



Digital Expansion Terminal Block CompactBlock LDX I/O

(Cat. Nos. 1790-T16BV0X, -T8BV8VX, -T8BV8BX, -T0B16X,
-T0V16X, -T0W8X, -T8A0X, -T0A8X)

What This Document Describes

This document describes how to install your CompactBlock LDX I/O.

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Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

WARNING

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.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

ATTENTION**Preventing Electrostatic Discharge**

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.
 - If available, use a static-safe workstation.
 - When not in use, store the equipment in appropriate static-safe packaging.
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ATTENTION**Environment and Enclosure**

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 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 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.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

Installing CompactBlock LDX I/O

Follow these steps to install the expansion block:

1. Mount the block.
2. Connect an expansion block to a base block.
3. Wire the expansion blocks.

These steps are explained in detail in the following sections.

WARNING



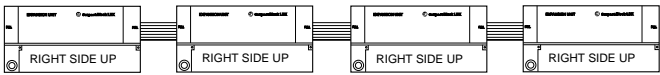
When used in a Class I, Division 2, hazardous location, this equipment must be mounted in a suitable enclosure with the proper wiring method that complies with the governing electrical codes.

Mount the Expansion Block

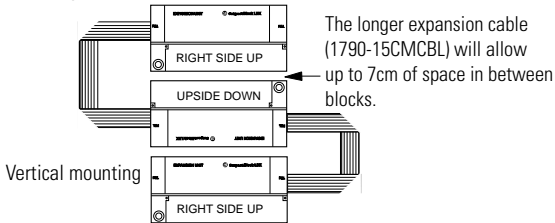
Mount the expansion block and connect it to a previously-installed CompactBlock LDX I/O base or expansion block.

Beginning with the base block, you can mount your CompactBlock LDX I/O 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.



Horizontal mounting

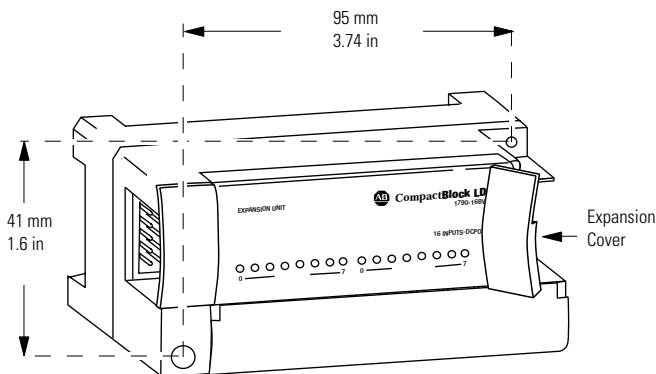


Vertical mounting

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

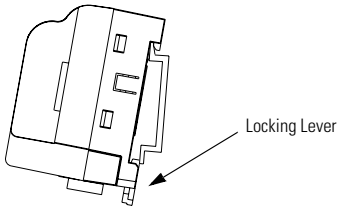
Panel Mounting

1. On the panel, position the expansion block next to your previously-installed base block.
2. Gently pull and position the expansion covers inward.
3. Place a center punch, nail or similar device through the mounting holes in the block (lower left and upper right corners of the module) and make two marks on the panel.
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 when block is flush against the rail. This secures the block to the rail.

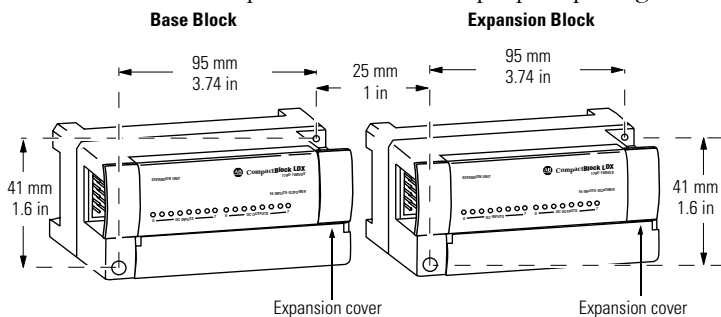
Connect an Expansion Block to a Base Block

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.

