

# Digital Expansion Terminal Block

## CompactBlock LDX I/O

Catalog Numbers 1790-T16BV0X, 1790-T8BV8VX,  
1790-T8BV8BX, 1790-T0B16X, 1790-T0V16X, 1790-T0W8X,  
1790-T8A0X, 1790-T0A8X

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### Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	<b>WARNING:</b> Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	<b>ATTENTION:</b> Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
	<b>SHOCK HAZARD:</b> Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.
	<b>BURN HAZARD:</b> Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.
<b>IMPORTANT</b>	Identifies information that is critical for successful application and understanding of the product.

## Environment and Enclosure

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**ATTENTION:** This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters (6562 ft) without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see:

- Industrial Automation Wiring and Grounding Guidelines, for additional installation requirements, Allen-Bradley publication [1770-4.1](#).
- NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

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## Prevent Electrostatic Discharge



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**ATTENTION:** This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
  - Wear an approved grounding wriststrap.
  - Do not touch connectors or pins on component boards.
  - Do not touch circuit components inside the equipment.
  - Use a static-safe workstation, if available.
  - Store the equipment in appropriate static-safe packaging when not in use.
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## North American Hazardous Location Approval

<b>The following information applies when operating this equipment in hazardous locations:</b>	<b>Informations sur l'utilisation de cet équipement en environnements dangereux:</b>
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>	<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>
<div style="display: flex; align-items: center;">  <div> <p><b>EXPLOSION HAZARD</b></p> <ul style="list-style-type: none"> <li>• Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.</li> <li>• Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.</li> <li>• Substitution of components may impair suitability for Class I, Division 2.</li> <li>• If this product contains batteries, they must only be changed in an area known to be nonhazardous.</li> </ul> </div> </div>	<div style="display: flex; align-items: center;">  <div> <p><b>RISQUE D'EXPLOSION</b></p> <ul style="list-style-type: none"> <li>• Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.</li> <li>• Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.</li> <li>• La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.</li> <li>• S'assurer que l'environnement est classé non dangereux avant de changer les piles.</li> </ul> </div> </div>

## Overview

This document describes how to install the expansion blocks.

## Install Your Module

Follow these steps to install the block:

1. Mount the block.
2. Connect the expansion blocks.
3. Wire the expansion blocks.

These steps are explained in detail in the following sections.

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**WARNING:** When used in a Class I, Division 2, hazardous location, this equipment must be mounted in a suitable enclosure with the proper wiring method that complies with the governing electrical codes.

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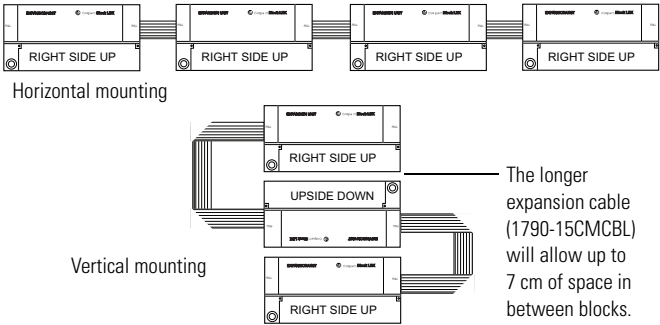
## Mount the Expansion Block

Mount the expansion block by connecting it to a previously-installed CompactBlock LDX I/O base or expansion block.

Beginning with the base block, you can mount your expansion blocks either horizontally or vertically:

- **horizontally (left to right)** – add expansion blocks in an end-to-end configuration

- **vertically (up or down)** – add expansion blocks either up or down in a back-to-back configuration. In this configuration, you must use the optional 15cm ribbon cable (1790-15CMCBL) and alternately position the blocks in a right-side up, upside-down fashion.

