Overview

The Metasys® system family of Field Equipment Controllers (FECs) comprises a group of versatile field controllers designed to monitor, control, and integrate a wide variety of HVAC and other building equipment. Some controllers use the BACnet®/IP communications protocol and other controllers are switchable to use either the MS/TP or N2 communications protocol. Both the BACnet/IP controllers and the field controllers in MS/TP mode are BACnet network-compliant devices. Controllers running in N2 mode can be used to maintain or modernize sites with installed legacy Johnson Controls® controllers.

The FEC family of controllers integrate into the web-based Metasys system, and include the following broad portfolio of controllers:

- Advanced Application Field Equipment Controllers (FACs)
- Field Equipment Controllers (FECs)
- Variable Air Volume Modular Assembly (VMA) VMA16 series, VMA18 series and VMA1930 controllers
- Input/Output Modules (IOMs)

The FAC, FEC, VMA16 (32-bit), VMA18, VMA1930, and IOM models feature an advanced design that provides optimum performance and easy access to power, network, and field terminations. These controllers come with 32-bit microprocessors to meet and exceed demanding industry standards. Some FEC models include an intuitive UI with an integral LCD screen and a 6-button navigation touchpad that provides enhanced local monitoring of controlled field equipment.

The embedded capabilities of the VMA18 Controller, in addition to its modular accessories, make it well suited as a replacement for legacy VMA14xx Series Controllers. VMA16 (16-bit) Series Controllers are also part of this family of controllers but cannot be configured as N2 Controllers.

For demanding environments, such as rooftop applications, extended temperature range models are available that provide accurate control over a wider operational temperature range. Look for the ET (Extended Temperature) suffix in the controller model.

Devices in the Field Equipment Controller family integrate easily with the NS Series Network Sensors, ZFR and ZFR Pro Series Wireless Field Bus Systems, and WRZ Series Wireless Sensors. The Field Equipment Controller family also supports the WRZ Series Wireless Sensors using the WRZ-78xx One-to-One Wireless Receiver. These products complement the FEC family of controllers and enable enhanced capabilities in both wired and wireless field controller network applications.

Figure 1: Metasys System Field Equipment Controllers and Accessories

A wide variety of Johnson Controls network sensor models provides options for measuring and displaying zone temperature, duct temperature, zone humidity, carbon dioxide level, setpoint adjustments, fan speed control, and discharge air temperatures.

The Wireless ZFR, ZFR Pro, and WRZ Series devices use open wireless technology standards, including Institute of Electrical and Electronic Engineers, Inc. (IEEE) 802.15.4 and meshing technology, to provide flexibility and reliability.

Features and benefits

- **Large product family**—Provides a wide range of point mix to meet application requirements and allows for the addition of one or more IOMs and Network Sensors to provide even more I/O capacity.
- **Standard hardware and software platform**—Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows; also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.
- **Universal Inputs and configurable Outputs**—Allows multiple signal options to provide input/output flexibility.
- **Auto-Tuned Control Loops**—Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.
- **Patented proportional adaptive control (P-Adaptive) and PRAC**—Provide continuous loop tuning.

- **Standard BACnet Protocol**—Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.
- **BACnet Testing Laboratories (BTL) listed and certified**—Ensures interoperability with other BTL-listed devices. BTL is a third-party agency, which validates that BAS vendor products meet the BACnet industry-standard protocol.
- **Models to support communications protocols that are switchable between BACnet MS/TP and N2**—With Controller Configuration Tool (CCT) Release 10.1 and later, FACs, FECs, and VMAs can be configured to communicate using either the BACnet MS/TP or the N2 field bus networking protocol. The operation of the IOM is not affected by the selection of the BACnet MS/TP or the N2 protocol in the host controller.
- **Models to support BACnet/IP communications**—The FAC4911 and the VMA1930 communicate over the BACnet/IP protocol. This allows more flexibility in choosing the devices for your site's network.
- **ZFR Wireless FC or SA Bus Interface**—Both the ZFR and ZFR Pro Series provide a wireless alternative to hard-wired Metasys system counterparts, offering application flexibility and mobility with minimal disruption to building occupants.
- **Bluetooth Wireless Commissioning**—Provides an easy-to-use connection to the configuration and commissioning tool.
- **Optional Local User Interface Display**—Allows convenient monitoring and adjusting capabilities at the local device.

Network diagram with Field Controllers

Figure 2: Metasys system with Field Equipment Controllers
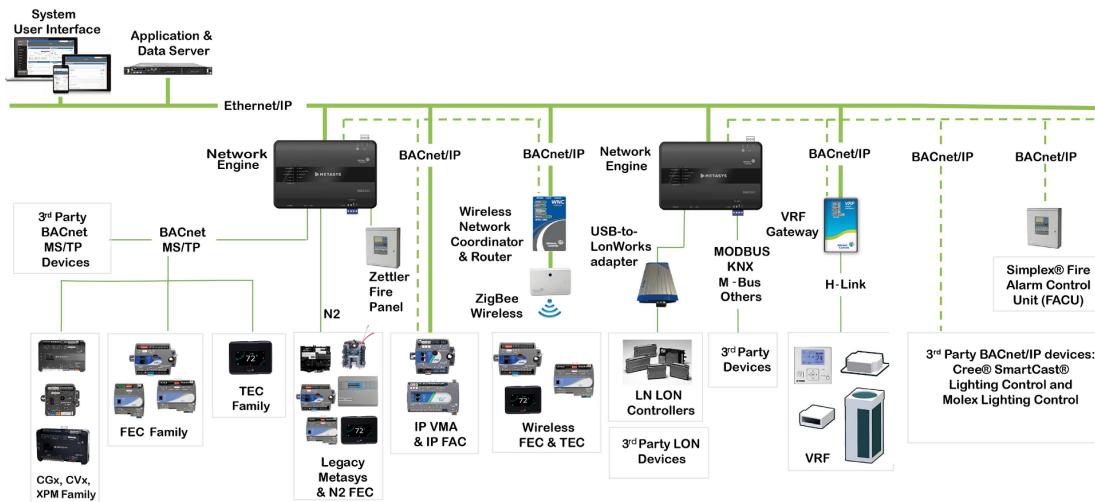
Integration to the Metasys System Supervisory Devices

The FEC family is designed to integrate seamlessly into the Metasys system by connecting to, communicating with, and being supervised by Metasys network engines (including SNE, SNC, NAE, NIE, and NCE series network

engines). This seamless integration of field controllers with Metasys delivers coordinated, system-wide control and enables building operators to monitor and adjust equipment controllers from the Metasys system UI.

In addition, service personnel can view equipment controller information locally through an optional local controller display (MS-DIS1710-0) available for equipment

controllers, or through the optional Mobile Access Portal (MAP) Gateway.

Field Equipment Controller family

The full range of FAC and FEC models combined with the IOM models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management. All controllers in the Metasys Field Equipment Controller family run pre-engineered and user-programmed applications and provide the I/O required to monitor and control a wide variety of HVAC equipment.

This large family of diverse field controllers is designed to install easily and communicate through standard RS485 BACnet MS/TP protocol or BACnet/IP protocol, which enables you to build an almost endless variety of field controller network applications, ranging from simple fan coil, heat pump, or VAV control applications to very advanced central plant management and stand-alone applications.

Metasys Field Controller features

Features and benefits common to the FAC, FEC, VMA16 Series, VMA18 Series, VMA1930, and IOM devices include the following:

- **32-bit Microprocessor**—Ensures optimum performance and meets industry specifications.
- **BACnet automatic discovery**—Supports easy controller integration into a *Metasys* BAS.
- **End-of-Line (EOL) switch in MS/TP Field Controllers** —Enables field controllers to be terminating devices on the communications bus.
- **Pluggable Communications Bus and supply power terminal blocks**—Expedites installation and troubleshooting.
- **Wireless ZFR and ZFR Pro Series Wireless Field Bus systems in MS/TP Controllers**—Enables wireless mesh connectivity to supervisory controllers, facilitating easy initial location and relocation.

Additional features and benefits common to FAC, FEC, and VMA field controllers include the following:

- **Writable Flash Memory**—Allows standard or customized applications to be downloaded from the CCT and enables persistent application data.
- **Local UI Display**—Provides enhanced local monitoring.
- **User-friendly graphic theme and clear pushbutton identification**—Facilitate easy navigation of the integral or optional UI/display.

Communications protocols

By default, the Metasys system FEC Family Controllers and network sensors communicate using the standard BACnet protocol based on the ANSI/ASHRAE 135-2008. The BACnet protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

FEC, VMA16, and VMA18 are BTL-listed as BACnet Application Specific Controllers (B-ASCs). FAC Field Controllers and the VMA1930 Field Controller are BTL-listed as BACnet Advanced Application Controllers (B-

AACs). The NS Series Sensors are BTL-listed as BACnet Smart Sensors (B-SSs).

Release 10.1 and later of the Controller Configuration Tool (CCT) can be used to switch the Field Bus communications protocol in supported FEC Family Field Controllers to be either the standard BACnet MS/TP or the N2 protocol. All new controllers use either BACnet MS/TP or BACnet/IP as the default communications protocol. Switchable communications protocols in the MS/TP models provide a cost-effective upgrade and modernization path for customers with existing N2 controllers.

The *Modernization Guide for Legacy N2 Controllers (LIT-12012005)* and the controller-specific documentation provide installation and commissioning support including tips for efficient and safe replacement. For information about mapping N2 Objects in controllers with switchable communications protocols, refer to the N2 Compatibility Options chapter of the *Controller Tool Help (LIT-12011147)*.

The N2-capable FEC Family Controllers can be used as functional replacements for legacy N2 controllers. The N2-capable FEC Family Controllers:

- have the input and output (I/O) quantities and characteristics of the FEC Family Controllers
- must be programmed with CCT
- support SA Bus devices
- support WRZ wireless sensors from the controller using the WRZ-7860 receiver (most models)
- are available in Buy American versions (most models)
- are listed for UL 864 UUKL/ORD-C100-13 UUKLC 10th Edition Smoke Control (some models). N2 is now supported as part of the *Metasys* 10th Edition listing for Smoke Control System Equipment. For details, refer to the *Metasys System UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System Technical Bulletin (LIT-12012487)*.

The N2-capable controllers:

- do not support Zone Bus (for example, TMZ sensors and M100 actuators) or XT-Bus (System 91) devices (for example, XT, XTM, and XP modules)
- do not support a wireless connection to the N2 bus
- do not support NxE passthrough

Hardware and installation

Metasys field controllers are encased in a durable plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check specific controller documentation and regional, national, and local code requirements for appropriate applications.

Metasys field controllers feature bright, color-coded LEDs, visible on the controller cover, that indicate the supply power, communications bus, and EOL switch status, as well as a variety of fault conditions to aid troubleshooting the controller and bus.

