

Installation Instructions

DeviceNet 32 Point Digital Base Terminal Block CompactBlock LDX I/O

Catalog Numbers 1790D-T16BV16V, 1790D-T16BV16B,
1790D-T0B32, 1790D-T32BVO, 1790D-T0V32 Series B

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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://literature.rockwellautomation.com>) 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.

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

Preventing Electrostatic Discharge

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.
-

WARNING

If you connect or disconnect the communications cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

ATTENTION

To comply with the CE Low Voltage Directive (LVD), all wiring connections to this equipment must be powered from a source compliant with the following: Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

ATTENTION

To comply with UL restrictions, DeviceNet must be powered from a source compliant with the following:

Class 2 or Limited Voltage/Current.

Environment and Enclosure

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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North American Hazardous Location Approval

<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 1, Division 2. S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Before You Begin

Read this section about important CompactBlock I/O requirements.

Current functions of CompactBlock LDX I/O blocks require the current, modular electronic data sheet (EDS) file for RSNetWorx for DeviceNet software, version 8.0 or later. These files are available online at <http://www.ab.com/networks/eds/>.

EDS files for blocks with matching catalog numbers for both D-shell and terminal block versions are the same. On the website and in RSNetWorx for DeviceNet software, find the EDS file for both versions

of the blocks. For example, for the EDS file for 1790D-T16BV16B blocks, use the EDS file labelled 1790D-16BV16B.

Install the Base Block

To install the base block:

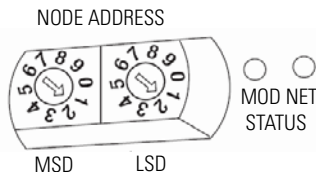
- set the node address on the base block.
- mount the base block.
- mount the optional expansion blocks.
- wire the terminal block.
- connect the DeviceNet cable.

Set the Node Address

When setting the node address on the base block, note that each base block comes with its internal program set for node address 63. To reset the node address, adjust the switches on the front of the base block. The two switches are most significant digit (MSD) and least significant digit (LSD). You can set switches to 00...63.

Node Address Example

In this example, the node address setting is 11.



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The base block reads the rotary switches only when power is applied. Switch settings 64...99 cause the base block to use the last valid node address stored internally.

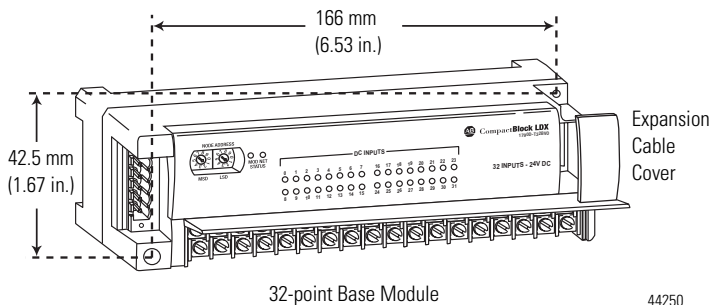
You can also set the node address through RSNetWorx for DeviceNet software or a similar configuration tool.

When you use software configuration for the node address, set the switches to 64...99.

Mount the Base Block

Mount the base block to a panel or DIN rail. We recommend that you ground the panel or DIN rail before mounting the block.

Dimensions



Mount on a Panel

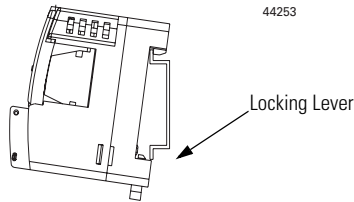
For panel mounting, use these steps.

1. Place the block against the panel where you want it mounted.
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 at the 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.
6. Tighten the screws until the block is firmly in place.

Mount on DIN Rail

For DIN-rail mounting, use these steps.

1. Hook the top slot of the base block over the DIN rail.



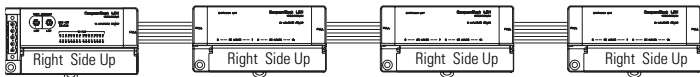
2. Pull down on the locking lever while pressing the base block against the rail.
3. Push up on the locking lever to secure the base block to the rail when the base block is flush against the rail.

Mount the Optional Expansion Block

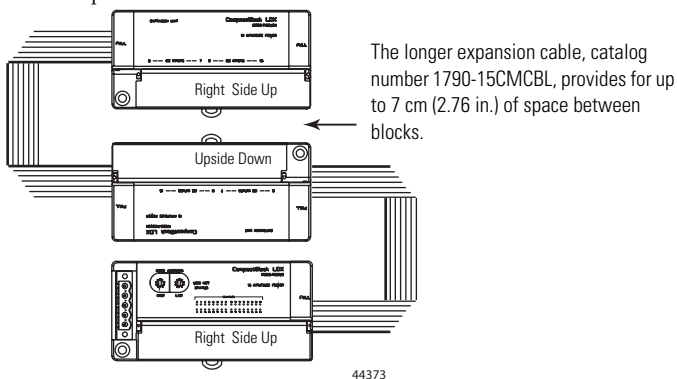
To mount the optional expansion block, use these steps.

