



## *Installation Instructions*

# ControlLogix High Speed Analog I/O Module

Catalog Number 1756-IF4FXOF2F

To:	See page:
Obtain a User Manual	1
Identify the Module Components	6
Prevent Electrostatic Discharge	5
Note the Power Requirements	7
Install the Module	7
Key the Removable Terminal Block/Interface Module	8
Wire the Module	11
Assemble the Removable Terminal Block and the Housing	13
Install the Removable Terminal Block onto the Module	13
Check the Indicators	14
Remove the Removable Terminal Block from the Module	15
Remove the Module	15
See 1756-IF4FXOF2F Specifications	16

### Obtain a User Manual

This product also has a user manual (pub. no. 1756-UM005). To view it, visit [www.ab.com/manuals](http://www.ab.com/manuals) or [www.theautomationbookstore.com](http://www.theautomationbookstore.com).

To purchase a manual, you can:

- contact your distributor or Rockwell Automation representative
- visit [www.theautomationbookstore.com](http://www.theautomationbookstore.com) and place an order
- call 800.963.9548 (USA/Canada) or 001.320.725.1574 (outside USA/Canada)

### 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 Allen-Bradley 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, Allen-Bradley 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 Allen-Bradley 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:

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**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.

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**ATTENTION**

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

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**IMPORTANT**

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

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## 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 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.

## 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.
  - If available, use a static-safe workstation.
  - When not in use, store the equipment in appropriate static-safe packaging.
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## Removal and Insertion Under Power

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**WARNING**

When you insert or remove the module while backplane 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.

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## Identify the Module Components

You received the following components with your order:

- 1756-IF4FXOF2F module
- Removable Terminal Block (RTB) door label

If you did not receive these components, contact your local distributor Rockwell Automation sales office.

This module mounts in a ControlLogix™ chassis and uses a separately-ordered RTB or a Bulletin 1492 Interface Module (IFM) to connect all field-side wiring.

This module uses one of the following RTBs:

- 1756-TBCH 36 position Cage clamp RTB
- 1756-TBS6H 36 position Spring clamp RTB

Use an extended-depth cover (1756-TBE) for applications with heavy gauge wiring or requiring additional routing space. When using an IFM, consult the documentation that came with it to connect all wiring.

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### **IMPORTANT**

Before you install your module, you should have already:

- installed and grounded a 1756 chassis and power supply.
  - ordered and received an RTB or IFM and its components for your application.
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## Note the Power Requirements

This module receives power from the 1756 chassis power supply and requires 2 sources of power from the backplane:

- 375mA at 5.1V dc
- 100mA at 24V dc

Add this current/power value (4.3W) to the requirements of all other modules in the chassis to prevent overloading the power supply.

## Install the Module

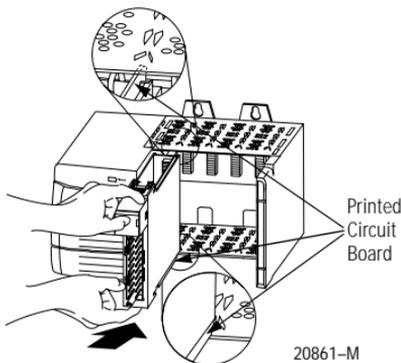
You can install or remove the module while chassis power is applied.

### WARNING

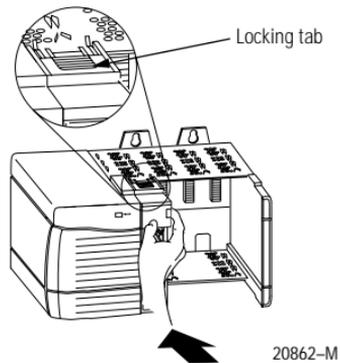


When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

1. Align circuit board with top and bottom chassis guides.



2. Slide module into chassis until module locking tabs 'click'.



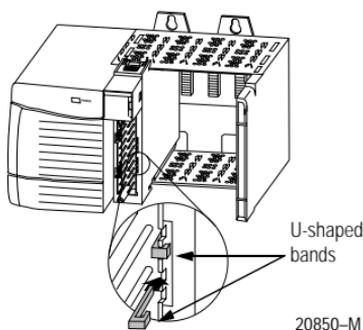
## Key the Removable Terminal Block/Interface Module

Use the wedge-shaped keying tabs and U-shaped keying bands to prevent connecting the wrong wires to your module.