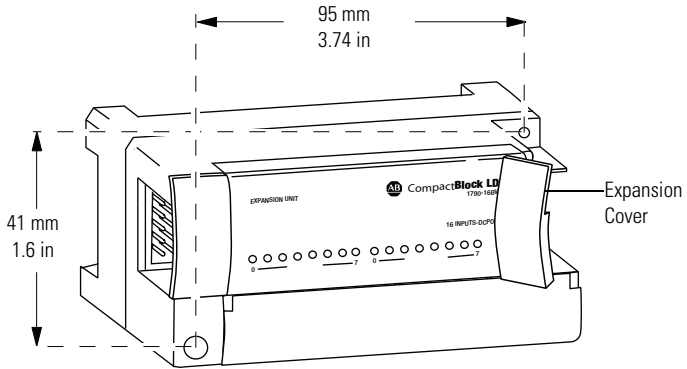


You can mount your blocks on a panel or DIN rail as described in the following section.

### *Panel Mounting*

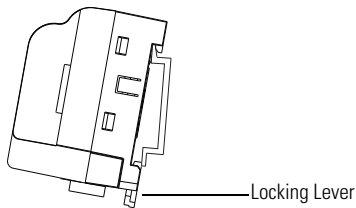
1. Place the block against the panel where you want to mount it.
2. Gently pull and position the expansion cover to the left.
3. Place a center punch, nail or similar device through the mounting holes in the block and make two marks on the panel (lower left and upper right corners of the module).
4. Remove the block and drill two holes in the panel to accommodate each of the mounting screws.

5. Replace the block on the panel and place a screw through each of the two mounting holes. Tighten the screws until the block is firmly in place.



### *DIN Rail Mounting*

1. On the DIN rail, position the expansion block next to your previously-installed base block.
2. Hook the top slot of the block over the DIN Rail.
3. Pull down on the locking lever while pressing the block against the rail.



4. Push up on the locking lever to secure the block to the rail when block is flush against the rail.

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## Connect an Expansion Block to a Base Block

Follow these procedures when connecting the expansion block to the base block.

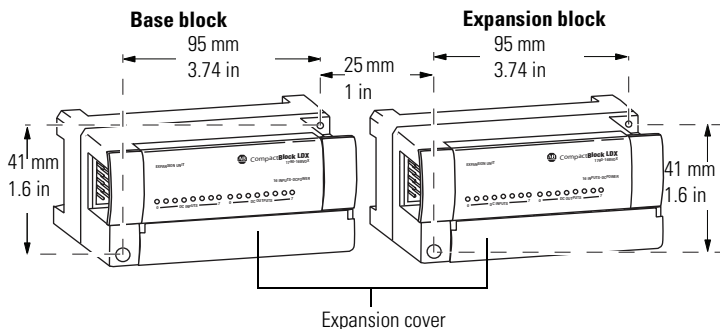
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**ATTENTION:** Expansion blocks should not be installed when power is applied to the base.

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1. Pull and position the expansion covers inward on both the base and expansion blocks.
2. Position the expansion block with proper spacing..



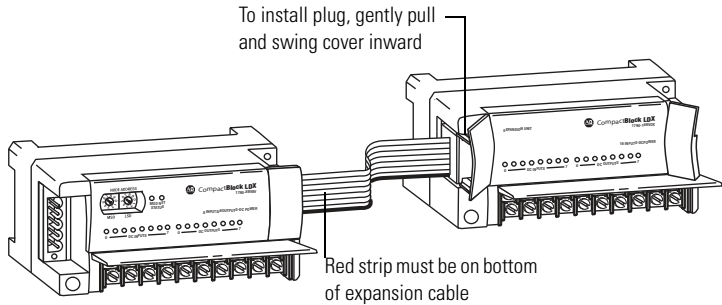
3. Mount the expansion block using panel or DIN rail mounting, as described in the previous section.
4. Plug the expansion cable into the base and expansion blocks.

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**IMPORTANT** The expansion cable can only be connected to the modules so that the red stripe on the cable is on the bottom as shown below.

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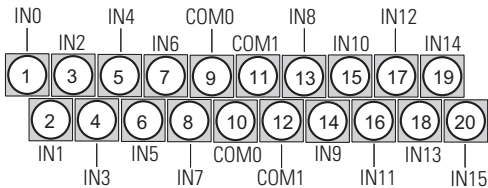
5. Replace the expansion covers on all blocks.

## Wire the Expansion Blocks

The following figures show the wiring information for the expansion blocks.