1. Mount the expansion block by connecting it to a previously-installed CompactBlock LDX I/O base or expansion block.
2. Beginning with the base block, mount your expansion block either horizontally or vertically.
 - To mount horizontally (left to right), add an expansion block in an end-to-end configuration.

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- To mount vertically (up or down), add an expansion block either up or down in a back-to-back configuration. In this configuration, you must use the optional 15 cm (5.9 in.) ribbon cable, catalog number 1790-15CMCBL, and alternately position the block in a right-side up, upside-down fashion.



3. Mount your block on a panel or DIN rail.

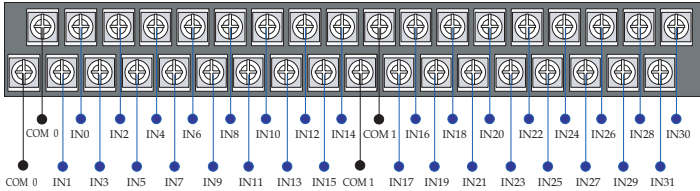
Wiring the Terminal Block

WARNING

If you connect or disconnect wiring while the field-side power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

See the diagrams that follow for wiring information.

1790D-T32BV0 Input Base Block Wiring Diagram

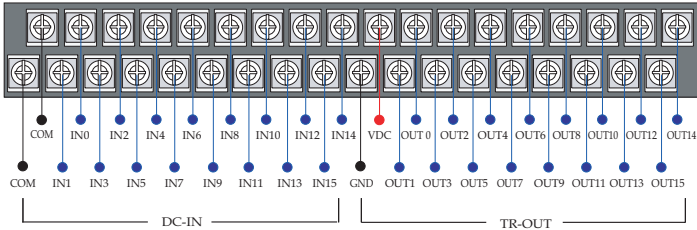


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For inputs 0...15: For sinking inputs, wire COM 0 to Field Power (-) GND.
 For sourcing inputs, wire COM 0 to Field Power (+) 24V dc.

For inputs 16...31: For sinking inputs, wire COM 1 to Field Power (-) GND.
 For sourcing inputs, wire COM 1 to Field Power (+) 24V dc.
 Note that both COM 0 and COM 1 are internally connected.

1790D-T16BV16V Input/Output Base Block Wiring Diagram

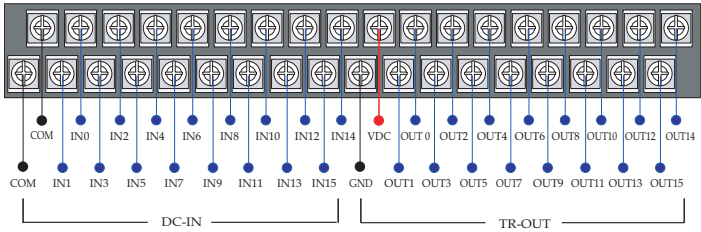


44255

For sinking inputs, wire COM to Field Power (-) GND.
 For sourcing inputs, wire COM to Field Power (+) 24V dc.
 Note that both COM are internally connected.

For sinking outputs, wire V dc to Field Power (+) 24V dc, and wire GND to Field Power (-) GND.

1790D-T16BV16B Input/Output Base Block Wiring Diagram

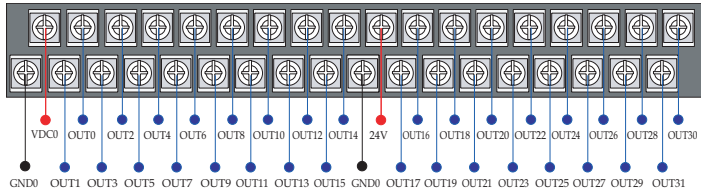


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For sinking inputs, wire COM to Field Power (-) GND.
 For sourcing inputs, wire COM to Field Power (+) 24V dc.
 Note that COM are internally connected.

For sourcing outputs, wire V dc to Field Power (+) 24V dc, and
 wire GND to Field Power (-) GND.

