Installation Instructions

GuardPLC 1753-IF8XOF4 Analog I/O Module

Catalog Number 1753-IF8XOF4

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Publication 1753-IN013A-EN-P - September 2005

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.ab.com/manuals/gi) 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: • identify a hazard • avoid a hazard • recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be dangerous temperatures.

Related Documentation

The table below provides a listing of publications that contain important information about GuardPLC Controller systems.

For	Read this document	Publication number
Detailed information regarding the safety certification of the GuardPLC System.	GuardPLC Controller Systems Safety Reference Manual	1753-RM002
Detailed information on installing, wiring, configuring, operating, maintaining, and troubleshooting GuardPLC systems.	GuardPLC Controller Systems User Manual	1753-UM001
Information on programming with RSLogix Guard PLUS! software	Using RSLogix Guard PLUS! Software with GuardPLC Controllers	1753-PM001
Information on installing GuardPLC 1600 controllers	GuardPLC 1600 Controller Installation Instructions	1753-IN001
Information on installing GuardPLC 1800 controllers	GuardPLC 1800 Controller Installation Instructions	1753-IN002
Information on installing GuardPLC 1753-IB20XOB8 Digital Input/Output Modules	GuardPLC Digital Input/Output Module	1753-IN003
Information on installing GuardPLC 1753-IB16 Digital Input Modules	GuardPLC Digital Input Module Installation Instructions	1753-IN004
Information on installing GuardPLC 1753-OB16 Digital Output Modules	GuardPLC Digital Output Module Installation Instructions	1753-IN005
Information on installing GuardPLC 1753-IB8XOB8 Digital Input/Output Modules	GuardPLC 8-Digital Inputs and 8-Digital Outputs Module Installation Instructions	1753-IN010
Information on installing GuardPLC 1753-IB16XOB8 Digital Input/Output Modules	GuardPLC16-Digital Inputs and 8-Digital Outputs Module Installation Instructions	1753-IN011
Information on installing GuardPLC 1753-OW8 Relay Output Modules	GuardPLC 8-Relay Output Module Installation Instructions	1753-IN012

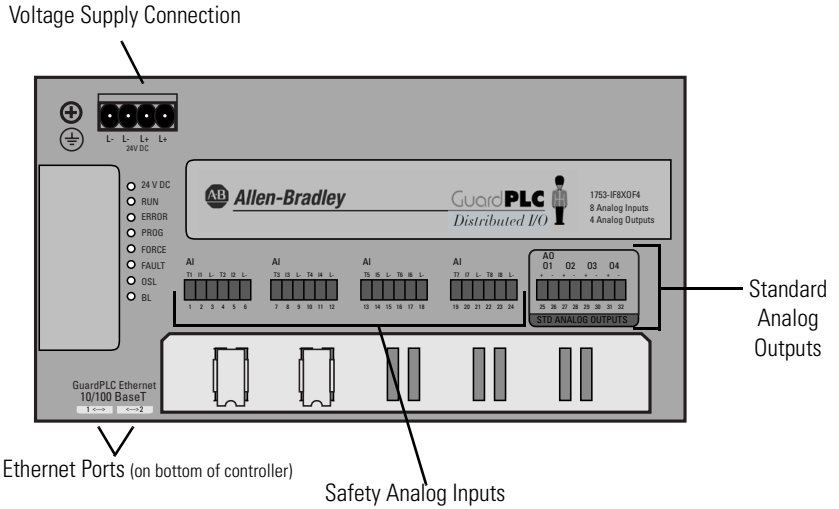
If you would like a manual, you can:

- download a free electronic version from the internet at **www.rockwellautomation.com/literature**
- purchase a printed manual by contacting your local distributor or Rockwell Automation representative)

IMPORTANT For planning information, see the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Description

The 1753-IF8XOF4 module is a distributed safety I/O module for use with GuardPLC controllers. The module features 8 safety analog inputs and 4 standard analog outputs. The module communicates with the GuardPLC controller via GuardPLC Ethernet.



General Safety

ATTENTION



Personnel responsible for the application of safety-related Programmable Electronic Systems (PES) shall be aware of the safety requirements in the application of the system and shall be trained in using the system.

Open style devices must be provided with environmental and safety protection by proper mounting in enclosures designed for specific application conditions.

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.

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 static potential.
- Wear an approved wrist-strap grounding device.
- 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.

