Vertical Wallbox-Mounted or Surface-Mounted NS8000 Series Network Sensors Graphical Display Models Installation Guide

Part No. 24-11443-00006 Rev. D

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Figure 1: NS8000 Series Network Sensor Graphical Display model

Important (USA, Canada)

The NS Series Network Sensor is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the network sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the network sensor.

Le NS Series Network Sensor est destiné à transmettre des données entrantes à un équipement dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du network sensor risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du network sensor.

Software terms

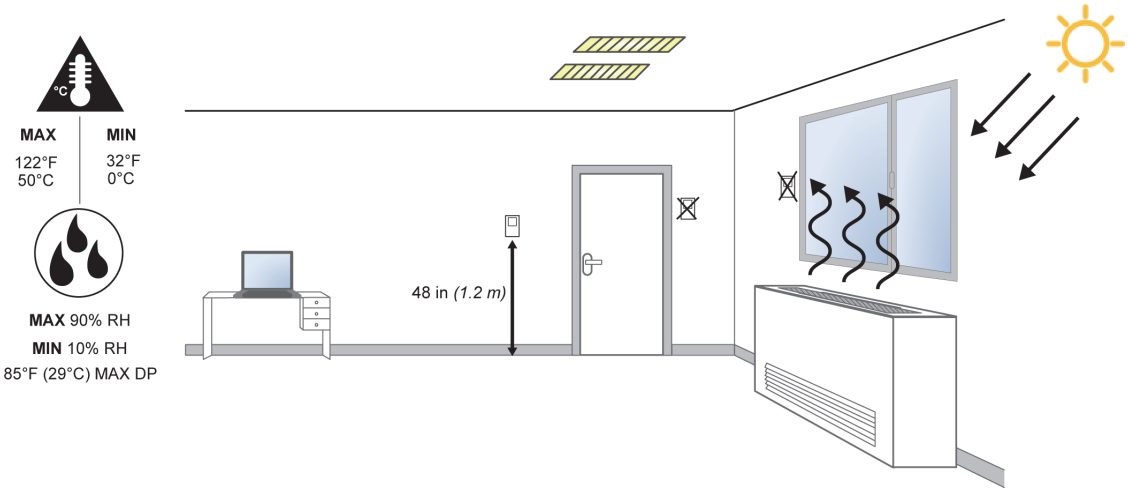
Use of the software that is in (or constitutes) this product or access to the cloud or hosted services applicable to this product, if any, is subject to applicable terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms. If you do not agree to be bound by such terms, you may return the unused product to your place of purchase.

Mounting

The NS Series Network Sensor can be surface mounted or wallbox mounted. For wallbox-mounted installations, mount the NS Series Network Sensor on a vertically roughed-in wallbox only. Do not attempt to mount the sensor on a horizontally roughed-in wallbox.

Note: Johnson Controls® does not supply the required hardware for mounting.

Location considerations



Note:

- Locate the network sensor away from steam or water pipes, warm air stacks, unconditioned areas (not heated or cooled), or sources of electrical interference.
- Height requirements may vary depending on the site.
- Network sensors without CO_2 sensing are shock and vibration resistant, but not shock and vibration proof. Be careful not to drop the unit or mount it where it could be exposed to excessive vibration. Dropping a CO_2 network sensor may result in readings outside of the specified accuracy tolerance.

Special tools (only one type needed)

Figure 2: Johnson Controls T-4000-119 Allen-head adjustment tool

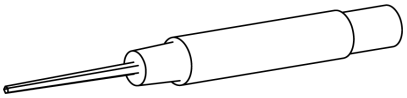


Figure 3: JC 5309 Allen-head flexible tool

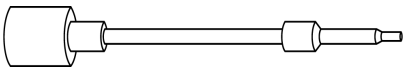
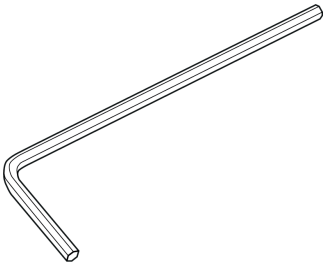


Figure 4: 1/16 in (1.5 mm) Allen wrench



Installation

CAUTION

Risk of Electric Shock.