An integral EOL switch on MS/TP field controllers allows you to enable the controller as a bus terminating device, which, when properly configured, reduces reflected noise on the bus and improves bus communication.

Each MS/TP field controller has an easily accessible eight-position DIP switch that allows you to set a valid and unique device address for each field controller on the

bus. A blank space is included on the controller cover for recording the device address.

The BACnet/IP field controllers feature rotary switches to give each controller a unique number on the subnet where it resides, in order to identify it in the Controller Tool for uploading, downloading, and commissioning.

The field controllers feature removable, color-coded, keyed, and labeled terminal block plugs for the supply power and communications bus terminations. Most models have fixed, color-coded, and labeled terminal blocks for the input and output terminations, which facilitate installing and servicing the controllers.

The I/O terminations on the VMA models are spade lugs. Pluggable screw terminal blocks that connect to the I/O spade terminations are available as optional accessories.

FAC2612 models have removable, color-coded, and labeled terminal block plugs for the I/O terminations.

On FAC, FEC, and IOM Series Controllers, integral mounting clips and a DIN rail track on the controller back-plate allow you to easily mount the field controller either on a horizontal section of 35 mm DIN rail or directly to a wall or flat vertical surface.

Some FEC models have a backlit user interface display with adjustable brightness and contrast to ensure readability in low-light environments. The easy-to-use display provides convenient local monitoring and adjusting of key setpoints and control parameters. For the FAC and FEC models without a display, a stand-alone DIS1710 Local Controller Display module or MAP Gateway are available that connect directly to the SA Bus port. For details, refer to the *DIS1710 Local Controller Display Product Bulletin (LIT-12011273)* and the *Mobile Access Portal Gateway Product Bulletin (LIT-1201184)*.

Advanced Application Field Equipment controller (FAC)

The Advanced Application Field Equipment Controller (FAC) Series Controllers are programmable controllers that can communicate using BACnet/IP, MS/TP, or N2 communications protocols, depending on the model. The FAC4911 is a BACnet Advanced Application Controller (B-AAC) that communicates using BACnet/IP communications protocol. All other FAC Series controllers can be switched between MS/TP and N2 communication protocols. FAC controllers used as MS/TP devices are B-AACs with integral RS-485 MS/TP communications.

FAC Series Controllers feature an integral real-time clock. FACs support time-based tasks and maintain time-based control, which enables these field controllers to monitor and control schedules, calendars, alarms, and trends. FACs can continue time-based control and monitoring when offline for extended periods of time from a Metasys system network.

FAC Series Controllers can also operate as stand-alone controllers in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.

The FAC4911 controllers operate on BACnet/IP networks and integrate into Johnson Controls® and third-party systems.

The FAC3613 models include a fast persistence feature that allows data values to be held at a configurable value, up to once per second. Persistence refers to how often samples of data are stored locally. In the event of a problem, such as a loss of power, data can be retrieved up to the rate that the data is persisted, minimizing the potential loss of data. When power is restored, previously persisted data, up to the rate of persistence, remains available and accessible. For example, if persistence is configured for once per second, you only risk losing one second of data. Persisting data may be essential for situations that require greater data accuracy, including certain methods of utility data collection and billing.

The FAC2612 controller features line-voltage relay outputs, which makes this controller well-suited for use in terminal units. The FAC2612-2 model uses a line-voltage power supply, which eliminates the need for a 24 VAC transformer in line-voltage applications.

The FAC2611, FAC2612, and FAC3613 controllers using the MS/TP protocol support wireless communications using the ZFR or ZFR Pro Series accessories and the WRZ-7860 One-to-One Receiver.

➤ **Important:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL Smoke Control Listing.

➤ **Important:** Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a Metasys system UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/cUL Listed and labeled for this application prevents the entire system from being UL/cUL Listed for smoke control.

FAC Series model information (Including point type counts)

ⓘ **Note:** The FAC2513 is only available in certain regions. Contact your local Johnson Controls representative for more information.

Table 1: FAC Series model information (Including point type counts)

		FAC2513	FAC2611	FAC2612	FAC3613	FAC4911
Communication protocol		BACnet MS/TP, N2				BACnet/IP
Engines supported		All Model types. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.				SNC, SNE OAS, NAE and ODS at Release 9 or later.
Modular jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.				
			6-pin FC Bus for tool support			
Point types	**Signals accepted**					
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4–20 mA Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	4 Current Mode not supported	6	5	8	10
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	6	2	4	6	6
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Current Mode, 4–20 mA	2 Current Mode not supported	2		6	4
Binary Output (BO)	24 VAC Triac	2 External Power only	3		6	4
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	4	4		4
Relay Output (RO)	RO: Single-Pole, Double-Throw (SPDT) RO: Single-Pole, Single-Throw (SPST)			2 - SPDT and 3 - SPST line-voltage relays, 1/4 hp 120 VAC, 1/2 hp 240 VAC		

Field Equipment Controller (FEC)

The Field Equipment Controller (FEC) Series products are programmable controllers that can be switched between BACnet MS/TP and N2 communications protocols. When they are used as BACnet MS/TP devices, they are BACnet Application Specific Controllers (B-ASCs) with integral MS/TP communications. In N2 mode, they can be used to modernize sites with legacy Johnson Controls controllers.

FECs feature 32-bit microprocessor architecture, patented continuous tuning adaptive control, and peer-to-peer communications, and are available with an optional built-in LCD screen local UI.

A full range of FEC models combined with the Input/Output Module (IOM) models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management. All FEC Series Controllers configured for BACnet support wireless communications using the ZFR System accessories.

➤ **Important:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL Smoke Control Listing.

➤ **Important:** Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a Metasys system UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/cUL Listed and labeled for this application prevents the entire system from being UL/cUL Listed for smoke control.

FEC Series model information (Including Point Type Counts)

ⓘ **Note:** The FEC2511 is currently only available in Europe. Contact your local Johnson Controls representative for more information.

Table 2: FEC Series model information (Including Point Type Counts)

		FEC2511	FEC16	FEC26
Communication protocol		BACnet MS/TP, N2		
Engines supported		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.		
Modular jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.		
			6-pin FC Bus for tool support	
Point types	**Signals accepted**			
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC	4 (Does not support Current Mode)	2	6
	Analog Input, Current Mode, 4–20 mA (set by hardware for the FEC26, and by software for the FEC16)			
	Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2)			
	Binary Input, Dry Contact Maintained Mode			
Binary Input (BI)	Dry Contact Maintained Mode	6	1	2
	Pulse Counter/Accumulator Mode (High Speed), 100 Hz			

Table 2: FEC Series model information (Including Point Type Counts)

		FEC2511	FEC16	FEC26
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA	2 (Does not support Current Mode)		2
Binary Output (BO)	24 VAC Triac	2 (External Power Only)	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	4	4

VAV Modular Assembly (VMA) Controller Series

VMA16 (32-bit), VMA18, and VMA1930

VAV Modular Assembly Controller series

VMA16s (32-bit) and VMA18s are programmable digital controllers tailored for VAV applications that can be switched between MS/TP and N2 communications protocols. When they are used as MS/TP devices, they communicate through the BACnet® MS/TP protocol. In N2 mode, they can be used as replacements for legacy Johnson Controls® controllers. The VMA1615-xU and VMA1630-xU models are listed for UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System applications.

ⓘ **Note:** When a VMA1400 Series controller is replaced on an existing N2 network, the VMA18 Series controller is the preferred device because certain existing sensor models can be reused. VMA18 controllers are intended for use as functional replacements for the VMA1410, VMA1415, VMA1420, and VMA1440 controllers only. VMA18 controllers support field-selectable BACnet MS/TP or N2 protocols. VMA18 controllers support the N2 Open Communications protocol at a maximum rate of 9600 baud.

The VMA1930 programmable controller uses BACnet/IP networking for higher speed communication with the Controller Configuration Tool (CCT) and improved bandwidth. This gives you more flexibility in choosing controllers for your site's specific needs.

The VMA1615, VMA1630, VMA1832, and VMA1930 (32-bit) controllers feature an integral digital differential pressure transducer (DPT), an integral damper actuator, and a 32-bit microprocessor. The controllers' small package size facilitates quick field installation and efficient use of space, while not compromising high-tech control performance. These controllers easily adapt NS Series Network Sensors for zone and discharge air temperature sensing.

The VMA1626 controller is shipped with an actuator but without a differential pressure transducer (DPT), making it well suited for commercial zoning applications or for pressure-dependent VAV box applications where no DPT is required.

The VMA1656 controller is shipped without a differential pressure transducer but with an integrated actuator and ball valve linkage. These controllers are for use on the Johnson Controls VG-1000 1/2 - 1 inch valves and needs to be used primarily as a replacement for the VMA assembly of the VG-1000 Series Smart Valve product. The smart valve product line is ideal for chilled beam applications.

The VMA1628 includes a DPT but does not have an actuator. Without an actuator, this controller is well suited for controlling large VAV boxes that require more than 4 N•m of torque.

These features make the VMA16 (32-bit) controllers the product of choice for VAV systems. The wide variety of network sensor models provides options for measuring and displaying zone temperature, occupancy detection, duct temperature, zone humidity and dewpoint determination, carbon dioxide (CO_2) level, setpoint adjustments, VAV box fan speed control, and discharge air temperatures.

The VMA18 models are designed to be functional replacements for the VMA14xx Series Variable Air Volume Modular Assembly controllers. They contain a sensor actuator bus port and accessories well suited for replacing VMA14xx controllers.

➤ **Important:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL Smoke Control Listing.

➤ **Important:** Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a Metasys system UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/cUL Listed and labeled for this application prevents the entire system from being UL/cUL Listed for smoke control.

VMA16 (32-bit) features

In addition to the features and benefits listed in Metasys Field Controller features, VMA16s (32-bit) provide the following:

• Models that include an actuator feature a fast response actuator that drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time.

• Models that include a DPT feature a state-of-the-art digital non-flow DPT to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections; this pressure sensor eliminates high- and low-pressure connection mistakes.

• A phone jack-style connector on the FC Bus and SA Bus of the VMA16 supports quick connection to the Mobile Access Portal (MAP) Gateway, ZFR or ZFR Pro Series Wireless Field Bus System wireless routers, and network sensors.

• A 33 percent smaller package than the VMA16s (16-bit)

• Two additional Universal Inputs that provide more low-cost sensor options

• Available in models with or without DPT or actuator to suit your needs

VMA16 (16-bit) VAV Modular Assembly series

VMA16 (16-bit) VAV Modular Assembly controllers are programmable BACnet® Application Specific Controllers (B-ASCs) with RS-485 MS/TP communications. VMA controllers feature an integral 4 N•m damper actuator and differential pressure transducer (DPT) with models for cooling only or cooling with reheat applications and fan control.