Key positions on the module that correspond to unkeyed positions on the RTB. For example, if you key the first position on the module, leave the first position on the RTB unkeyed.

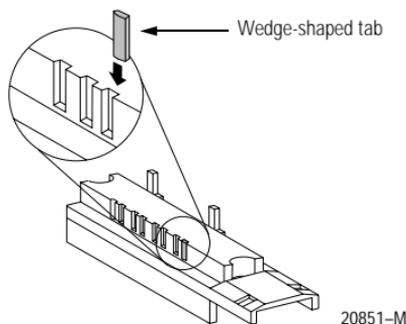
### Key the Module

1. Insert the U-shaped band as shown.
2. Push the band until it snaps in place.



### Key the RTB/IFM

1. Insert the wedge-shaped tab with rounded edge first.
2. Push the tab until it stops.



Reposition the tabs to rekey future module applications.

## Wire the Removable Terminal Block

Wire the RTB with a 1/8 inch (3.2mm) maximum flat-bladed screwdriver before installing it onto the module. Shielded cable is required when using this module.

We recommend using Belden 8761 cable to wire the RTB. The RTB terminations can accommodate 14-22 gauge shielded wire.

### WARNING



When you connect or disconnect the Removable Terminal Block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Make sure that power is removed or the area is nonhazardous before proceeding.

*Connect grounded end of the cable*

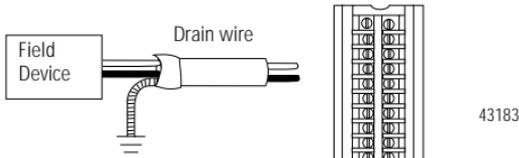
**Ground one end** of the cable only. Follow the steps below.

**1. Prepare one end of the cable for grounding.**

- a. Remove a length of cable jacket from the connecting cable.
- b. Pull the foil shield and bare drain wire from the insulated wire.
- c. Twist the foil shield and drain wire together to form a single strand.
- d. Attach a ground lug and apply heat shrink tubing to the exit area.



**2. Ground the drain wire.** We recommend grounding the drain wire at the field device as shown below.

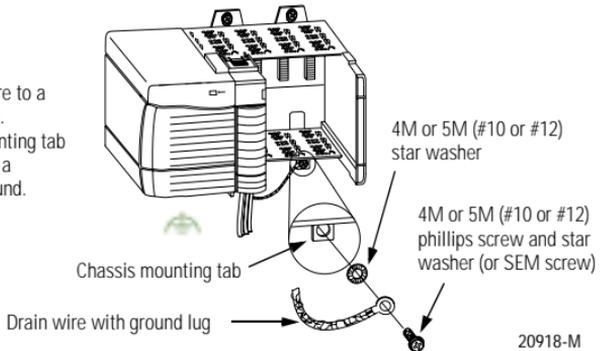


**3. Connect the insulated wires to the field device.**

If you cannot ground at the field device, follow these steps:

- 1. Prepare one end of the cable as shown in step 1.**
- 2. Ground at an earth ground on the chassis as shown below.**

Connect the drain wire to a chassis mounting tab. Use any chassis mounting tab that is designated as a functional signal ground.



**3. Connect the insulated wires to the RTB.**

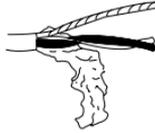
*Connect ungrounded end of the cable*

**1. Prepare the non-grounded end of the cable.**

- a. Remove a length of cable jacket from the connecting cable.



- b. Pull the foil shield and bare drain wire from the insulated wire.



- c. Cut the foil shield and drain wire back to the cable casing and apply shrink wrap, exposing only the insulated wires.



