

Overview

The B5 Series Toxic/Combustible Gas Detectors use various sensing technologies to detect a wide assortment of gases. These units are housed in a NEMA 4X rated plastic enclosure that will meet the most stringent applications. All models feature an internal clock, LCD Display for displaying gas concentrations and setup, LED Status Indication, integral buzzer with three user configurable relays and a number of different communication protocols for use with one of our gas controllers or your building management system. Factory calibrated sensor module replacements are available and are easily replaced in the field by removing two screws on the previous module. All units should be checked for proper functionality and calibration once the replacement sensor module is reinstalled and has had a chance to warm up. A user selectable password can be used to protect the system integrity.



Applications: Mechanical Rooms, Warehouses, Refrigeration Plants, Industrial Plants, Process Monitoring, Leak Detection, Parking Garages, Auto/Truck Maintenance Facilities, Oil and Gas Industry

 Caution	Refer to all applicable Federal, State, Provincial and Local Health and Safety laws and regulations before using these products.
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Part Numbers

N2-B5C-CO-250P-O-X

N2-B5-NO2-10P-O-X

Specifications

Fuse Protection:	0.750A Polyswitch; (Resets after fault is cleared & power to circuit is removed)
Supply Current Power Consumption:	0.3A maximum 8.4 VA
Analog Output Signals (Q5 Only):	Analog: 4-20 mA, 1 to 5 VDC or 2 to 10 VDC (All Analog Output Signals require 4-Wires)
Maximum Load Impedance:	4-20 mA Output: 600 Ohms maximum 1-5 VDC or 2-10 VDC: 3000 Ohms minimum
Communication Protocols:	B5: RS-485 Serial BACnet MS/TP (Master and Slave - Default: Master)
Communication Baud Rates:	B5: 9600, 19200, 38400, 76800 Bits/Second (Default: 38400)
Factory Calibration Range:	See Sensor Selection & Specification table
Display:	LCD Graphic Display with backlight (Displays: TWA, STEL and Concentration)
Keypad:	Three Capacitive Touch sensing keys
Relays Contact Type Relay Contact Ratings:	Three SPDT (Form C) Dry Contacts 1.0A max. @ 30 VDC or 0.3A max. @ 125 VAC (Resistive Loads)
Relay Life Expectancy:	Mechanical: 50,000,000 operations minimum @ 36,000 operations/hour Electrical: 200,000 operations minimum @ rated load
Status LEDs:	Two Green LEDs (Tx/Rx Communication Status); Three Red LEDs (Relays 1, 2, & 3)
Buzzer:	80 dB at 3.94" (10 cm), 2700 Hz (3 Programmable Tones)

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Sensor Warm Up Time:	24 Hours (Allow 24 hours before calibrating sensor after installation)
Sensor Type:	B5 = Toxic/Combustible MS/TP BACnet™ Gas Detection Transmitter with Relays and LCD Display (All gases except CO) B5C = Carbon Monoxide MS/TP BACnet™ Toxic Gas Transmitter (Certified to meet UL 2075 Requirements for Carbon Monoxide (CO) only)
Sensor Gas Types:	Combustible, Toxic Gases/Oxygen Sensor & Infrared
Coverage Area Mounting Height:	Sensor Selection & Specification table
Sensor Life Expectancy:	Electrochemical (Toxic): 2 to 3 Years, typical Oxygen/Hydrogen (Toxic): 18 months, typical Catalytic (Combustible): 3 to 5 Years, typical CO: 7 Years, typical Infrared: >5 Years
Unit Shelf Life:	Electrochemical (Toxic) Sensors: 6 months from date of purchase Catalytic (Combustible) Sensors: 1 year from date of purchase
Replacement Sensor Modules:	See additional on-line product literature or contact Carrier®
Recommended Maintenance:	Catalytic (Combustible): Accuracy & Bump test every 3 months / as required by Code Electrochemical (Toxic): Accuracy & Bump test every 6 months / as required by Code Oxygen/Hydrogen (Toxic): Calibrate every 3 months Infrared: Accuracy and Bump Test yearly
Enclosure Specifications (Material Type, Flammability, NEMA/IP Rating):	Plastic Enclosure; Polycarbonate Lexan; UL94 V-0, NEMA 4, 4X, 12 and 13 (IP66)
Enclosure Knockouts:	¾" Knockouts (accepts ½" Conduit Fittings)
Operating Temperature Humidity:	14.696 psi (1.0132 bar) +/- 10%
Operating Atmospheric Pressure¹:	32 to 68°F (0 to 20°C) 5 to 95% RH, Non-Condensing
Recommended Storage Temperature/Humidity:	De-pluggable Screw Terminal Blocks 16 to 24 AWG (0.2047 to 1.301 mm) Shielded Twisted Pair
Wiring Connections Wire Size:	Belden 9841 or Equivalent, 120 Ohms Input Impedance
Communications Cable:	0.37 ft-lb (0.502 Nm) Nominal
Terminal Block Torque Rating:	Plastic Enclosure; Polycarbonate Lexan; UL94 V-0, NEMA 4, 4X, 12 and 13 (IP66)
Approvals:	RoHS, cETL Listed, Safety requirement for Electrical Equipment for Measurement, Control & Laboratory Use Part 1: CAN/CSA-22.2 No. 61010-1 Third Edition, Dated May 11, 2012; General Requirements UL 61010-1 Third Edition, Dated May 11, 2012
Product Weight:	1.00 lbs. (0.454 kg)
Product Dimensions (L x W x H):	5.91" (150 mm) x 3.54" (90 mm) x 2.56" (65 mm)

