

\* 241115400018A \*

24-11154-00018, Rev. A  
(barcode for factory use only)

# Johnson Controls Vibration Diagnostics Service

## Installation Guide

WVS-1000

Part No. 24-11154-00018, Rev. A  
Issued September 2019

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

### Applications

HVAC and other rotating equipment often emit vibratory forces that can often be used to diagnose machinery health. This information can be used to create a maintenance plan to avoid premature failure and downtime. The WVS-1000 data acquisition device (DAQ) connects wirelessly to smart devices with Apple® iOS® 10.3 operating system and above and Android™ 6.0 and above. Using the Johnson Controls® Vibration Diagnostics Service mobile app, the user can collect vibration data that uses a tri-axial vibration sensor and expedites the data collection process. The data is then uploaded from the smart device to the cloud. The data is analyzed by certified vibration analysts and a customer report is generated and sent via email.

### 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.

#### RF Transmitters: 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.

#### RF Exposure (OET Bulletin 65)

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20 cm separation distance between the antenna and all persons.

## Canada

### Industry Canada Statement(s)

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

This device has been designed to operate with an antenna having a maximum gain of 0.5 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the Equivalent Isotropically Radiated Power (EIRP) is not more than that required for successful communication.

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

Cet appareil a été conçu pour fonctionner avec une antenne d'un gain maximum de 0.5 dBi. En application des réglementations d'Industry Canada, l'utilisation d'une antenne de gain supérieur est strictement interdite. L'impédance d'antenne requise est de 50 ohms.

Pour réduire les interférences radio potentielles avec les dispositifs d'autres utilisateurs, le type d'antenne et son gain doivent être choisis de façon à ce que la Puissance Isotrope Rayonnée Équivalente (PIRE) ne soit pas supérieure à la puissance nécessaire pour une bonne communication.

## Installation

### *Parts included*

- WVS-1000 DAQ
- Tri-axial accelerometer
- Sensor cable
- Sensor magnet
- WVS-1000 holster
- Protective carrying case

### *Dimensions*

The WVS-1000 DAQ is 75 mm x 120 mm x 25 mm.

## Accessories

You can purchase an adapter that allows you to collect vibration data from a single axis vibration sensor via a BNC connector. This adapter plugs into the tri-axial sensor cable and converts the M-12 connector to a male BNC. This is useful when collecting data from permanently mounted sensors or online systems.

## General precautions

### **WARNING**

#### **Risk of Personal Injury.**

To reduce the risk of serious injury or death, read these instructions thoroughly and follow all warnings and cautions included in all manuals that accompany the product and attached to the unit.

### **AVERTISSEMENT**

#### **Risque de blessure personnelle.**

Pour réduire le risque de blessures graves ou de décès, lisez attentivement ces instructions et suivez tous les avertissements et mises en garde inclus dans les manuels qui accompagnent le produit et qui sont joints à l'unité.

- Carefully review all manuals and on-product instructions, cautions, and warnings for the equipment under test prior to use of the WVS-1000 DAQ or mounting of the sensor cable to avoid any hazards from the equipment under test.
- To reduce the risk of personal injury or death, thoroughly review and ensure you understand the instructions, cautions, and warnings on the WVS-1000 DAQ and in the manual that accompany the device prior to use of the WVS-1000 DAQ or mounting of the sensor cable.
- Incorrect use could cause personal injury from contact with rotating equipment or damage to the product and the equipment under test. Operators should be qualified according to local, state, and national building and safety codes and regulations.
- Use appropriate personal protective equipment and tools suited for electrical operation purposes.
- Make sure that the sensor cable is clear of any moving components on the equipment under test. Use cable ties as necessary to ensure that the sensor cable is securely mounted to the equipment under test and will not move during testing.
- Assess each piece of equipment under test and any potential safety concerns with the test operation. In some instances, it is best to de-energize the equipment and let it come to rest prior to mounting the accelerometer if the sensor is mounted close to a rotating component. Coordinate with facility representative to ensure proper lockout tagout operations and notifications are complete before using the WVS-1000 DAQ.
- If it is necessary to de-energize the equipment under test, follow all instructions, cautions, and warnings for shutting down the equipment under test, then open and tag all disconnected switches. Never assume electrical power is disconnected. Check with a meter and test equipment. Some equipment under test may require added time to fully de-energize.
- Do not touch or adjust any safety devices associated with the equipment under test. All safety features, disengagements, and interlocks must be in place and correctly functioning. If these devices are adjusted or tampered with in any way, serious injury or death can occur. Never bypass or wire around a safety device.

