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## NI USB-TC01

### Thermocouple Measurement Device With NI InstantDAQ Technology



- NI InstantDAQ technology to instantly take measurements with your PC, no driver installation required
- Built-in application for graphing and logging data included
- Additional downloadable free applications for alarming, triggering, and scheduled data logging
- NI-DAQmx support for LabVIEW graphical programming and software customization
- Compatibility with J, K, R, S, T, N, E, and B thermocouples
- Standard miniplug for easy thermocouple connection
- Windows 7/Vista/XP support

#### Overview

The NI USB-TC01 thermocouple measurement device features NI InstantDAQ technology so you can instantly take temperature measurements with your PC. Just plug it in, and built-in software for viewing and logging data automatically loads. No driver installation is necessary. Connect to any USB port to use your PC as a display and monitor data in real time. The USB-TC01, which is compatible with J, K, R, S, T, N, E, and B thermocouples, uses a standard miniplug for easy thermocouple connection. Additional applications for alarming, triggering, and scheduled data logging are available as free downloads. For even further customization, you can build your own applications with NI LabVIEW graphical programming and NI-DAQmx driver software.

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#### Requirements and Compatibility

##### OS Information

- Windows 7
- Windows Vista
- Windows XP

##### Driver Information

- NI-DAQmx

##### Software Compatibility

- ANSI C
- LabVIEW
- LabWindows/CVI
- Measurement Studio
- SignalExpress
- Visual Basic
- Visual Studio .NET

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#### Application and Technology

##### NI InstantDAQ Technology

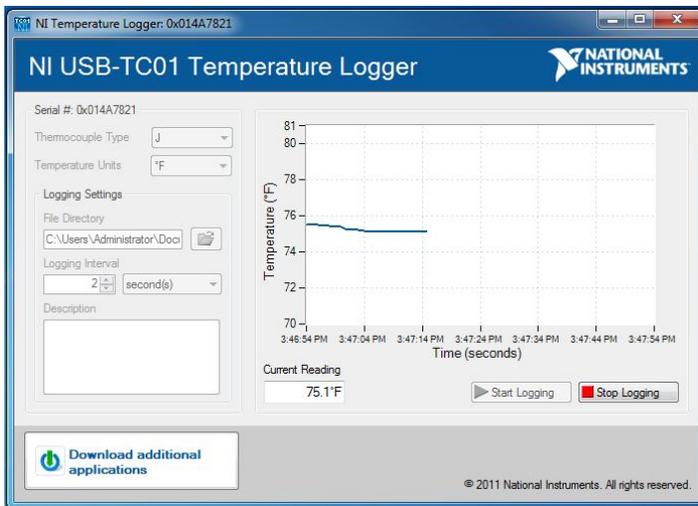
The USB-TC01 features NI InstantDAQ technology that automatically loads software for viewing and logging data after connecting the device to your computer. No prior driver installation is necessary. Simply plug the device into your USB port, and the USB-TC01 launch screen is loaded from built-in memory on the device.

The launch screen displays the current thermocouple reading so you can configure the thermocouple type and temperature units. You can log data with the temperature logger application, open and customize the temperature logger source code in NI LabVIEW software, or learn other ways to do more with the USB-TC01.



### Built-In Temperature Logger

Directly from the USB-TC01 launch screen, you can load the USB-TC01 temperature logger. With the temperature logger, you can configure your sampling interval, graph live measurements from your USB-TC01, and log data with timestamps to a text file.



### Optional Included Thermocouple

You can purchase the USB-TC01 with a thermocouple or use your own. Thermocouples are inexpensive temperature sensors for measuring wide temperature ranges. Choose from two thermocouple options: an exposed-tip junction or a grounded probe. The exposed-tip junction thermocouple offers the best response time, which is ideal for measuring rapid temperature changes. The grounded probe thermocouple is enclosed by a metal sheath and is ideal for measuring corrosive gases and liquids.



