



CompactBlock I/O for DeviceNet Modules Series B

(Cat. No. 1791D-16B0, -16V0, -0V16P, -0B16P, -16B0X, -16V0X, -0B16PX, -0V16PX, -8B8P, -4B0, -4B4P, -0B8P, -8V8P)

1791D CompactBlock™ I/O modules are stand-alone 24V dc Block I/O products that communicate via a DeviceNet™ link. Each DeviceNet node consists of either one base module or one base module coupled with one expansion module.

NOTE: The 1791D-4B0 module cannot be expanded.

CompactBlock I/O modules must be installed in a secondary enclosure. Base modules are equipped with 4 to 16 points and expansion modules are equipped with 16 I/O points.

Sinking or sourcing inputs are 24V dc NEMA Type 1+ compatible. Sinking or sourcing self-protected 24V dc outputs can provide up to 0.5 amp each.

European Union Directive Compliance

If this product has the CE mark, it is approved for installation within the European Union and EEA regions and it has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC - Generic Emission Standard, Part 2 - Industrial Environment
- EN 50082-2 EMC - Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1
- Automation Systems Catalog, publication B113

This equipment is classified as open equipment and must be installed (mounted) in an enclosure during operation as means of providing safety protection.

Installing CompactBlock I/O

Follow these steps, to install the 1791D I/O module:

1. Set the Node Address on the Base Module.
2. Mount the Block(s).
3. Connect the Input/Output Wires to the Block.
4. Connect the DeviceNet Cable.
5. Communicate with the 1791D Module.

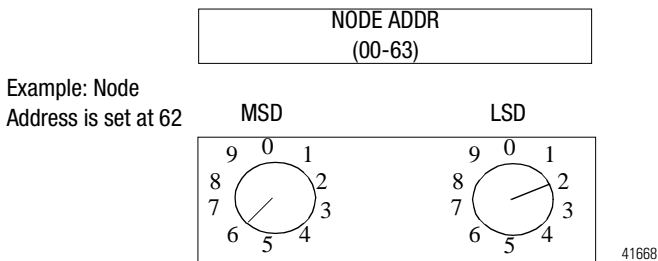
These steps are explained in detail in the following procedures.

Set the Node Address on the Base Module

Each 1791D base module comes with its internal program set for node address 63. To reset the node address, adjust the switches located behind the door on top of the module. The two switches are most significant digit (MSD) and least significant digit (LSD).

The switches can be set between 00 and 63. Use the node adjusting tool provided in the package, or a small bladed screwdriver to rotate the switches.

The rotary switches are read at module power up only. Switch settings between 64 and 99 cause the module to use the last valid node address stored internally.



The node address may also be set through RSNetWorx for DeviceNet™, DeviceNetManager™ or a similar configuration tool. When software configuration is used for the node address, the switches must be set between 64 and 99.

Mount the Block(s)

The base and expansion modules mount to a panel or DIN rail which must be grounded before installing the module(s).

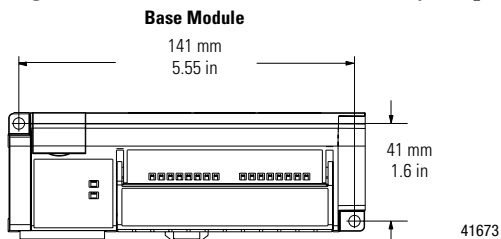
Base Module Mounting

You can install the Compact**Block** base module on a panel or DIN rail.

Panel Mounting

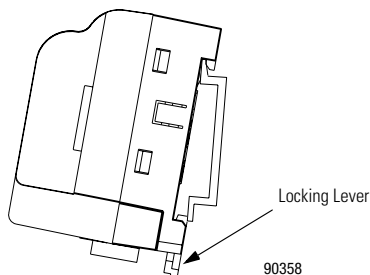
1. Place the module against the panel where you want to mount it.

2. Drill holes in the panel that are aligned with mounting holes on the module.
3. Place screws through each of the 2 mounting holes and tighten until the module is firmly in place.