Disconnect the power supply before making electrical connections to avoid electric shock.

ATTENTION

Risque de décharge électrique.

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

Important

Do not insert tools into the housing. Be careful not to damage any components when pushing the tabs on either side of the sensor.

Important

Do not remove the printed circuit board (PCB). Removing the PCB voids the product warranty.

Important

Do not connect the Sensor/Actuator (SA) connection at the controller until the cables have completely been terminated.

Important

Do not connect the SA bus ground, the modular phone jack GND or the screw terminal COM, to the negative communication terminal SA–.

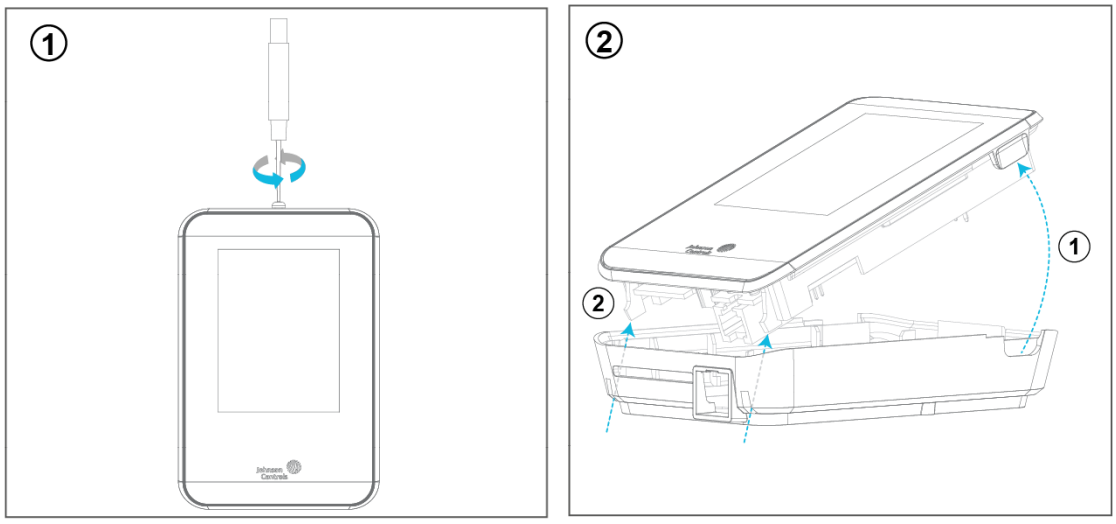
Important

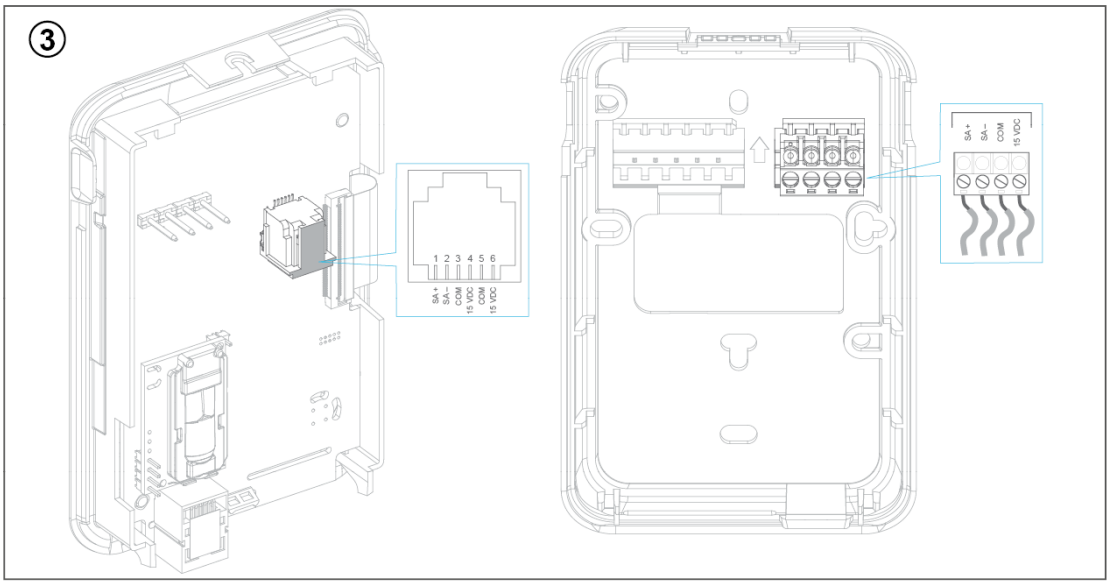
Failure to adhere to these wiring details causes the network sensor to function incorrectly. You will not be able to connect to the system using the Bluetooth® Wireless Comissioning Converter (BTCVT), Mobile Access Portal Gateway (MAP), or the handheld VAV balancing tool, and you will not be able to expand the system with future offerings.