ⓘ **Note:** These 16-bit models are available for UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System applications.
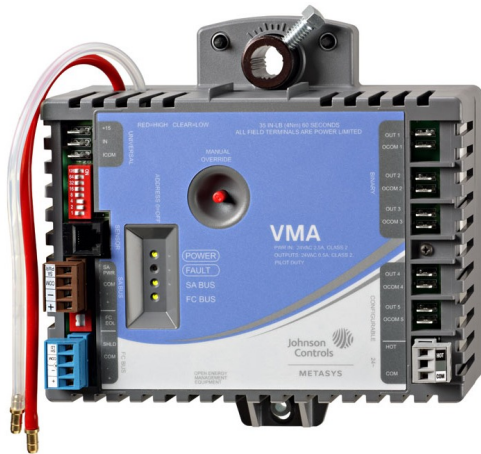
The differential pressure transducer (DPT) in the VMA16 (16-bit) controllers provides consistent flow readings with minimal drift and requires minimal auto-zero calibration. There are no filters to change, which helps to ensure very close tolerance to published accuracy.

The VMA16 (16-bit) controllers can be configured for single-duct, dual-duct, and supply/exhaust applications. Note that some of these applications may require an additional actuator and DPT.

VMA16 (16-bit) controllers support NS and WRZ Series Communicating Network Sensors for temperature sensing, fan override, and occupancy override control.

➤ **Important:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL Smoke Control Listing.

➤ **Important:** Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a Metasys system UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/cUL Listed and labeled for this application prevents the entire system from being UL/cUL Listed for smoke control.

Figure 3: VMA16 (16-bit) Controller

VMA16 (16-bit) Features

In addition to the features and benefits listed in Metasys Field Controller features, VMAs (16-bit) provide the following:

- **Integrated Differential Pressure Transducer (DPT) sensor and actuator**—Reduces installation time.

- **Fast response actuator**—Drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time.
- **Expandable point capacity**—Allows for additional Input/Output Modules (IOMs) on the Sensor/Actuator (SA) Bus, providing further application flexibility.

VMA installation

Field mounting the VMA16 controllers is straightforward. The VMA16 controllers require minimal wiring and are mounted to the terminal box using a single sheet metal screw and a single set screw to lock the actuator to the damper shaft. The set screw has a self-locking cup point end to resist loosening due to vibration.

The actuator coupling is serrated, providing additional damper shaft grip and minimizing shaft slippage during operation. The coupling accommodates shafts from 10 mm (3/8 in.) square and up to 13 mm (1/2 in.) diameter round. A gear release lever allows easy resetting of the damper to fully open or fully closed.

The housing dimensions of the VMA16 controllers meet industry mounting requirements and make the controllers easy to handle.

The controller address can be unique for each VMA using the DIP switches that are accessible through the VMA controller housing.

VMA16 (32-bit) series, VMA18 series, and VMA1930 model information (Including point type counts)

ⓘ **Note:** The VMA1617 and VMA1632 models are currently only available in Asia. Contact your local Johnson Controls representative for more information.

Table 3: VMA16 (32-bit) Series and VMA1930 information (Including point type counts per model)

		VMA 1615	VMA 1626	VMA 1628	VMA 1630	VMA 1656	VMA 1930	VMA 1617	VMA 1632
Communication protocol		BACnet MS/TP, N2					BACnet/IP	BACnet MS/TP, N2	
Engines supported		All Model types					SNE, SNC, OAS. NAEs and ODS at R9.0 or greater.	All Model types	
Modular jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.						8-pin SA Bus supports analog non-communicating sensor (port labeled TSTAT)	
		6-pin FC Bus for tool support							
Point types	**Signals accepted**								

Table 3: VMA16 (32-bit) Series and VMA1930 information (Including point type counts per model)

		VMA 1615	VMA 1626	VMA 1628	VMA 1630	VMA 1656	VMA 1930	VMA 1617	VMA 1632
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	3	3	3	3	3	3	3
Binary Output (BO)	24 VAC Triac	2	3	3	3	3	3	2	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	2	2		2	2		2
Integrated Actuator	Internal	1	1		1	1 with ball valve linkage	1	1	1
Differential Pressure Transducer	Internal	1		1	1		1	1	1
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and IOM series expansion I/O modules and up to 4 NS series network sensors.	Up to 4 NS Series Network Zone Sensors Up to 9 WRZ sensors when using the ZFR or ZFR Pro Series wireless router configuration and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration							

Table 4: VMA18 Series information (Including point type counts per model)

		VMA1826	VMA1832
Communication protocol		BACnet MS/TP, N2	
Engines supported		All model types	
Modular jacks		8-pin SA Bus supports analog non-communicating sensor	
Point types	**Signals accepted**		
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	3
Binary Output (BO)	24 VAC Triac	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	2

Table 4: VMA18 Series information (Including point type counts per model)

		VMA1826	VMA1832
Integrated Actuator	Internal	1	1
Differential Pressure Transducer	Internal		1
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and IOM series expansion I/O modules and up to 4 NS series network sensors.	Up to 4 NS Series Network Zone Sensors Up to 9 WRZ sensors when using the ZFR or ZFR Pro Series wireless router configurations and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration	

VMA16 (16-bit) series model information (Including point type counts)

Table 5: VMA16 (16-bit) series information (Including point type counts per model) (For Smoke Control applications only)

		VMA1610-0U and -1U	VMA1620-0U and -1U
Communication protocol	BACnet MS/TP		
Engines supported	MS-NAE5510-1U, MS-NAE5510-2U, MS-NAE4510-2U, MS-NAE3510-2U, MS-NCE2560-0U		
Point types	**Signals accepted**		
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	1	1
Binary Output (BO)	24 VAC Triac		3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac		2
Integrated Actuator	Internal	1	1
Integrated Flow Sensor	Internal	1	1

Input/Output Module (IOM)

The IOM Series expansion I/O modules have integral RS-485 MS/TP communications and integrate into the web-based Metasys system. IOMs can serve in one of two capacities, depending on where they are installed in the Metasys system. When installed on the Sensor/Actuator (SA) Bus of an Advanced Application Field Equipment Controller (FAC), Field Equipment Controller (FEC), or VAV Modular Assembly (VMA) controller, the IOM expands the point count of these controllers. When installed on the Field Controller (FC) Bus, IOMs can be used as I/O point multiplexors to support monitoring and control from a Network Automation Engine (SNE) or Network Control Engine (SNC). The point multiplexor can also be useful for sharing points between other field controllers on the FC Bus using peer-to-peer connectivity.

ⓘ **Note:** At Controller Configuration Tool (CCT) Release 10.1 and later, FACs, FECs, and VMAs can communicate by using either the BACnet or the N2 field bus networking protocol. The operation of the IOM Input/Output Module is not affected by the selection of the BACnet or the N2 protocol in the host controller.

All IOM expansion modules are BACnet Testing Laboratory (BTL) listed and certified. Refer to Table 21 for details.

◆ **Important:** You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

◆ **Important:** Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a Metasys System UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/ULC Listed and labeled for this application prevents the entire system from being UL/ULC Listed for smoke control.

IOM features

In addition to the features and benefits listed in Metasys Field Controller features, IOMs provide the following:

- **Ability to reside on the FC Bus or SA Bus**—Provides application flexibility.

IOM series model information (Including point type counts)

ⓘ **Note:** The IOM2723, IOM3723, and IOM3733 models are only available in certain regions. Contact your local Johnson Controls representative for more information.

Table 6: IOM series model information (Including point type counts)

		IOM 1711	IOM 2711	IOM 2721	IOM 3711	IOM 3721	IOM 3731	IOM 4711	IOM 2723	IOM 3723	IOM 3733
Communication protocol		BACnet MS/TP									
Engines supported		All Model types.									
Modular jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.									
		6-pin FC Bus for tool support									
Point types	**Signals accepted**										
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4–20 mA Analog Input, Resistive Mode, 0–2 kOhm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode		2	8	4			6	8		
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	4				16	8	2		16	8

Table 6: IOM series model information (Including point type counts)

		IOM 1711	IOM 2711	IOM 2721	IOM 3711	IOM 3721	IOM 3731	IOM 4711	IOM 2723	IOM 3723	IOM 3733
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA			2				2	2		
Binary Output (BO)[1]	24 VAC Triac						8	3			8
Universal Output (UO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC/DC Field-Effect Transistor (FET) Analog Output, Current Mode, 4–20 mA	2			4						
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac							4			
Relay Output (RO) (-0 models only)	120/240 VAC		2		4						
Relay Output (RO) (-2 models only)	240 VAC		2		4						

1   The BOs on the MS-IOM3733-0 model requires an external low-voltage power source.

Panel and sub-panel assembly options

FAC and FEC field controllers, and IOM expansion modules are also available in pre-wired panels and sub-panel assemblies. The panelized controller options provide all of the controllers necessary for a complete application solution, including a pre-wired power source and a latching or lockable door.

Controller Configuration Tool (CCT)

The CCT is used in conjunction with the Metasys system to configure, simulate, and commission the FEC family of controllers.

Configuration mode allows you to select a number of mechanical and control logic options through System Selection Trees for typical air handling, terminal unit, VAV box, and central plant mechanical systems. When required, you can customize the standard logic provided by the system selection process to meet your specialized control logic requirements. Configuration mode also allows you to customize certain display options available to Field Equipment Controllers that use a local controller display (Figure 4).

Figure 4: Mechanical Selection in CCT
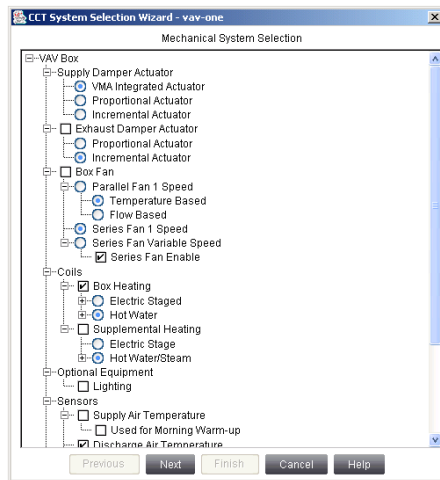
Simulation mode allows you to review, run, or simulate the application logic as if you were commissioning a live system. You can make adjustments to setpoints, inputs, or sensors during a simulation session to validate the logic before assigning the configuration to a specific controller.

Commissioning mode manages the downloading of files to the field equipment controllers through multiple network connection points. You can connect using the MAP Gateway or N2 Field Bus, or using the Ethernet Passthru mode in conjunction with the SCT through a SNE or SNC.

ⓘ **Note:** Ethernet Passthru is not available on controllers configured for N2 communications.

After downloading the controllers, you can use the CCT Commissioning mode to validate the sensor and control point interfaces and adjust key setpoints and setup parameters (Figure 5).