DIN Rail Mounting

1. Hook top of slot over DIN Rail.
2. Pull down on the locking lever while pressing block against the rail.



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

Connecting an Expansion Module to a Base Module

ATTENTION



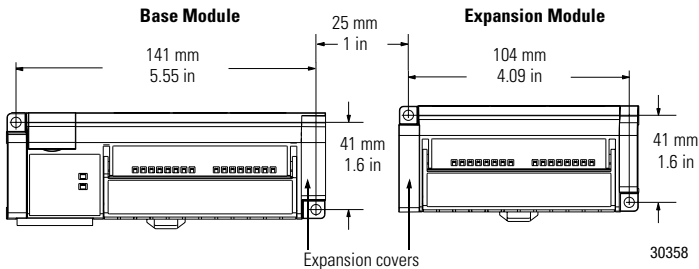
Expansion blocks should not be installed when power is applied to the base.

IMPORTANT

Make sure you carefully read “Communicate With the 1791D Module” on page 12 to change produce and consume data sizes.

NOTE: 1791D-4B0 cannot be connected to expansion modules.

1. Remove the expansion covers from both the base and expansion modules.
2. Position the expansion block with the proper spacing. See the illustration below.

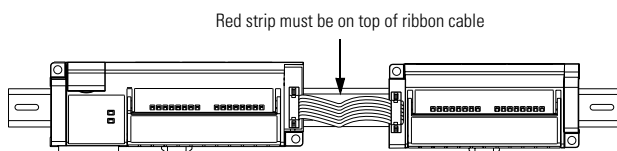


3. Mount expansion module using panel or DIN rail mounting, as described in the previous section.

4. Plug the expansion cable into both the base and expansion modules.

IMPORTANT

The expansion cable can only be connected to the modules such that the red stripe on the cable is on top as shown below.



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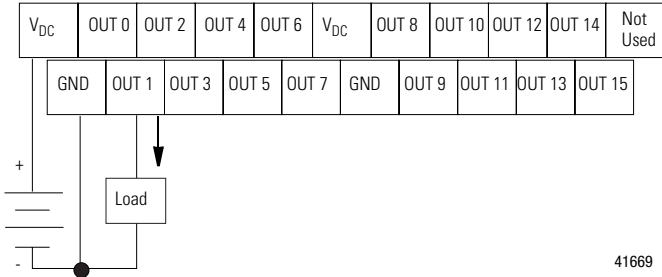
5. Replace the expansion covers on both modules.

Connect the Input/Output Wires to the Block

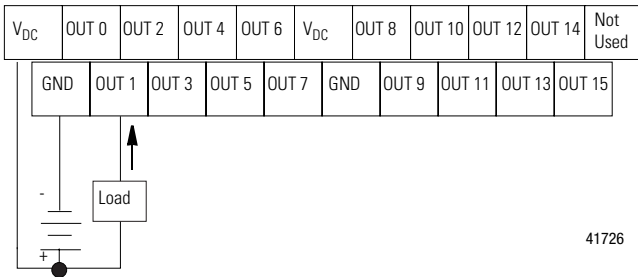
Two sets of VDC+ and GND power pins are located on each terminal (one for each bank of 8 points) except on the 1791D-4B0, -4B4P, and -0B8P modules. The following figures show the wiring information for both sinking and sourcing wiring. Refer to the following table for the proper cable to use for your application.

| Use | Cable type |
|-------------------------|--|
| Input and output wiring | Up to 14AWG (2mm ²) stranded with 3/64 inch insulation |

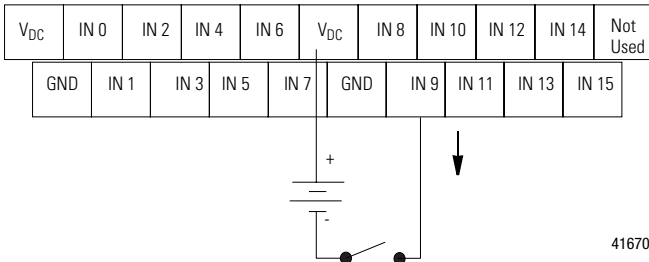
Output Wiring Diagram for 1791D-0B16P and 1791D-0B16PX Modules



