

# HE-69xx Surface-Mount Duct Humidity and Temperature Sensors

## Product Bulletin

Code No. LIT-12012444  
Issued October 2019

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### Introduction

The HE-6900 series product line delivers  $\pm 3\%$  relative humidity (RH) sensing products.

The HE-69xx Series sensors combine humidity and temperature sensing in an all plastic enclosure for use inside ducts and economizer rooftop systems. These models are available with a nickel, platinum, or one of three thermistor temperature sensors.

The thermistor temperature sensors have a negative temperature coefficient, and a reference resistance of 2.252k ohms or 10.0k ohms. The nickel and platinum temperature sensors have a reference resistance of 1.0k ohms. These units can be powered with 14 to 30 VDC or 20 to 30 VAC. The output signal is 0 to 5 VDC or 0 to 10 VDC for humidity indication.

### Features and benefits

- **Humidity and Temperature Sensor in one unit—** Eliminates need for separate sensors; reduces installation time and cost.
- **Senses RH over full 0 to 100% range—** Accommodates a wide range of applications.
- **Protective membrane—** Protects sensors from contamination.
- **Quick-mount, 2-screw installation—** Reduces installation time.
- **Compact enclosure for mounting inside ducts—** Designed for rooftop unit applications and retrofits; enables surface-mount installation.

Figure 1: HE-6900 Series Humidity and Temperature Sensors



## Product overview

**IMPORTANT:** The HE-69xx Series Surface-Mount Duct Humidity and Temperature Sensor is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the 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 sensor.

**IMPORTANT :** Le HE-69xx Series Surface-Mount Duct Humidity and Temperature Sensor est destiné à transmettre des données entrantes à un équipement dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du 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 sensor.

The HE-69xx sensors provide humidity and temperature sensing inside ducts and rooftop economizers. They are suitable for use with Johnson Controls® direct-mount economizer controllers. The humidity element senses over the entire range of 0 to 100% RH and is housed in a plastic enclosure that is easy to install.

Temperature and humidity information from the HE-69xx can be used to precisely calculate enthalpy, which plays an important role in determining an energy-efficient and cost-effective economization strategy.

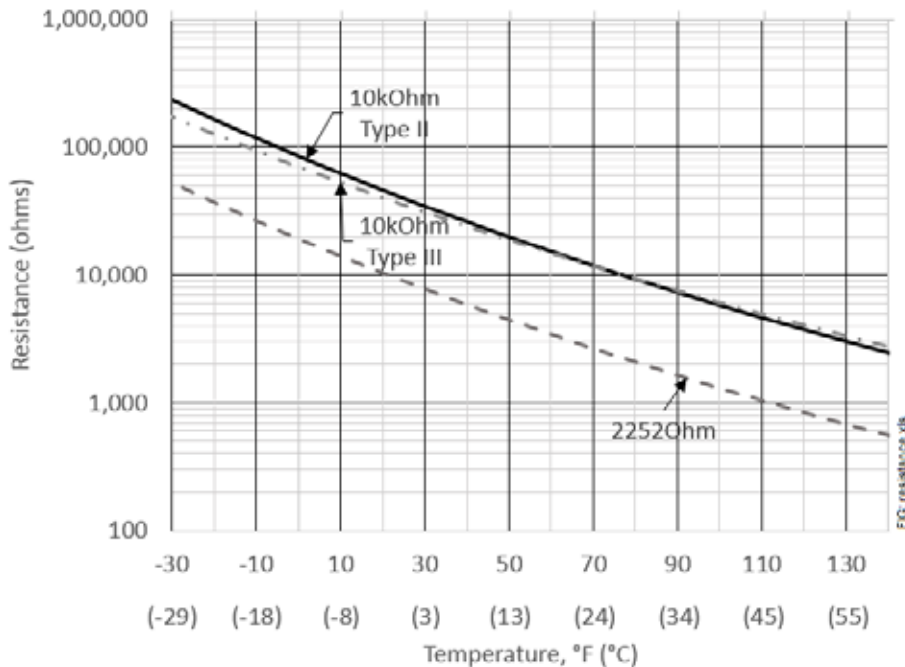
Duct humidity is an important factor in the overall quality of indoor air. The HE-69xx allows you to monitor and compare duct humidity with levels recommended in ASHRAE ventilation standards.

