

LN Series Variable Air Volume (VAV) LN-VAVCF-12 Controller

Product Bulletin

LN-VAVCF-12

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Refer to the [QuickLIT website](#) for the most up-to-date version of this document.

The LN-VAVCF-12 is a microprocessor-based, programmable Variable Air Volume (VAV) controller designed to control any variable air volume box. The controller uses the LonTalk® communication protocol and is LONMARK® certified as a Space Comfort Control (SCC) VAV device. The LN-VAVCF-12 supports various input types including resistance, voltage, and digital-based inputs. In addition, the controller provides digital, floating, pulse width modulation, and proportional control outputs for valves, heating elements, fans, and lighting applications. The device has an onboard airflow sensor with a range of 0 to 2 inches of water column (500 Pascal) and a built-in brushless actuator for precise damper positioning for loads requiring up to 35 inch-pounds (4 Newton-meters) of torque.



Figure 1: LN-VAVCF-12 Controller

The LN-VAVCF-12 controller works with the LN Series Communicating Sensors, which feature a backlit display and graphical menus. These sensors are used for indoor temperature measurement, setpoint adjustment, and occupancy state override

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
Pre-loaded Applications	Save setup time. One technician can locally configure and troubleshoot the VAV controller with an LN-Series Communicating Sensor without need for a programming interface.
Integrated VAV Performance Assessment Control Charts (VPACC) Control Sequences	Provide a means of automatically detecting when the VAV controller is operating outside of its design parameters, including Persistent High/Low Space Temperature, Persistent High/Low Discharge Temperature, Persistent High/Low Air Flow, and Unstable Air Flow.
LONMARK Certification	Guarantees interoperability with other suppliers of LONMARK approved controllers.
Accurate Onboard Airflow Sensor	Ensures precise airflow monitoring and control at low and high airflow rates, allowing you to design for maximum energy efficiency while maintaining an optimal comfort level.
Built-in Actuator with a Brushless Motor and Integrated Position Feedback System	Eliminates periodic damper re-initialization and ensures worry-free operation, providing increased occupant comfort and extended service life.
Optimized Air Balancing Process	Saves time during commissioning. The flow sensor requires no zero flow calibration, and its variable-speed motor goes to minimum and maximum flow settings in half the time of typical VAV actuators.
Optional Wireless Receiver¹	Supports up to 18 wireless sensors, letting you create wire-free installations and use various wireless battery-less sensors and switches. With up to four software-configurable universal inputs and up to six software-configurable outputs, this controller covers all industry-standard VAV applications.

Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
Highly Accurate Universal Inputs	Support thermistors and resistance temperature detectors (RTDs) that range from 0 to 350,000 ohms, giving you the freedom to use your preferred or engineer-specified sensors, in addition to any existing sensors.
Rugged Input and Output Hardware	Eliminates the need for external protection components, such as diodes for 12 VDC relays.

1. Wireless sensors with an override require two inputs.

Overview

Factory pre-loaded applications allow this controller, straight out of the box, to operate standard VAV equipment with a proven energy-efficient sequence of operation, thereby eliminating the need for programming. You can select the pre-loaded application using an LN Series Communicating Sensor even before the network has been installed, for rapid deployment or through any LNS® based software tool such as Johnson Controls® LN Builder. The LN-VAVCF-12 controller is fully programmable, allowing you to create your own control sequences capable of meeting the most demanding control requirements.

LN Wireless Receiver

To reduce the cost of installation, and minimize the impact on existing partition walls, the LN Wireless Receiver enables the controller to communicate with a line of wireless, battery-less room sensors and switches. The LN Wireless Receiver devices include:

- the LN- WMOD315-0 receiver for EnOcean® 315 MHz wireless-enable sensors and switches
- the LN-WMOD868-0 receiver for EnOcean 315 MHz wireless-enable sensors and switches
- LN controllers have one wireless port to support a single LN Wireless Receiver. For more information about the EnOcean and Open-to-Wireless technologies, refer to the *LN Series Wireless Solution Guide Technical Bulletin (LIT-12011628)*.
- LONWORKS® Network Services (LNS)

The LNS client-server platform allows multiple users, running different LNS-compatible applications, to access a common source for directory, installation, management, monitoring, and control services for the network system being managed. The Johnson Controls LN Builder is an example of an LNS based network management tool that can use plug-ins to configure and monitor controllers and devices in the control system.