*J-Type Exposed-Junction Thermocouple*

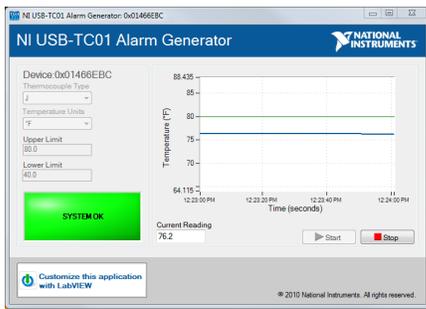


*J-Type Grounded Probe Thermocouple*

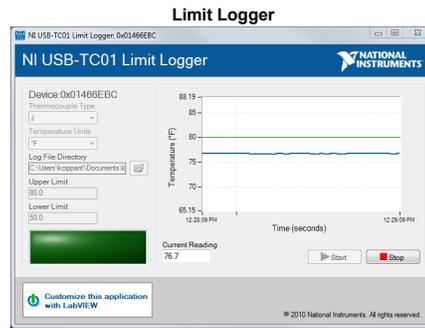
### Four Free Ready-to-Run Applications

In addition to the USB-TC01 temperature logger application that is built into the device, you can download the following applications to expand the functionality of your device.

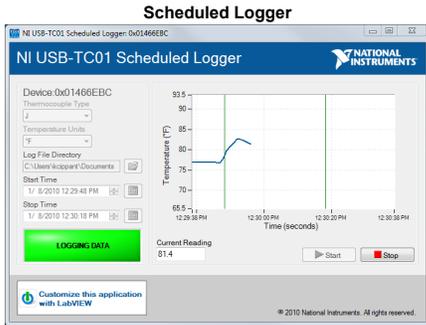
#### Alarm Generator



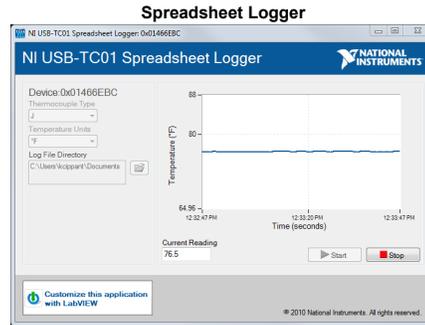
Display a message or system beep if the signal is above or below the threshold.



Start or stop logging data if the signal is above or below a user-specified limit.



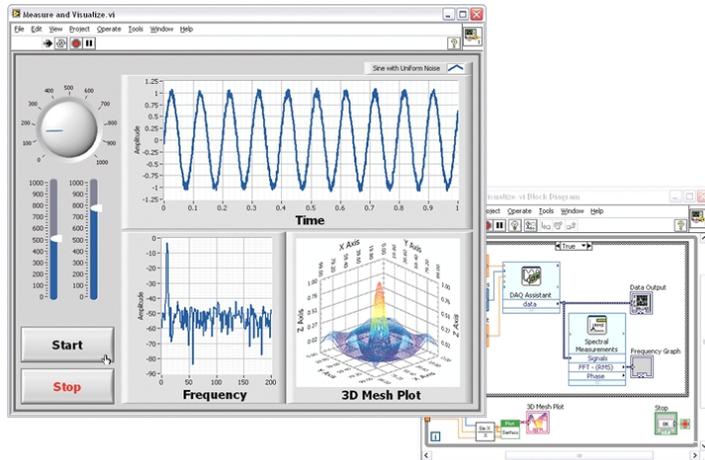
Schedule times to start and stop logging data.



Log data to a spreadsheet file that can be opened with Microsoft Excel.

## Support for Building Your Own Applications With LabVIEW

LabVIEW is a graphical programming environment used by millions of engineers and scientists. Using intuitive graphical icons and wires that resemble a flowchart, you can build your own custom applications for the USB-TC01. Simply drag and drop controls and graphs to create custom user interfaces, and graphically wire together function blocks to define your own software functionality for logging data, alarming, triggering, reporting, and performing real-time data analysis.



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## Ordering Information

For a complete list of accessories, visit the product page on ni.com.