## Setup and adjustments

### ***Installing the Johnson Controls Vibration Diagnostics Service mobile application on your mobile device***

1. Download and install the Johnson Controls Vibration Diagnostics Service mobile app on your mobile device.
2. Complete the training. The training videos are accessible from the mobile app or at:  
<https://jcpublic.kzoplatform.com/library>
3. Open the app and set up your account. Your program administrator will set up your username and password. If you do not have this information, contact your program administrator.

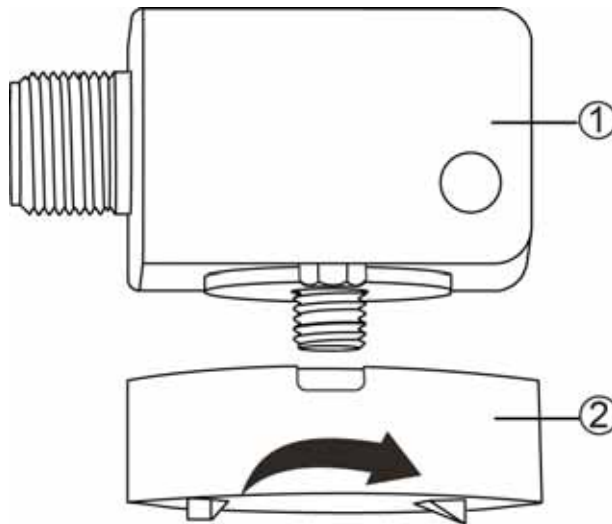
### Assembling the hardware

1. Screw on and tighten the sensor magnet to the tri-axial accelerometer. See Figure 1.

#### Notes:

- Align the standoff on the outer edge of the base of the sensor with the cutout on the surface of the magnet, so that the base of the sensor sits flush with the top surface of the magnet.
- When mounting the sensor to a mounting pad, remove the standoff from the sensor so that the sensor sits flush with the mounting pad.
- To mount the tri-axial accelerometer to a mounting pad that is pre-installed on the equipment, do not attach the sensor magnet.
- The tri-axial accelerometer senses data in three axes. For orientation, see Figure 2 and Figure 3.

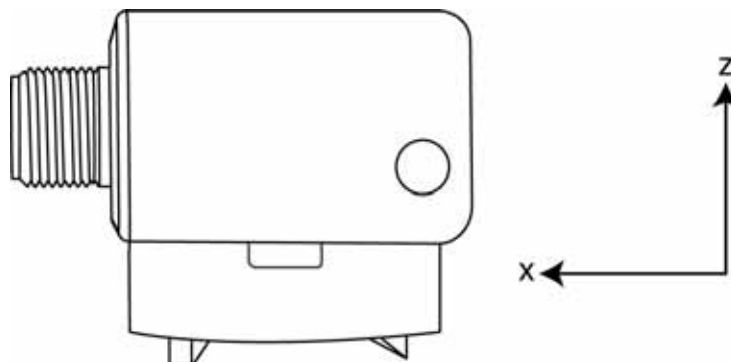
**Figure 1: Connecting the sensor magnet to the tri-axial accelerometer**