### Theory of operation

The humidity element is a capacitive sensor. The plates sandwich a water-permeable polymer that changes its dielectric constant through absorption of moisture in the air. The humidity-induced change in capacitance is used to produce a voltage signal proportional to the relative humidity of the sensed air.

See Figure 2 for 2.252k ohm and 10k ohm thermistor sensor Resistance/Temperature (R/T) response characteristics. See Table 1 for all R/T values.

Figure 2: Thermistor temperature response

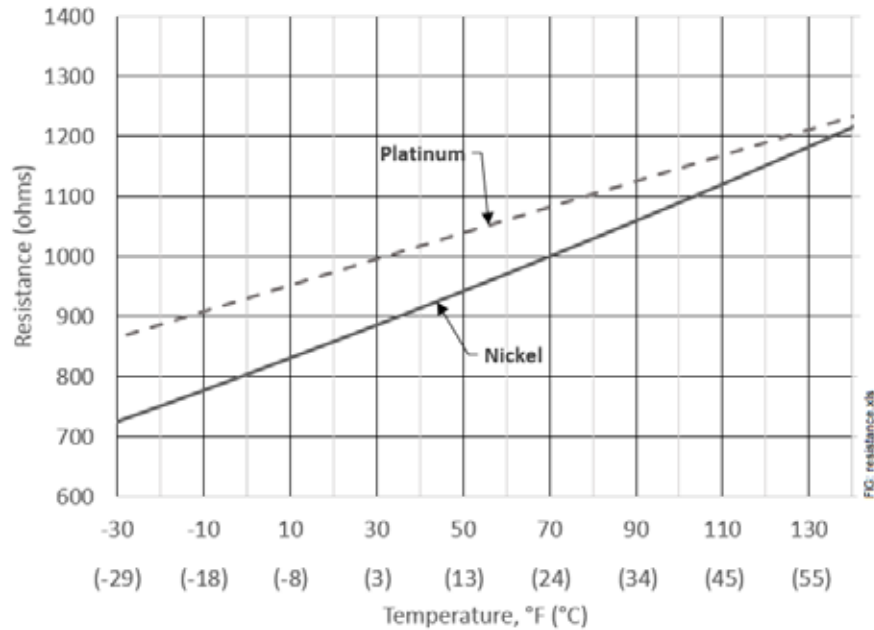


**Table 1: Nominal values for nickel, platinum, and thermistor sensors**

Temperature		Resistance (ohm)				
°F	°C	Nickel	Platinum	2.252k	10k Type II	10k Type III
-50	-45.6	673.7	820.7	109,904.8	489,981	335,052
-40	-40.0	699.0	842.7	75,487.3	336,185	239,828
-30	-34.4	724.6	864.7	52,584.2	233,990	173,676
-20	-28.9	750.5	886.6	37,123.5	165,085	127,170
-10	-23.3	776.8	908.5	26,543.7	117,978	94,103
0	-17.8	803.5	930.3	19,209.6	85,349	70,337
10	-12.2	830.4	952.1	14,062.5	62,464	53,079
20	-6.7	857.8	973.9	10,407.7	46,221	40,424
30	-1.1	885.5	995.7	7783.4	34,562	31,055
40	4.4	913.5	1017.4	5878.7	26,103	24,058
50	10.0	942.0	1039.0	4482.4	19,903	18,787
60	15.6	970.8	1060.7	3448.6	15,313	14,783
70	21.1	1000.0	1082.3	2676.2	11,883	11,717
80	26.7	1029.6	1103.8	2094.0	9298	9,353
90	32.2	1059.6	1125.3	1651.3	7333	7,516
100	37.8	1089.9	1146.8	1312.0	5827	6,079
110	43.3	1120.7	1168.3	1050.0	4663	4,947
120	48.9	1151.9	1189.7	846.0	3757	4,050
130	54.4	1183.5	1211.1	686.2	3048	3,334
140	60.0	1215.6	1232.4	560.1	2488	2,760
150	65.6	1248.0	1253.7	459.9	2043	2,297
160	71.1	1280.9	1275.0	379.9	1687	1,921
170	76.7	1314.2	1296.2	315.5	1401	1,614
180	82.2	1348.0	1317.4	263.4	1170	1,363
190	87.8	1382.2	1338.6	221.1	982	1,156
200	93.3	1416.8	1359.7	186.4	828	985
210	98.9	1451.9	1380.8	158.0	701	843
220	104.4	1487.5	1401.9	134.5	597	724