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**2. Connect the insulated wires to:**

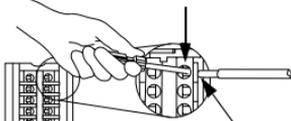
- the RTB (as shown below) if the cable is grounded at the field device.

OR

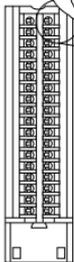
- the field device if the cable is grounded at the chassis.

**Spring Clamp RTB**

- Strip 7/16 inch (11mm) maximum length of wire.
- Insert the screwdriver into the inner hole of the RTB.



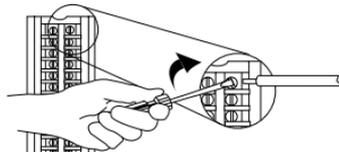
- Insert the wire into the open terminal and remove the screwdriver.



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**Cage Clamp RTB**

- Strip 3/8 inch (9.5mm) maximum length of wire.
- Insert the wire into the open terminal.
- Turn the screw clockwise to close the terminal on the wire.

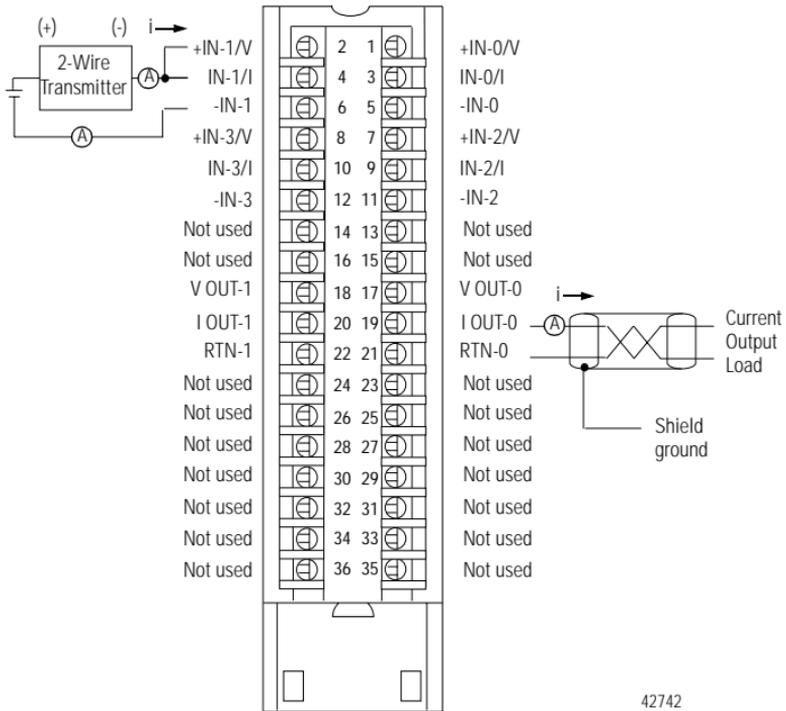


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## Wire the Module

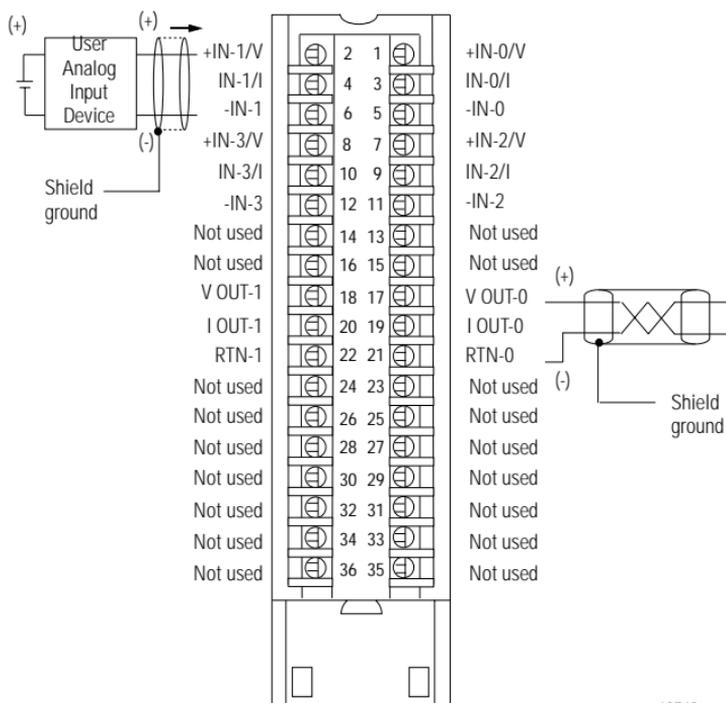
You can only connect wiring to your module through an RTB or IFM. The example below shows how to wire the module.