LN Graphical Programming Interface (GPI) Plug-In

The Johnson Controls GPI plug-in is a programming tool that allows you to quickly create control sequences by dragging and dropping block objects and then linking the objects with a simple click, select, and release. Select objects from an extensive library of over 100 commonly used functions; you can also create your own custom blocks. With a user-friendly interface and intuitive programming environment, HVAC programming could not be easier. Refer to the *LN Graphical Interface Programming Tool (GPI) Technical Bulletin (LIT-12011449)* for more information. The GPI Plug-in offers these advantages:

- Johnson Controls supplies the plug-in as freeware with no associated licensing costs.
- The plug-in features live debugging, which allows you to view code execution and input/output values, and to detect errors in real time.
- The plug-in contains a code library for managing your favorite or most commonly used code or code sections.



Figure 2: Block Objects

Configure Schedules and Holidays

Configure the controller's built-in schedules and holidays from LNS LN Series Programmable controllers, or directly from within the LN GPI plug-in with an easy-to-use point, drag, and click interface. It features a weekly schedule for regular, repeating, events by time-of-day and day-of-week, while a holiday schedule is available to define events for specific days. The LN-VAVCF-12 controller allows you to:

- Configure schedules using a graphical slider.
- Copy and paste entries; and duplicate a schedule entry for Monday to Friday.
- Set exceptions to a schedule, such as holidays, with Special Events.
- Set holidays for recurring events such as the ninth day, or the third Thursday of a given month.
- Create a schedule as an effective period during which the schedule is active.
- Create a schedule that provides Next State and Time to Next State — ideal for use with programming functions such as Optimum Start and morning Warm Up.

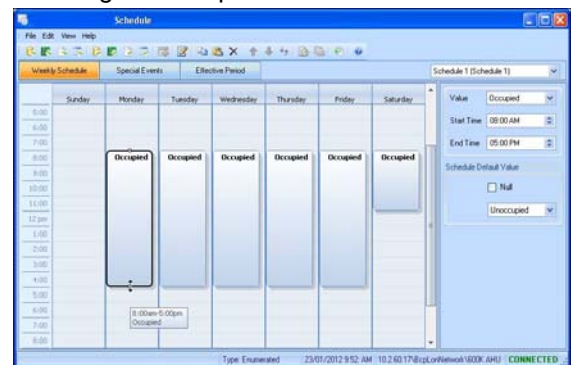


Figure 3: LN GPI Plug-In Screen

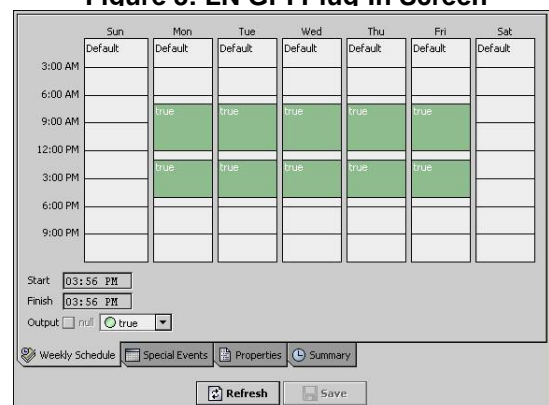


Figure 4: Built-In Scheduling Tool Screen

LN Series Communicating Sensors

This line of communicating sensors features a backlit display and graphical menus.

Because you can use the sensor as a handheld tool, you can start VAV commissioning immediately after installation. Use the sensor to select the appropriate VAV controller application for the VAV box configuration in use, to perform air balancing of the system without requiring an on-site controls engineer, and to troubleshoot the system.

The LN Communicating Sensor capabilities include a Leaf Icon that displays the efficiency of your setpoints.



Figure 5: Leaf Icon

The LN Series Communicating Sensors are available in two versions:

- The LN-SVSEN-0 room temperature sensor with backlight display, graphic menus, and leaf icon.
- The LN-SVSENH-0 room temperature and humidity sensor with backlight display, graphic menus, and leaf icon.



