type J (-100 to 760° C) EX10SC-8B47K-13 Linearized TC Type K (-100 to 1350° C)

EX10SC-8B47T-06

Linearized TC Type T (-100 to 400° C)

Input Range Input Bias Current Input Resistance Normal Power Off Overload Input Protection Continuous Transient **CMV**, Input to Output Transient, Input to Output CMR (50Hz or 60Hz) NMR Stability Offset Gain

Noise Output, 100kHz Bandwidth, –3dB Response Time, 90% Span Transient Cold Junction Compensation Accuracy, 25°C Accuracy, –40°C to +85°C Open Input Response Open Input Detection Time Model 12 TC Type Input Range

Accuracy Model 13 TC Type

Input Range

Accuracy Model 06 TC Type Input Range

Accuracy

-0.1V to +0.5V -25nA

50MΩ 200kΩ 200kΩ

240VAC ANSI/IEEE C37.90.1 1500Vrms max ANSI/IEEE C37.90.1 120dB 70dB at 60Hz

±20ppm/°C ±75ppm/°C

250µVrms 3Hz 150ms ANSI/IEEE C37.90.1

±0.5°C ±1.5°C Upscale <10s

J

-100°C to +760°C (-148°F to +1400°F) ±0.24% ±2.10°C

К

-100°C to +1350°C (-148°F to +2462°F) ±0.24% ±3.60°C

Т

-100°C to +400°C (-148°F to +752°F) ±0.48% ±2.40°C

EX10SC-8B42-01

2 Wire Transmitter Interface

Input Range Input Resistance

Input Resistance Normal Power Off Input Protection Continuous Transient Loop Supply Voltage Loop Supply Protection CMV, Input to Output Transient, Input to Output CMR (50Hz or 60Hz) NMR

Accuracy Linearity Stability

Offset Gain

Noise

Output, 100kHz Bandwidth, –3dB Response Time, 90% Span

35Ω
35Ω
40VAC
ANSI/IEEE C37.90.1
12VDC
40VAC
1500Vrms max
ANSI/IEEE C37.90.1
100dB
60dB per decade
above 100Hz
±0.05% Span
±0.02% Span

4mA to 20mA

....

±25ppm/°C ±75ppm/°C

500µVrms 100Hz 5ms

7

EX1000 Series

Ordering Information

MODEL	ТҮРЕ
EX1000A	48-channel Precision Voltage Instrument
EX1000A-TC	48-channel Precision Thermocouple and Voltage Instrument
EX1016A	16-channel Precision Thermocouple Instrument 32-channel Precision Voltage Instrument
EX1032A	32-channel Precision Thermocouple Instrument 16-channel Precision Voltage Instrument
EX1048A	48-channel Precision Thermocouple Instrument
70-0355-900	Rack Mount Kit for EX10XXA Series
70-0355-902	Table Top Kit for EX10XXA Series
EX10SC	16-Channel Signal Conditioning Expansion Chassis (Modules sold separately. See below)
EX10SC-RK001	Rackmount slide rails

EX10SC MODULES

MODEL	ТҮРЕ	INPUT RANGE	OUTPUT RANGE
EX10SC-8B32-02	Current input	0 to 20mA	0 to +5V
EX10SC-8B33-03	RMS Voltage	0 to 10V	0 to +5V
EX10SC-8B34-04	2/3-Wire RTD (100Ω Pt)	0°C to +600°C (+32°F to +1112°F)	0 to +5V
EX10SC-8B35-04	4-Wire RTD (100 Ω Pt)	0°C to +600°C (+32°F to +1112°F)	0 to +5V
EX10SC-8B36-04	Potentiometer	0 to 10kΩ	0 to +5V
EX10SC-8B38-01	Strain gage	±10mV (excitation +3.333V / sense 3mV/V)	±5V
EX10SC-8B38-02	Strain gage	±30mV (excitation +10.0V / sense 3mV/V)	±5V
EX10SC-8B41-01	Voltage input	±1V	±5V
EX10SC-8B41-03	Voltage input	±10V	±5V
EX10SC-8B41-07	Voltage input	±20V	±5V
EX10SC-8B41-09	Voltage input	±40V	±5V
EX10SC-8B41-12	Voltage input	±60V	±5V
EX10SC-8B42-01	2-wire Transmitter	4 to 20mA	0 to +5V
EX10SC-8B45-02	Frequency input	0 to 1kHz	0 to +5V
EX10SC-8B45-05	Frequency input	0 to 10kHz	0 to +5V
EX10SC-8B45-08	Frequency input	0 to 100kHz	0 to +5V
EX10SC-8B47J-12	J-thermocouple	–100°C to +760°C (–148°F to +1400°F)	0 to +5V
EX10SC-8B47K-13	K-thermocouple	-100°C to +1350°C (-148°F to +2462°F)	0 to +5V
EX10SC-8B47T-06	T-thermocouple	-100°C to +400°C (-148°F to +752°F)	0 to +5V

EX10SC CABLE ASSEMBLIES

MODEL	ТҮРЕ
EX10SC-CBL01	24" EX10SC to EX10xx interconnect cable