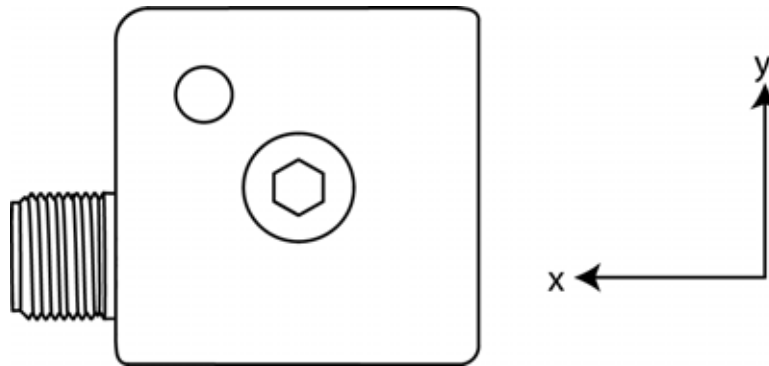
**Table 1: Connecting the sensor magnet to the tri-axial accelerometer**

Callout	Description
1	Tri-axial accelerometer
2	Sensor magnet

**Figure 2: Orientation of the tri-axial accelerometer and sensor magnet (side view)**

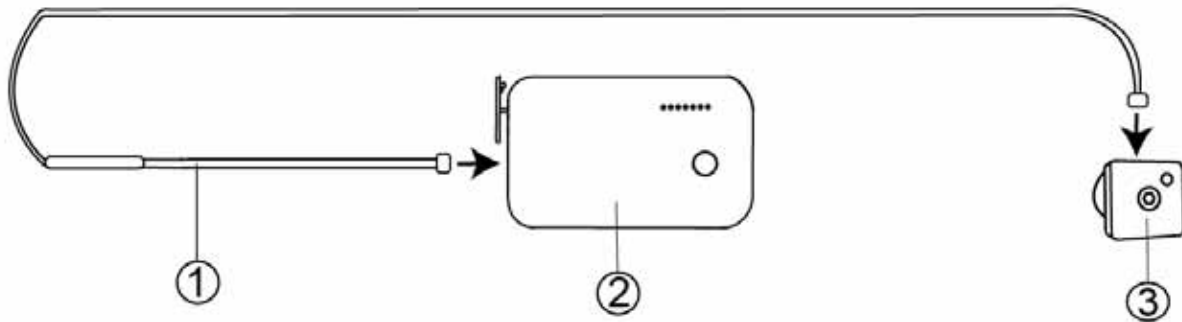


**Figure 3: Orientation of the tri-axial accelerometer (top view)**



2. Connect the tri-axial accelerometer and the WVS-1000 DAQ to the sensor cable. For assembly, see Figure 4.

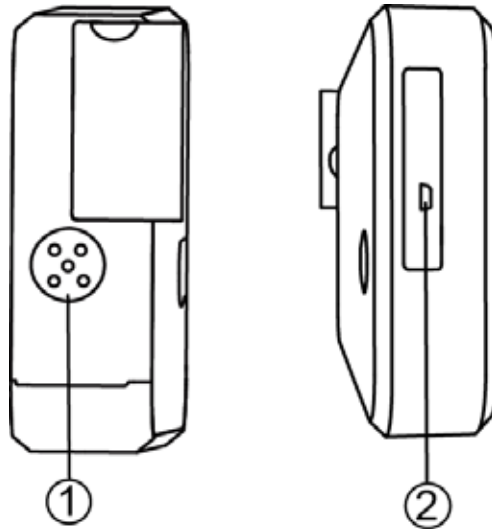
**Figure 4: Johnson Controls Vibration Diagnostics Service hardware assembly**