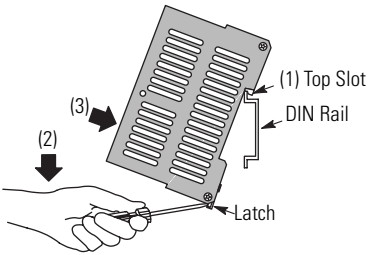
Mount the Module

IMPORTANT For effective cooling:

- Mount the module horizontally.
- Provide a gap of at least 100 mm (3.94 in.) above and below the module.
- Select a location where air flows freely or use an additional fan.
- Do not mount the module over a heating device.

The module cannot be panel-mounted. Mount the module to a DIN rail by following the steps below.

1. Hook the top slot over the DIN rail.
2. Insert a flathead screwdriver into the gap between the housing and the latch and pull the latch downward.
3. Hold the latch down as you push the housing back onto the DIN rail.
4. Release the latch to lock the module onto the rail.



TIP To remove the module from the DIN rail, insert a flathead screwdriver into the gap between the housing and the latch and pull the latch downward as you lift the module off of the rail.

IP Address Label

A transparent label shipped with the module can be used to note the IP address and system ID (SRS).

IMPORTANT If you attach the label to the module, make sure you do not cover any of the ventilation slots.

Wire the Module

Ground the Module

You must provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication number 1770-4.1.

The I/O module is functionally grounded through its DIN rail connection. A protective earth ground connection is required and is provided by a separate grounding screw, located on the upper left of the housing and marked with the grounding symbol ⏚.

ATTENTION



This product is grounded through the DIN rail to chassis ground. Use zinc plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (e.g. aluminum, plastic, etc.) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding.

Connections for Safety-Related Communications

Ethernet Switch

The module has two 10/100BaseT, RJ-45 connectors, located on the bottom of the unit, that provide communications to the GuardPLC controller via GuardPLC Ethernet. Because this is an Ethernet switch, you can daisy-chain connections from the GuardPLC to other distributed I/O blocks. The switch is auto-detect. Either cross-over or straight-through shielded Ethernet cabling can be used.

Star or line configurations are available. Make sure that a network loop is not generated. Data packets must only be able to reach a node via a single path. Ring topology is not supported.

MAC Address

The Media Access Control (MAC) Address of the module can be found on the label positioned over both lower RJ-45 connections.

Connect the Voltage Supply

The 24V dc voltage supply must feature galvanic isolation (in accordance with EN 60950 or UL 1950) since inputs and outputs are not electrically isolated from the internal processor. In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this module. A SELV supply cannot exceed 30V rms, 42.4V peak or 60V dc under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.

IMPORTANT Protect the module with a 10 A slow-blow fuse.

The supply voltage is connected via a 4-pin connector.. You only need to connect one wire to L+ and one wire to L-. Both L+ and L- terminals are internally connected, so you can daisy-chain 24V dc power from the GuardPLC to other devices in the panel using the remaining terminal. See the wire size and terminal torque specifications on page 16

ATTENTION Do not reverse the L+ and L- terminals or damage to the module will result. There is no reverse polarity protection.

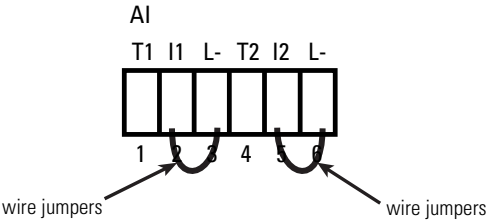


Safety Analog Inputs

The module has 8 analog inputs with sensor supplies for the unipolar measurement of voltages from 0 to 10V. A 10 kΩ shunt is used for single-ended voltage signals. With a 500 Ω shunt resistor, currents from 0 to 20 mA can also be measured.

Analog cabling should be no more than 300 m (984 ft) in length and must be shielded, twisted-pair cables for each measurement input. The shields must be connected at one end.

IMPORTANT Short-circuit unused input channels to the reference pole by connecting wire jumpers.



Analog Input Values

The following input values are available:

Input Channels	Polarity	Current or Voltage	Range	Safety Accuracy
8	unipolar	0…+10V	0…2000	2%
		0…20 mA / 4…20 mA	0…1000(1) 0…2000(2)	