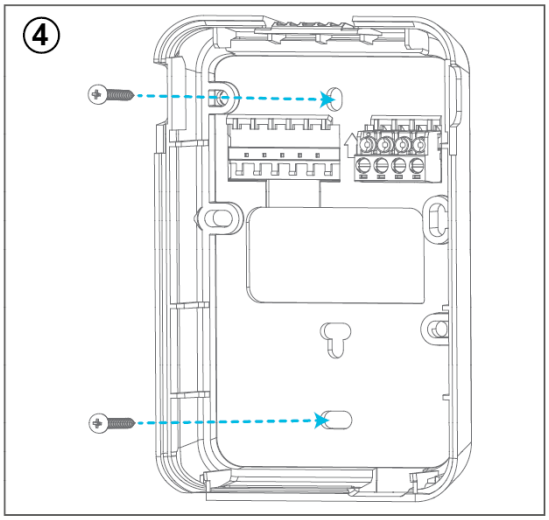
Note:

- Do not use both the modular phone jack and screw terminal connections on the same SA bus segment at the same time.
- The modular phone jack and screw terminal connections cannot be used simultaneously.

Figure 5: Installation of the NS8000 Network Sensor




3
1 2 3 4 5 6
SA +
SA –
COM
15 VDC
COM
15 VDC
SA +
SA –
COM
15 VDC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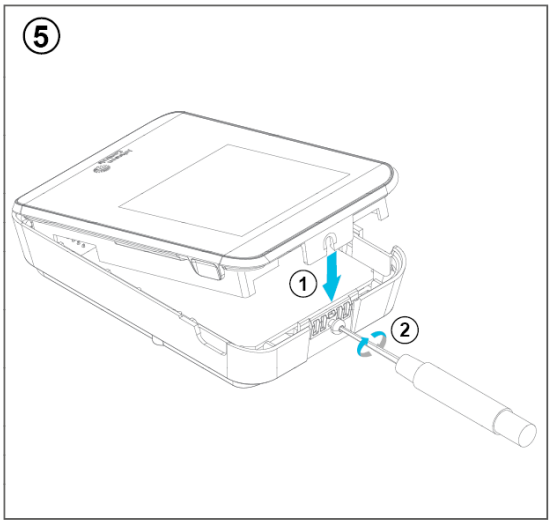
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1
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Graphical display overview

The following figures show examples of the graphical model display screens.