Figure 6: LN Series Communicating Sensor

Dimensions

Figure 7 shows the dimensions for the LN-VAVCF-12 Controller.

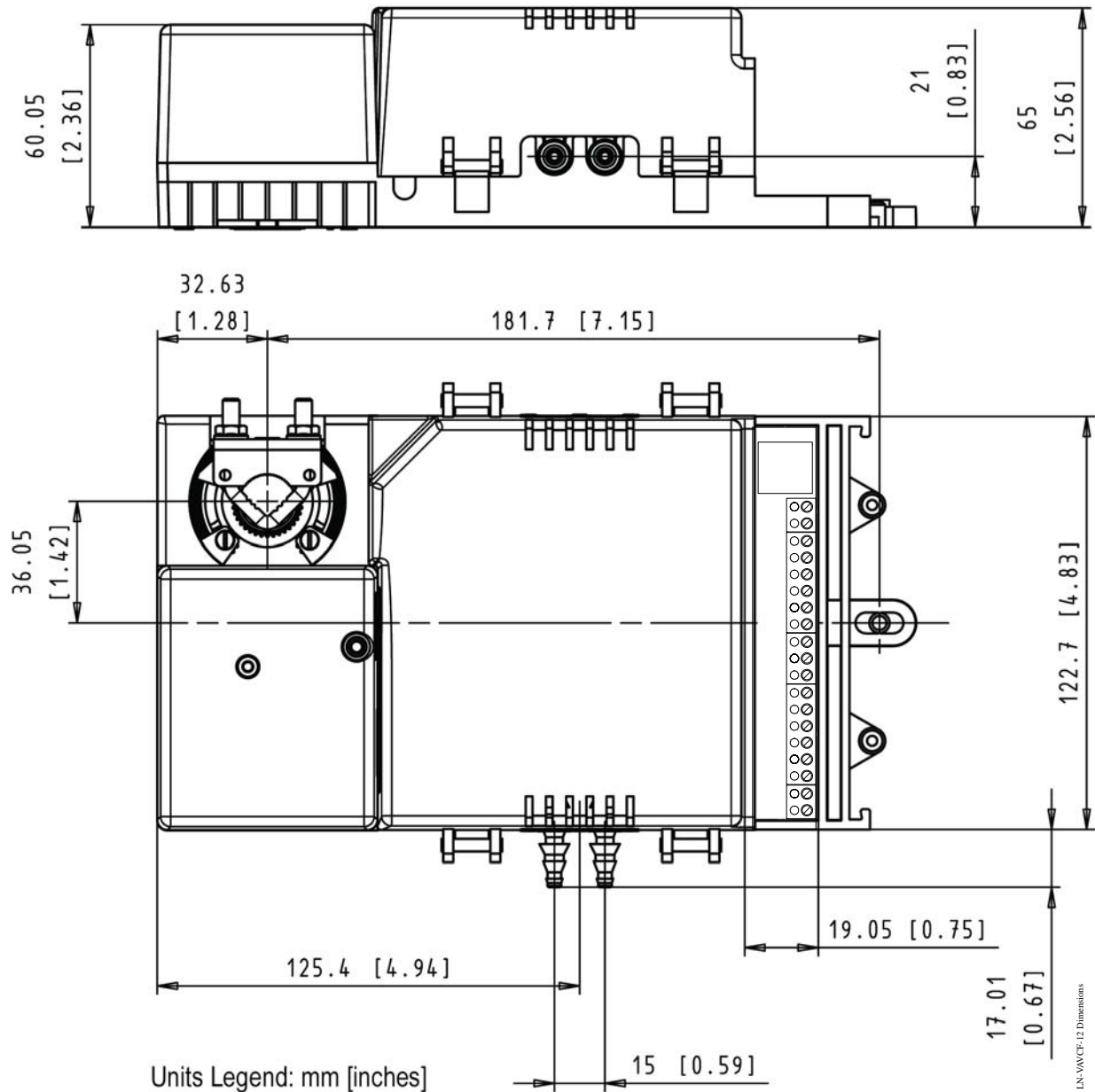


Figure 7: LN-VAVCF-12 Dimensions, mm (in.)