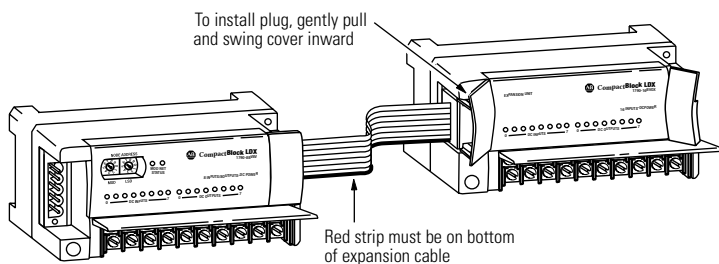
- Position the expansion block with proper spacing.



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

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.

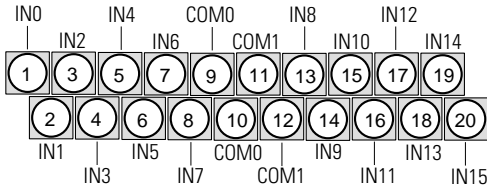


- Replace the expansion covers on all blocks.

Wire the Expansion Blocks

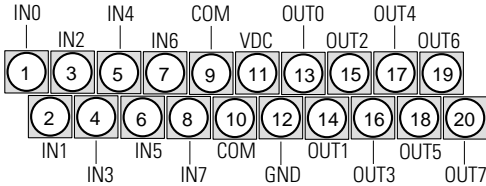
The following figures show the wiring information for the expansion blocks.

1790-T16BVOX Input Expansion Block Wiring Diagram



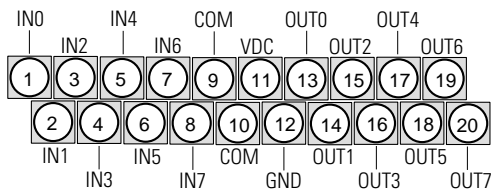
- **For inputs 0-7: Sinking inputs** - wire COM 0 (pin 9) to Field Power (-) GND
Sourcing inputs - wire COM 0 (pin 9) to Field Power (+) 24V dc
- **For inputs 8-15: Sinking inputs** - wire COM 1 (pin 11) to Field Power (-) GND
Sourcing inputs - wire COM 1 (pin 11) to Field Power (+) 24V dc
Note: both 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



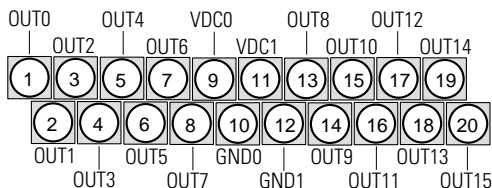
- **Sinking inputs** - wire COM (pin 9) to Field Power (-) GND
Sourcing inputs - wire COM (pin 9) to Field Power (+) 24V dc
Note: both COM (pins 9 and 10) are internally connected.
- **Sinking outputs** - wire VDC (pin 11) to Field Power (+) 24Vdc,
 wire GND (pin 12) to Field Power (-) GND

1790-T8BV8BX Input/Output Expansion Block Wiring Diagram



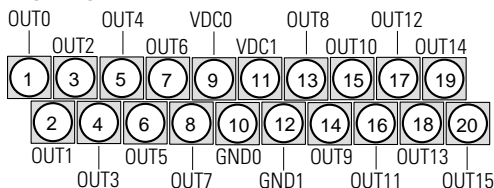
- **Sinking inputs** - wire COM (pin 9) to Field Power (-) GND
- **Sourcing inputs** - wire COM (pin 9) to Field Power (+) 24Vdc
Note: both COM (pins 9 and 10) are internally connected.
- **Sourcing outputs** - wire VDC (pin 11) to Field Power (+) 24Vdc,
 wire GND (pin 12) to Field Power (-) GND