(1) with external 250 Ω shunt
(2) with external 500 Ω shunt

Voltage Measurment

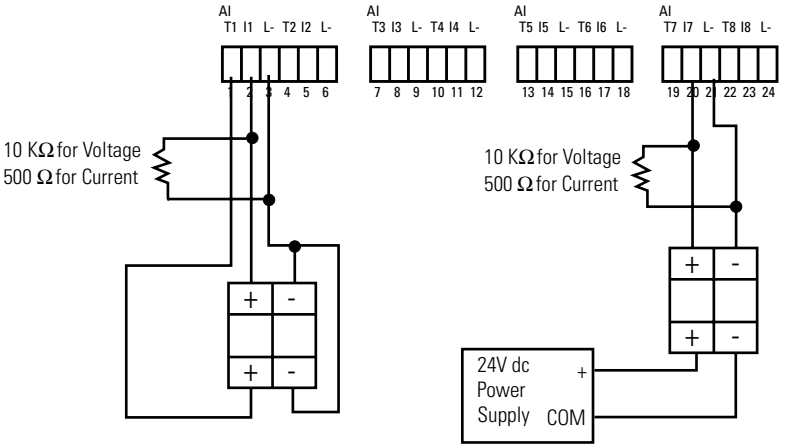
If an open-circuit fault occurs during voltage measurement, unpredictable input signals are received on the high resistance inputs. Values resulting from this fluctuating input voltage are not reliable. Because the module does not feature circuit monitoring, you must terminate input channels with a 10 kΩ resistor when measuring voltage. Consider the internal resistance of the source as well.

Current Measurement

To measure current, connect a 500 Ω external shunt in parallel to the input. Accuracy of the shunt must be included in accuracy calculations of the input signal. Terminating resistors are not required for current measurement with the external shunt connected in parallel.

Wiring Examples

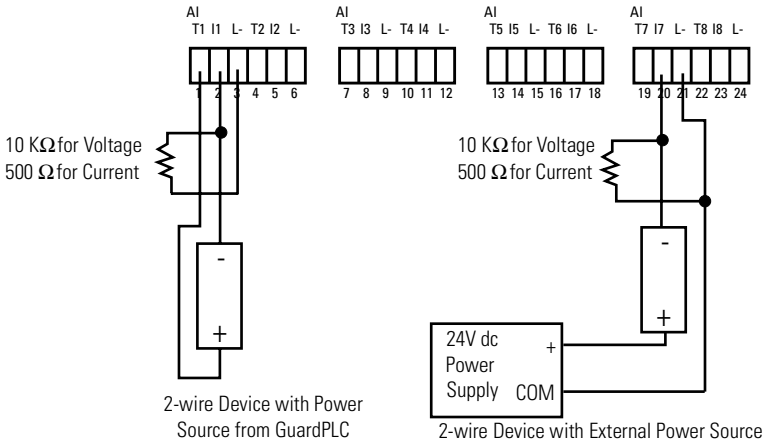
1753-IF8XOF4 with a 4-wire device:



4-wire Device with Power Source from GuardPLC

4-wire Device with External Power Source

1753-IF8XOF4 with a 2-wire device:



2-wire Device with Power Source from GuardPLC

2-wire Device with External Power Source

Analog Input Terminals

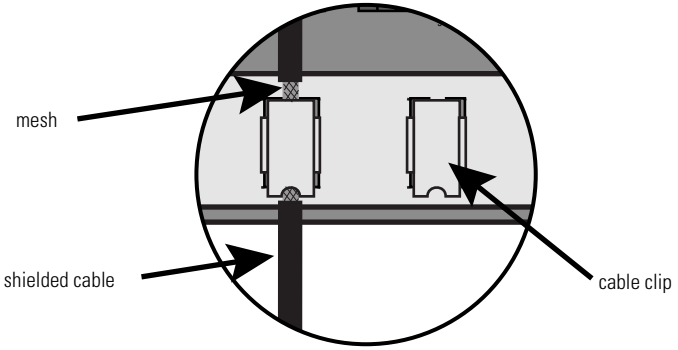
Analog inputs (AI) are connected to the following terminals:

Terminal Number	Designation	Function
1	T1	Sensor supply 1
2	I1	Analog input 1
3	L-	Reference pole input 1
4	T2	Sensor supply 2
5	I2	Analog input 2
6	L-	Reference pole input 2
7	T3	Sensor supply 3
8	I3	Analog input 3
9	L-	Reference pole input 3
10	T4	Sensor supply 4
11	I4	Analog input 4
12	L-	Reference pole input 4
13	T5	Sensor supply 5
14	I5	Analog input 5
15	L-	Reference pole input 5
16	T6	Sensor supply 6
17	I6	Analog input 6
18	L-	Reference pole input 6
19	T7	Sensor supply 7
20	I7	Analog input 7
21	L-	Reference pole input 7
22	T8	Sensor supply 8
23	I8	Analog input 8
24	L-	Reference pole input 8

Connect the Wires

See the wire size and terminal block torque specifications on page 16. The cables are connected to the front plate of the module using pluggable terminals. Shielded cabling is fed in from below so that the shielding can be connected to the shield contact plate using a clip. Remove about 2 cm (3/4 in) of the outer cable insulation so that the mesh is exposed at the point where the cable is clipped to the plate.