Specifications subject to change without notice.

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Dimensional Drawing

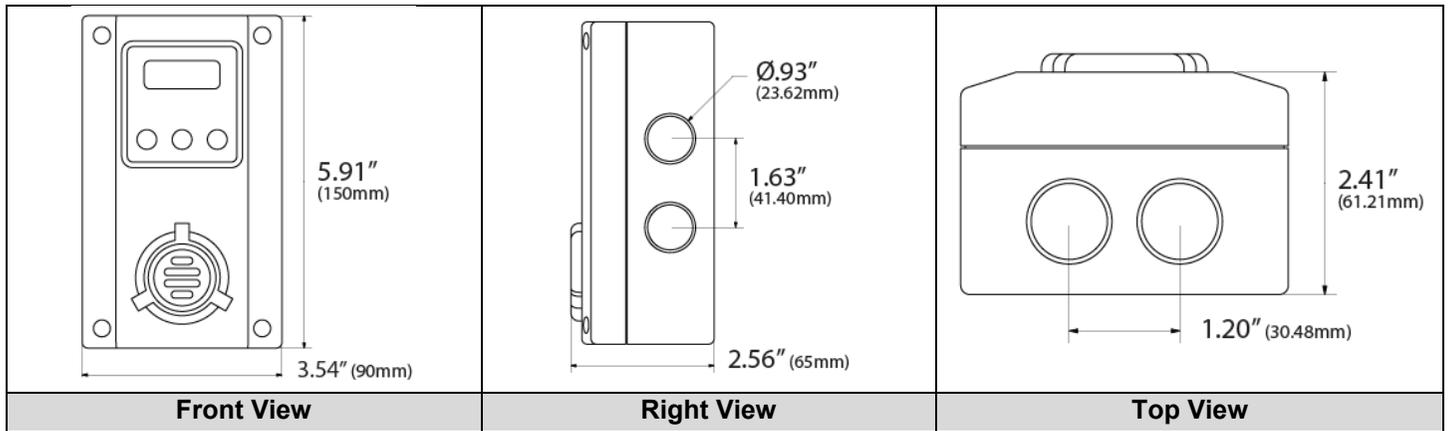


Figure 1

Sensor Selection and Specification

Gas Type	Gas Span Code	Combustible	Toxic	100% LEL ¹ in % By Vol.	Measurement Range	Operating Temp °F (°C)	Square Feet ft ₂ (m ₂)	Radius ft (m)	Mounting Height
Acetone	CH3CO-100L	✓		2.6 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Ammonia	NH3-100P		✓	N/A	0 - 100 PPM	-22 to 122 (-30 to 50)	7500 (696.7)	49 (14.9)	High **
Ammonia	NH3-1000P		✓	N/A	0 - 1000 PPM	-22 to 122 (-30 to 50)	7500 (696.7)	49 (14.9)	High **
Arsine	ASH3-1P		✓	N/A	0 - 1 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Low **
Benzene	C6H6-100L	✓		1.3 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Iso-Butane	C4H10-100L	✓		1.8 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Butanol, n-Butane	BUTAN-100L	✓		1.9 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Carbon Dioxide	CO2-5000P	Infrared	Infrared	N/A	0 - 5000 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Carbon Dioxide	CO2-5V	Infrared	Infrared	N/A	0 - 5% by Volume	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Carbon Dioxide	CO2-20V	Infrared	Infrared	N/A	0 - 20% Volume	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Carbon Dioxide	CO2-100V	Infrared	Infrared	N/A	0 - 100% Volume	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Carbon	CO-250P		✓	N/A	0 - 250 PPM	-4 to 122 (-20 to	7500	49	Mid **