LONMARK Objects and Network Variables

Figure 8 shows the LN-VAVCF-12 LONMARK Objects and Network Variables when you program the controller with LN GPI software.

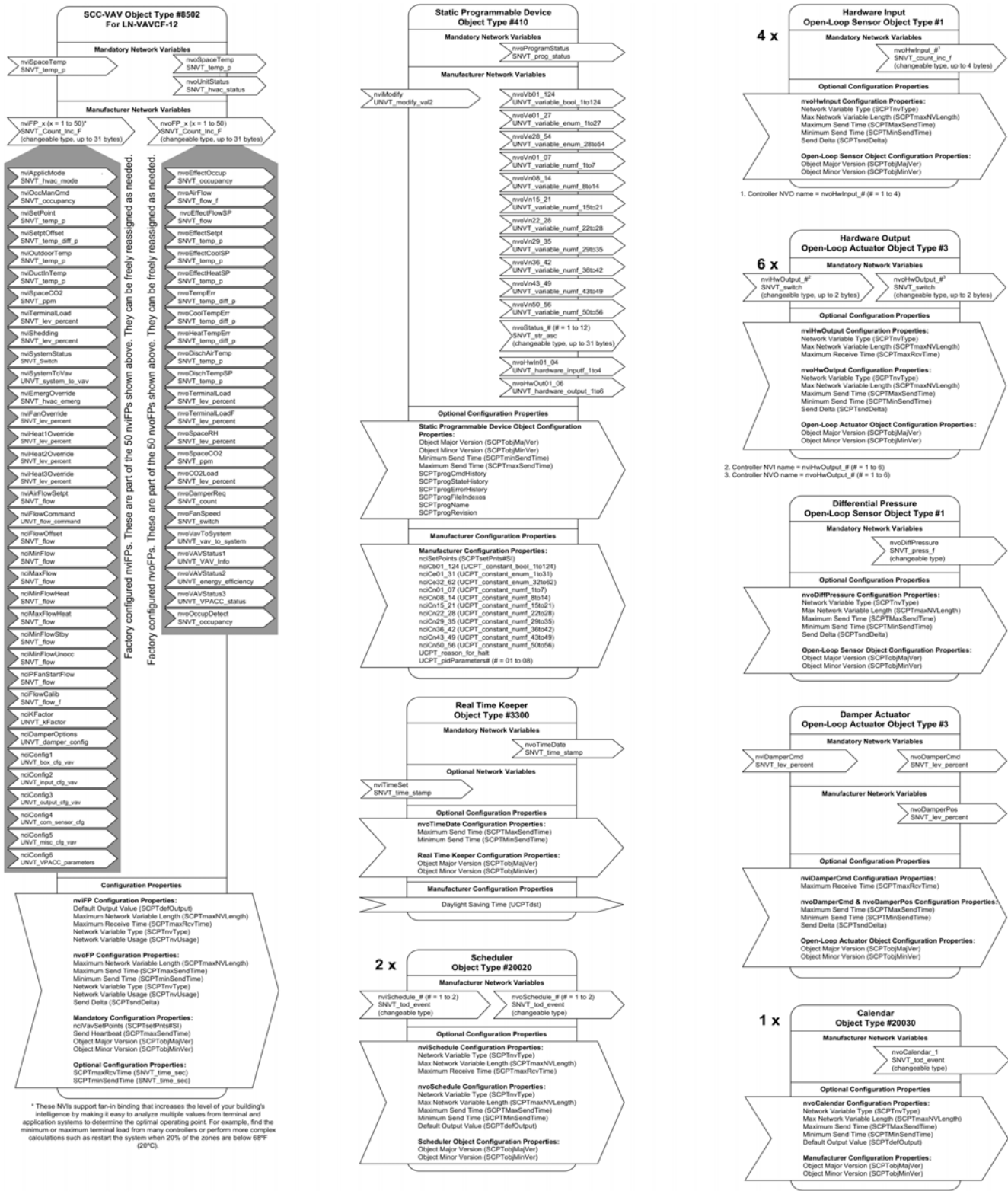


Figure 8: GPI LonMARK Objects and Network Variables – LN-VAVCF-12

Controller Models

Table 2 shows the available models and I/O extension models within the series.