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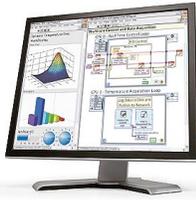
## Software Recommendations

### NI LabVIEW Full Development System for Windows

- Fully integrated graphical system design software
- Support for a wide range of measurement hardware, I/O, and buses
- Custom, event-driven user interfaces for measurement and control

### SignalExpress for Windows

- Quickly configure projects without programming
- Control over 400 PC-based and stand-alone instruments
- Log data from more than 250 data acquisition devices



- Extensive signal processing, analysis, and math functionality
- Advanced compiler to ensure high-performance execution and code optimization
- Includes SSP for professional technical support, online training, and software upgrades



- Perform basic signal processing, analysis, and file I/O
- Scale your application with automatic LabVIEW code generation
- Create custom reports or easily export data to LabVIEW, DIAdem or Microsoft Excel

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## Support and Services

### Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit [ni.com/support](http://ni.com/support) to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit [forums.ni.com](http://forums.ni.com) for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit [community.ni.com](http://community.ni.com) to find, contribute, or collaborate on customer-contributed technical content with users like you.

### Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit [ni.com/repair](http://ni.com/repair).

### Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit [ni.com/training](http://ni.com/training) for more information.

### Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit [ni.com/warranty](http://ni.com/warranty).

### OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

### Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).

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## Detailed Specifications

### Single Channel Thermocouple Input Module

The NI USB-TC01 provides a Full-Speed USB interface for a single thermocouple channel.



**Caution** Electromagnetic interference can adversely affect the measurement accuracy of this product. The input terminals of this device are not protected for electromagnetic interference. As a result, this device may experience reduced measurement accuracy or other temporary performance degradation when connected cables are routed in an environment with radiated or conducted radio frequency electromagnetic interference. To limit radiated emissions and to ensure that this device functions within specifications in its operational electromagnetic environment, take precautions when designing, selecting, and installing measurement probes and cables.

The following specifications are typical at 25 °C, unless otherwise noted.

Recommended warm-up time	15 minutes
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### Input Characteristics

Number of channels	1
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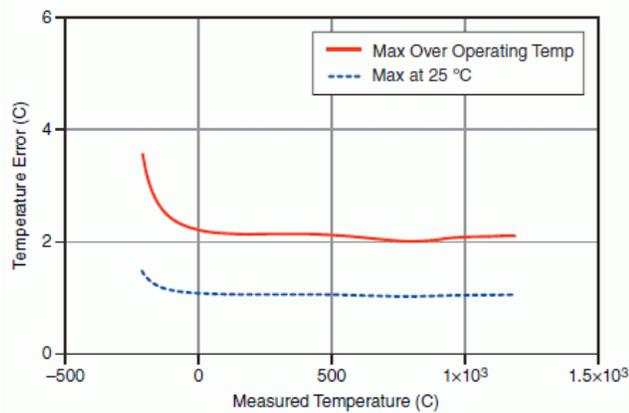
ADC resolution	20 bits
Input range	±73.125 mV
Common-mode range	
Channel-to-USB Ground	±30 V
Common-mode rejection ratio (0 to 60 Hz)	
Common-to-USB ground	>145 dB
Noise rejection (50/60 Hz)	>80 dB
Temperature measurement ranges	Works over temperature ranges defined by NIST (J, K, R, S, T, N, E, and B thermocouple types. The E type has a maximum limit of 900 °C.)
Conversion time	250 ms
Sampling rate	4 samples per second max
Input bandwidth (-3 dB)	1 Hz
Differential input impedance	20 MΩ between isolated 3.3 V and ground
Input noise	2 μVpp
Open thermocouple bias voltage	3.3 V
Cold-junction compensation sensor accuracy	
0 to 65 °C	1.25 °C max, 0.6 °C typical
Cold-junction compensation sensor resolution	0.0625 °C typical
Overvoltage protection	30 V max between TC+ and TC-