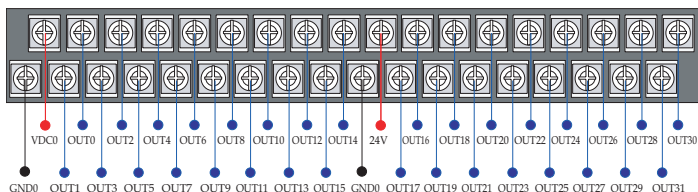
1790D-T0B32 Input/Output Base Block Wiring Diagram



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For sourcing outputs, wire V dc 0 and V dc 1 to Field Power (+) 24V dc, and wire GND0 and
 GND1 to Field Power (-) GND.

1790D-T0V32 Input/Output Base Block Wiring Diagram



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For sinking outputs, wire V dc 0 and V dc 1 to Field Power (+) 24V dc, and wire GND0 and GND1 to Field Power (-) GND.

Connect the DeviceNet Cable

Follow these procedures to connect the DeviceNet cable to the base block. The DeviceNet connector is not supplied with the base block. You must purchase the connector separately. These are the types of connectors you order directly from Rockwell Automation.

- 1799-DNETCON - 5-position open-style connector
- 1799-DNETSCON - 5-position open-style connector with locking screws
- 1799-DNC5MMS - 5-position open-style to 12 mm (0.47 in.) connector with locking screws

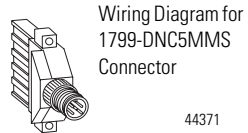
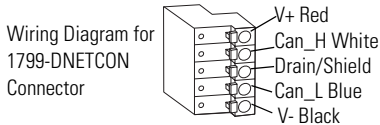
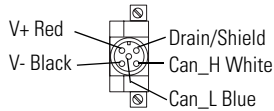
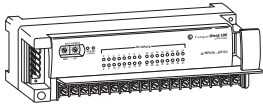
WARNING



If you connect or disconnect the communication cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding

1. Connect the DeviceNet wiring (drop line) to one of the DeviceNet connectors as shown in the figure, noting that a color-coded wiring diagram is printed next to the connector on the left side of the base block.



2. Attach the connector to the base block once you have properly wired the drop line to the connector.
3. Use the locking screws on the connector to fasten it to the base block, if applicable.

Interpret the Status Indicators

Read this section for information about how to interpret base block status indicators. The base block has these status indicators:

- Block status
- Network status
- I/O status

If a module status indicator is flashing red, refer to the cable break procedures section.

Status Indicators

Indicator	Status	Description
Module	Solid red	Unrecoverable fault in base unit. Replace base block.
	Flashing red	Fault in expansion unit, or Node address switches do not match current node address. Reconnect or replace, as needed.
	Solid green	Normal operation.
	Off	No power. Apply power to device.
Network	Solid red	Module node number is a duplicate of an existing node, or network communication issues exist. Change module node number to an unused address, or verify network wiring is correct and communication is stable.
	Flashing red	An I/O connection has timed out. Cycle power to the module.
	Solid green	The module is operating in a normal condition, and the module is online with connections in the established state. As a group 2 module, the module is allocated to a master.
	Flashing green	The module is online with no connections in the established state. Establish connections to other nodes. As a group 2 module, allocate the module to a master.
	Off	No power. Wait until the module has completed the dup_MAC_id test or power the module.

I/O Status Indicators

Indicator	Status	Description
Each output	None	Output is not energized.
	Green	Output is energized.
Each input	None	No valid input is present.
	Green	Valid input is present.

Cable Break Procedures

A cable break in any location between either of the following produces data of 0 in the data table for all inputs down stream of the cable break:

- Base and digital input expansion module
- Digital input expansion module and another digital input expansion module

All digital-expansion inputs produce data of 0 if the expansion cable is removed. No status is in the default produced assembly. Attribute 101 in the identity object reports module faults.

If no faults are present, an explicit message GET command returns 0.

If the ribbon cable is disconnected, it returns 0x04, which is for module location change. The module status indicator also flashes indicating a fault if an expansion is disconnected. Select an alternate produced assembly that contains the expansion status byte, using the EDS Properties configuration dialog.

Specifications

Universal DC Input Base Block - 1790D-T32BV0

Attribute	Value
Number of inputs	32
Input type	Sink, source 24V dc
Voltage, off-state input, max	5V dc
Voltage, on-state input, max	28.8V dc
Voltage, on-state input, nom	24V dc
Voltage, on-state input, min	9.6V dc
Current, off-state input, max	1.5 mA @ 5V dc
Current, on-state input, max	8 mA @ 28.8V dc per channel
Input impedance, nom	4.8 kohm
Field power dissipation	3.68 W max @ 28.8V dc
DC field power	Supply voltage - 24V dc nom Voltage range - 10...28.8V dc