**1756-IF4FXOF2F Current Mode Wiring Diagram**



(A) = Inline field device (i.e. strip chart recorder or meter)

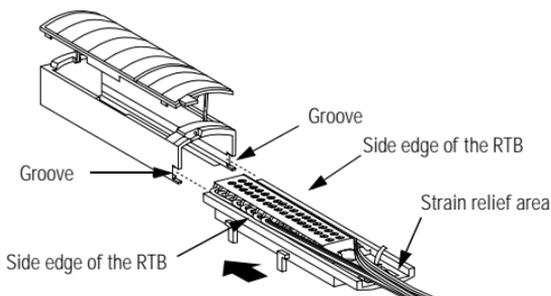
### 1756-IF4FXOF2F Voltage Mode Wiring Diagram



After completing field-side wiring, secure the wires in the strain relief area with a cable-tie.

## Assemble the Removable Terminal Block and the Housing

1. Align the grooves at the bottom of the housing with the side edges of the RTB.



2. Slide the RTB into the housing until it snaps into place. 20858-M

## Install the Removable Terminal Block onto the Module

### WARNING

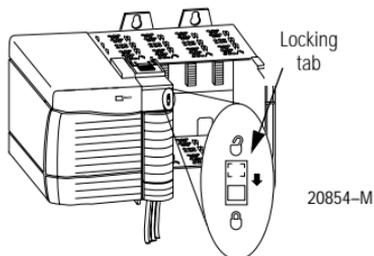
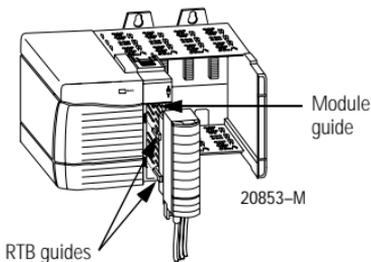


When you connect or disconnect the Removable Terminal Block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Before installing the RTB, make certain:

- field-side wiring of the RTB has been completed.
- the RTB housing is snapped into place on the RTB.
- the RTB housing door is closed.
- the locking tab at the top of the module is unlocked.

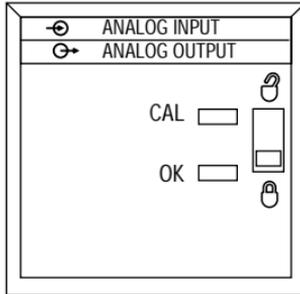
1. Align the side and top, bottom RTB guides with the side, top and bottom module guides.
2. Press quickly and evenly to seat the RTB on the module until the latches snap into place.



3. Slide the locking tab down to lock the RTB onto the module.

## Check the Indicators

The indicators show CAL status (green) and a bi-colored LED for module "OK" (red/green).



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During power up, an indicator test is done and the following occurs:

- The "OK" indicator turns red for 1 second and then turns to flashing green if it has passed the self-test.

LED indicators:	This display:	Means:	Take this action:
OK	Steady green light	The inputs and outputs are being multicast and in normal operating state.	None
OK	Flashing green light	<ol style="list-style-type: none"> <li>1. The module has passed internal diagnostics but is not actively controlled.</li> <li>2. The controller is in Program mode.</li> </ol>	<ol style="list-style-type: none"> <li>1. Configure the module with RSLogix 5000.</li> <li>2. If ready, switch the controller to Run mode.</li> </ol>
OK	Flashing red light	Previously established communication has timed out.	Check controller and chassis communication
OK	Steady red light	The module must be replaced.	Replace the module.
CAL	Flashing green light	The module is in calibration mode.	None

This completes installation of the module. Use the following information to remove the module, if necessary.