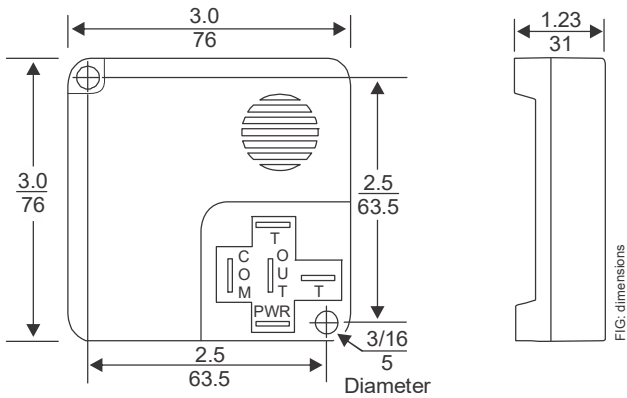
See Figure 3 for nickel and platinum sensor R/T response characteristics.

**Figure 3: Nickel and platinum temperature response**



**Dimensions**

**Figure 4: HE-69xx Dimensions, in. (mm)**



**Ordering information**

To order a HE-69 humidity and temperature sensor, contact the nearest Johnson Controls representative. Specify the product code number from Table 3 for a sensor and Table 4 for an accessory.

**Note:** Not all models are available. See Table 3 for a list of available models.

**Repair information**

If the HE-69xx Surface-Mount Duct Humidity and Temperature Sensor fails to operate within its specifications, replace the unit. For a replacement sensor, contact the nearest Johnson Controls Representative.

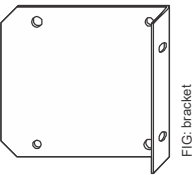
**Table 2: HE-69xx Surface-Mount Duct Humidity and Temperature Sensor**

	Ordering Code Number	H	E	-	6	9		3		N	S	-	
Application	H = Humidity sensing												
Device Function	E = Element												
	-69												
Temperature Sensor Type	Y = 10k ohm Thermistor, Type III 1 = 1000 ohm Nickel 4 = 2.252k ohm Thermistor, $\pm 0.2^{\circ}\text{C}$ ( $\pm 0.36^{\circ}\text{F}$ ) 5 = 1000 ohm Platinum, Class A 6 = 10k ohm Thermistor, Type II												
Humidity Sensor Accuracy	3 = $\pm 3\%$												
Output Signal	0 = 0 to 10 VDC 5 = 0 to 5 VDC proportional output												
	N												
Enclosure Style	S = Duct, surface mount, grey												
Logo	0 = Johnson Controls 2 = No logo												