1790-T0B16X Output Expansion Block Wiring Diagram



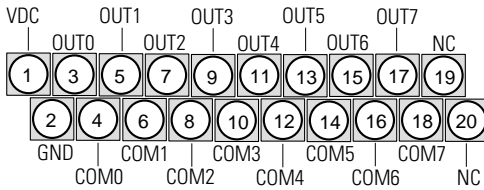
- **Sourcing outputs** - wire VDC0 (pin 9) and VDC1 (pin 11) to Field Power (+) 24V dc, wire GND0 (pin 10) and GND1 (pin 12) to Field Power (-) GND

1790-T0V16X Output Expansion Block Wiring Diagram



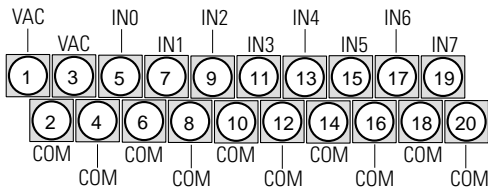
- **Sinking outputs** - wire VDC0 (pin 9) and VDC1 (pin 11) to Field Power (+) 24V dc, wire GND0 (pin 10) and GND1 (pin 12) to Field Power (-) GND

1790-T0W8X Relay Output Expansion Block Wiring Diagram



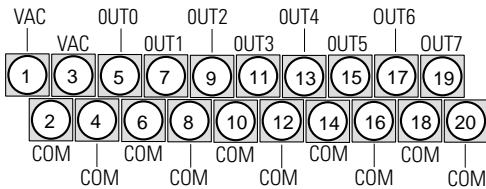
- Wire VDC (pin 1) to Field Power (+) 24Vdc
Wire GND (pin 2) to Field Power (-) GND

1790-T8A0X AC Input Expansion Block Wiring Diagram



- Wire 120Vac Field Power to VAC (pin 1) and COM (pin 2)
Note: all VAC are internally connected. All COM are internally connected.

1790-T0A8X AC Output Expansion Block Wiring Diagram



- Wire 120Vac Field Power to VAC (pin 1) and COM (pin 2)
Note: all VAC are internally connected. All COM are internally connected.

Troubleshoot with the Indicators

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

I/O Status Indicators			
Function:	LED Color:	Module Illumination:	Condition:
Outputs	Each output: Green	None Green	Output not energized Output energized
Inputs	Each Input: Green	None Green	No valid input Valid input

Digital Expansion Block Specifications

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

Environmental Specifications	
Operating Temperature	0 to 55°C (32 to 131°F) - Analog I/O 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)
Storage Temperature	-40 to 85°C (-40 to 185°F) IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock)
Relative Humidity	5-90% non-condensing IEC 60068-2-30 (Test Db, Un-packaged Non-operating)
Operating Altitude	2000m
Vibration	2g @ 10-500Hz IEC60068-2-6 (Test Fc, Operating)
Shock	
Operating	10g
Non-operating	30g EC60068-2-27 (Test Ea, Unpackaged Shock)
Emissions	Group 1, Class A CISPR 11
ESD Immunity	8kV air discharges IEC 61000-4-2
Radiated RF Immunity	10V/m with 1kHz sine-wave 80%AM from 80MHz to 1000MHz 10V/m with 200Hz 50% Pulse 100%AM @ 900Mhz IEC 61000-4-3
EFT/B Immunity	1kV @ 5kHz on power ports ±2kV @ 5kHz on signal ports IEC 61000-4-4
Surge Transient Immunity	±1kV line-line(DM) and ±2kV line-eath(CM) on power ports ±1kV line-line(DM) and ±2kV line-eath(CM) on signal ports EC 61000-4-5
Conducted RF Immunity	10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz IEC 61000-4-6
Enclosure Type Rating	None (open style)
Mounting	DIN rail or screw
Dimensions	52x104x42mm (2.03x4.07x1.64in)
Weight	0.3lb (0.1kg)