## Remove the Removable Terminal Block from the Module

If you need to remove the module, you must remove the RTB first.

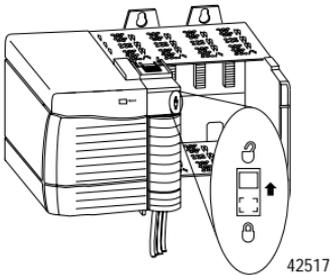
### WARNING



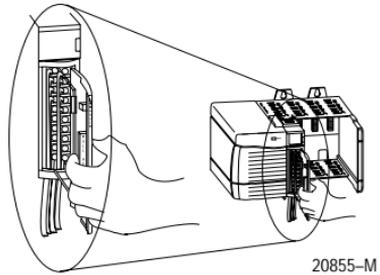
When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Before removing the module, you must remove the RTB.

1. Unlock the locking tab at the top of the module.

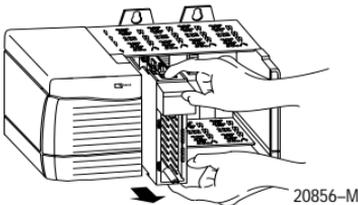


2. Open the RTB door and pull the RTB off the module.

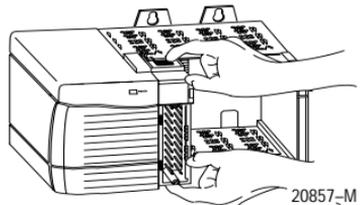


## Remove the Module

1. Push in top and bottom locking tabs.



2. Pull module out of the chassis.



## 1756-IF4FXOF2F Specifications

General Module Specifications	
Module Location	1756 ControlLogix chassis
Backplane Current (No module external power requirements)	375mA @ 5.1V dc & 100mA @ 24V dc (Total backplane power = 4.3W)
PowerDissipation within Module	4.3W voltage 4.7W current
Thermal Dissipation	14.66 BTU/hr voltage 16.02 BTU/hr current
Data Format	Floating point IEEE 32 bit
Isolation Voltage Field side to system side	Optoisolated, transformer isolated 100% tested at 2550V dc for 1s
RTB Screw Torque (NEMA)	7-9 inch-pounds (0.8-1Nm)
Module Keying (Backplane)	Electronic
RTB Keying	User defined
Field Wiring Arm and Housing	36 Position RTB (1756-TBCH or TBS6H) <sup>(1)</sup>
Conductors	Wire Size
	22-14 gauge (2mm <sup>2</sup> ) stranded <sup>(2)</sup> 3/64 inch (1.2mm) insulation maximum 2 <sup>(2)</sup>
	Category
Screwdriver Width for RTB	5/16 inch (8mm) maximum
Environmental Conditions	
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 to 60°C (32 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold) IEC 60068-2-2 (Test Bc, Un-packaged Non-operating Dry Heat) IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal) -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat) 5 to 95% non-condensing
Vibration	IEC60068-2-6 (Test Fc, Operating) 2g @ 10-500Hz

Environmental Conditions (continued)	
Shock	IEC60068-2-27:1987, Test Ea (Unpackaged shock, ES#002) Operating 15g Non-operating 30g
Emissions	CISPR 11 Group 1, Class A
ESD Immunity	IEC 61000-4-2 6kV contact discharges 15kV air discharges
Radiated RF Immunity	IEC 61000-4-3 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz
EFT/B Immunity	IEC 61000-4-4 ±4kV at 2.5kHz on power ports ±2kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5 ±2kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Certifications (where product is marked)	<ul style="list-style-type: none"> <li>UL UL Listed Industrial Control Equipment</li> <li>CSA CSA Certified Process Control Equipment</li> <li>CSA CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations</li> <li>FM FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations</li> <li>CE<sup>(3)</sup> European Union 89/336/EEC EMC Directive, compliant with: <ul style="list-style-type: none"> <li>EN 50081-2; Industrial Emissions</li> <li>EN 50082-2; Industrial Immunity</li> <li>EN 61326; Meas./Control/Lab., Industrial Requirements</li> <li>EN 61000-6-2; Industrial Immunity</li> </ul> </li> <li>C-Tick<sup>(3)</sup> Australian Radiocommunications Act, compliant with: <ul style="list-style-type: none"> <li>AS/NZS 2064; Industrial Emissions</li> </ul> </li> </ul>