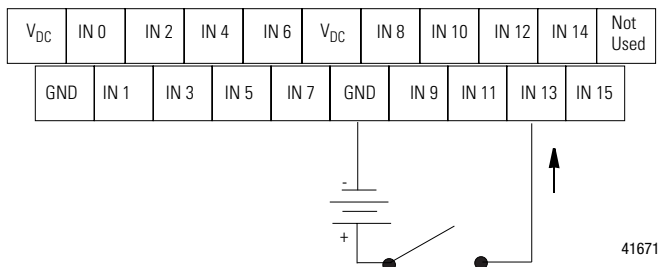
Output Wiring Diagram for 1791D-0V16P and 1791D-0V16PX Modules



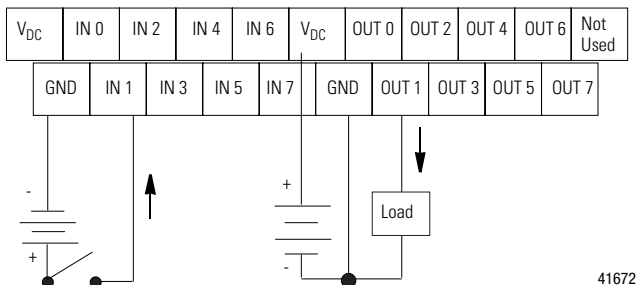
Input Wiring Diagram for 1791D-16V0 and 1791D-16V0X Modules



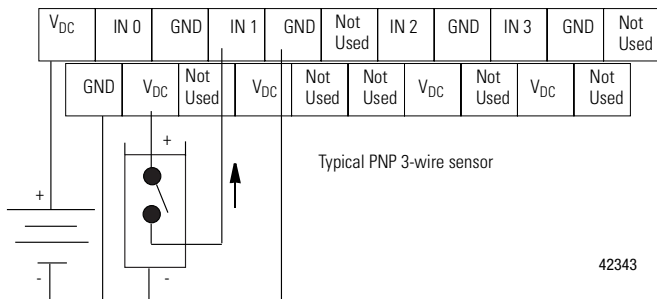
Input Wiring Diagram for 1791D-16B0 and 1791D-16B0X Modules



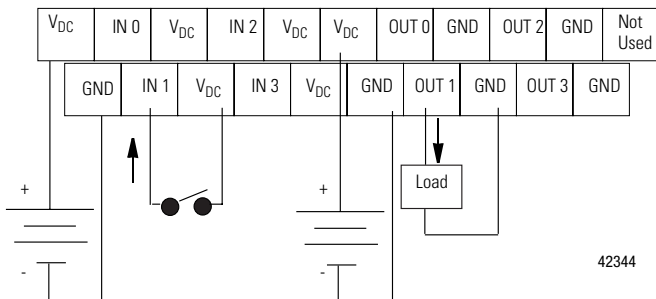
Wiring Diagram for the 1791D-8B8P Module