Figure 6: Temperature screen

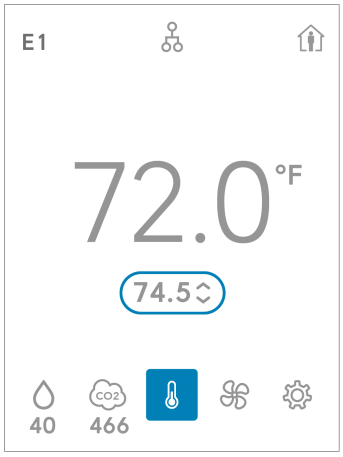

Figure 7: Fan speed screen

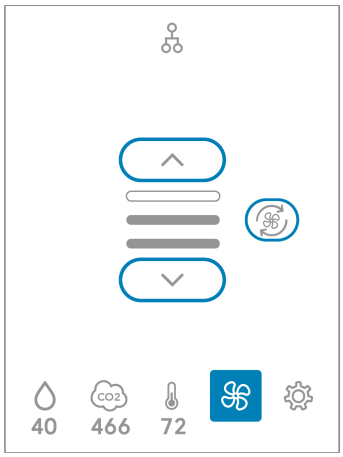

Figure 8: Settings screen

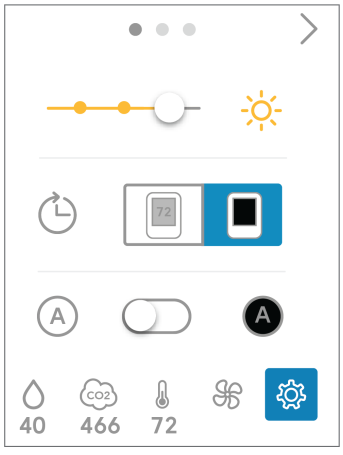

Table 1: Display icons

Icon	Icon name	Icon description	Hide options
	Up arrow	Increases current setting	No
	Down arrow	Decreases current setting	
	Background light	Sets light background color	
	Background dark	Sets dark background color	
	Brightness bar	Screen brightness setting	
	Brightness	Screen brightness level	
	Cancel	Cancels a setting change	
	Checkmark	Confirms a setting change	

Table 1: Display icons

Icon	Icon name	Icon description	Hide options
	CO_2	CO_2 measurement	Yes. See Hiding icons on the home screen.
	Fan speed	Fan speed setting	
	Fan auto	Automatic fan speed	
	Fan speed bars	Current fan speed	
	Relative humidity	Humidity measurement	
	Occupancy	Occupancy indicator	
	Setpoint	Configurable setpoint temperature	
	Network	Network connection to host controller over SA bus	No
	No network	Sensor not connected to host controller	No
	Settings	Settings menu	Yes. See Activating and deactivating the screen lockout mode.
	Settings lock	Lockout mode	

Table 1: Display icons

Icon	Icon name	Icon description	Hide options
	Temperature	Displays current temperature	No
	Setting enabled	Toggle setting is blue	
	Setting disabled	Toggle setting is white	
	Error	Title 24 error indicator	
	Page indicator	Settings screen page indicator	
	Scroll arrows	Settings screen scroll arrows	
	Timeout	Screen timeout mode	
	Screen dim	Screen timeout set to dim	
	Screen off	Screen timeout set to turn off	

Setup and adjustments for the graphical display model

Main screens overview

The NS8000 Graphical Sensor model features five main display screens. See *Table 1* for touchscreen icon descriptions. The current values for temperature, relative humidity (RH), or CO2 show below the relevant icon. Any interaction with a display screen activates temporary occupancy mode for 2 minutes. See *Figure 1* to *Figure 3* for individual graphical display screens.

Note:

- Press an icon to select the display screen for temperature, RH, CO_2 , fan speed, or screen settings.
- A blue square highlights the selected icon at the bottom of the screen.
- After 10 seconds of inactivity on any adjustment screen, the UI returns to the previous display screen.
- A pressed arrow displays as dark gray while inactive arrows and inactive settings display as pale gray.
- An enabled **Up** or **Down** arrow displays as blue.
- After 60 seconds of inactivity, the display screen dims or turns off based on the user settings for sleep mode.
- When any user interaction occurs, the display screen exits sleep mode.

Adjusting the temperature setpoint

To adjust the temperature setpoint, complete the following steps:

1. Press the **Temperature** icon to view the temperature display screen.
2. Press the oval **Setpoint** icon to open the setpoint adjustment settings screen.
3. Press the **Up** or **Down** arrow to increase or decrease the temperature setpoint by 0.5°F or 0.5°C.