CCT includes integrated productivity features with utilities to facilitate mass application uploads and downloads, including upgrades of entire trunks of controllers with just a few mouse clicks. Template files provide an intuitive method of reading and writing configuration parameters to multiple controllers, reducing the time it takes to commission your field controller networks.

For VAV applications, CCT features an optional box flow test to automatically exercise all the VAV boxes to ensure correct mechanical installation and proper configuration of the key flow setup parameters. Additionally, the Metasys system provides multiple configurations of room network sensors and a handheld VAV balancing tool that can be used to perform VAV balancing tasks.

In addition, the Commissioning wizard has a Balancer tab for VAV applications to easily auto-calibrate VAV boxes and set flow constants in one location.

A Commissioning-mode-only version of the CCT software is available to the Johnson Controls branch offices for jobs or individuals that require only commissioning tasks (for example, balancing contractors). The Configuration and Simulation modes are disabled in the CCT Commissioning software.

Figure 5: CCT User Interface
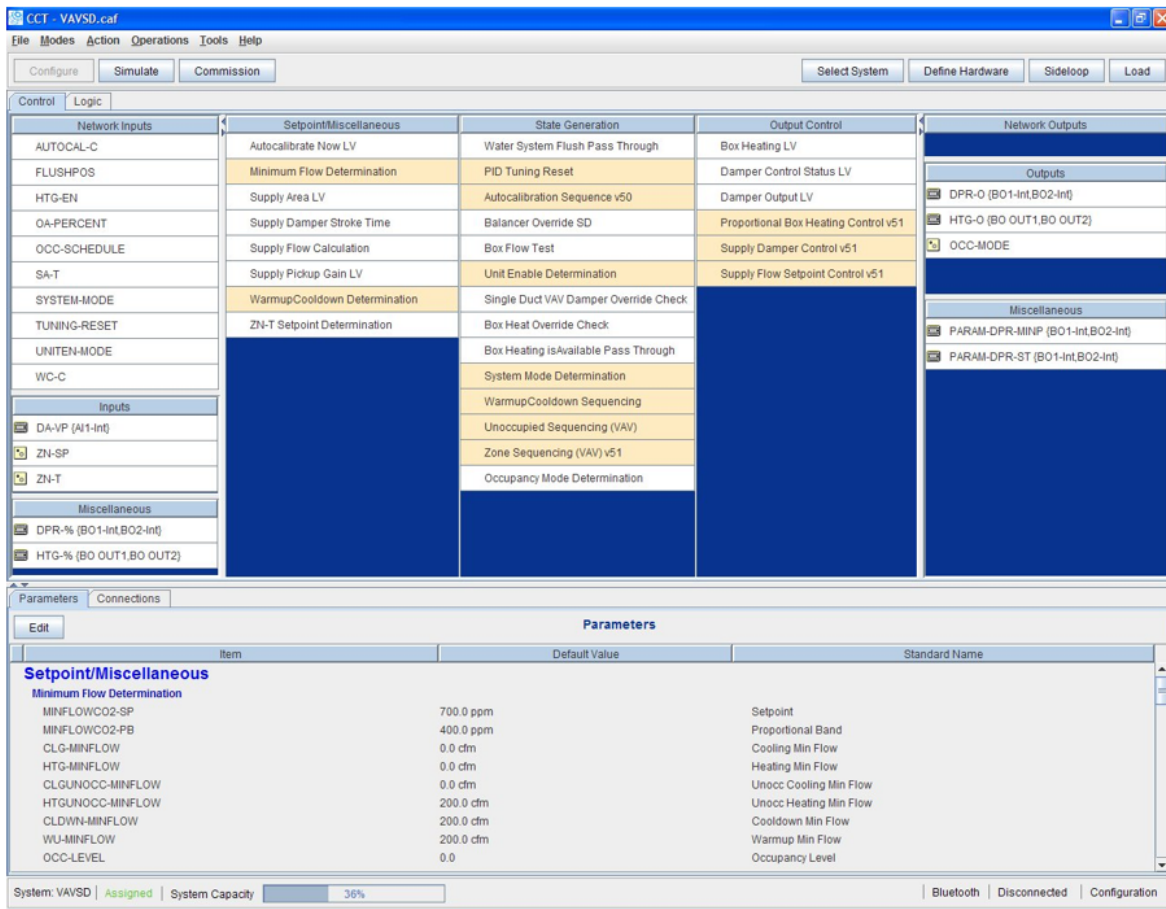
CCT features

- Capability to customize standard control system logic that is created from simple system selection trees
- Consistent user interface across the Configuration, Simulation, and Commissioning modes
- Flexible connection capabilities for loading and commissioning controllers

Mobile Access Portal (MAP) Gateway

The MAP Gateway is a pocket-sized web server that provides a wireless mobile user interface to SMART Equipment and Johnson Controls branded system controllers and thermostats. Small, lightweight, and easy to use, the MAP Gateway joins the rapidly expanding list of Johnson Controls products that leverage the power of mobility and smart devices to improve daily operations.

The MAP Gateway can be used to access field bus devices on Metasys systems, Facility Explorer® systems, and SMART Equipment rooftop units (RTUs) with unit control boards (UCBs). The MAP Gateway supports Johnson Controls branded Field Controllers, including FAC, FEC, and VMA Series devices. It also supports the TEC3000 Series Thermostats. Offering many-to-one, multi-client connectivity, the MAP Gateway provides access to any SMART Equipment device that is on a connected BACnet MS/TP field bus. The MAP Gateway solution is conveniently sized and has a built-in wireless access point. The MAP Gateway provides an intuitive, browser-based user interface to access advanced features like alarms and point configuration.

The MAP Gateway at Release 4.2 or later can be used to commission the BACnet/IP field controllers, the FAC4911 and VMA1930, when directly connected to them using their SA bus sensor port or through a thermostat connected on the same port.

For more information about the MAP Gateway, refer to the *Mobile Access Portal Gateway Product Bulletin (LIT-12011884)*.

Figure 6: MAP Gateway

Figure 7: Handheld VAV Balancing Tool

Handheld VAV Balancing Tool features

The Handheld VAV Balancing Tool provides the following features:

- Allows VAV balancing and commissioning without a laptop
- Connects directly to the controller or the controller NS Series Network Sensor through standard RJ-12 plug
- Intuitive, menu-driven operation simplifies balancing tasks

ⓘ **Note:** All of the balancing features are built in to MAP at release 5.0

Network Sensors

The NS Series Network Sensor offering includes NS Series Network Zone Sensors and NS Series Network Discharge Air Sensors.

Handheld VAV Balancing Tool

The Handheld VAV Balancing Tool lets you set the parameters for VAV applications that reside on Metasys system VMA16 Series, VMA1930, Field Equipment Controller (FEC) Series, Advanced Application Field Equipment Controller (FAC) Series Controllers, General Purpose Application Controllers (CGM) or VAV Box Controllers (CVM).

The VAV balancing parameters appear on the tool's LCD. A dial and two buttons let you navigate through intuitive menus to balance the VAV box. The menus are customized to the type of application residing in the controller. The balancing operation features an adjustable time-out parameter that returns the tool and controller to normal operation if you leave the controller in balancing mode.

The Handheld VAV Balancing Tool is lightweight and portable. You can access the VAV controller by plugging the tool into most network sensor models.

The Handheld VAV Balancing Tool is compatible with the following Metasys system field equipment controllers:

- FAC or FEC loaded with a VAV application
- CGM or CVM loaded with a VAV application
- VMA16 or VMA1930 loaded with a VAV application
- NS Series Network Sensor connected to an FAC, FEC, or VMA16, or VMA1930 loaded with a VAV application

Figure 8: Network Zone Sensors and Discharge Air Sensors

The NS Series Network Zone Sensors are designed to function directly with the Metasys system family of FEC field controllers. Several models of network zone sensors monitor room temperature. Options are available to also monitor zone humidity, carbon dioxide (CO_2), local temperature setpoint adjustments, and other variables. This data is transmitted to a field controller on the SA Bus.

The NS Series Network Zone Sensors include models with a temperature setpoint dial and LCD that allows occupants to view the zone temperature and view and adjust the zone temperature setpoint. A fan mode pushbutton is included to set the desired fan speed (AUTO-OFF-low-medium-high). An occupancy override function allows the user to signal the controller that the zone is occupied to override the scheduled mode. Some models have DIP switches to set a unique address for applications that require multiple sensors.

For communication wiring flexibility, the wires connecting the network zone sensor to a controller can be terminated using either a modular jack or screw terminals.

Most network zone sensors include an SA Bus access port to allow accessories to access the SA Bus. This plug allows accessories to service or commission the connected controller or gain access to any other controller on the same FC Bus.

The NS Series Network Discharge Air Sensors are electronic duct sensors designed to function directly with the Johnson Controls FEC family of digital controllers in HVAC systems. Models in this series monitor the duct temperature, typically at the discharge of the VAV box, and transmit this data to an FAC, FEC, VMA16, VMA1930, or an SNC on the SA Bus using the 10 ft (305 cm) wiring lead included with the unit. The 10 ft (305 cm) wiring lead consists of four 22 AWG trade size color-coded wires encased in a plenum-rated jacket. Each of the wires is stripped and tinned for easy connection to the SA Bus screw terminal block.

The NS Series Network Discharge Air Sensors are available with either a 4 or 8 in. (102 or 203 mm) temperature probe. All models include DIP switches for applications requiring multiple discharge air sensors, each with a unique DIP switch address.

VMA18 can be used with the following sensors and receivers:

• NS Series Network sensors
• WRZ Series wireless sensors
• WRZ78xx Series One-to-One wireless receiver

When using the VMA18 as a replacement for an existing VMA1400, VMA18 is able to reuse the following existing sensors:

• TE-6xxx Series
• TE-700 Series
• TE-730 Series

ⓘ **Note:** VMA18 is not able to reuse existing TMZ1600 Series sensors and requires replacement of the TMZ with a new sensor.

For important product application information, ordering information, and technical specifications, refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)*.

WRG1830/ZFR183x Pro Series Wireless Field Bus System

The WRG1830/ZFR183x Pro (ZFR Pro2) Series Wireless Field Bus System provides a wireless platform and an IP interface for BACnet MS/TP Metasys FEC and TEC3000 Thermostat Controller (TEC) family controllers using BACnet® protocol over 2.4 GHz wireless ISM band.

The pairing of a ZFR1823 router and a BACnet MS/TP FEC family device, or a wireless TEC3xxx model (with built-in router), are referred to as Wireless-Enabled Field Controllers (WEFCs).