Wiring Diagram for the 1791D-4B0 Module

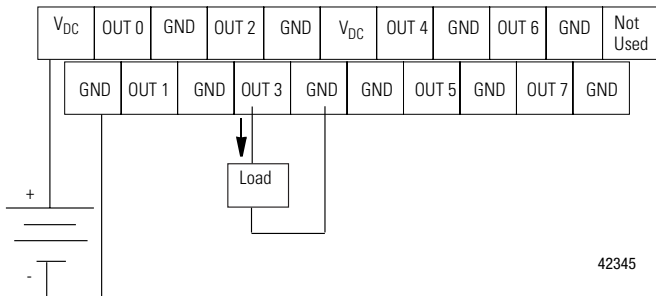


Wiring Diagram for the 1791D-4B4P Module



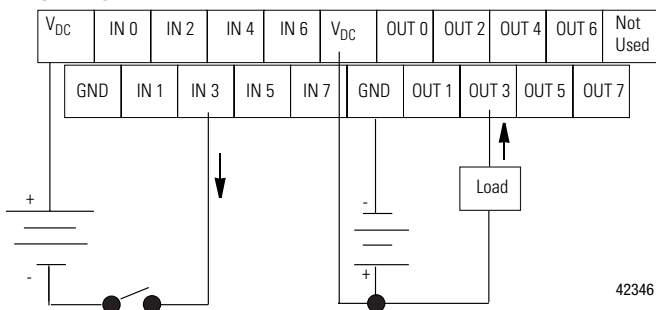
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Wiring Diagram for the 1791D-0B8P Module



42345

Wiring Diagram for the 1791D-8V8P Module

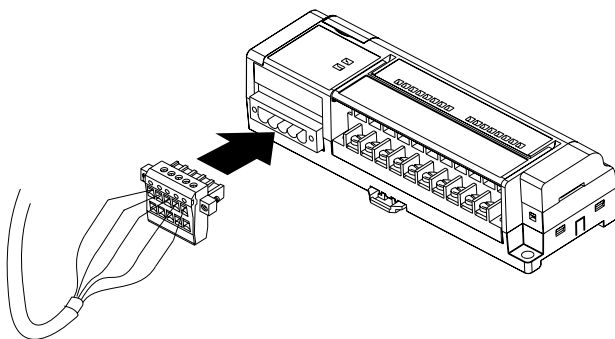


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Connect the DeviceNet Cable

Refer to the following information when connecting the DeviceNet wire to the 1791D block I/O.

1. Connect the DeviceNet cable (drop line) to the unsealed DeviceNet terminal connector as shown below.



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2. Connect the terminal connector to the Block. Use the side screws on the terminal connector to fasten it to the Block.

IMPORTANT

DeviceNet cable connections must match the color bars on the blocks. See the table below.

| Pin Number: | Wire Color: | Abbreviation: | Description: |
|-------------|-------------|---------------|-------------------------------|
| 1 | black | V- | power return |
| 2 | blue | CAN_L | data line (CAN Low) |
| 3 | clear | shield | between cable jacket and wire |
| 4 | white | CAN_H | data line (CAN High) |
| 5 | red | V+ | positive voltage (hot) |

Communicate With the 1791D Module

Determine the Baud Rate for Your DeviceNet Connection

All 1791D Compact**Block** I/O for DeviceNet modules contain the autobaud feature. Autobaud allows the modules to automatically detect the baud rate for the network upon connection to the live network.

The 1791D base modules' I/O is exchanged with the master through a polled, cyclic or change of state connection.

Polled - master initiates communication by sending its polled I/O message to the 1791D module. The module consumes the message, updates any outputs, and produces a response. If inputs are present, the response contains the input data.

Cyclic - allows configuration of the block as an I/O client. The block will produce and consume its I/O cyclically at the rate configured.

Change of state - production occurs when an input changes. If no input change occurs within the expected packet time, a heartbeat production occurs. This heartbeat production tells the scanner module that the 1791D I/O module is alive and ready to communicate. Consumption occurs when data changes and the master produces new output data to the I/O block.

The module produces 1 byte for every 8 inputs. Similarly, the module consumes 1 byte for every 8 outputs. When an expansion module is connected, an additional byte will be returned indicating the health of the expansion module.

IMPORTANT

When installing an expansion module, refer to the following table to see how many bytes are produced and consumed by the modules.

Remember, though, when configuring your Compact**Block** I/O application, these values are entered as bytes received (R_x) and bytes transmitted (T_x) by the scanner.

For example, a Base Input module produces 2 bytes and consumes 0 bytes. In such a case, the scanner connected to the Base Input module will receive (R_x) 2 bytes and transmit (T_x) 0 bytes.