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Monoxide						50)	(696.7)	(14.9)	
Carbon Monoxide	CO-1000P		✓	N/A	0 - 1000 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Chlorine	CL2-5P		✓	N/A	0 - 5 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Low **
Chlorine Dioxide	CLO2-2P		✓	N/A	0 - 2 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Low **
Combustibles* **	GENL-100L	✓		Specify Gas	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Gas Dependent
Diborane	B2H6-2P		✓	N/A	0 - 2 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Mid **
Ethylene	C2H4-100L	✓		2.7 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Mid **
Ethylene Oxide	ETO-20P		✓	N/A	0 - 20 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Low **
Germane	GEH4-2P		✓	N/A	0 - 2 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Low **
Hydrogen	H2-1000P		✓	N/A	0 - 1000 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	High **
Hydrogen	H2-2000P		✓	N/A	0 - 2000 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	High **
Hydrogen	H2-100L	✓		4.0 %	0 - 100% LEL	14 to 122 (-10 to 50)	7500 (696.7)	49 (14.9)	High **
Hydrogen Bromide	HBR-30P		✓	N/A	0 - 30 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Low **
Hydrogen Chloride	HCL-30P		✓	N/A	0 - 30 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Mid **
Hydrogen Cyanide	HCN-50P		✓	N/A	0 - 50 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Mid **
Hydrogen Sulfide	H2S-25P		✓	N/A	0 - 25 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Low **
Hydrogen Sulfide	H2S-100P		✓	N/A	0 - 100 PPM	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Methane	CH4-100L	✓		5.0 %	0 - 100% LEL	14 to 122 (-10 to 50)	7500 (696.7)	49 (14.9)	High **
Methanol	CH3OH-100L	✓		6.7 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Nitric Oxide	NO-100P		✓	N/A	0 - 100 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Mid **
Nitrogen Dioxide	NO2-10P		✓	N/A	0 - 10 PPM	-4 to 122 (-20 to 50)	7500 (696.7)	49 (14.9)	Low **
Oxygen	O2-25V		✓	N/A	0 - 25% by Vol	-22 to 122 (-30 to 50)	7500 (696.7)	40 (12.2)	Mid **
Ozone	O3-1P		✓	N/A	0 - 1 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	High **

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Iso-Pentane	C5H12-100L	✓		1.4 %	0 - 100% LEL	14 to 122 (-10 to 50)	5000 (464.5)	40 (12.2)	Low **
Phosphine	PH3-1P		✓	N/A	0 - 1 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Low **
Phosphine	PH3-5P		✓	N/A	0 - 5 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Low **
Propane	C3H8-100L	✓		2.1 %	0 - 100% LEL	14 to 122 (-10 to 50)	7500 (696.7)	49 (14.9)	High **
Silane	SiH4-50P		✓	N/A	0 - 50 PPM	-4 to 104 (-20 to 40)	5000 (464.5)	40 (12.2)	Mid **
Sulphur Dioxide	SO2-6P		✓	N/A	0 - 6 PPM	-4 to 122 (-20 to 50)	5000 (464.5)	40 (12.2)	Low **

***: Lower Explosive Limit (LEL) | **: Low = 0.5 to 1.5' (0.15 to 0.46m) above floor | Mid = 4.0 to 6.0' (1.20 to 1.83m) above floor | High = 0.5 to 1.5' (0.15 to 0.46m) below ceiling

¹When installed @ > 3000' above sea level, the gas transmitters must be verified for accuracy and re-calibrated as needed after installation

Installation

Enclosures Physical Dimensions

The enclosure is a NEMA 4 rated enclosure and can be wall mounted with 4 screws.