1790D-TOV32, 1790D-TOB32

Attribute	Value
Number of outputs, nonisolated	32, sinking (1790D-TOV32) 32, sourcing (1790D-TOB32)
Voltage, off-state output, max	28.8V dc
Voltage, on-state output, max	28.8V dc
Voltage, on-state output, nom	24V dc
Voltage, on-state output, min	10V dc
Voltage, on-state drop, max	0.5V dc
Current, on-state output, min	1 mA per channel
Leakage, off-state, max	0.5 mA

1790D-TOV32, 1790D-TOB32

Attribute	Value
Output signal delay, off to on, max	0.5 ms
Output signal delay, on to off, max	1.0 ms
Output current rating, output, max	0.5 A
Output current rating, common, max	4.0 A
Field power dissipation	2.76 W @ 28.8V dc
DC field power	Supply voltage - 24V dc nom Voltage range - 10...28.8V dc

1790D-T16BV16V, 1790D-T16BV16B

Attribute	Value
Number of inputs, non-isolated	16 points , sinking or sourcing
Voltage, off-state input, max	5.0V dc
Voltage, on-state input, max	28.8V dc
Voltage, on-state input, nom	24V dc
Voltage, on-state input, min	9.6V dc
Current, on-state, max	8 mA per channel @ 28.8V dc
Current, on-state, min	1 mA per channel
Input impedance, nom	4.8 kohm
Number of outputs, non-isolated	16 points, sinking (1790D-T16BV16V) 16 points, sourcing (1790D-T16BV16B)
Voltage, on-state output, max	28.8V dc (catalog number 1790D-T16BV16B only)
Voltage, on-state output, nom	24V dc (catalog number. 1790D-T16BV16B only)
Voltage, on-state output, min	10V dc (catalog number 1790D-T16BV16B only)
Voltage, on-state drop, max	0.5V dc
Output current rating, output, max	0.5 A
Output current rating, common, max	4.0 A

1790D-T16BV16V, 1790D-T16BV16B

Attribute	Value
Leakage, off-state, max	0.5 mA
Output signal delay, off to on, max	0.5 ms
Output signal delay, on to off, max	1.0 ms
Field power dissipation	3.22 W @ 28.8V dc
DC field power	Supply voltage - 24V dc nom Voltage range - 10...28.8V dc

General

Attribute	Value
DeviceNet power	Supply voltage - 24V dc nom Voltage range - 10...25V dc
DeviceNet power dissipation	1.2 W max @ 25V dc
Network length	500 m (1640 ft) max @ 125 Kbps 100 m (328 ft) max @ 500 Kbps
Network protocol	Slave messaging: <ul style="list-style-type: none"> • Poll command • Bit Strobe command • Cyclic command • COS command
Status indicators	Module Status - red/green Network Status - red/green
Number of nodes	64 max - rotary switch-type node address setting
Communication rate	125 Kbps, 250 Kbps, 500 Kbps - auto baud rate selection
Dimensions (HxWxD), approx.	52 x 176 x 42 mm (2.03 x 6.93 x 1.64 in.)
Weight, approx.	0.3 kg (0.9 lb)

General

Attribute	Value
Enclosure type rating	Meets IP20
Isolation voltage	50V dc (continuous), Basic Insulation Type Type tested at 500V ac for 60 s, I/O to system No isolation between individual I/O channels
Mounting	DIN rail or panel
Wiring, terminal block (M3.0) screw torque	0.9 Nm (8 lb-in)
Wire size	0.25... 2.5 mm ² (22...14 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater 1.2 mm (3/64 in.) insulation max
Wiring category ⁽¹⁾	2 - on signal ports 2 - on communication ports
Pilot duty rating	Not Rated
North American temperature code	T4

⁽¹⁾ Use this conductor category information for planning conductor routing as described in Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental

Attribute	Value
Temperature, operating	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...60 °C (32...140 °F)
Temperature, storage	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...95% non-condensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, non-operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity	IEC 61000-4-2: 6 kV contact discharges 10 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80%AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100%AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100%AM at 1890 MHz 10V/m with 1 kHz sine-wave 80%AM from 2000...2700 MHz

Environmental

Attribute	Value
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on signal ports ±2 kV at 5 kHz on communications ports
Surge transient immunity	IEC 61000-4-5: ±1.2 kV line-line(DM) and ±2 kV line-earth(CM) on signal ports ±2 kV line-earth(CM) on communications ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80%AM from 150 kHz...80 MHz

Certifications

Certification (when product is marked)⁽¹⁾	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E150833. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E195620.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR11; Industrial Emissions
ODVA	ODVA conformance tested to DeviceNet specifications

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

Notes:

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, 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://support.rockwellautomation.com>.

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	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

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 (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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