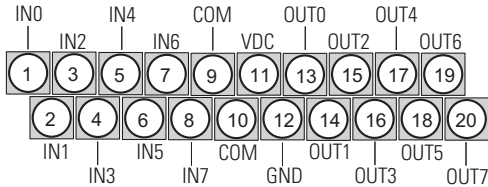
**IMPORTANT** Input and output wiring must be in accordance with Class 1, Division 2 wiring methods and in accordance with the authority having jurisdiction.

### 1790-T16BVOX Input Expansion Block Wiring Diagram



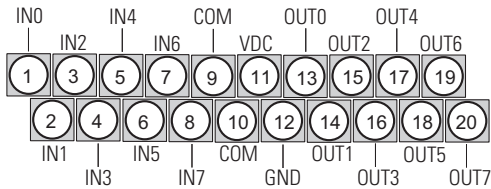
- For inputs 0...7: **Sinking inputs** – wire COM 0 (pin 9) to Field Power (-) GND  
**Sourcing inputs** - wire COM 0 (pin 9) to Field Power (+) 24V DC
  - For inputs 8...15: **Sinking inputs** – wire COM 1 (pin 11) to Field Power (-) GND  
**Sourcing inputs** – wire COM 1 (pin 11) to Field Power (+) 24V DC
- Note:** both COM 0 are internally connected - COM 0 is used for inputs 0...7, COM 1 is used for inputs 8...15. Both COM 1 are internally connected.

### 1790-T8BV8VX Input/Output Expansion Block Wiring Diagram



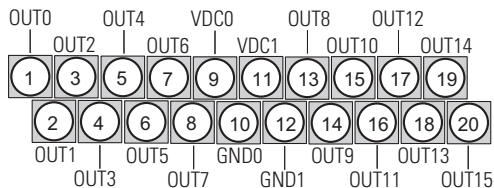
- **Sinking inputs** – wire COM (pin 9) to Field Power (-) GND  
**Sourcing inputs** – wire COM (pin 9) to Field Power (+) 24V DC  
**Note:** both COM (pins 9 and 10) are internally connected.
- **Sinking outputs** – wire VDC (pin 11) to Field Power (+) 24V DC, wire GND (pin 12) to Field Power (-) GND.

### 1790-T8BV8BX Input/Output Expansion Block Wiring Diagram



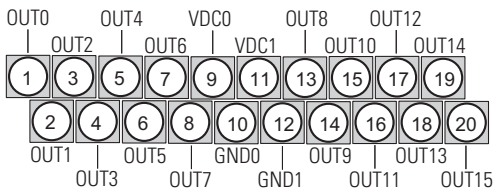
- **Sinking inputs** – wire COM (pin 9) to Field Power (-) GND  
**Sourcing inputs** - wire COM (pin 9) to Field Power (+) 24V DC  
**Note:** both COM (pins 9 and 10) are internally connected.
- **Sourcing outputs** – wire VDC (pin 11) to Field Power (+) 24V DC, wire GND (pin 12) to Field Power (-) GND.

### 1790-T0B16X Output Expansion Block Wiring Diagram



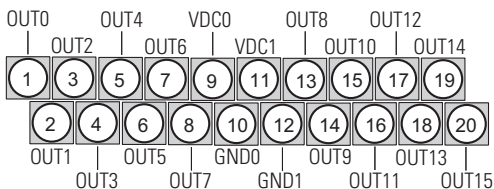
- **Sourcing outputs** – wire VDC0 (pin 9) and VDC1 (pin 11) to Field Power (+) 24V DC, wire GND0 (pin 10) and GND1 (pin 12) to Field Power (-) GND.

### 1790-T0V16X Output Expansion Block Wiring Diagram



- **Sinking outputs** – wire VDC0 (pin 9) and VDC1 (pin 11) to Field Power (+) 24V DC, wire GND0 (pin 10) and GND1 (pin 12) to Field Power (-) GND

### 1790-T0W8X Relay Output Expansion Block Wiring Diagram



- Wire VDC (pin 1) to Field Power (+) 24V DC  
Wire GND (pin 2) to Field Power (-) GND

## Troubleshoot with the Indicators

Use the I/O status indicators to troubleshoot your expansion blocks:

### I/O Status Indicators

Indicator	Status	Description
Output status	Off	Output not energized
	Solid green	Output energized
Input status	Off	No valid input
	Solid green	Valid input

## Specifications

The following table contains specifications that are common to all of the blocks in this document. Individual base block specifications are detailed after this table.