 <p>Caution</p>	<p>To maintain the NEMA rating, it is important that the conduit opening is sealed upon installation.</p>
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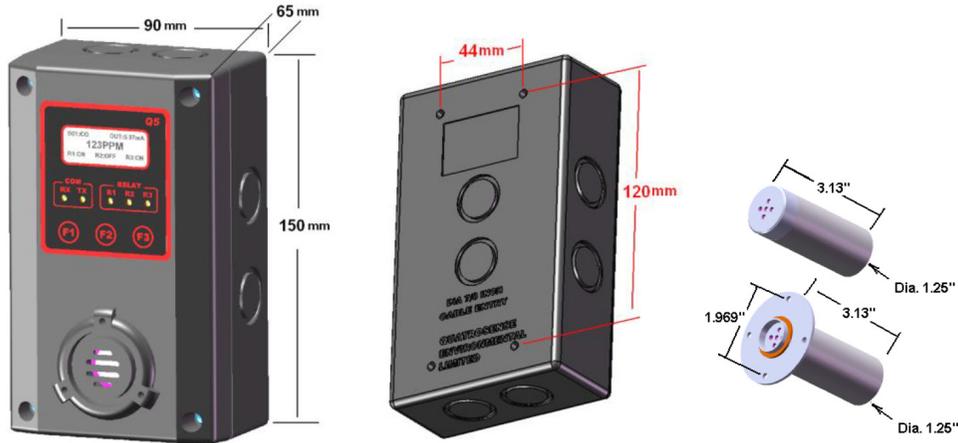


Figure 2

Terminals

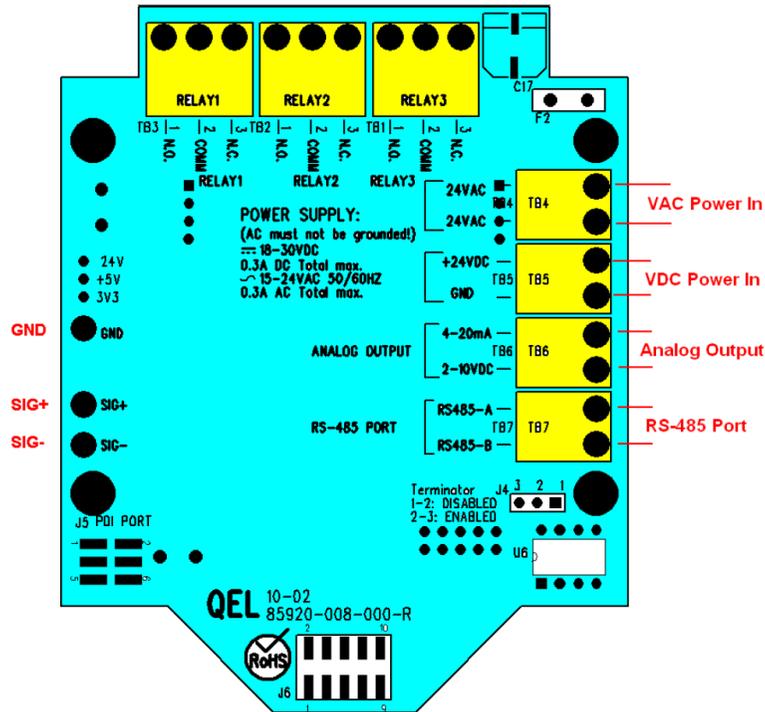


Figure 3

Wire and Cable

Terminal blocks TB1 to TB7 accept 12 AWG to 24 AWG wire. Use 16 AWG or 18 AWG wire for the power supply in long wiring runs, which can be up to 1km (1,000 meters) long.

 Tip	Carrier® recommends using BELDEN 9841 for communications. This wire has 120 ohm input impedance, which will eliminate RS-485 communication problems.
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Digital Connection