Figure 9: ZFR Pro Wireless Field Bus Devices

A ZFR183x Pro Series system consists of the following devices:

- Up to 8 Wireless Network Coordinators (WNC) Gateways per network engine
- Up to 35 Wireless Enabled Field Controllers (WEFCs) per coordinator
- Up to 100 WEFCs per field bus, depending on the network engine
- Up to 9 WRZ Sensors per FEC or VMA16 field controllers
- Additional ZFR183x Wireless Field Bus Router-Repeaters connected as required, acting as repeaters

ⓘ **Note:** Repeaters extend the wireless transmission distance of the BACnet data communications, fill any gaps within the wireless mesh network, and provide alternate wireless data transmission pathways.

Together, these components create a wireless mesh network that allows the exchange of data between the collection of WRG Gateways, WEFCs, TEC3000s, and WRZs within the ZFR183x Pro Series system's wireless network and a network engine, using standard BACnet/IP communications.

➤ **Important:** You cannot intermix the WRG1830/ZFR183x Pro Series Wireless Field Bus System components with the earlier ZFR1800 and WNC1800/ZFR182x Pro Series Wireless Systems. The system is not backwards compatible. However, it can coexist with the ZFR1800 and WNC1800/ZFR182x Pro Series Wireless Systems when you install the system under the same supervisor, such as a network engine.

For more information about the WRG1830/ZFR183x Pro Series Wireless Field Bus System, please refer to the *WRG1830/ZFR183x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12013553)*

Ordering Information

Contact your Johnson Controls representative to order *Metasys* field controllers and related products. See FAC series ordering information, FEC series ordering information, VMA16 (32-bit), VMA18 series, and VMA1930 ordering information, and IOM series ordering information for product code numbers and product descriptions.

For product code numbers and descriptions of field controllers used in smoke control applications, see FAC series Smoke Control ordering information, FEC series for Smoke Control ordering information, VMA16 series (32-bit) for Smoke Control ordering information, VMA16 series (16-bit) for Smoke Control ordering information and IOM series for Smoke Control ordering information.

FAC series ordering information

Table 7: FAC series ordering information

Product code number	Description
MS-FAC2513-0	16-Point Advanced Application Field Equipment Controller with 4 UI, 6 BI, 2 CO, 2 BO, and 2 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock ⓘ **Note:** This model is only available in certain regions. Contact your local Johnson Controls representative for more information.
MS-FAC2611-0	17-Point Advanced Application Field Equipment Controller with 6 UI, 2 BI, 4 CO, 3 BO, and 2 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC2612-1	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, 2 SPDT and 3 SPST Line-Voltage ROs 1/4 hp 120 VAC, 1/2 hp 240 VAC; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock;
MS-FAC2612-2	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, 2 SPDT and 3 SPST Line-Voltage ROs, 1/4 hp 120 VAC, 1/2 hp 240 VAC; 100–240 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC3613-0	26-Point Advanced Application Field Equipment Controller with 8 UI, 6 BI, 6 BO, and 6 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock; Fast Persistence
MS-FAC4911-0	28-Point Advanced Application Field Equipment Controller with 10 UI, 6 BI, 4 BO, 4 AO, and 4 CO; 24 VAC; SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Communications

FAC series Smoke Control ordering information

Table 8: FAC series for Smoke Control ordering information

Product code number	Description
MS-FAC2611-0U	17-Point Advanced Application Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC, MS/TP (FC) Bus, SA Bus, integral real-time clock
MS-FAC2612-1U	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, 2 SPDR RO, and 3 SPST RO; 24 VAC, MS/TP (FC) Bus, SA Bus, integral real-time clock

ⓘ **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.

ⓘ **Note:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL Smoke Control Listing.

FEC series ordering information

Table 9: FEC series ordering information

Product code number	Description
MS-FEC1611-1	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC1611-1ET	10-Point Field Equipment Controller Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
MS-FEC1621-1	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touchpad
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC2611-0ET	FEC2611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touchpad

FEC series for Smoke Control ordering information

Table 10: FEC series for Smoke Control ordering information

Product code number	Description
MS-FEC1611-1U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC, FC and SA Bus, with Mounting Base
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; with Mounting Base
MS-FEC2611-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC, FC and SA Bus, with Mounting Base
MS-FEC2621-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touchpad
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; with Mounting Base

ⓘ **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.

ⓘ **Note:** All field controllers in a smoke control system must be mounted in Johnson Controls custom or standard UL 864 panels or in panels that are ordered from Johnson Controls. If these field controllers are used with panels that are not supplied by Johnson Controls, they are not compliant with the UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

VMA16 (32-bit), VMA18 series, and VMA1930 ordering information

Table 11: VMA16 (32-bit), VMA18 and VMA1930 series ordering information

Product code number	Description
MS-VMA1615-1	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus
MS-VMA1617-1	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus, includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors ⓘ **Note:** This model is currently only available in Asia. Contact your local Johnson Controls representative for more information.
MS-VMA1626-1	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus; (No DPT)
MS-VMA1628-1	32-bit, Integrated VAV Controller and DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No Actuator)
MS-VMA1630-1	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus
MS-VMA1632-1	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors ⓘ **Note:** This model is currently only available in Asia. Contact your local Johnson Controls representative for more information.
MS-VMA1656-1	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Integrated Ball Valve Linkage
MS-VMA1826-1	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus; Includes cable adapters for use when replacing VMA14xx Series controllers. Recommended replacement for VMA1440 controller (No DPT)
MS-VMA1832-1	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus, includes cable adapters for use when replacing VMA14xx Series controllers. Recommended replacement for VMA1410, VMA1415, or VMA1420 controller.
MS-VMA1930-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; and SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Communications

VMA16 series (32-bit) for Smoke Control ordering information

Table 12: VMA16 (32-bit) series for Smoke Control ordering information

Product code number	Description
MS-VMA1615-0U	1-Point Variable Air Volume Modular Assembly with Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), MS/TP (FC) Bus and SA Bus, 32-bit model
MS-VMA1630-0U	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), MS/TP (FC) Bus and SA Bus, 32-bit model
MS-VMA1615-1U	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), MS/TP (FC) Bus and SA Bus, 32-bit model, Isolation Optimized
MS-VMA1630-1U	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), MS/TP (FC) Bus and SA Bus, 32-bit model, Isolation Optimized

ⓘ **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System.

ⓘ **Note:** All field controllers in a smoke control system must be mounted in Johnson Controls custom or standard UL 864 panels or in panels that are ordered from Johnson Controls. If these field controllers are used with panels that are not supplied by Johnson Controls, they are not compliant with the UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

VMA16 series (16-bit) for Smoke Control ordering information

Table 13: VMA16 series (16-bit) for Smoke Control ordering information

Product code number	Description
MS-VMA1610-0U	1-Point Variable Air Volume Modular Assembly with Integrated VAV Controller, Actuator and Pressure Sensor; 1 UI; 24 VAC; FC and SA Bus Support (Cooling only)
MS-VMA1610-1U	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), FC Bus and SA Bus, 3.3 Volt Model
MS-VMA1620-0U	6-Point Variable Air Volume Modular Assembly with Integrated VAV Controller, Actuator, and Pressure Sensor; 1 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (with Reheat and Fan Control)
MS-VMA1620-1U	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus and SA Bus, 3.3 Volt Model

ⓘ **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System.

ⓘ **Note:** All field controllers in a smoke control system must be mounted in Johnson Controls custom or standard UL 864 panels or in panels that are ordered from Johnson Controls. If these field controllers are used with panels that are not supplied by Johnson Controls, they are not compliant with the UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

IOM series ordering information

Table 14: IOM series ordering information

Product code number	Description	UL and cUL (Canada)	CE Marked
MS-IOM1711-0	4-Point IOM with 4 BI, FC Bus and SA Bus Support	X	X
MS-IOM2711-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC.	X	
MS-IOM2711-2	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.		X
MS-IOM2721-0	10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support	X	X
MS-IOM2723-0	10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support ⓘ **Note:** This model is only available in certain regions. Contact your local Johnson Controls representative for more information.	X	X
MS-IOM3711-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC.	X	
MS-IOM3711-2	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.		X
MS-IOM3721-0	16-Point IOM with 16 BI, FC Bus, and SA Bus Support	X	X
MS-IOM3723-0	16-Point IOM with 16 BI, FC Bus, and SA Bus Support ⓘ **Note:** This model is only available in certain regions. Contact your local Johnson Controls representative for more information.	X	X

Table 14: IOM series ordering information

Product code number	Description	UL and cUL (Canada)	CE Marked
MS-IOM3731-0	16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support	X	X
MS-IOM3733-0	16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support Binary Outputs (BOs) on MS-IOM3733 controllers do not supply power for the outputs; the BOs require external low-voltage (<30 VAC) power sources. ⓘ **Note:** This model is only available in certain regions. Contact your local Johnson Controls representative for more information.	X	X
MS-IOM4711-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC and SA Bus Support	X	X

IOM series for Smoke Control ordering information

Table 15: IOM Series for Smoke Control ordering information

Product code number	Description
MS-IOM1710-0U	4-Point IOM with 4 BI; 24 VAC; FC Bus and SA Bus Support
MS-IOM1711-0U	4-Point IOM with 4 BI; 24 VAC; FC Bus and SA Bus Support
MS-IOM2710-0U	6-Point IOM with 2 UI, 2 UO, 2 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM2711-0U	6-Point IOM with 2 UI, 2 UO, 2 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM3710-0U	12-Point IOM with 4 UI, 4 UO, 4 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM3711-0U	12-Point IOM with 4 UI, 4 UO, 4 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOU4710-0U	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO; 24 VAC; FC Bus and SA Bus Support with Mounting Base
MS-IOM4711-0U	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO; 24 VAC; FC Bus and SA Bus Support with Mounting Base

ⓘ **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.

ⓘ **Note:** All field controllers in a smoke control system must be mounted in Johnson Controls custom or standard UL 864 panels or in panels that are ordered from Johnson Controls. If these field controllers are used with panels that are not supplied by Johnson Controls, they are not compliant with the UL 864 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

FEC Family accessories ordering information

Table 16: Field Equipment Controller family accessories (Order separately)

Product Code Number	Description
XPM Series Expansion Modules	Refer to the M4-XPM Expansion Modules Catalog Page (LIT-1901145) for a complete list of available Expansion Modules.
IOM Series Expansion Modules	Refer to the *Metasys® System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for a complete list of available IOM Series Modules.
Mobile Access portal (MAP) Gateway	Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region.