### Universal DC Input Expansion Block – 1790-T16BVOX

Attribute	Value
Number of inputs per expansion block	16 points, sinking or sourcing
Indicators	16 green – Input status
Common type	8 points/2COM (non-polarity)
On-state voltage	9.6V DC min 24V DC nom 28.8V DC max
Off-state voltage, max	5.0V DC
On-state current, max	8 mA per channel @ 28.8V DC
Input signal delay, max OFF to ON ON to OFF	10 ms 10 ms

**DC Input/Output Combination Expansion Block –  
1790-T8BV8VX, 1790-T8BV8BX**

<b>Attribute</b>	<b>1790-T8BV8VX</b>	<b>1790-T8BV8BX</b>
<b>Input Specifications</b>		
Number of inputs per expansion block	8 points, non-isolated, sinking or sourcing	
Indicators	8 green status	
Common type	8 points/2COM (non-polarity)	
On-state voltage	9.6V DC min 24V DC nom 28.8V DC max	
Off-state voltage, max	5.0V DC	
On-state current, max	8 mA per point @ 28.8V DC	
Nominal input impedance	4.8 K $\Omega$	
Input signal delay, max OFF to ON ON to OFF	10 ms 10 ms	
<b>Output Specifications</b>		
Number of outputs per expansion block	8 points, non-isolated, sinking	8 points, non-isolated, sourcing
Indicators	8 green status	
Common type	8 points/2COM (non-polarity)	
On-state voltage	10V DC min 24V DC nom 28.8V DC max	
On-state voltage drop, max	0.5V DC	
On-state current, min	1 mA per channel	
Off-state leakage, max	0.5 mA	

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Attribute	1790-T8BV8VX	1790-T8BV8BX
Output signal delay, max OFF to ON ON to OFF	0.5 ms 1.0 ms	
Output current rating, max	0.5 A per output 4.0 A per common	
Field power dissipation	3.22 W @ 28.8V DC	

### DC Output Expansion Block – 1790-TOV16X, 1790-TOB16X

Attribute	1790-TOV16X	1790-TOB16X
Number of inputs per expansion block	16 points, non-isolated, sinking	16 points, non-isolated, sourcing
Indicators	16 green status	
Common type	8 points/2COM	8 points/8COM
Off-state voltage, max	28.8V DC	
On-state current, min	1 mA per channel	
Off-state leakage, max	0.5 mA	
Nominal input impedance	4.8 K $\Omega$	
Output signal delay, max OFF to ON ON to OFF	0.5 ms 1.0 ms	
On-state voltage	10V DC min 24V DC nom 28.8V DC max	
On-state voltage drop, max	0.5V DC	
On-state current, min	1 mA per channel	
Output current rating, max	0.5 A per output 4.0 A per common	
Field power dissipation	2.76 W @ 28.8V DC	

**AC/DC Relay Output Expansion Block – 1790-TOW8X**

<b>Attribute</b>	<b>Value</b>
Relay type	Form A, normally open Single pole, single throw
Indicators	8 green status
Common type	1 point/1COM
Output voltage range, load dependent	5...28V DC @ 2.0 A resistive 48V DC @ 0.8 A resistive 125V AC @ 2.0 A resistive 250V AC @ 2.0 A resistive
Minimum load, per point	100 $\mu$ A, 100 mV DC
Off-state leakage, max	1.5 mA
On-state voltage drop, max	0.5V DC @ 2.0 A, resistive load, 24V DC
Initial contact resistance	30 m $\Omega$
Expected contact life	300K cycles resistive 100K cycles inductive
Output delay time, max OFF to ON ON to OFF	10 ms 10 ms
Field power voltage range	19.2...28.8V DC
Field power dissipation	2.3 W @ 28.8V DC