4. Press the green **Checkmark** icon to confirm the change or press the red **Cancel** icon to cancel the change, and return to the previous screen.
5. Optional: Press and hold the **Up** or **Down** arrow to continuously increase or decrease the temperature setpoint.

Note:

- The large number on the temperature display screen shows the current temperature.
- The number in the blue oval shows the current setpoint value displayed in degrees Fahrenheit or Celsius.
- You can change the temperature unit in the **Settings** section. See Adjusting the temperature unit.

Adjusting the fan speed

To adjust the fan speed, complete the following steps:

1. Press the **Fan** icon to view the fan display screen.
2. Press the **Up** or **Down** arrow to increase or decrease the fan speed to cycle through off, low, medium, or high fan speed settings.
3. Optional: Press the **Fan Auto** icon to set the fan speed to automatic mode. The **Fan Auto** icon circle is blue and the **Up** arrow, the **Down** arrow, and the **Fan Speed** bars display as inactive. Deselect auto mode to increase or decrease the fan speed.

Note: The **Up** or **Down** arrows display as inactive when the fan reaches the maximum or minimum fan speed setting.

Viewing the SA bus sensor address and the firmware version

To view the SA bus sensor address and the firmwire version, complete the following steps:

1. Press the **Network** icon at the top of the display screen to access the network settings screen.The firmware version displays for diagnostic purposes.
2. Press and hold the SA Bus for 3 seconds to access the SA Bus address edit screen.
3. Press the **Up** or **Down** arrows to modify the SA Bus sensor address.
4. Set the SA Bus sensor address between 199 and 206 to connect to the corollary controller.
5. Press the green **Checkmark** icon to confirm the change or press the red Cancel icon to cancel the change, and return to the previous screen.

Viewing the settings screens

To view the settings screens, complete the following steps:

1. Tap the **Settings** icon to access the settings screens.
2. Tap the left and right arrows at the top of the screen to scroll through the three pages of screen settings.
3. Tap any of the icons: temperature, RH, CO_2, or fan on the bottom row to exit the Settings menu.

Note:

- The page indicator at the top of the screen shows the selected settings page.
- After a fixed duration of 60 seconds, the settings screen returns to the last visited main display screen.

Adjusting the screen display settings

To adjust the screen display settings, complete the following steps:

1. Press the **Settings** icon to open the screen display settings.
2. Toggle the **Brightness Bar** icon to the left or right to adjust the screen brightness.
3. Set the **Screen Timeout** mode to dim or turn off after 60 seconds. The default setting is to turn off the screen.
4. Tap the **Toggle** icon to switch between light and dark mode. The default setting is light mode.

Note: After a fixed duration of 60 seconds, the settings screen returns to the last visited main display screen.

Adjusting the temperature unit

To change the temperature units from Fahrenheit to Celsius or Celsius to Fahrenheit, complete the following steps:

1. Press the **Settings** icon and use the scroll arrow to navigate to the second page.
2. To change the temperature unit, tap the **Toggle** icon to switch between Fahrenheit and Celsius.

Changing the decimal separator

To change the decimal separator, complete the following steps:

1. Press the **Settings** icon and tap the arrow in the top right to navigate to the second page.
2. To change the decimal separator, tap the **Toggle** icon to switch between the decimal comma and decimal point.

Selecting the maximum fan speed settings

The default fan speed is automatic. To change the value of the maximum fan speed, complete the following steps:

1. Press the **Settings** icon and tap the arrow in the top right to navigate to the second page.
2. Tap the **Fan Speed** bars to select the maximum setting as No Fan, Low, Medium, or High.

Hiding icons on the home screen

To hide display icons on the home screen, complete the following steps:

1. Press the **Settings** icon and tap the arrow in the top right to navigate to the third page.
2. Press an icon to toggle between showing the icon and hiding the icon.