Position the clip over the uninsulated cable shielding and push it into the slots of the shield contact plate until it fits firmly in place, as shown below.



IMPORTANT Make sure that the mesh comes in direct contact with the shield contact plate. If the mesh does not touch the plate, the cable is not grounded.

Standard Analog Outputs

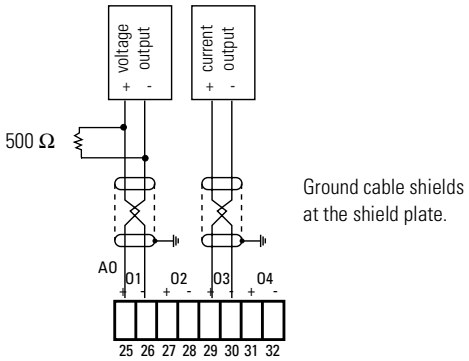
The module has 4 analog outputs, which are not safety-rated outputs. However, in the event of an internal error, they can be shut down safely through configuration via the user program.

ATTENTION To achieve SIL 3, the output values must be read back via safety analog inputs and evaluated in the RSLogix Guard PLUS! user program. Otherwise, they may not be used as safety outputs.

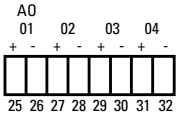
The following output values are available:

Value Range in the Application	Output Current
0	0 mA
2000	20 mA

Wiring Example



Analog Output Terminals



Analog outputs (AO) are connected to the following terminals:

Terminal Number	Designation		Function
25	O1	+	Analog output 1
26		-	Reference pole output 1
27	O2	+	Analog output 2
28		-	Reference pole output 2
29	O3	+	Analog output 3
30		-	Reference pole output 3
31	O4	+	Analog output 4
32		-	Reference pole output 4

See the wire size and terminal block torque specifications on page 16.

Reset Pushbutton

You can use the reset button if you forget the password for connecting the programming software. The pushbutton is accessible through a small round hole at the top of the housing, approximately 4 to 5 cm (1.6 to 2.0 in.) from the left rim and recessed approximately 9.5 mm (0.375 in.).

IMPORTANT Activate the reset pushbutton using an insulated pin to prevent short-circuits.

To reset, press and hold the pushbutton for 20 seconds while rebooting the device by cycling power. Pressing the Reset pushbutton during operation has no affect.

With activation of the reset button:

- All accounts are deleted except for the default account.
- IP address and system ID (SRS) are set to default values.

At the next power cycle, these settings will be restored to the last values stored into Flash. This means that either:

- the settings prior to the reset will be restored, or
- if any settings were changed after the reset, these new settings will still be in effect.

Troubleshoot with LED Indicators

Indicator	State	Condition
24V dc	On	24V dc operating voltage present.
	Off	No operating voltage.
RUN	On	This is the normal status of the module. A routine, which has been loaded into the controller, is executed. The controller processes input and output signals, carries out communication, and performs hardware and software tests.
	Flashing	The controller is in STOP mode and is not executing a routine. All system outputs are reset. STOP mode can be triggered by setting the Emergency stop system variable to TRUE in the routine, or by direct command from the programming software.
	Off	The controller is in ERROR_STOP (see ERROR).
ERROR	On	• A hardware error has been detected by the controller. The controller goes to ERROR_STOP and the execution of the routine is halted. Hardware errors are errors in the controller, errors in one or more of the digital input and output modules, or errors in the counters. • A software error in the operating system has been detected by the controller. • The watchdog has reported an error due to exceeded cycle time. All system outputs will be reset and the controller ceases all hardware and software tests. The controller can only be restarted by a command from the programming software.
	Off	No errors are detected.
PROGress	On	The upload of a new controller configuration is in progress.
	Flashing	The upload of a new operating system into the Flash ROM is in progress.
	Off	No upload of controller configuration or operating system in progress.
FORCE	On	The controller is executing a routine (RUN) and FORCE mode is activated by the user.
	Flashing	The controller is in STOP, but Forcing has been initiated and will be activated when the controller is started.
	Off	Forcing is OFF.
FAULT	On	• The routine (logic) has caused an error. • The controller configuration is faulty. • The upload of a new operating system was not successful and the operating system is corrupted.
	Flashing	An error has occurred during a Flash ROM write cycle. One or more I/O errors have occurred.
	Off	None of the above errors has occurred.

Indicator	State	Condition
OSL	Flashing	Emergency **O**perating **S**ystem **L**oader is active.
BL	Flashing	**B**oot **L**oader unable to load operating system or unable to start COMM operating system loader.

Controller status can be interrogated through the programming software. For more information, refer to the GuardPLC™ Controller Systems User Manual (1753-UM001).