Table 2: Controller Models Inputs/Outputs

Controller Features	LN-VAVCF-12
Universal Inputs	4
Wireless Inputs ¹	18
Universal Outputs	2
Digital Outputs	4

1. Available when optional Wireless Receiver is connected to the controller.

Ordering Information

Contact the nearest Johnson Controls® representative to order the LN Series Variable Air Volume (VAV) LN-VAVCF-12 Controller. See Table 3 for ordering codes.

Repair Information

If the LN Series Variable Air Volume (VAV) LN-VAVCF-12 Controller fails to operate within specifications, replace the unit. For a replacement unit, contact the nearest Johnson Controls® representative.

Table 3: LN Series Variable Air Volume (VAV) LN-VAVCF-12 Controller


Product Code Number	Description
LN-VAVCF-12	LONMARK® Certified Programmable Controller with 4 Universal Inputs (UI), 2 Universal Outputs (UO), 4 Digital Outputs (DO), LNS Plug-in, 24 VAC, and Wireless Option

Technical Specifications

LN-VAVCF-12 (Part 1 of 2)

Product Code	LN-VAVCF-12
Power Requirement	<p>Voltage: 24 VAC/DC; $\pm 15\%$, 50/60 Hz, Class 2</p> <p>Protection: 2 A user-replaceable fuse; 3 A user-replaceable fuse for triac when using the internal power supply</p> <p>Consumption: 10 VA typical, all external loads.</p> <p>Maximum Consumption: 85 VA</p>
Environmental	<p>Operating Temperature: 0 to 50°C (32 to 122°F)</p> <p>Storage Temperature: -20 to 50°C (-4 to 122°F)</p> <p>Relative Humidity: 0 to 90% noncondensing</p>
Interoperability	<p>Communication: LonTalk® protocol</p> <p>Transceiver: FT 5000 Free Topology Transceiver</p> <p>Channel: TP/FT-10, 78 Kbps</p> <p>LONMARK® Interoperability: Version 3.4</p> <p>Guidelines:</p> <ul style="list-style-type: none"> Device Class: SCC VAV LONMARK Functional Profile (pending) Input objects: Open Loop Sensor #1 Output objects: Open Loop Actuator #3 Node object: Node object #0 Real-Time Clock: Real Time Keeper #3300 Scheduler: Scheduler #20020 Calendar: Calendar #20030 Programmable Device: Static Programmable Device #410 SCC VAV #8502
Hardware	<p>Processor: STM32 (ARM Cortex™ M3) MCU, 32 bit</p> <p>CPU Speed: 68 MHz</p> <p>Memory: 384 KB nonvolatile Flash (applications), 1 MB nonvolatile Flash (storage), 64 KB RAM</p> <p>Status Indicator:</p> <ul style="list-style-type: none"> Green LEDs, power status and LAN Tx Orange LEDs, controller status and LAN Rx
Enclosure	<p>Material: FR/ABS</p> <p>Dimensions (with screws): 4.8 x 8.4 x 2.5 in. (122.7 x 214.3 x 63.0 mm)</p> <p>Shipping Weight: 2.30 lbs (1.05 kg)</p>
Inputs	<p>Quantity of Points: 4; universal, software configurable</p> <p>Input Types:</p> <ul style="list-style-type: none"> Voltage: 0 to 10 VDC (40 ohm input impedance), 0 to 5 VDC (high input impedance) Digital: Dry Contact Current: 0 to 20 mA with 249 ohms external resistor (wired in parallel) Resistor: 0 to 350 k ohms. All thermistor types that operate in this range are supported. The following temperature sensors are pre-configured: <ul style="list-style-type: none"> Thermistor: 10 ohms Type, 2, 3 (10k ohms at 25°C [77°F]) Platinum: Pt1000 (1k ohms at 0°C [32°F]) Nickel: RTD Ni1000 (1k ohms at 0°C [32°F]); RTD Ni1000 (1k ohms at 21°C [69.8°F]) Input Resolution: 16-bit analog/digital converter Differential Pressure: 0 to 500 Pa (0 to 2 in. H₂O) <ul style="list-style-type: none"> Input Resolution: 0.0167 Pa (0.00007 in. H₂O) Airflow Accuracy: $\pm 4.0\%$ at more than 12.5 Pa (0.05 in. H₂O); $\pm 1.5\%$ once calibrated through airflow balancing at more than 12.5 Pa (0.05 in. H₂O) Power Supply Output: 15 VDC; maximum 80 mA (4 inputs x 20 mA each)