3. Press the green **Checkmark** icon to confirm the change or the red Cancel icon to cancel the change, and return to the previous screen.

Note:

- The fan icon is hidden by default in a newly shipped unit. You can activate it in the Settings menu.
- RH and CO_2 icons are only visible in units that support these features.
- An icon displays as blue when enabled and an icon displays as gray when disabled.
- Hidden or visible icons remain in a fixed position and cannot be realigned.
- Hidden icons are grayed out in **Settings** mode and are not visible in screen display mode.
- It is not possible to scroll from Page 3 to Page 2. Confirm or cancel a change to return to the previous screen.

Activating and deactivating the screen lockout

Lock the screen to prevent users from making setpoint changes or accessing the settings screens. To activate and deactivate the screen lockout, complete the following steps:

1. Press the **Settings** icon for 10 seconds to enter **Lockout** mode.The lock symbols replaces the Settings icon.
2. In Lockout mode, you cannot access the **Temperature** setpoint screen, the **Settings** screen, or the **Network** screen.
3. Press the **Lock** icon for 10 seconds to exit **Lockout** mode.

Title 24 error indicators

In the event of a Title 24 related error, the graphical screen displays the **Error** icon in the upper left of the display screen with the corresponding error code number for all the required state of California Title 24 economizer fault conditions. See the following table for fault error codes.

Table 2: Fault error codes

Display text	California Title 24 economizer fault condition	Possible problem
E0	Air temperature sensor failure or fault	Problem with one of the air temperature sensors. Check outdoor air, return air, or supply air sensors.
E1	Not economizing when it should	The economizer is not using outdoor air when it should.
E2	Economizing when it should not	The economizer is allowing outdoor air inside when the conditions are not suitable for economizer operation.
E3	Damper not modulating	The economizer damper is not able to modulate properly. Check damper, linkage to actuator, or the actuator.
E4	Excess outdoor air	The economizer is allowing excess outdoor air inside.

CO_2 altitude compensation

The Johnson Controls NS Series CO_2 Network Sensors ship from the factory calibrated for an altitude range of 0 ft to 2,000 ft (0 m to 600 m) without compensation.

For altitudes above 2,000 ft (600 m) where optimum accuracy of the CO_2 concentration measurement is essential, modify the offset property of the NS Series CO_2 Network Sensors (Zone Quality [ZN-Q] Analog Input [AI]). The offset represents the local atmospheric pressure in hectopascals (hPa). Set the offset to the known local pressure or use the local altitude value listed in Table 3. The factory default value is 978 hPa.

As of Release 5.3 of the Controller Configuration Tool (CCT) and Facility Explorer® Programmable Controller Tool (FX-PCT) software, the NS Series CO_2 Network Sensors (Zone Quality [ZN-Q] Analog Input [AI]) automatically change the hPa value entered from Table 3 into the correct offset value in the CCT and FX-PCT software. The offset value for the SA bus device is labeled ppm; however, it is the proper field to enter the hPa value found in Table 3. Refer to the *Controller Tool Help (LIT-12011147)* for more details.

Note: Enter the pressure value only in units of hPa. The sensor reads the value entered as hPa. The CO_2 present value may require several minutes to settle after changing the offset value.

See Table 3 for local altitude values.

Table 3: CO_2 altitude compensation

Altitude above sea level		Absolute pressure
Feet	**Meters**	**hPa**
-656	-200	1,038
0	0	1,013
656	200	989
1,312	400	966
1,969	600	943
2,625	800	921
3,281	1,000	899
3,937	1,200	877
4,593	1,400	856
5,249	1,600	835
5,906	1,800	815
6,562	2,000	795
7,218	2,200	775
7,874	2,400	756
8,530	2,600	738
9,186	2,800	719
9,843	3,000	701

Repair information

If the NS Series Graphical Network Sensor fails to operate within its specifications, replace the unit. For a replacement NS Series Graphical Network Sensor, contact the nearest customer service center or Johnson Controls representative.