### Temperature Measurement Accuracy

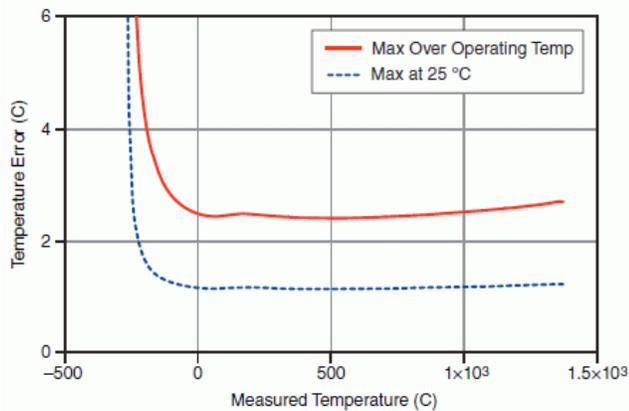
The following figures show the errors for each thermocouple type when connected to the NI USB-TC01. The figures display the maximum errors at 25 °C and over the full operating temperature range, and account for cold-junction compensation errors. The figures were generated using thermocouples connected to subminiature connectors of the same type.

The CJC sensor resolution is 0.0625 °C. This is the minimum value of the CJC step width. As such, the reading may result in a saw tooth curve rather than a square curve as the temperature inside the board changes. This is the expected behavior.

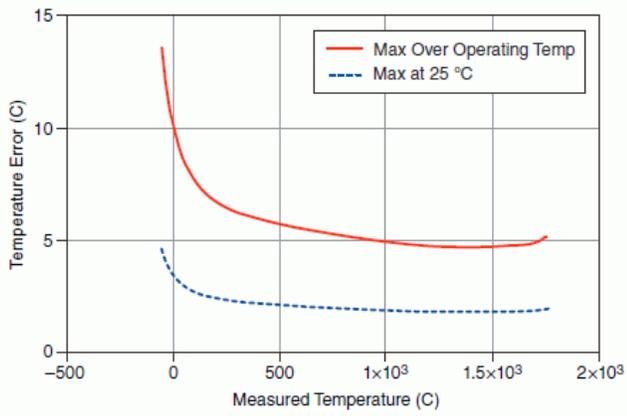
#### Temperature Error of Type J Thermocouple



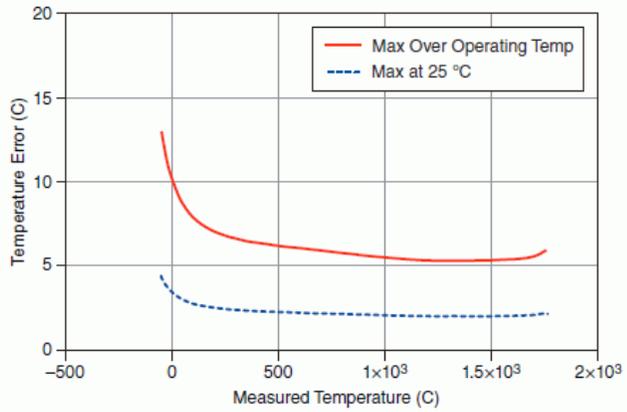
#### Temperature Error of Type K Thermocouple



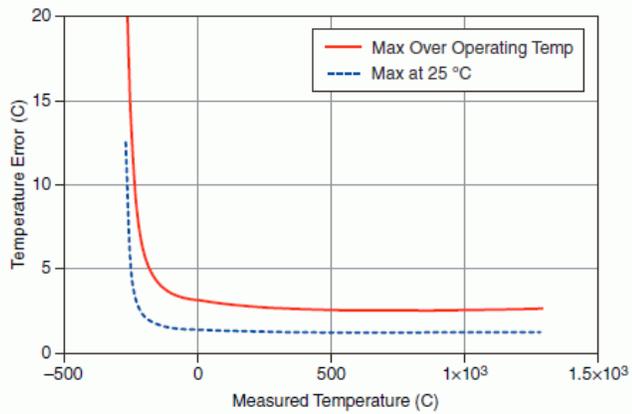
#### Temperature Error of Type R Thermocouple