**Table 2: Johnson Controls Vibration Diagnostics Service hardware assembly**

Callout	Description
1	Sensor cable
2	WVS-1000 DAQ
3	Tri-axial accelerometer

**Figure 5: Ports and connections**



**Table 3: Ports and connections**

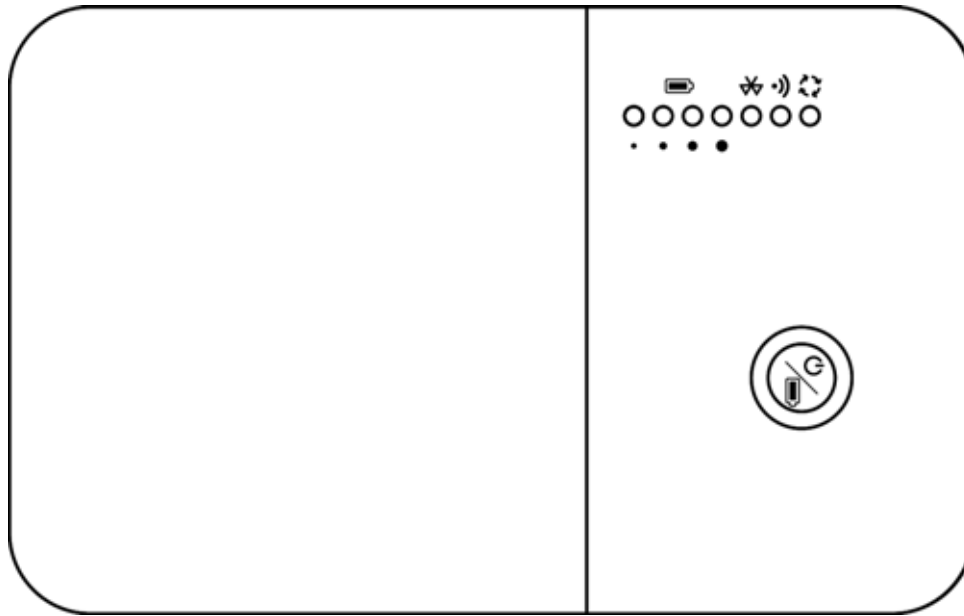
Callout	Description
1	WVS-1000 DAQ, female connector
2	USB and power connection

***Connecting the WVS-1000 DAQ to the Johnson Controls Vibration Diagnostics Service mobile app***










**Note:** The Johnson Controls Vibration Diagnostics Service is operated by an app that you download and install on your smart device. The app is available for Android and iOS devices (add URLs or QR codes).

1. Turn on the WVS-1000 DAQ by holding the power button for 6 seconds. When turned on, the WVS-1000 DAQ goes through a boot sequence which takes approximately 30 seconds. The Data Status LED flashes rapidly to indicate this sequence. The LEDs indicate that power is on. For more information about the LEDs, see Figure 6 and Table 4.

**Figure 6: WVS-1000 DAQ LED indicators and button**



**Table 4: WVS-1000 DAQ LED indicators and button**

Indicator	LED or button	Indicator name	Description
	<p>0-15% 15-50% 50-80% 80-100%</p> 	Battery capacity	Four green LEDs indicate the battery capacity.
		Bluetooth connectivity	One solid blue LED indicates connectivity to the smart device.
		Wi-Fi connectivity	One solid blue LED indicates that Wi-Fi is active for the WVS-1000 DAQ.
		Data status	<p>One blue and green LED indicates data capture.</p> <ul style="list-style-type: none"> <li>• Solid blue: Indicates that the device is capturing data</li> <li>• Flashing green: Indicates internal processing activity</li> </ul>
		Power button	<p>Power button</p> <ul style="list-style-type: none"> <li>• Press the button for 6 seconds to turn on.</li> <li>• Press the button for 12 seconds to turn off.</li> <li>• One single press indicates battery life on the battery capacity LEDs.</li> </ul>

- Open the Johnson Controls Vibration Diagnostics Service mobile app. Enter your login credentials and press **>GO**.
- To return to the **OPEN** tab.
- In the **OPEN** tab, select an open job or press **+** to start a new job. For additional operating instructions, refer to the training videos that can be found in the app.

5. To turn off the WVS-1000 DAQ, press the power button for 12 seconds.

## Operation

**Note:** These are general instructions for reference. It is very important to view the training videos to fully understand how to capture vibration data. These videos can be found in the app.