LN-VAVCF-12 (Part 2 of 2)

<p>Outputs</p>	<p>Quantity of Points: 4; 24 VAC Triac, digital (on/off), PWM, or floating¹; software configurable 0.5 A continuous 1.0 A at 15% duty cycle for a 10-minute period PWM control: adjustable period from 2 seconds to 65 seconds Floating control: requires two consecutive outputs Minimum pulse on/off: 500 milliseconds Adjustable drive time period External or Internal power supply (jumper selectable) Universal: quantity: 2; 0 to 10 VDC linear, digital 0 to 12 VDC (on/off), floating¹ or PWM; software configurable. Built-in snubbing diode to protect against back EMF, for example, when used with a 12 VDC relay. PWM control: adjustable period from 2 seconds to 65 seconds Floating control: requires two consecutive outputs¹ Minimum pulse on/off: 500 milliseconds Adjustable drive time period 20 mA max at 12 VDC, Minimum load 600 ohms Output Resolution: 10-bit digital/analog converter</p>
<p>Damper Actuator</p>	<p>Motor: Belimo® LMZS-H brushless DC motor Torque: 35 in-lb, 4 N·m Degree of Rotation: 95° adjustable Fits Shaft Diameter: 5/16 to 3/4 in. (8.5 to 18.2 mm) Acoustic Noise Level: less than 35 dB (A)</p>
<p>Wireless Receiver^{2,3}</p>	<p>Communication: EnOcean wireless standard² Wireless Inputs: 18⁴ Supported Wireless: LN-WMOD315-0, LN-WMOD868-0 Cable: telephone cord, connector: 4P4C modular jack, length: 6.5 ft (2 m)</p>
<p>Electromagnetic Compatibility</p>	<p>CE Emission: EN61000-6-3: 2007 Generic standards for residential, commercial, and light-industrial environments. CE Immunity: EN61000-6-1: 2007; Generic standards for residential, commercial, and light-industrial environments. FCC: This device complies with FCC rules part 15, subpart B, class B (pending)</p>
<p>LN Series Communicating Sensors</p>	<p>Quantity of Points: 4 Models Supported: LN-SVSEN-0, LN-SVSENH-0 Communication: RS-485 Number of Sensors per controller: up to 4, in daisy-chain configuration Cable: Cat 5e, 8 conductor twisted pair Connector: RJ-45</p>
<p>Compliance</p> 	<p>United States: UL Listed: 6EA7 Energy management equipment Material⁵: UL94-5VA</p> <p>Canada: UL Listed: 6EA7 Energy management equipment Material⁵: UL94-5VA</p>

1. Floating only available when controller is programmed with LN GPI software.
2. Available when an optional external Wireless Receiver is connected to the controller. Refer to the *LN Wireless Location Guide* for a list of supported EnOcean wireless modules.
3. You cannot use an LN-Series Communicating Sensor and Wireless Receiver at the same time. However, you can temporarily connect an LN-Series Communicating sensor to a controller in wireless mode to perform VAV airflow balancing.
4. Some wireless sensors may use more than one input from the controller.
5. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive.

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

United States Emissions Compliance

Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1. This device may not cause harmful interference, and*
- 2. This device must accept any interference received, including interference that may cause undesired operation.*

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canadian Emissions Compliance

Industry Canada Statement(s)

The term IC before the certification/registration number only signifies that the Industry Canada technical specifications were met.

Le terme « IC » précédant le numéro d'accréditation/inscription signifie simplement que le produit est conforme aux spécifications techniques d'Industry Canada.



Building Efficiency

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