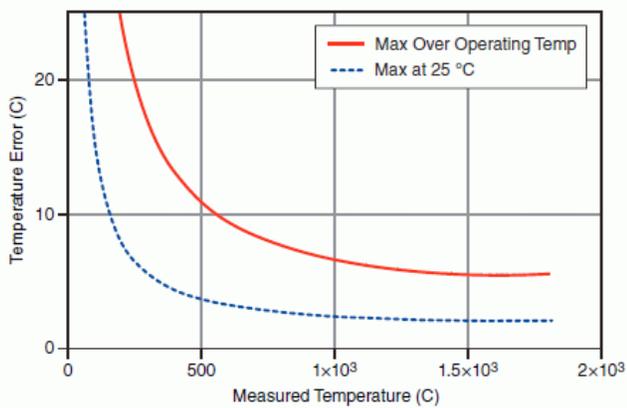
Temperature Error of Type S Thermocouple



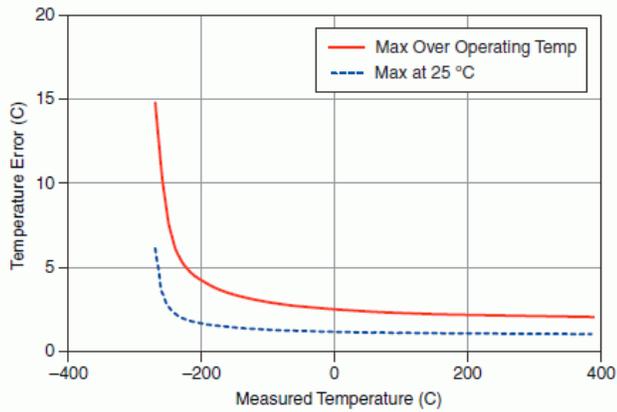
Temperature Error of Type N Thermocouple



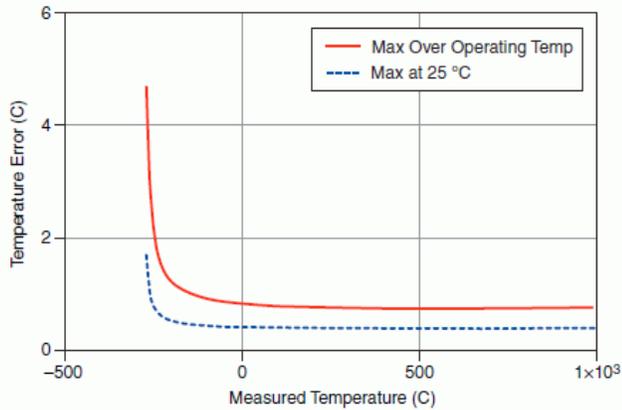
Temperature Error of Type B Thermocouple



Temperature Error of Type T Thermocouple



#### Temperature Error of Type E Thermocouple



#### Power Requirements

Current consumption from USB	150 mA max, 100 mA typical
Suspend mode	2.5 mA max

#### Bus Interface/Communication

USB specification	USB 2.0 Full-Speed
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#### Physical/Mechanical Characteristics

Dimensions	62.56 × 38.10 × 20.32 mm (2.463 × 1.5 × 0.8 in.) with a 2 m USB cable
Weight	Approx. 116 g (4.1 oz)
USB cable length	2 m (6.5 ft)

#### Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**Note** For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

#### Safety Voltages

Connect only voltages that are within these limits.

Isolation

Channel-to-earth ground

Continuous

±30 V max, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as *MAINS* voltage. *MAINS* is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

#### Hazardous Locations

The NI USB-TC01 is not certified for use in hazardous locations.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

## CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit [ni.com/certification](http://ni.com/certification), search by module number or product line, and click the appropriate link in the Certification column.

## Environmental

The NI USB-TC01 device is intended for indoor use only.

Operating temperature (IEC 60068-2-1 and IEC 60068-2-2)	0 to 55 °C
Storage temperature (IEC 60068-2-1 and IEC 60068-2-2)	- 40 to 85 °C
Operating humidity (IEC 60068-2-56)	10 to 90% RH, noncondensing
Storage humidity (IEC 60068-2-56)	5 to 95% RH, noncondensing
Maximum altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree (IEC 60664)	2

## Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://ni.com/environment). This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit [ni.com/environment/weee.htm](http://ni.com/environment/weee.htm).

## 电子信息产品污染控制管理办法（中国 RoHS）



**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。  
关于 National Instruments 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china)。  
(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

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