**AC Input Expansion Block – 1790-T8AOX**

<b>Attribute</b>	<b>Value</b>
Inputs per expansion block	8 points non-isolated
Indicators	8 green – input status
Common type	8 points/8COM
On-state voltage range	79V AC min 110V AC nom 132V AC max
Input impedance	18 K $\Omega$
On-state current, max	9 mA @ 132V AC

<b>Attribute</b>	<b>Value</b>
Off-state voltage, max	45V AC
Input signal delay, max OFF to ON ON to OFF	10 ms 30 ms
External AC power supply voltage	110V rms, 60 Hz
External AC power supply voltage range	85...132V rms, 47...63 Hz
External AC power supply power dissipation	3 W @ 132V AC

### 110V AC Output Expansion Block – 1790-T0A8X

<b>Attribute</b>	<b>Value</b>
Outputs per expansion block	8 points non-isolated
Indicators	8 green – input status
Common type	8 points/8COM
Load voltage range	15...132V rms
Load current, max	0.5 A rms
Load current, min	10 mA rms
Off-state leakage current, max	1.0 mA rms @ 100V rms, 60 Hz
On-state voltage drop, max	1.3V rms @ max load
Operate time, max	1 ms
Release, max	1/2 cycle + 1 ms
Input signal delay, max OFF to ON ON to OFF	10 ms 30 ms
Insulation resistance, min	1,000 M $\Omega$ (for input-output)
Dielectric strength	2500V rms, 1 minute (for input-output)
External AC power supply voltage	110V rms, 60 Hz



Attribute	Value
External AC power supply voltage range	15...132V rms, 60 Hz
External AC power supply power dissipation	5.2 W @ rated current

### General Specifications

Attribute	Value
Mounting	DIN rail or screw
Dimensions	52H x 104W x 42D mm (2.03H x 4.07W x 1.64D inches)
Weight	100 g (3.53 oz)
Number of nodes, max	64 – rotary switch type node address setting
Indicators	1 red/green – module status 1 red/green – network status
Isolation voltage	I/O to logic: photocoupler isolation Type tested at 1250V AC for 60 s, between field power and DeviceNet (I/O to logic) DeviceNet to logic: non-isolated DeviceNet power: non-isolated
Field Power, Voltage range	10...28.8V DC
Field Power, Supply voltage	24V DC nom
Field power dissipation	3.68 W max @ 28.8V DC
Network protocol	I/O Slave messaging: - Poll command - Bit Strobe command - Cyclic command - COS command
Network length, max	500 m @ 125 Kbps 100 m @ 500 Kbps
Communication rate	125 Kbps, 250 Kbps, 500 Kbps – auto baud rate selection
Enclosure type rating	None (open-style)
Wiring Category <sup>(1)</sup>	2
Wiring	copper or copper-clad aluminum conductors
Wiring terminal screw torque, max	0.6 Nm (5.2 lb-in.)
Removable terminal block screw torque, max	0.56 Nm (5.0 lb-in.)

<sup>(1)</sup> Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

**Environmental Specifications**

<b>Attribute</b>	<b>Value</b>
Operating temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): 0...55 °C (32...131 °F)
Non-operating temperature	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40...85 °C (-40...185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...90% noncondensing
Operating altitude	2000 m
Vibration	IEC 60068-2-6 (Test Fc, Operating): 2 g @ 10...500 Hz
Operating shock	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 10 g
Non-operating shock	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity	IEC 61000-4-2: 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...1000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz
EFT/B immunity	IEC 61000-4-4: 1 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on signal ports
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV line-earth(CM) on power ports ±1 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

**Certification (when product is marked)**

<b>Certification (when product is marked)<sup>(1)</sup></b>	<b>Value</b>
c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
RCM	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
ODVA	ODVA conformance tested to DeviceNet specifications

<sup>(1)</sup> See the Product Certification link at <http://www.rockwellautomation.com/products/certification/> for Declaration of Conformity, Certificates, and other certification details.

## Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

## Installation Assistance

If you experience a problem within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the <a href="#">Worldwide Locator</a> at <a href="http://www.rockwellautomation.com/support/americas/phone_en.html">http://www.rockwellautomation.com/support/americas/phone_en.html</a> , or contact your local Rockwell Automation representative.

## New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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