Word/Bit Definitions

The following table lists the combination of input and output modules and the input and output bytes produced and consumed.

| Base | Expansion | I/O Points | Produced (input bytes) | Consumed (output bytes) |
|--------------|-----------|----------------|------------------------|-------------------------|
| 16 input | | 16 in | 2 | 0 |
| 16 output | | 16 out | 0 | 2 |
| 8 in / 8 out | | 8 in / 8 out | 1 | 1 |
| 4 in | | 4 in | 1 | 0 |
| 4 in / 4 out | | 4 in / 4 out | 1 | 1 |
| 8 out | | 8 out | 0 | 1 |
| 16 input | 16 input | 32 input | 5 | 0 |
| 16 input | 16 output | 16 in / 16 out | 3 | 2 |
| 16 output | 16 input | 16 in / 16 out | 3 | 2 |
| 16 output | 16 output | 32 out | 1 | 4 |
| 8 in / 8 out | 16 input | 24 in / 8 out | 4 | 1 |
| 8 in / 8 out | 16 output | 8 in / 24 out | 2 | 3 |
| 4 in / 4 out | 16 input | 20 in / 4 out | 3 | 1 |
| 4 in / 4 out | 16 output | 4 in / 20 out | 1 | 3 |
| 8 out | 16 input | 16 in / 8 out | 3 | 1 |
| 8 out | 16 output | 24 out | 1 | 3 |

The following table shows an example of the word/bit definitions for an 8 input/8 output combination module.

| Bit | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|----------|----|----|----|----|----|----|----|----|
| Produces | I7 | I6 | I5 | I4 | I3 | I2 | I1 | I0 |
| Consumes | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 |

The following table shows an example of the word/bit definitions for an 8 in / 8 out combination module that uses a 16 input expansion module.

| Bit | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|------------|-----|----------|-----|-----|-----|-----|-----|-----|
| Produces 0 | I7 | I6 | I5 | I4 | I3 | I2 | I1 | I0 |
| Produces 1 | I15 | I14 | I13 | I12 | I11 | I10 | I9 | I8 |
| Produces 2 | I23 | I22 | I21 | I20 | I19 | I18 | I17 | I16 |
| Produces 3 | ES | Reserved | | | | | | |
| Consumes 0 | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 |

The table below provides descriptions of input and output bits used in both of the example tables above.

| Byte | Bit | Description |
|--------------|-------|---|
| Produces 0-2 | 00-07 | Input Status bits - when the bit is set (1), the input is on. Bit 00 corresponds to input I0, bit 01 corresponds to input I1, bit 02 corresponds to input I2, and so forth. |
| Produces 3 | 07 | If Expansion Status (ES) bit is set, the expansion module is not functioning properly or missing. |
| Consumes 0 | 00-07 | Output bits - when the bit is set (1), the output will be turned on. Bit 00 corresponds to output O0, bit 01 corresponds to output O1, bit 02 to output O2, and so forth. |

The DeviceNet Network uses advanced network technology, producer/consumer communication, to increase network functionality and throughput. Visit our web site at <http://www.ab.com/networks> for producer/consumer technology information and updates.

Troubleshoot with the Indicators

The 1791D I/O module has the following indicators:

- Mod/Net status indicator - base only
- Logic status indicator - base only
- I/O status indicators - base and expansion

| Mod/Net Status Indicator | |
|---------------------------------|---|
| Indication: | Status: |
| Off | No power or auto bauding |
| Flashing Green/Off | On line but not connected |
| Solid Green | On line, link OK, connected |
| Flashing Red | Recoverable fault - (expansion module fault or module configuration error) |
| | I/O connection fault - one or more I/O connections in the timed-out state |
| Solid Red | Unrecoverable fault |
| | Communication failure - duplicate node address present or incorrect baud rate |
| Green to Red to Off | At powerup only - LED test |

| Logic Status Indicator | |
|-------------------------------|---|
| Indication: | Status: |
| Off | Logic is disabled |
| Solid Green | Logic is enabled |
| Flashing Green | Local forces are applied and local logic is enabled |

