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WHEN ACCURACY MATTERS

ProDAQ LXI Instruments

ProDAQ 6150
Isolated Precision Thermocouple LXI Instrument

OVERVIEW

The ProDAQ 6150 is an LXI instrument designed for up to 48-channel isolated precision thermocouple measurements. It supports all common thermocouple types, namely J, E, N, K, T, R, S and B as well as custom types via a programmable conversion. Each channel is isolated from both the chassis and all other channels.

The ProDAQ 6150 provides an easy to use, cost effective and scalable solution for the most demanding thermocouple measurement applications. As a standalone LXI instrument it can be directly connected to your network and operated either through the integrated web pages or integrated to your data acquisition application using the VISA-based industry standard plug & play drivers provided. Multiple devices can be synchronized via the IEEE1588 precision time protocol or optional via the LXI trigger bus.

Features & Benefits

- **19", 1U** Solution for 16, 32 or 48 **Thermocouple** Inputs
- **Support for** all common thermocouple types
- **Channel Isolation up to ±350 V_{RMS}** (channel to channel and channel to ground)
- **CJC Sensor** per channel
- **24-Bit Sigma Delta** ADC per channel
- **Simultaneous Sampling** of all channels
- **Data Storage** using an SSD available as an option

FEATURES

Analog Inputs: Each channel of the ProDAQ 6150 employs a 24-bit Sigma-Delta ADC to provide the highest possible measurement accuracy. Each channel is isolated from any other and also from the chassis, with a working isolation voltage up to 350V_{RMS}. This allows any channel not only to float to different voltage potentials but also eliminates the possibility of ground loop error. Each channel is protected against overvoltage, both short-term transient spikes as well as constant DC voltages up to ±20V. An EMI filter is included per channel to reduce the possibility of error due to high frequency conducted noise. This filter also acts as an Anti-alias filter for the Sigma-Delta ADC.

Simultaneous Sampling: The ProDAQ 6150 has a dedicated ADC per channel. This allows for true simultaneous sampling of all channels. The scan rate can be varied from 1 S/s to 1000 S/s, with a resolution of 1Hz.

External Triggers: Two isolated TTL level input and output triggers are available on the rear panel of the ProDAQ 6150.

Cold Junction Compensation: One of the keys to making precision thermocouple measurements is the accuracy of the Cold Junction Compensation. The ProDAQ 6150 is equipped with a dedicated temperature sensor per channel which is measured along with the thermocouple input during every scan. The sensor is thermally bonded to the cold junction in order to provide the most accurate and fastest response to changes in the cold junction temperature.

Open Thermocouple Detection: Each channel is equipped with open thermocouple detection functionality. It provides immediate indication in the event of a broken thermocouple, both in software and by a LED on the instruments front panel.

Data Storage: The ProDAQ 6150 features a RAM disk of 64MB to store data acquired independently of the host controlling the device. Optional SSD hard drives can be installed to permanently store data on the device, allowing a fully independent stand-alone mode. Data acquisition to both storage devices as well as the data retrieval can be done via the web interface. Contact the factory for more details.

Various Mounting Options: The ProDAQ 6150 comes in a 1U high unit suitable for rack mount in a standard 19" rack if used with the ProDAQ 5726 Rack-Mount kit. The ProDAQ 6150 can also be desktop mounted using the ProDAQ 5726 Stackable Tabletop Feet Set.

For more information, visit **www.bustec.com**.

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SPECIFICATIONS
ProDAQ 6150 Isolated Precision Thermocouple LXI Instrument

General	
Number of signal channels	16, 32 or 48
Isolation	350 V_{RMS} (Channel to channel and channel to chassis)
ADC Resolution	24-bit
ADC Sampling Rates	1 to 1000 Samples per second, 1Hz Resolution
EMI Filtering	Yes, per channel
Channel Input Protection	Yes, ±20V
Thermocouple	
Thermocouple Types	J, E, N, K, T, R, S, B, Custom
Temperature Range	J: Min (°C) -200, Max (°C) 1200 E: Min (°C) -200, Max (°C) 1000 N: Min (°C) -200, Max (°C) 1300 K: Min (°C) -200, Max (°C) 1372 T: Min (°C) -200, Max (°C) 400 R: Min (°C) -50, Max (°C) 1768 S: Min (°C) -50, Max (°C) 1768 B: Min (°C) 250, Max (°C) 1820
Temperature Accuracy	Refer to the tables on the following pages
Ambient Temperature Drift[1]	±10ppmFS/°C typical ±25ppmFS/°C maximum
Cold Junction Compensation	Per channel
Open Thermocouple Detection	Yes, per channel
Open Thermocouple Indication	Yes, per channel
Control Interface	
Interface Type	LXI Programmatic Interface via Ethernet
Speed	10/100/1000 TX
Driver	VISA-based drivers (compatible to LabVIEW, LabWindows/CVI, MS Visual C++, MS Visual Basic, …)
Operating System Support	Windows XP, Windows 7, Windows 8, Linux
Environmental	
Temperature	5 °C to +50 °C (operational) -40 °C to +70 °C (storage only)
Humidity	5% - 95% (non-condensing)
Power Supply	
Input	85 - 264V AC, 47 - 63 Hz
Power	90W max.

[1] FS is the maximum temperature listed in the Temperature Range table. For example, for type K the maximum temperature is 1372°C. This then equates to a typical drift error of ±0.014°C/°C. Hence, for an operating ambient temperature of 10°C an additional typical error of (23-10)*0.014 = ±0.2°C and an additional maximum error of ±0.45°C should be included.