DeviceNet Specifications	
Network protocol	I/O Slave messaging: - Poll command - Bit Strobe command - Cyclic command - COS command
Network length	500 meters maximum @ 125Kbps 100 meters maximum @ 500Kbps
Indicators	1 red/green module status 1 red/green network status
Number of nodes	64 maximum - rotary switch type node address setting
Communication rate	125Kbps, 250Kbps, 500Kbps - auto baud rate selection
Isolation	Type test 1250Vac rms for 60 seconds between field power and DeviceNet (I/O to logic)
Wiring	Refer to publication DN-6.7.2
General Specifications	
Wiring Category	2 ¹
Product Certifications (when product is marked)	c-UL-us UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada CE ² European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick ² Australian Radiocommunications Act, compliant with: AS/NZS CISPR11; Industrial Emissions ODVA ODVA conformance tested to DeviceNet specifications

¹ Refer to publication 1770-4.1, *Programmable Controller Wiring and Grounding Guidelines*.

² See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Universal DC Input Expansion Block Specifications

1790-T16BVOX	
Inputs per expansion block	16 points, sinking or sourcing
On-state voltage	9.6V dc minimum 24V dc nominal 28.8V dc maximum
Off-state voltage	5.0V dc maximum
On-state current	8mA maximum per channel @ 28.8V dc
Nominal input impedance	4.8K Ω
Input signal delay	Off to On: 10ms maximum On to Off: 10ms maximum
Indicators	16 green input status
Common type	8 points/2COM (non-polarity)
General Specifications	
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms DeviceNet to logic: non-isolated DeviceNet power: non-isolated
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)
Field Power	Power dissipation - 3.68W maximum @ 28.8V dc

DC Input/Output Combination Expansion Block Specifications

1790-T8BV8VX, -T8BV8BX	
INPUT SPECIFICATIONS	
Inputs per expansion block	8 points non-isolated, sinking or sourcing
On-state voltage	9.6V dc minimum 24V dc nominal 28.8V dc maximum
On-state current	8mA maximum per point @ 28.8V dc
Off-state voltage	5V dc maximum

Nominal input impedance	4.8K Ω
Input signal delay	Off to On: 10ms maximum On to Off: 10ms maximum
Indicators	8 green status
Common type	8 points/2 COM (non-polarity) - 1790D-T8BV8VX 8 points/2 COM (non-polarity) - 1790D-T8BV8BX
OUTPUT SPECIFICATIONS	
Outputs per expansion block	8 points non-isolated, sinking - 1790D-T8BV8VX 8 points non-isolated, sourcing - 1790D-T8BV8BX
On-state voltage	10V dc minimum 24V dc nominal 28.8V dc maximum
On-state voltage drop	0.5V dc maximum
On-state current	1mA minimum per channel
Off-state leakage	0.5mA maximum
Output signal delay	Off to On: 0.5ms maximum On to Off: 1.0ms maximum
Indicators	8 green status
Output current rating	Maximum 0.5A per output 4.0A maximum per common
Common type	8 points/2 COM - 1790D-T8BV8VX 8 points/2 COM - 1790D-T8BV8BX
General Specifications	
Field Power	Supply voltage - 24V dc nominal Voltage range - 10-28.8V dc Power dissipation - 3.22W @ 28.8V dc
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms DeviceNet to logic: non-isolated DeviceNet power: non-isolated
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)

DC Output Expansion Block Specifications

1790-TOV16X and -TOB16X	
Outputs per expansion block	16 points non-isolated, sinking: 1790D-TOV16X 16 points non-isolated, sourcing: 1790D-TOB16X
On-state voltage	10V dc minimum 24V dc nominal 28.8V dc maximum
On-state voltage drop	0.5V dc maximum
On-state current	1mA minimum per channel
Off-state voltage	28.8V dc maximum
Off-state leakage	0.5mA maximum
Output signal delay	Off to On: 0.5ms maximum On to Off: 1.0ms maximum
Indicators	16 green status
Output current rating	Maximum 0.5A per output 4.0A maximum per common
Common type	8 points/2COM for 1790D-TOV16X 8 points/8COM for 1790D-TOB16X
General Specifications	
Field Power	Supply voltage - 24V dc nominal Voltage range - 10-28.8V dc Power dissipation - 2.76W @ 28.8V dc
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)