Specifications

General	
Interfaces: GuardPLC Ethernet	2 x RJ-45, 10/100BaseT (with 100 Mbps) with integrated switch
Operating Voltage	24V dc, -15% to +20%, w_{ss} 15% from a power supply with protective separation, conforming to IEC 61131-2 requirements, as well as either of the following: • EN 60950 - SELV (Safety Extra Low Voltage) • EN 60204 - PELV (Protective Extra Low Voltage)
Response Time	≥ 20 ms
Battery Backup	none
Current Consumption	max. 0.8 A (with max. load), idle current 0.4 A @24V
Isolation Voltage	No isolation between circuits
Wiring Category(1)	category 2 on communications ports, signal ports, and power ports
Wire Size	I/O – 16 AWG (1.5 mm^2) to 26 AWG (0.14 mm^2) solid or stranded copper wire rated at 75 °C (167 °F) or greater with 3/64 inch (1.2 mm) insulation maximum Power – 14 AWG (2.5 mm^2) to 22 AWG (0.34 mm^2) solid or stranded copper wire rated at 75 °C (167 °F) or greater with 3/64 inch (1.2 mm) insulation maximum
Terminal Block Torque	0.51 Nm (4.5 in-lb)

Analog Inputs	
Number of Inputs	8 (not electrically isolated)
Input Signal Range, Nominal	Voltage: 0 to +10V dc Current: 0 to +20 mA[3]
Input Signal Range, Service	Voltage: -0.1 to +11V dc Current: -0.4 to +23 mA[3]
Shunt Resistor, External	500 Ω (for current input)
Impedance, Analog Input	>2 MΩ
Analog Input Signal, Source Impedance	≤500 Ω
Input Resolution	12 bits
Effective Resolution	9 bits @ 10V
Sensor Supply	selectable 26V/8.2V 200 mA, short-circuit-proof
Accuracy	0.5%
Safety Accuracy	2%
Calibration Error Zero Point	±1%
Calibration Error Terminal Point	±0.4%
Channel Error	±0.5%
Temperature Error Zero Point	±0.5%/10 K
Temperature Error Terminal Point	±0.5%/10 K
Linearity Error	±0.5%
Long-term Drift	±0.5%
Analog Outputs	
Number of Outputs	4 (not electrically isolated) non-safety with common safety switch off
Output Signal Range	4…20 mA nominal 0…20 mA full range
Resolution of Software	12 bits
Impedance, Current Output	600 Ω max.
Calibration Error Zero Point	±1%
Calibration Error Terminal Point	±1%
Channel Error	±1%
Temperature Error Zero Point	±1%/10 K
Temperature Error Terminal Point	±1%/10 K
Linearity Error	±1%

Environmental Conditions	
Storage Temperature	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): -40°C to +85°C (-40°F to +185°F) without backup battery
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°C to +60°C (+32°F to +140°F)
Vibration	IEC60068-2-6 (Test Fc, Operating): 1 g @ 10…150 Hz
Shock, Operating	IEC60068-2-27 (Test Ea, Unpackaged Shock):15 g
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 10 to 95% non-condensing
Emissions	Group 1, Class A
ESD Immunity	IEC 61000-4-2: 6 kV contact discharges 8 kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80% AM from 80 Hz to 2000 MHz
EFT/B Immunity	IEC 61000-4-4: ±2 kV @ 5 kHz on power ports ±1 kV @ 5 kHz on signal ports ±1 kV @ 5 kHz on communication ports
Surge Transient Immunity	IEC 61000-4-5: ±500V line-line (DM) and ±500 line-earth (CM) on DC power ports ±1 kV line-earth (CM) on shielded ports ±1 kV line-earth (CM) on communication ports
Conducted RF Immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz to 80 MHz
Enclosure Type Rating	meets IP20
Mechanical Dimensions	
Width	207 mm (8.16 in.) including housing screws
Height	114 mm (4.49 in.) including latch
Depth	97 mm (3.82 in.) including grounding bolt
Weight	0.95 kg (2.09 lb)

Certifications (when product is marked)[2]	
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada
CE	European Union 89/336/EEC EMC Directive, compliant with: • EN 61000-6-4; Industrial Emissions • EN 61000-6-2; Industrial Immunity
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
TÜV	TÜV Certified for Functional Safety

(1) Use this Conductor Category information for planning conductor routing. Refer to Publication 1770-4.1, *Industrial Automation Wiring and Grounding Guidelines*.

(2) See the product certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

(3) with external shunt resistor

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Publication 1753-IN013A-EN-P - September 2005 PN 40071-201-01(1)

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