Ordering Information

- **6150-AA** LXI Isolated Precision Thermocouple Instrument, 16 Channel
- **6150-AB** LXI Isolated Precision Thermocouple Instrument, 32 Channel
- **6150-AC** LXI Isolated Precision Thermocouple Instrument, 48 Channel

Related Products:

- **ProDAQ 5725** Rack-Mount Kit
- **ProDAQ 5726** Stackable Tabletop Feet Set

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ACCURACY SPECIFICATIONS (23°C ±3°C)

1Hz Sample Rate, Typical Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.36	±0.29	±0.28	±0.28	±0.28	±0.29	±0.31	±0.34		
Type K	±0.07	±0.05	±0.05	±0.06	±0.08	±0.11	±0.15	±0.18	±0.22	
Type T	±0.07	±0.05	±0.05	±0.05						
Type E	±0.12	±0.10	±0.10	±0.10	±0.10	±0.14	±0.20			
Type S		±0.12	±0.08	±0.08	±0.10	±0.13	±0.15	±0.18	±0.23	±0.29
Type R		±0.12	±0.10	±0.10	±0.11	±0.13	±0.15	±0.17	±0.22	±0.28
Type B					±0.18	±0.14	±0.12	±0.12	±0.12	±0.13
Type N	±0.15	±0.12	±0.11	±0.10	±0.10	±0.13	±0.16	±0.18		

1Hz Sample Rate, Maximum Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.70	±0.55	±0.50	±0.50	±0.55	±0.65	±0.75	±0.85		
Type K	±0.60	±0.40	±0.30	±0.30	±0.40	±0.50	±0.60	±0.70	±0.80	
Type T	±0.45	±0.35	±0.30	±0.30						
Type E	±0.45	±0.40	±0.35	±0.35	±0.40	±0.50	±0.60			
Type S		±1.05	±0.85	±0.73	±0.68	±0.70	±0.74	±0.77	±0.85	±1.09
Type R		±1.07	±0.77	±0.68	±0.64	±0.65	±0.70	±0.73	±0.79	±1.02
Type B					±1.20	±0.80	±0.68	±0.67	±0.67	±0.70
Type N	±0.65	±0.50	±0.40	±0.40	±0.45	±0.50	±0.60	±0.70		

100Hz Sample Rate, Typical Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.39	±0.34	±0.31	±0.32	±0.35	±0.40	±0.45	±0.47		
Type K	±0.08	±0.07	±0.07	±0.10	±0.16	±0.21	±0.29	±0.34	±0.40	
Type T	±0.07	±0.05	±0.05	±0.05						
Type E	±0.15	±0.13	±0.11	±0.14	±0.17	±0.24	±0.30			
Type S		±0.26	±0.19	±0.16	±0.15	±0.14	±0.12	±0.13	±0.15	±0.17
Type R		±0.27	±0.13	±0.11	±0.13	±0.13	±0.16	±0.17	±0.19	±0.25
Type B					±0.24	±0.19	±0.16	±0.15	±0.15	±0.15
Type N	±0.19	±0.13	±0.13	±0.15	±0.19	±0.23	±0.30	±0.34		

100Hz Sample Rate, Maximum Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.80	±0.65	±0.60	±0.65	±0.85	±1.05	±1.25	±1.40		
Type K	±0.60	±0.45	±0.40	±0.50	±0.65	±0.85	±1.05	±1.20	±1.40	
Type T	±0.45	±0.35	±0.30	±0.30						
Type E	±0.55	±0.40	±0.40	±0.50	±0.65	±0.80	±1.00			
Type S		±1.38	±1.10	±0.90	±0.80	±0.75	±0.74	±0.74	±0.75	±0.81
Type R		±1.48	±1.20	±0.92	±0.79	±0.79	±0.78	±0.79	±0.80	±0.90
Type B					±1.53	±1.00	±0.85	±0.83	±0.83	±0.83
Type N	±0.70	±0.55	±0.50	±0.55	±0.70	±0.85	±1.05	±1.20		

1000Hz Sample Rate, Typical Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.42	±0.34	±0.33	±0.34	±0.35	±0.37	±0.40	±0.43		
Type K	±0.13	±0.12	±0.12	±0.13	±0.15	±0.21	±0.27	±0.32	±0.39	
Type T	±0.08	±0.07	±0.07	±0.07						
Type E	±0.17	±0.14	±0.14	±0.14	±0.17	±0.20	±0.27			
Type S		±0.40	±0.35	±0.25	±0.18	±0.20	±0.20	±0.23	±0.27	±0.32
Type R		±0.45	±0.36	±0.25	±0.17	±0.19	±0.25	±0.24	±0.23	±0.24
Type B					±0.59	±0.49	±0.39	±0.35	±0.30	±0.38
Type N	±0.22	±0.17	±0.17	±0.16	±0.17	±0.22	±0.28	±0.32		

1000Hz Sample Rate, Maximum Error (°C)

	-100°C	0°C	100°C	250°C	500°C	750°C	1000°C	1150°C	1350°C	1750°C
Type J	±0.95	±0.80	±0.75	±0.80	±0.95	±1.10	±1.30	±1.40		
Type K	±0.75	±0.65	±0.60	±0.60	±0.70	±0.85	±1.05	±1.20	±1.40	
Type T	±0.65	±0.55	±0.50	±0.50						
Type E	±0.70	±0.60	±0.55	±0.55	±0.65	±0.80	±1.00			
Type S		±2.05	±1.85	±1.59	±1.20	±1.10	±1.12	±1.15	±1.17	±1.43
Type R		±2.47	±1.70	±1.35	±1.16	±1.10	±1.09	±1.08	±1.07	±1.20
Type B					±3.30	±2.16	±1.65	±1.52	±1.40	±1.49
Type N	±1.05	±0.85	±0.75	±0.70	±0.75	±0.90	±1.10	±1.25