Table 16: Field Equipment Controller family accessories (Order separately)

Product Code Number	Description
NS Series Network Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
TL-CCT-0	Metasys Controller Configuration Tool (CCT) Software
MS-FCP-0	Metasys Field Controller Firmware Package Files for CCT
NS-ATV7003-0	Handheld VAV Balancing Tool
MS-DIS1710-0	Local Controller Display: Refer to *Local Controller Display Product Bulletin (LIT-12011273)* for more information.
NS-WALLPLATE-0	Network Sensor Wall Plate
WRZ Series Wireless Room Sensors	Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for specific sensor model descriptions. ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
WRZ-7860-0	Receiver for One-to-One Wireless Room Sensing Systems - functions with WRZ Series Sensors room sensors ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
WRZ-SST-120	Wireless System Survey Tool (for use with the lower power 10mW WRZ and WRZ-7860 systems) ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
ZFR-HPSST-0	Wireless System Survey Tool (for use with the higher power WRG1830/ZFR183x systems)
WRG1830/ZFR183x Pro Wireless Field Bus System	This system is used for installations that support BACnet/IP but can also coexist with the ZFR1800 Series when installed under the same supervisor (i.e., network engine). Refer to the *WRG1830/ZFR183x Pro Series Wireless Field Bus System Catalog Page (LIT-1901026)* for a list of available products. ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2 ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 8 in. Primary Leads and 30 in. Secondary Leads, Class 2 ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2 ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2 ⓘ **Note:** This accessory is not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.
AP-TBK1002-0	2-Position Screw Terminal that Plugs onto VMA Output Point Spade Lug
AP-TBK1003-0	3-Position Screw Terminal that Plugs onto VMA Output Point Spade Lugs
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown (Bulk Pack of 10)
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector (Bulk Pack of 10)
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray (Bulk Pack of 10)

Table 16: Field Equipment Controller family accessories (Order separately)

Product Code Number	Description
AP-TBK2PW-0	Replacement Power Terminal, 2-Position Connector, Gray (Bulk Pack of 10)
AS-CBLVMA-1	Cable Adapter, 8-Pin Female Socket to 6-Pin Male Jack (Bulk Pack of 10)
AS-CBLTSTAT-0	Cable adapter for connection to 8-pin TE-6700 Series sensors
MS-TBKLV03-0	Terminal Block Kit - FAC Line Voltage AC Power - 3 Pieces
MS-TBKRO02-0	Terminal Block Kit - FAC 2-Position Relay Output - 9 Pieces
MS-TBKRO03-0	Terminal Block Kit - FAC 3-Position Relay Output - 6 Pieces
MS-TBKCO04-0	Terminal Block Kit - FAC 4-Position Configurable Output - 6 Pieces
MS-TBKUI04-0	Terminal Block Kit - FAC 4-Position Universal Input - 3 Pieces
MS-TBKUI05-0	Terminal Block Kit - FAC 5-Position Universal Input - 3 Pieces
MS-VMAACT-701	VMA Actuator Assembly Gearbox Replacement Kit
F-1000-325	Replacement Barbed Fitting for use on VMA1615, VMA1630, and VMA1832 for Connecting Tubing (Bulk Pack of 10)
F-1000-326	Flexible Tubing Extension with Barbed Fitting for VMA1615, VMA1630, and VMA1832, 14 in. Length (Bulk Pack of 20). Use to extend tubing that connects between the DPT connectors and the DPT sensors, including when replacing a VMA1400 series controller with a VMA16xx or VMA18xx controller.
TL-BRTRP-0	Portable BACnet/IP to MS/TP Router
TE730-29C-0	Sensor with Temperature Setpoint Adjustment and without Occupancy Button
TE730-39C-0	Sensor with Temperature Setpoint Adjustment and Occupancy Button
AS-XFR050-0	Power transformer (Class 2, 24VAC, 50 VA maximum output), no enclosure
TP-2420	Transformer, 120 VAC Primary to 24 VAC Secondary, 20 VA, Wall Plug

Technical Specifications

FAC Series technical specifications

ⓘ **Note:** The MS-FAC2513-0 model is only available in certain regions. Contact your local Johnson Controls representative for more information.

Table 17: FAC Series

Product Code Numbers	**MS-FAC2513-0:** 16-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power **MS-FAC2611-0:** 17-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power **MS-FAC2612-1:** 18-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power **MS-FAC2612-2:** 18-Point FAC with Integral Real-Time Clock and 100–240 VAC Supply Power **MS-FAC3613-0:** 26-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power with Fast Persistence **MS-FAC4911-0:** 28-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power; Communicates over BACnet/IP network **Smoke Control Models:** **MS-FAC2611-0U:** 17-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power **MS-FAC2612-1U:** 18-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power
Communications Protocol	**MS-FAC2513-0, MS-FAC2611-0, MS-FAC2612-1, MS-FAC2612-2, and MS-FAC3613-0:** BACnet MS/TP, N2 **MS-FAC4911-0:** BACnet/IP
Engines Supported	**MS-FAC2513-0, MS-FAC2611-0, MS-FAC2612-1, MS-FAC2612-2, and MS-FAC3613-0:** All network engine models. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details. **MS-FAC4911-0:** SNE, SNC, NAE55, NAE85, ODS (MS-FAC4911-0 at R9.0 or later.
Power Requirement	**MS-FAC2513-0, MS-FAC2611-0, MS-FAC2612-1, MS-FAC3613-0, and MS-FAC4911-0:** 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60Hz, Power Supply Class 2 (North America), SELV (Europe) **MS-FAC2612-2:** 100–240 VAC 50/60 Hz
Power Consumption	**MS-FAC2513-0, MS-FAC2611-0, MS-FAC3613-0, and MS-FAC4911-0:** 14 VA maximum **MS-FAC2612-1:** 30 VA maximum **MS-FAC2612-2:** 40 VA maximum ⓘ **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F), 10% to 90% RH noncondensing; Pollution Degree 2 **Storage:** -40°C to 80°C (-40°F to 176°F), 5% to 95% RH noncondensing
Addressing	**For BACnet MS/TP-configured controllers:** DIP switch set; valid field controller device addresses 4–127 (device addresses 0–3 and 128–255 are reserved and not valid controller addresses.) **For BACnet/IP controllers:** 3 rotary switches to assign unique number for each controller on the subnet to identify it in the Controller Tool for uploading, downloading, and commissioning **For N2-configured controllers:** DIP switch set; valid controller device addresses 1–254

Table 17: FAC Series

Communications Bus	**RS-485, field selectable between BACnet MS/TP and N2 communications on certain models:** • 3-wire FC Bus between the supervisory controller and field controllers • 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices. **MS-FAC4911-0:** • BACnet/IP over Ethernet cable • 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices.
Processor	**MS-FAC2611-0, MS-FAC2612-1, and MS-FAC2612-2 :** H8SX/166xR Renesas® microcontroller **MS-FAC2513-0 and MS-FAC3613-0**: RX631 32-Bit Renesas microcontroller **MS-FAC4911-0:** RX63N 32-Bit Renesas microcontroller
Memory	**MS-FAC2611-0, MS-FAC2612-1, and MS-FAC2612-2** 4 MB Flash Memory and 1 MB RAM **MS-FAC2513-0 and MS-FAC3613-0:** 16 MB Flash Memory and 8 MB SDRAM **MS-FAC4911-0:** 16 MB Flash Memory and 8 MB RAM
Real-Time Clock Backup Power Supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Input and Output Capabilities	**MS-FAC2513-0:** 4 - Universal Inputs: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 2 - Analog Outputs: Defined as 0–10 VDC 2 - Binary Outputs: Defined as 24 VAC Triac (external power source only) 2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO **MS-FAC2611-0:** 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO

Table 17: FAC Series

Input and Output Capabilities	**MS-FAC2612-1 and MS-FAC2612-2:** 5 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 4 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Relay Outputs (Single-Pole, Double-Throw): UL 916: 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24–240 VAC; EN 60730: 6 (4) A N.O. or N.C. only 3 - Relay Outputs (Single-Pole, Single-Throw): UL 916:1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24–240 VAC; EN 60730: 6 (4) A N.O. or N.C. only **MS-FAC3613-0:** 8 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 6 - Binary Outputs: Defined as 24 VAC Triac (external power source only) 6 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA **MS-FAC4911-0:** 10 - Universal Inputs: Defined as 0–10 VDC, 0–600k ohms, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 4 - Binary Outputs: Defined as 24 VAC Triac (external power source only) 4 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA 4 - Configurable Outputs: Defined as AO mode , 0–10 VDC or BO mode, 24 VAC Triac
Analog Input (AI)/ Analog Output (AO) Resolution and Accuracy	Analog Input: 15-bit resolution Analog Output: 15-bit resolution, +/- 200 mV accuracy in 0–10 VDC applications
Terminations	**MS-FAC2513-0:** Input/Output: Fixed Screw Terminal Blocks FC Bus, SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks SA Bus Port: RJ-12 6-pin Modular Jacks **MS-FAC2611-0 and MS-FAC3613-0:** Input/Output: Fixed Screw Terminal Blocks FC Bus, SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks **MS-FAC2612-1 and MS-FAC2612-2:** Input/Output: Pluggable Screw Terminal Blocks FC Bus, SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks **MS-FAC4911-0:** Input/Output: Fixed Screw Terminal Blocks SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks SA Bus Port: RJ-12 6-pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rain mount (preferred), or screw mount on flat surface with three integral mounting clips on controller

Table 17: FAC Series

Housing	Enclosure material: ABS and polycarbonate UL94 5VB, self-extinguishing; Plenum-rated Protection Class: IP20 (IEC529) (except the FAC2612 controller)
Dimensions (Height x Width x Depth)	**MS-FAC2513-0:** 150 x 164 x 48 mm (5-7/8 x 6-7/16 x 1-7/8 in.) including terminals and mounting clips
	MS-FAC2611-0: 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips
	MS-FAC2612-x: 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips
	MS-FAC3613-0 and MS-FAC4911-0: 150 mm x 220 mm x 57.5 mm (5-7/8 in. x 8-3/4 in. x 2-3/8 in.) including terminals and mounting clips
	ⓘ **Note:** Mounting space for FAC models requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb)
Compliance C E	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with **U** product code suffix only)
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003
	UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only)
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Johnson Controls, declares that the FAC2612-2 models are also in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive. Declared as Independently Mounted, Intended for Panel Mounting, Operating Control Type 1.B, 4kV rated impulse voltage, 100°C ball pressure test.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International:
	MS-FAC261x-x: BACnet® Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Advanced Application Controller (B-AAC)
	MS-FAC2513-0, MS-FAC3613-0, and MS-FAC4911-0: BACnet® Testing Laboratories (BTL) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