<b>Input Specifications</b>	
Number of Inputs	4 differential inputs
Input Range Selections	+/- 10.5V, 0-10.5V, 0-5.25V, 0-21ma overrange indication when exceeded
Voltage Resolution +/- 10.5V range 0-10.5V range 0-5.25V range	Approximately 14 bits across +/-10.5V dc (21V total) 1.3mV/bit - 14-bit effective 1.3mV/bit - 13-bit effective 1.3mV/bit - 12-bit effective
Current Resolution 0-21ma range	Approximately 12 bits across 21mA 5.25 $\mu$ A/bit
Repeatability	$\pm$ 1 Least Significant Bit (LSB) <sup>(4)</sup>
Input Impedance	>1M $\Omega$ - voltage 249 $\Omega$ - current
Open Circuit Detection Time	Positive full scale reading within 1 second
Overvoltage Protection	30V dc - when wired for voltage operation 8V ac/dc - when wired for current operation
Common Mode Noise Rejection	70dB typical, 50/60 Hz
Accuracy at 25°C	0.05% of range immediately after calibration Better than 0.1% of range within calibration interval
Calibration Interval	12 months typical
Gain Drift with Temperature	25 ppm/degree C maximum - voltage 35 ppm/degree C maximum - current
Input Error over Full Temp. Range	0.2% of range
Minimum Scan Time for all Channels (Sample Rate)	400 $\mu$ S
Input Conversion Method	Successive approximation
<b>Output Specifications</b>	
Number of Outputs	2 voltage or current outputs
Output Range	0 - 21mA +/-10.4V
Resolution	13 bits across 21mA = 2.8 $\mu$ A/bit 14 bits across 20.8V = 1.3mV/bit
Open Circuit Detection	Current output only (Output must be set to >0.1mA)
Output Overvoltage Protection	24Vdc
Output Short Circuit Protection	Electronically current limited to 21mA or less
Drive Capability	>2000 $\Omega$ - voltage 0-750 $\Omega$ - current
Output Settling Time	<2mS to 95% of final value with resistive loads

Accuracy at 25°C Current (4mA to 21mA range) Voltage (-10.4 to +10.4V range)	0.05% of selected range immediately after calibration Better than 0.1% of range with calibration interval Better than 0.1% of range with calibration interval
Calibration Interval	12 months typical
Output Offset Drift with Temperature	50 $\mu$ V/° C typical 1 $\mu$ A/° C typical
Gain Drift with Temperature	25 ppm/degree C maximum - voltage 50 ppm/degree C maximum - current
Module Error over Full Temperature Range	0.2% of range - voltage 0.3% of range - current
Min. Scan Time for all Channels	1mS
Output Conversion Method	R-Ladder DAC, monotonicity with no missing codes

- (1) Maximum wire size will require extended housing - 1756-TBE.
- (2) Use this conductor category information for planning conductor routing as described in the system level installation manual. Refer to publication 1770-4.1 "Industrial Automation Wiring and Grounding Guidelines".
- (3) See the Product Certification link at [www.ab.com](http://www.ab.com) for Declarations of Conformity, Certificates, and other certification details.
- (4) Repeatability is defined as the stability of the input channel reading when a steady state signal is applied (i.e. +/- 1 LSB is one count [1.3mV] from the nominal reading).

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**The following information applies when operating this equipment in hazardous locations:**

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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.

**WARNING**



**EXPLOSION HAZARD**

- 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.

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## Informations sur l'utilisation de cet équipement en environnements dangereux :

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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.

### AVERTISSEMENT



### RISQUE D'EXPLOSION

- 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.

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[www.rockwellautomation.com](http://www.rockwellautomation.com)

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