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

Specifications





| Sinking or Sourcing Input Specifications | |
|---|---|
| Inputs per block | groups of 4 or 8 |
| Off-state Voltage | 5V dc maximum |
| On-state Voltage | 30V dc @ 40°C maximum 25V dc @ 60°C maximum 10V dc minimum |
| Off-state Current | 1.5mA minimum |
| On-state Current | 11mA @ 30V dc maximum 2mA @ 10V dc minimum |
| Sinking or Sourcing Output Specifications | |
| Outputs per block | groups of 4 or 8 |
| On-state Voltage Range | 10 - 30V dc |
| On-state Voltage Drop | 0.5V dc @ rated current |
| On-state Current | 0.5A maximum |
| Off-state Leakage | 1.0mA maximum |
| Module Current (per output) | 0.5A maximum |
| Surge Current - for 10 mS repeatable every 2 S | 1.0A maximum |
| General Specifications | |
| Indicators | Mod/Net status - red/green Logic status - red/green I/O status - yellow |
| Communication Rate Thick Cable | 125Kbps @ 500m (1600ft) 250Kbps @ 200m (600ft) 500Kbps @ 100m (330ft) |
| Flat Media | 125Kbps @ 420m (1230ft) 250Kbps @ 200m (490ft) 500Kbps @ 75m (245ft) |
| Isolation Auxiliary I/O power to DeviceNet I/O group-to-group I/O group-to-DeviceNet | 500V ac/60s 500V ac/60s 500V ac/60s |

| General Specifications (continued) | |
|--|---|
| DeviceNet Power Voltage Current | 11 - 25V dc 200mA maximum (with expansion) (for the 1791D-4B0, 150mA) |
| Expansion Power Voltage Current | 5V dc 100mA |
| Auxiliary Power Inputs Voltage Current | 10-30V dc 88mA each group of 8 |
| Auxiliary Power Outputs Voltage Current | 10-30V dc 4A each group of 8 |
| Base Module Dimensions | 150mm X 50mm X 38mm 5.91in X 1.97in X 1.5in |
| Expansion Module Dimensions | 115mm X 50mm X 38mm 4.4in X 1.97in X 1.5in |
| Field Wiring Tightening Torque | 5-7lb-in. (0.5-0.6 Nm) |
| Environmental Conditions Operating Temperature Non-Operating Temperature Relative Humidity Shock Operating Non-operating Vibration | 0 to 60°C (32 to 140°F) -40 to 85°C (-40 to 185°F) 5-95% non-condensing 30g 50g tested 5g @ 10-500Hz per IEC 68-2-6 |
| Conductors Wire Size Category | 14 gauge (2mm ²) stranded maximum 3/64 inch insulation maximum 2 ^{1, 2} |
| Product Certifications (where product or packaging is marked) | UL, UL Hazardous Class I, Div 2, Groups A, B, C, D. C-UL, C-UL Hazardous Class I, Div 2, Groups A, B, C, D. CE marked for all applicable directives |
| Enclosure | IEC IP20 |

1 You use this conductor category information for planning conductor routing as described in the system level installation manual.