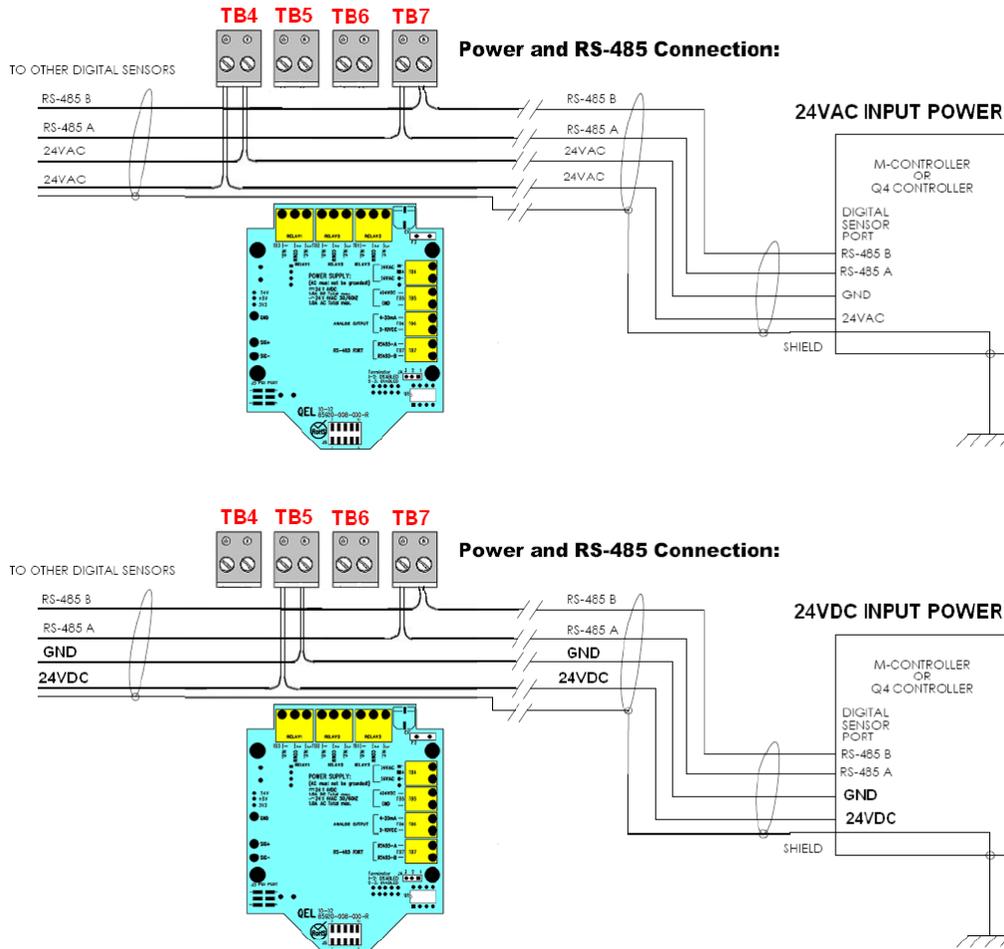


Figure 4

RS-485 Terminator

The terminator on each end of the RS485 run is designed to match the electrical impedance characteristic of the twisted pair wire, and will prevent signal echoes from corrupting the data on the line. The terminator should be enabled on BOTH ends of the RS485 run. Short and medium length Modbus/485 runs can operate without the terminating resistor. Longer runs may require the terminating resistors.

 Tip	Adding terminator dramatically increases power consumption.
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Factory default setting is disabled terminator.

The B5 supplies this resistor on the main board, and it is chosen using a jumper at J4.

- J4 1-2: Terminator Disabled / OFF (default)
- J4 2-3: Terminator Enabled / ON

RS-485 Driver Replacement

RS-485 lines in heavy industrial environments are sometimes subjected to magnetic disturbances causing sufficient inducted power surges to damage the driver integrated circuit (IC). This IC (U6) has a socket on the circuit card for ease of replacement in the field.

Relays Output

The B5 has three onboard programmable Single-Pole Double-Throw (SPDT) relays. These relays can be used to control other equipment, such as fans, lights, horns, etc. eliminating the need for a separate controller.

Three terminal blocks (TB1, TB2 and TB3) are located on the main board. Each relay can be programmed individually.

Switching capability of each relay is:

- A maximum resistive load at 30 VDC
- 0.3A maximum resistive load at 125VAC

Note for B5:

Avoid running communication wires or sensor input wires next to AC power wires or the relay output wires. These can be sources of noise that can affect signal quality.

When the B5 input power is AC, the 24VAC must not be grounded. A dedicated floating 24VAC may be needed if other nodes on the network are grounded, otherwise a DC power supply is recommended.

Certification

The B5 series has been certified to the following Standard:

Safety requirement for Electrical Equipment for Measurement, Control, and Laboratory Use

Part 1: General Requirements CAN/CSA-22.2 No. 61010-1 Third Edition, Dated May 11, 2012; And Safety Requirements for Electrical Equipment for measurement, Control, and Laboratory Use-Part 1: General Requirements UL 61010-1 Third Edition, Dated May 11, 2012.

Installation must be in accordance with ANSI/NFPA 70, National Electrical Code (NEC); the Canadian Electrical Code (CEC), Part I, CSA C22.1, and CSA C22.2 No. 0; and the Manufacturers' installation instructions

 Caution	The B5 series have not been tested for Life Safety Applications and are not to be used in Life Safety Applications in jurisdictions that require this certification.
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Appendix – Symbols Key

 Warning	Potential for death, serious injury, or permanent damage to a system.
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 Caution	Potential for injury, damage to a system, or system failure.
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 Tip	Useful information not related to injury or system damage.
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