### Recording

To diagnose a machine, navigate to the machine page in the Johnson Controls Vibration Diagnostics Service mobile app and start a recording as follows:

1. Mount the tri-axial accelerometer to the mounting pad that is pre-installed on the equipment or to the correct location on the machine using the sensor magnet. Refer to the image in the mobile app to determine the correct mounting location.

**Note:** Before collecting data, check that the tri-axial accelerometer is mounted correctly.

2. Press the **Collect Data** button in the mobile app.
3. When the recording has finished, remove the tri-axial accelerometer. If the mobile app indicates that there is a problem with the recording, check that the tri-axial accelerometer is mounted correctly. Repeat the recording if necessary.
4. Record vibration data for the machine at all locations as instructed by the mobile app if the locations can be accessed safely.
5. After you have recorded all required locations, use the mobile app to send the recording to Johnson Controls for diagnosis.

### Charging

The WVS-1000 DAQ is powered by an internal rechargeable battery and cannot be used when the battery is depleted. It is recommended that you charge the device on a regular basis and monitor the battery status on the device.

### Using other sensors

You can use a single axis 100 mV/G sensor with the WVS-1000 DAQ. During data collection, remember to indicate that you are using a single axis sensor.

To connect the WVS-1000 DAQ to a junction box, a permanently mounted sensor, or any other BNC output, you must use an M12 4 pin-to-male BNC adapter. This adapter is sold separately.

To connect the sensor cable to a single axis sensor, a different cable needs to be used based on the specific sensor that is being used. This cable is sold separately.

## Maintenance

### Cleaning

Keeping the WVS-1000 DAQ clean extends the operational life of the device. Clean the device with a soft wet cloth and mild soap. Do not use abrasives, solvents, or alcohol.

The WVS-1000 DAQ is water resistant and protected against dust. It is designed and tested to adhere to IP54 standards.

### Storing

**Note:** To prevent the magnet from weakening, attach the magnet to a metal washer or to the attachment area of the WVS-1000 holster.

When not in use, store the WVS-1000 DAQ inside a dedicated case or bag.

For optimal battery performance, charge the WVS-1000 DAQ periodically. For more information on charging, see [Charging](#).



## Troubleshooting

If the LEDs on the WVS-1000 DAQ flash continuously, do not turn off, do not light up, or if the device does not connect to the Johnson Controls Vibration Diagnostics Service mobile app, there is a problem with the device.

Make sure that the WVS-1000 DAQ is on, that the mobile phone or data-enabled tablet app is connected to Bluetooth, and that the Johnson Controls Vibration Diagnostics Service mobile app is open. If the problem persists, restart the WVS-1000 DAQ by doing the following:

1. Press and hold the power button for 12 seconds to turn it off.
2. Release the power button.
3. Press and hold the power button for six seconds to turn it back on.
4. Wait for the WVS-1000 DAQ to restart and use it as normal.

Otherwise, the problem might result from the following:

- A connectivity fault
- A battery fault
- Device malfunction

### ***Depleted battery***

You cannot use the WVS-1000 DAQ if the battery is depleted. Charge the device regularly. To check the battery status, see Table 4.

## Repair information

If the WVS-1000 DAQ fails to operate within its specifications, replace the unit. For a replacement device, contact the nearest Johnson Controls representative.