2 See publication 1770-4.1, "Programmable Controller Wiring and Grounding Guidelines."

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

| C-UL and UL Hazardous Location Approval | Approbation d'utilisation dans des environnements dangereux par la C-UL and UL |
|---|--|
| <p>C-UL and UL certifies products for general use as well as for use in hazardous locations. Actual C-UL and UL certification is indicated by the product label as shown below, and not by statements in any user documentation.</p> | <p>La C-UL and UL certifie des produits pour une utilisation générale aussi bien que pour une utilisation en environnements dangereux. La certification C-UL and UL en vigueur est indiquée par l'étiquette produit et non par des indications dans la documentation utilisateur.</p> |
| <p>Example of the C-UL and UL certification product label:</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 20px;"> <p>LISTED</p>  </div> <div style="text-align: center;"> <p>CL I, DIV 2 GP A,B,C,D TEMP</p> <div style="background-color: black; width: 60px; height: 20px; margin: 0 auto;"></div> </div> </div> | <p>Exemple d'étiquette de certification d'un produit par la C-UL and UL :</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 20px;"> <p>LISTED</p>  </div> <div style="text-align: center;"> <p>CL I, DIV 2 GP A,B,C,D TEMP</p> <div style="background-color: black; width: 60px; height: 20px; margin: 0 auto;"></div> </div> </div> |
| <p>To comply with C-UL and UL certification for use in hazardous locations, the following information becomes a part of the product literature for this C-UL and UL-certified industrial control product. This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only. The products having the appropriate C-UL and UL markings (that is, Class I, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the C-UL and UL or the local inspection office having jurisdiction Peripheral equipment must be suitable for the location in which it is used.</p> | <p>EPour satisfaire à la certification C-UL and UL en environnements dangereux, les informations suivantes font partie intégrante de la documentation des produits de commande industrielle certifiés. Cet équipement ne convient qu'à une utilisation dans des environnements de Classe I, Division 2, Groupes A, B, C, D ou non dangereux. Les produits portant le marquage C-UL and UL approprié (c'est-à-dire Classe I, Division 2, Groupes A, B, C, D) sont certifiés pour une utilisation avec d'autres équipements, les combinaisons d'applications et d'utilisation étant déterminées par la C-UL and UL ou le bureau local d'inspection. L'équipement périphérique doit convenir à l'emplacement d'utilisation.</p> |
| <p>Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2, location. The temperature code rating is marked on the product label as shown.</p> | <p>De par la nature modulaire des systèmes de commande programmables, le produit ayant le code de température le plus élevé détermine le code de température global du système dans un environnement de Classe I, Division 2. Le code de température est indiqué sur l'étiquette produit.</p> |
| <p>:</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 20px;"> <p>LISTED</p>  </div> <div style="text-align: center;"> <p>CL I, DIV 2 GP A,B,C,D TEMP</p> <div style="background-color: black; width: 60px; height: 20px; margin: 0 auto;"></div> <p>Look for temperature code rating here.</p> </div> </div> | <p>:</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; margin-right: 20px;"> <p>LISTED</p>  </div> <div style="text-align: center;"> <p>CL I, DIV 2 GP A,B,C,D TEMP</p> <div style="background-color: black; width: 60px; height: 20px; margin: 0 auto;"></div> <p>Le code de température est indiqué ici.</p> </div> </div> |

| | |
|---|--|
| <p>The following warnings apply to products having C-UL and UL certification for use in hazardous locations.</p> | <p>Les avertissements suivants s'appliquent aux produits ayant la certification C-UL and UL pour une utilisation dans des environnements dangereux.</p> |
| <p>Explosion Hazard Substitution of components may impair suitability for Class I, Division 2. Do not replace components unless power has been switched off or the area is known to be non-hazardous. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute. Batteries must only be changed in an area known to be non-hazardous.</p> | <p>AVERTISSEMENT : Risque d'explosion La substitution de composants peut rendre ce matériel inadapté à une utilisation en environnement de Classe I, Division 2. Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de remplacer des composants. 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 fournis par l'utilisateur pour se brancher aux circuits externes de cet appareil à l'aide de vis, loquets coulissants, connecteurs filetés ou autres, de sorte que les connexions résistent à une force de séparation de 15 Newtons (1,5 kg - 3,4 lb.) appliquée pendant au moins une minute. S'assurer que l'environnement est classé non dangereux avant de changer les piles.</p> |
| <p>C-UL and UL logo is a registered trademark of the Underwriters Laboratories.</p> | <p>Le sigle C-UL and UL est une marque déposée de la Underwriters Laboratories.</p> |

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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