FEC series technical specifications

Table 18: FEC Series Technical Specifications

Product Code Numbers	**MS-FEC1611-1:**10-Point FEC **MS-FEC1611-1ET:** FEC1611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F). **MS-FEC1621-1:** 10-Point FEC with Integral Display and Pushbutton User Interface **MS-FEC2611-0:** 17-Point FEC **MS-FEC2611-0ET:** FEC2611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F). **MS-FEC2621-0:** 17-Point FEC with Integral Display and Push Button User Interface **Smoke Control Models:** **MS-FEC1611-0U:** 10-Point FEC **MS-FEU1610-0U:** 10-Point FEC **MS-FEC2611-0U:** 17-Point FEC **MS-FEU2610-0U:** 17-Point FEC
Supply Voltage	**MS-FEC1611-x, MS-FEC1611-1ET, MS-FEC2611-0, MS-FEC2611-0ET, MS-FECx611-0U and MS-FEUx610-0U:** 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety, Extra-Low Voltage (SELV) (Europe)
Power Consumption	**MS-FEC1611-1 and MS-FEC2611-0:** 14 VA maximum (no integral display) **MS-FEC1621-1 and MS-FEC2621-0 (with integral display):** 20VA maximum ⓘ **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing **Storage:** -40°C to 80°C (-40°F to 176°F); 5% to 95% RH noncondensing ⓘ **Note:** FEC models with an -xET suffix have an operating temperature range of -40°C to 70°C (-40°F to 158°F).
Controller Addressing	**For BACnet-configured controllers:** DIP switch set; valid field controller device addresses 4–127 (device addresses 0–3 and 128-255 are reserved) **For N2-configured controllers:** DIP switch set; valid control device addresses 1–255
Communications Bus	RS-485, field selectable between BACnet MS/TP and N2 communications: 3-wire FC Bus between the supervisory controller and field controllers 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices ⓘ **Note:** For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*
Processor	H8SX/166xR Renesas® 32-bit microcontroller
Memory	1 MB Flash Memory and 512 KB RAM

Table 18: FEC Series Technical Specifications

Input and Output Capabilities	**MS-FEC16 Models:** 2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC **MS-FEC26 Models:** 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0–10 VDC applications
Terminations	Input/Output: Fixed Screw Terminal Blocks FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing; Plenum-rated protection class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**MS-FEC16 Models:** 150 mm x 164 mm x 53 mm (5-7/8 in. x 6-7/16 in. x 2-1/8 in.) including terminals and mounting clips **MS-FEC26 Models:** 150 mm x 190 mm x 53 mm (5-7/8 in. x 7-1/2 in. x 2-1/8 in.) including terminals and mounting clips ⓘ **Note:** Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	**MS-FEC16 Models:** 0.4 kg (0.9 lb) **MS-FEC26 Models:** 0.5 kg (1.1 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with **U** product code suffix only) **Canada:** UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003 UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only) **Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive. **Australia and New Zealand:** RCM Mark, Australia/NZ Emissions Compliant **BACnet International:** BACnet Testing Laboratories (BTL) Protocol Revision 4 Listed BACnet Application Specific Controller (B-ASC)

VMA16 (32-bit), VMA18 series, and VMA1930 technical specifications

Table 19: VMA16 (32-bit), VMA18 series, and VMA1930

Product Code Numbers	**MS-VMA1615-1:** 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor, 3 UI and 2 BO; 24 VAC; FC and SA Bus **MS-VMA1617-1:** Same description as VMA1615 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **MS-VMA1626-1:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No DPT) **MS-VMA1628-1:** 32-bit, Integrated VAV Controller and DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No Actuator) **MS-VMA1630-1:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus **MS-VMA1632-1:** Same description as VMA1630 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **MS-VMA1656-1:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Integrated Ball Valve Linkage (No DPT) **MS-VMA1826-1:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, with 8-9in TSTAT Port, Recommended for use as a replacement for VMA1440 (No DPT) **MS-VMA1832-1:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus, with 8-pin TSTAT Port. Recommended for use as a replacement for VMA1410, VMA1415, or VMA1420 **MS-VMA1930-0:** 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor - DPT, 3 UI and 3 BO, 2 CO, 24 VAC, and SA Bus, Includes 6-pin Sensor Port for use with TE-7xx Series Non-Communicating Sensors and two Ethernet Ports for BACnet/IP Communications **Smoke Control Models:** **MS-VMA1615-0U:** 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor, 3 UI and 2 BO; 24 VAC; FC and SA Bus **MS-VMA1630-0U:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus **MS-VMA1615-1U:** 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor, 3 UI and 2 BO; 24 VAC; FC and SA Bus, Isolation Optimized **MS-VMA1630-1U:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus, Isolation Optimized
Communications Protocol	**MS-VMA16xx-x and MS-VMA18xx-x:** BACnet MS/TP, N2 **MS-VMA1930-0:** BACnet/IP
Engines Supported	**MS-VMA16xx-x and MS-VMA18xx-x:** All Models **MS-VMA1930-0:** SNC, SNE, NAE55, NAE85, ODS, OAS (MS-VMA1930-0 supports R9.0 or later versions of these engines.)
Power Requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	10 VA typical, 14 VA maximum ⓘ **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 60 VA (maximum).
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F) **Storage:** -40°C to 70°C (-40°F to 158°F)

Table 19: VMA16 (32-bit), VMA18 series, and VMA1930

Terminations	**MS-VMA1615-x, MS-VMA1626-x, MS-VMA1628-x, MS-VMA1630-x, and MS-VMA1656-x:** Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs FC Bus, SA Bus, and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks FC Bus and SA Bus Port: RJ-12 6-Pin Modular Jacks **MS-VMA1617-x and MS-VMA1632-x:** Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs FC Bus: Pluggable Screw Terminal Block TSTAT Modular Port: RJ-45 8-Pin Modular Jack **MS-VMA1826-x and MS-VMA1832-x:** Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs N2/FC Bus: Pluggable Screw Terminal Block TSTAT Modular Port: RJ-45 8-Pin Modular Jack **MS-VMA1930-0:** Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs SA Bus and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks
Controller Addressing	**For BACnet-configured controllers:** DIP switch set: valid field controller device addresses 4–127 (device addresses 0–3 and 128–255 are reserved) **For BACnet/IP controllers:** 3 rotary switches to assign a unique number for each controller on the subnet to identify it in the CCT controller configuration tool for uploading, downloading, and commissioning **For N2-configured controllers:** DIP switch set; valid control device addresses 1–254
Communications Bus	**MS-VMA16xx and MS-VMA18xx models:** RS-485, field selectable between BACnet MS/TP and N2 communications: **N2/FC Bus:** 1.5 mm (18 AWG) standard 3-wire, twisted, shielded cable recommended between the supervisory controller and field controllers **BACnet MS/TP:** 0.6 mm (22 AWG) stranded, 4-wire (2-twisted pairs) shielded cable recommended from the VMA controller for network sensors and other sensor/actuator devices; includes a terminal to source 15 VDC supply power from VMA to SA Bus devices ⓘ **Note:** For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*. **MS-VMA1930-0:** BACnet/IP: Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector
Processor	**MS-VMA16 (32-bit) and MS-VMA18 models:** RX630 32-bit Renesas® microcontroller **MS-VMA1930-0:** RX63N 32-bit Renesas microcontroller
Memory	**MS-VMA16 (32-bit) and MS-VMA18 models:** 1 MB Flash Memory and 512 KB RAM **MS-VMA1930-0:** 16 MB serial flash memory and 8 MB of SDRAM

Table 19: VMA16 (32-bit), VMA18 series, and VMA1930

Input and Output Capabilities	**MS-VMA1615-x and MS-VMA1617-x:**
	3 - Universal Input: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact
	2 - Binary Outputs: Defined as 24 VAC Triac (internal power source)
	MS-VMA1626-x, MS-VMA1628-x, MS-VMA1630-x, MS-VMA1632-x, MS-VMA1656-x, MS-VMA1826-x, MS-VMA1832-x and MS-VMA1930-0:
	3 - Universal Input: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact
	3 - Binary Outputs: Defined as 24 VAC Triac (internal power source)
	2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
Analog Input/Analog Output Accuracy	**Analog Input:** 15-bit resolution on UIs
	Analog Output: 0–10 VDC ± 200 mV
Differential Pressure Transducer	Range: -1.5 in. to 1.5 in. W.C.
	Performance Characteristics:
	Accuracy +/-1.3% Full Span Maximum (+/- .039 in. w.c.)
	ⓘ **Note:** Combined error due to offset, non-linearity, and temperature variation.
	Typical accuracy at zero (null) pressure is +/-0.2% fullscale
	ⓘ **Note:** Includes error due to non-linearity.
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.
Actuator Rating	4 N•m (35 lb•in.) minimum shaft length = 44 mm (1-3/4 in.)
Dimensions	**Height x Width x Depth:** 165 mm x 125 mm x 73 mm (6.5 in. x 4.92 in. x 2.9 in.)
	Center of Output Hub to Center of Captive Spacer: 135 mm (5-5/16 in.)
Weight	0.65 kg (1.45 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment.
	Suitable for use in other environmental air space (plenums) in accordance with Section 300.22(C) of the National Electric Code (1615, 1630, 1617, 1626, 1628, 1632, 1656, 1832, 1826 and 1930). UL1995 Plenum Rated (Models other than 1615, 1630, 1617, 1626, 1628, 1632, 1656, 1832, 1826 and 1930).
	UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with **U** product code suffix only)
	FCC Compliant to CFR47, Part 15, Subpart B, Class A.
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003
	UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only)
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant.
	BACnet International:
	MS-VMA16xx and MS-VMA18xx models: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Application Specific Controller (B-ASC)
	MS-VMA1930-0: BACnet Testing Laboratories (BTL) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC)

 Note: The MS-VMA1617-x and MS-VMA1632-x models are currently only available in Asia. Contact your local Johnson Controls representative for more information.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

VMA (16-bit) series technical specifications

Table 20: VMA16 (16-bit) series for Smoke Control ordering information

Product Code Numbers	**Smoke Control Models:** **MS-VMA1610-0U:** 1-Point VMA (Cooling Only) **MS-VMA1610-1U:** Integrated VAV Controller/Actuator/DPT (Cooling Only), 3.3 Volt Model **MS-VMA1620-0U:** 6-Point VMA (Cooling with Reheat and Fan Control) **MS-VMA1620-1U:** Integrated VAV Controller/Actuator/DPT (with Reheat and Fan Control), 3.3 Volt Model
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	10 VA typical, 14 VA maximum **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 60 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F) **Storage:** -40 to 70°C (-40 to 158°F)
Terminations	Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs FC Bus, SA Bus, and Supply Power: 4-Wire and 3-Wire Pluggable Screw Terminal Blocks Sensor Port: RJ-12 6-Pin Modular Jacks
Controller Addressing	DIP switch set; valid field controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses.)
Communications Bus	BACnet MS/TP, RS-485: 3-wire FC Bus between the supervisory controller and field controllers 4-wire SA Bus from the VMA controller, network sensors, and other sensor/actuator devices, includes a terminal to source 15 VDC supply power from VMA to SA Bus devices **Note:** For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.
Processor	Renesas® 16-bit H8S/239x microcontroller
Memory	1 MB Flash Memory and 512 KB RAM
Input and Output Capabilities	**MS-VMA1610-0:** 1 - Universal Input: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact **MS-VMA1620-0:** 1 - Universal Input: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact 3 - Binary Outputs: Defined as 24 VAC Triac (internal power source) 2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
Analog Input/Analog Output Resolution and Accuracy	**Analog Input:** 15-bit resolution **Analog Output:** 16-bit resolution and ±200 mV in 0–10 VDC applications