AC/DC Relay Output Expansion Block Specifications

1790-TOW8X	
Relay type	Form A, normally open Single pole, single throw
Output voltage range (load dependent)	5-28V dc @ 2.0A resistive 48V dc @ 0.8A resistive 125V ac @ 2.0A resistive 250V ac @ 2.0A resistive
Minimum load	100 μ A, 100mV dc per point
Maximum on-state voltage drop	0.5V @ 2.0A, resistive load, 24V dc
Initial Contact Resistance	30m Ω
Expected contact life	300K cycles resistive 100K cycles inductive
Maximum off-state leakage	1.5mA maximum
Output delay time	10ms maximum on to off 10ms maximum off to on
Indicators	8 green status
Common type	1 point/1COM
General Specifications	
Field Power	Supply voltage - 24V dc nominal Voltage range - 19.2-28.8V dc Power dissipation - 2.3W @ 28.8V dc
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)

AC Input Expansion Block Specifications



1790-T8A0X	
Inputs per expansion block	8 points non-isolated
On-state voltage range	79V ac minimum 110V ac nominal 132V ac maximum
Input impedance	18K Ω
On-state current	9mA maximum @132V ac
Off-state voltage	45V ac maximum
Input signal delay	10ms off to on 30ms maximum on to off
Indicators	8 green input status
Common type	8 points/8COM
General Specifications	
External AC power supply	Supply voltage - 110V rms, 60Hz Voltage range - 85-132Vrms, 47-63Hz Power dissipation - 3W @ 132Vac
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms/V ac Field power: non-isolation
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)

110V AC Output Expansion Block Specifications

1790-T0A8X	
Outputs per expansion block	8 points non-isolated
Load voltage range	15-132Vrms
Maximum load current	0.5Arms
Minimum load current	10mArms
Max off-state leakage current	1.0mArms @ 100Vrms 60Hz
Max on-state voltage drop	1.3Vrms @ max load
Maximum operate time	1mS
Maximum release	1/2 cycle + 1mS
Insulation resistance	Minimum 1,000M Ω (for input-output)
Dielectric strength	2500 Vrms 1 minute (for input-output)
Input signal delay	10ms off to on 30ms maximum on to off
Indicators	8 green input status
Common type	8 points/8COM
General Specifications	
External AC power supply	Supply voltage - 110V rms, 60Hz Voltage range - 15-132Vrms, 60Hz Power dissipation - 5.2W @ rated current
Isolation	I/O to logic: photocoupler isolation Isolation voltage: 1250V ac rms/V ac Field power: non-isolation
Wiring	Terminal block (M3.0) - screw torque: 7 inch-pounds maximum (use copper or copper-clad aluminum conductors)

IMPORTANT

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

<p>The following information applies when operating this equipment in hazardous locations:</p>	<p>Informations sur l'utilisation de cet équipement en environnements dangereux :</p>		
<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>		
<p>WARNING</p> 	<p>EXPLOSION HAZARD</p> <ul style="list-style-type: none"> Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. 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. Substitution of components may impair suitability for Class I, Division 2. If this product contains batteries, they must only be changed in an area known to be nonhazardous. 	<p>AVERTISSEMENT</p> 	<p>RISQUE D'EXPLOSION</p> <ul style="list-style-type: none"> Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. 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. La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. S'assurer que l'environnement est classé non dangereux avant de changer les piles.

This product has been tested at an Open Device Vendors Association, Inc. (ODVA) authorized independent test laboratory and found to comply with ODVA Conformance Test. Please contact the ODVA website (<http://www.odva.org>) for listing of products tested by ODVA independent test labs for further details.

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