## Technical specifications

### Johnson Controls Vibration Diagnostics Service

<b>Product code numbers</b>		WVS-1000: DAQ				
		24-11236-00018: Tri-axial accelerometer				
		24-11237-00004: Sensor cable				
		24-11240-00006: Sensor magnet				
		24-11238-00009: WVS-1000 holster				
<b>Power</b>	<b>Battery type</b>	Custom lithium ion pack				
	<b>Battery voltage</b>	3.7 V				
	<b>Battery capacity (nominal)</b>	3200 mAh max				
	<b>Battery life</b>	Rechargeable with micro USB from standard USB power				
	<b>Charging requirements/ USB port power rating</b>	Micro-USB, typical 1.2 A				
<b>Sensor</b>	<b>Sensor type</b>	Triaxial vibration sensor				
	<b>Sampling rate</b>	Maximum of 125 kS/s				
	<b>Dynamic range</b>	>90 dB (24 bit ADC), accuracy +/-2.5% of full scale range				
<b>Environmental</b>	<b>Ambient temperature</b>	Operating: 32 to 122°F (0 to 50°C)				
	<b>Conditions</b>	Operating survival: 14 to 140°F (-10 to 60°C) Non-operating: -4 to 140°F (-20 to 60°C)				
	<b>Ambient humidity</b>	Storage: -4 to 140°F (-20 to 60°C); 5 to 95% RH 86°F (30°C) maximum dew point conditions				
	<b>Conditions</b>	Operating: 32 to 122°F (0 to 50°C); 5 to 95% RH, 86°F (30°C) maximum dew point conditions				
<b>Wireless</b>	<b>Transmission power</b>		11b	1 Mbps	20	Max Power (dBm)
	<b>Power</b>		11g	11 Mbps	20	
				6 Mbps	18	
			11n	54 Mbps	16	
				HT20 (MCS0)	17	
				HT20 (MCS7)	15	
	<b>Receiving</b>		11b	1 Mbps	-94	Max sensitivity (dBm)
	<b>Sensitivity</b>		11g	11 Mbps	-86	
				6 Mbps	-88	
			11n	54 Mbps	-71	
				HT20 (MCS0)	-88	
				HT20 (MCS7)	-70	
	<b>Transmission speeds</b>	WLAN communication: 2.4 GHz ISM bands, 802.11 b/g/n, 11/22/ 54 Mbps		Support MCS 0, 1, 2, 3, 4, 5, 6 and 7 for Ht20 and HT40		

## Johnson Controls Vibration Diagnostics Service

<b>Wireless (cont)</b>	<b>Wireless security</b>	WPA2-PSK TKIP (Wi-Fi Protected Access Pre-Shared Key mode Temporal Key Integrity Protocol) WPA2-EAP-PEAP WPA2-EAP-TLS
<b>Purpose of control</b>		Operating control
<b>Construction of control and whether the control is electronic</b>		In-line
<b>Type 1 or Type 2</b>		Type 1
<b>External pollution situation</b>		Pollution degree 2
<b>Rated impulse voltage</b>		330 V
<b>Ball pressure temperature</b>		176°F (80°C)
<b>External power supply</b>		5 VDC; 1200 mA, SELV, Class 2; Low power (<15 W)
<b>Battery disposal instructions</b>		The battery must be removed from the control before it is scrapped. Dispose of the battery safely.
<b>Dimensions (HxWxD)</b>		4.76 in. x 3.07 in. x 0.98 in. (121 mm x 78 mm x 25 mm)
<b>Weight</b>		0.37 lb (166 g)
<b>Housing material</b>		Polycarbonate
<b>CE</b>	<b>United States</b>	UL Listed, File 60730-1, CCN XAPX, Under UL60730-1
		FCC Compliant to CFR 47, Part 15, Subpart B, Class A
		Wireless: FCC ID Grant, Part 15, Subpart C
	<b>Canada</b>	Industry Canada, ICES-002, Class A
		Wireless: Industry Canada, ICES ID Grant, RSS-247
<b>Europe</b>	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.	
<b>Australia and New Zealand</b>	RCM Mark, ACMA, AS/NZS 61000-6-3 Emissions	

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.

### Points of single contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 - CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

### Software terms

Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable terms set forth at [www.johnsoncontrols.com/techterms](http://www.johnsoncontrols.com/techterms). Your use of this product constitutes an agreement to such terms.

### Product Warranty

This product is covered by a limited warranty, details of which can be found at [www.johnsoncontrols.com/buildingswarranty](http://www.johnsoncontrols.com/buildingswarranty).

### Patents

Patents: <http://jcipat.com>.



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