Table 20: VMA16 (16-bit) series for Smoke Control ordering information

Differential Pressure Transducer	Setra transducer, differential pressure to electrical, 0 to 0.375 kPa (0 to 1.5 in. WC) , 0.5 to 4.5 VDC output, 5 VDC supply, aluminum plated. **Performance Characteristics** Combined Repeatability and Hysteresis Error: ±0.05% of Full Span Maximum Non-linearity Errors (Best Fit Method): ±1.0% of Full Span Maximum Response Time (to within 63% of Full Scale Pressure with Step Change on Input): 15 ms Temperature Error from 15.6 to 48.9°C (60 to 120°F) Null: ±0.06% of Full Span per °F Maximum Span: ±1.5% of Full Span Maximum Stability, Null: ±0.5% of Full Scale Maximum, 1 Year Minimum Stability, Span: ±2.0% of Full Scale Maximum, 1 Year Minimum
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.
Housing	Enclosure Material: ABS polycarbonate UL94 5VB; Self-extinguishing, Plenum Rated Protection Class: IP20 (IEC529)
Actuator Rating	4 N•m (35 lb•in.) minimum shaft length = 44 mm (1-3/4 in.)
Dimensions	**Height x Width x Depth:** 182 x 182 x 64 mm (7-3/16 x 7-3/16 x 2-1/2 in.) **Center of Output Hub to Center of Anti Rotation Slot:** 160 mm (6-5/16 in.) ⓘ **Note:** Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.86 kg (1.9 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with **U** product code suffix only)
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003
	UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only)
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the Low Voltage Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Application Specific Controller (B-ASC)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

IOM Series Technical Specifications

Table 21: IOM Series

Product Code Numbers	**MS-IOM1711-0:** 4-Point IOM with 4 BI, FC Bus and SA Bus Support
	MS-IOM2711-0: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC
	MS-IOM2711-2: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.
	MS-IOM2721-0: 10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support
	MS-IOM2723-0: 10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support
	MS-IOM3711-0: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC
	MS-IOM3711-2: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC
	MS-IOM3721-0: 16-Point IOM with 16 BI, FC Bus, and SA Bus Support
	MS-IOM3723-0: 16-Point IOM with 16 BI, FC Bus, and SA Bus Support
	MS-IOM3731-0: 16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support
	MS-IOM3733-0: 16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support
	MS-IOM4711-0: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC and SA Bus Support
	Smoke Control Models:
	MS-IOM1710-0U: 4-Point IOM with 4 BI, FC Bus and SA Bus Support
	MS-IOM1711-0U: 4-Point IOM with 4 BI, FC Bus and SA Bus Support
	MS-IOM2710-0U: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
	MS-IOM2711-0U: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
	MS-IOM3710-0U: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
	MS-IOM3711-0U: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
	MS-IOU4710-0U: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC Bus and SA Bus Support with Mounting
	MS-IOM4711-0U: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC Bus and SA Bus Support with Mounting
Power Requirement	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) Europe
Power Consumption	14 VA maximum ⓘ **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum), depending on the IOM model.
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing **Storage:** -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing
Addressing	DIP switch set; valid field controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid IOM addresses).
Communications Bus	BACnet MS/TP, RS-485 3-wire FC Bus between the supervisory controller and expansion modules (for MS/TP bus communications at 38,400 baud) 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices. Includes a lead source 15 VDC supply power (from controller or expansion module) to bus devices(for MS/TP bus communications at 38,400 baud). ⓘ **Note:** For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*
Processor	**MS-IOM1711-0, MS-IOM2711-0, MS-IOM2711-2, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3711-2, MS-IOM3721-0, MS-IOM3731-0, and MS-IOM4711-0**: H8SX/166xR Renesas® 32-bit microcontroller **MS-IOM2723-0, MS-IOM3723-0, MS-IOM3733-0**: RX631 Renesas 32-bit microcontroller

Table 21: IOM Series

Memory	**MS-IOM1711-0, MS-IOM2711-0, MS-IOM2711-2, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3711-2, MS-IOM3731-0, and MS-IOM4711-0:** 512 KB Flash Memory and 128 KB RAM **MS-IOM3721-0:** 640 KB Flash Memory and 128 KB RAM **MS-IOM2723-0, MS-IOM3723-0, and MS-IOM3733-0:** 4 MB External Serial Flash Memory and 768 KB internal flash and 128 KB internal RAM
Input and Output Capabilities	**MS-IOM1711-0:** 4 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode
	MS-IOM2711-x: 2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Universal Outputs: Analog Output: Voltage Mode, 0-10 VDC; Binary Output Mode: 24 VAC/DC FET; Analog Output: Current Mode, 4-20 mA 2 - Relay Outputs: (Single-Pole, Double-Throw) **UL 916** (-0 model only): 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC **EN 60730** (-2 model only): 6 (4) A N.O. or N.C. only, 240 VAC
	MS-IOM2721-0 and MS-IOM2723-0: 8 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Input and Output Capabilities (Cont.)	**MS-IOM3711-x:** 4 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 4 - Universal Outputs: Analog Output: Voltage Mode, 0-10 VDC; Binary Output Mode: 24 VAC/DC FET; Analog Output: Current Mode, 4-20 mA 4 - Relay Outputs: (Single-Pole, Double-Throw) **UL 916** (-0 model only): 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC **EN 60730** (-2 model only): 6 (4) A N.O. or N.C. only, 240 VAC
	MS-IOM3731-0 and MS-IOM3733-0: 8 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode 8 - Binary Outputs: Defined as 24 VAC Triac (Require external low-voltage power source) ⓘ **Note:** Binary Outputs (BOs) on MS-IOM3733-0 models do not supply power for the outputs; the BOs require external low-voltage (< 30 VAC) power sources.
	MS-IOM4711-0: 6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse/Counter Accumulator Mode 3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) 4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	**MS-IOM1711-0, MS-IOM2711-0, MS-IOM2711-2, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3711-2, MS-IOM3731-0, and MS-IOM4711-0:** **Analog Input:** 16-bit resolution **Analog Output:** 16-bit resolution and ±200 mV in 0–10 VDC applications **MS-IOM2723-0, MS-IOM3723-0, and MS-IOM3733-0:** **Analog Input:** 15-bit resolution **Analog Output:** ±200 mV in 0–10 VDC applications

Table 21: IOM Series

Terminations	**MS-IOM1711-0, MS-IOM2711-0, MS-IOM2711-2, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3711-2, MS-IOM3731-0, and MS-IOM4711-0:** Input/Output: Fixed Screw Terminal Blocks SA/FC Bus and Supply Power: 4-wire and 3-wire Pluggable Screw Terminal Blocks SA/FC Bus Port: RJ-12 6-Pin Modular Jacks **MS-IOM2723-0, MS-IOM3723-0, and MS-IOM3733-0:** Input/Output: Fixed Screw Terminal Blocks ⓘ **Note:** There are no labels on I/Oterminal blocks. The labels are above/below the terminal blocks on theIOM packaging. SA/FC Bus and Supply Power: 4-wire and 3-wire Pluggable Screw Terminal Blocks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing, Plenum-rated protection class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**MS-IOM1711 and MS-IOM2711 models:** 150 x 120 x 53 mm (5-7/8 x 4-3/4 x 2-1/8 in.) including terminals and mounting clips **MS-IOM2721-0, MS-IOM2723-0, MS-IOM3721-0, MS-IOM3723-0, MS-IOM3731-0, and MS-IOM3733-0 models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips **MS-IOM3711-0 and MS-IOM4711-0 models:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips ⓘ **Note:** Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb) maximum
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with **U** product code suffix only) ⓘ **Note:** Except MS-IOM2711-2 and MS-IOM3711-2 **Canada:** UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003 UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only) ⓘ **Note:** Except MS-IOM2711-2 and MS-IOM3711-2 **Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive. Declared as Independently Mounted, Intended for Panel Mounting, Operating Control Type 1.B, 4kV rated impulse voltage, 100.7°C ball pressure test. ⓘ **Note:** Except MS-IOM2711-0 and MS-IOM3711-0 **Australia and New Zealand:** RCM Mark, Australia/NZ Emissions Compliant ⓘ **Note:** Except MS-IOM2711-0 and MS-IOM3711-0 **BACnet International:** **MS-IOM1711-0, MS-IOM2711-0, MS-IOM2711-2, MS-IOM2721-0, MS-IOM3711-0, MS-IOM3711-2, MS-IOM3731-0, and MS-IOM4711-0:** BACnet Testing Laboratories (BTL) Protocol Revision 4 Listed BACnet Application Specific Controller (B-ASC) **MS-IOM2723-0, MS-IOM3723-0, and MS-IOM3733-0:** BACnet Testing Laboratories (BTL) Protocol Revision 18 listed and certified BACnet Smart Actuator (B-SA)

> ⓘ **Note:** The MS-IOM2723-0, MS-IOM3723-0, and MS-IOM3733-0 models are only available in certain regions. Contact your local Johnson Controls representative for more information.

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Handheld VAV Balancing Tool technical specifications

Table 22: Handheld VAV Balancing Tool

Product Code	NS-ATV7003-0
Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal, supplied by the Sensor Actuator (SA) Bus Port
Current Consumption	90 mA maximum
Terminations	RJ-12, 6-Position Modular Jack
Transmission Speed	**Serial Communication (SA Bus)** 9600, 19.2k, 38.4k, or 76.8k bps
Sensor Addressing	Fixed address of 198
Ambient Conditions	**Operating :** 0°C to 50°C (32°F to 122°F); 5% to 95% RH, Noncondensing; 30°C (86°F) Maximum Dew Point **Storage:** -40°C to 85°C (-40°F to 185°F); 5% to 95% RH, Noncondensing
Dimensions	80 mm x 80 mm x 25 mm (3.2 in. x 3.2 in. x 1.0 in.)
Weight	0.165 kg (0.365 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada, ICES-003
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories (BTL) Listed BACnet Smart Sensor (B-SS)

Compliance for FEC Series, IOM Series, VMA16, VMA18 Series, and VMA1930 Controllers

North American emissions compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the users will be required to correct the interference at their own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Repair information

If a controller, network sensor, or any related product fails to operate within its specifications, replace the product. For replacement products, contact the nearest Johnson Controls representative.

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT	WESTENDHOF 3	507 E MICHIGAN ST
NO. 32 CHANGJIJANG RD NEW DISTRICT	45143 ESSEN	MILWAUKEE WI 53202
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Contact information

Contact your local branch office: www.johnsoncontrols.com/locations

Contact Johnson Controls: www.johnsoncontrols.com/contact-us