Technical specifications

Table 4: Vertical Wallbox-Mounted or Surface-Mounted NS8000 Series Network Sensors Graphical Display models

Description			Specification
Supply voltage			9.8 VDC to 16.5 VDC; 15 VDC nominal (from SA bus)
Current consumption	Base current draw (all models)	Screen off	18 mA maximum (non-transmitting)
		Screen on	45 mA maximum
	CO_2 models		13 mA maximum additional current (during measurement)
	ⓘ **Note:** SA bus applications are limited to a power load of 210 mA. The best practice when configuring an SA bus is to limit the total available operating power consumption to 120 mA or less. This power level allows you to connect a BTCVT Wireless Commissioning Converter temporarily or a DIS1710 Local Controller Display to the bus for commissioning, adjusting, and monitoring.		
Terminations			Modular jack and screw terminal block
Network sensor addressing	LCD full color graphical models		Configurable through graphical user interface
Wire size	Modular jack models		24 AWG or 26 AWG (0.5 mm or 0.4 mm diameter); three twisted pair (six conductors)
	Screw terminal block models		18 AWG to 22 AWG (1 mm to 0.6 mm diameter); 22 AWG (0.6 mm diameter)
Communication rate			Auto-detect: 9.6 kbps, 19.2 kbps, 38.4 kbps, or 76.8 kbps
Temperature measurement range			32.0°F (0°C) to 104°F (40°C)
Temperature sensor type			Digital temperature sensor
Humidity sensor type			Thin film capacitive sensor
Ambient conditions	Operating		32°F to 122°F (0°C to 50°C); 10% to 90% RH, noncondensing; 85°F (29°C) maximum dew point
	Storage		40°F to 122°F (-40°C to 50°C); 5% to 95% RH, noncondensing
Temperature resolution			±0.5°F (±0.5°C)
Temperature accuracy	NS Series Network Zone Sensor		±1°F (±0.6°C)
	Temperature element only		±0.36°F (±0.2°C) at 70°F (21°C)
Humidity element accuracy	NSB8BHxxxx-0 models		±2% RH for 20% to 80% RH at 50°F to 95°F (10°C to 35°C) ±6% RH for 10% to 20% and 80% to 90% RH at 50°F to 95°F (10°C to 35°C)
CO_2 measurement range			0 ppm - 2000 ppm
CO_2 sensor accuracy	Accuracy		±30 ppm +3% of CO_2 reading at 77°F (25°C) and 978 hPa (1,000 ft/300 m)
	Temperature dependence		±1.4 ppm/°F (± 2.5 ppm/°C)
	Pressure dependence		See Table 3 for CO_2 altitude compensation.
CO_2 sensor operation range			32°F to 122°F (0°C to 50°C)
Time constant			10 minutes nominal at 10 fpm airflow
Default temperature setpoint adjustment range			50°F (10°C) to 86°F (30°C) in 0.5° increments
CO_2 sensor lifespan			10 years under standard operating conditions

Table 4: Vertical Wallbox-Mounted or Surface-Mounted NS8000 Series Network Sensors Graphical Display models

Description			Specification
LCD lifespan		Screen timeout set to off	>10 years
		Screen timeout set to dim	At least 6 years
Dimensions (H x width x depth)			5 in. x 3.4 in. x 1.1 in. (85.3 mm x 127.55 mm x 26.8 mm)
Shipping weight			0.4 lb (0.18 kg)
Compliance	United States		UL Listed, File E107041, CCN PAZX, Under UL 60730-1, Energy Management Equipment
			FCC Compliant to CFR 47, Part 15, Subpart B, Class B
	Canada		cUL Listed, File E107041, CCN PAZX7, Under CAN/CSA E60730-1, Signal Equipment
CE	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
	China		RoHS2

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 shall not be liable for damages resulting from misapplication or misuse of its products.

Product warranty

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

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 end-user license, open-source software information, and other terms set forth at www.johnsoncontrols.com/techterms. Your use of this product constitutes an agreement to such terms.

Patents

Patents: https://jcipat.com

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