**Table 3: Humidity and Temperature Sensors**


Product Code Number	Temperature Sensor Type	Output Signal	Logo
HE-69130NS-0	1.0k ohm Nickel	0 to 10 VDC	Johnson Controls
HE-69135NS-0	1.0k ohm Nickel	0 to 5 VDC	Johnson Controls
HE-69435NS-0	2.252k ohm Thermistor, $\pm 0.2^{\circ}\text{C}$ ( $\pm 0.36^{\circ}\text{F}$ )	0 to 5 VDC	Johnson Controls
HE-69530NS-0	1000 ohm Platinum, Class A	0 to 10 VDC	Johnson Controls
HE-69630NS-0	10k ohm Thermistor, Type II	0 to 10 VDC	Johnson Controls
HE-69630NS-2	10k ohm Thermistor, Type II	0 to 10 VDC	No logo
HE-69Y35NS-0	10k ohm Thermistor, Type III	0 to 5 VDC	Johnson Controls

**Table 4: Accessories**

Product Code Number	Description
ACC-BRKT-100	<p>Mounting Bracket for mounting the sensor perpendicular to the duct; 3.25 H x 3.62 W x 0.75 in. D (83 x 92 x 19 mm)</p> 
ACC-CBL-100	Wiring Harness, 53 in. (1.3 m)

## Technical specifications

### HE-69xx Surface-Mount Duct Humidity and Temperature Sensors

<b>Power Requirements</b>		14 to 30 VDC or 20 to 30 VAC at 50/60 Hz, Class 2	
<b>Current Draw</b>		3 mA with no load; 25 mA maximum	
<b>Output Signal</b>	HE-69xx0NS HE-69xx5NS	0 to 10 VDC, into 1k ohm minimum load 0 to 5 VDC, into 1k ohm minimum load	
<b>Humidity Element at 77°F (25°C)</b>		Accuracy:	±3% RH for 20 to 80% RH ±5% RH for 10 to 20% and 80 to 90% RH
		Temperature Coefficient:	±0.03% RH/C
<b>Temperature Sensor</b>	Nickel (HE-691xxNS)	Sensor type	1.0k ohm thin-film nickel
		Reference resistance	1.0k ohms at 70°F (21°C)
		Accuracy	±0.34°F at 70°F (±0.18°C at 21°C)
	2.252k ohm NTC Thermistor (HE-694xxNS)	Sensor type	2.252k ohm NTC thermistor
		Reference resistance	2.252k ohms at 77°F (25°C)
		Accuracy	±0.36°F at 77°F (±0.2°C at 25°C)
	Platinum (HE-695xxNS)	Sensor type	1.0k ohm thin-film platinum, Class F0.15 IEC60751 (Class A)
		Reference resistance	1.0k ohms at 32°F (0°C)
		Accuracy	±0.35°F at 70°F (±0.19°C at 21°C)
	10k ohm NTC Thermistor, Johnson Controls Type II (HE-696xxNS)	Sensor type	10k ohm NTC thermistor, Johnson Controls Type II
		Reference resistance	10k ohms at 77°F (25°C)
		Accuracy	±0.9°F at 70°F (±0.5°C at 25°C)
10k ohm NTC Thermistor, Johnson Controls Type III (HE-69YxxNS)	Sensor type	10k ohm NTC thermistor, Johnson Controls Type III	
	Reference resistance	10k ohms at 77°F (25°C)	
	Accuracy	±0.36°F at 77°F (±0.2°C at 25°C)	
<b>Ambient Operating Conditions</b>		32 to 140°F (0 to 60°C) 0 to 100% RH, 85°F (29.4°C) maximum dew point	
<b>Survival Operating Conditions</b>		-20 to 140°F (-29 to 60°C) 0 to 100% RH, 85°F (29.4°C) maximum dew point	
<b>Ambient Storage Conditions</b>		-40 to 140°F (-40 to 60°C) 0 to 100% RH, 85°F (29.4°C) maximum dew point	
<b>Terminal Connections</b>		1/4 in. (6.4 mm) external spade	
<b>Acceptable Wire Gauge</b>		16 to 24 AWG (1.3 to 0.5 mm diameter) wire (18 AWG [1.0 mm diameter] wire recommended)	
<b>Dimensions (H x W x L)</b>		3 x 3 x 1-1/4 in. (76 x 76 x 31 mm)	
<b>Shipping Weight</b>		0.50 lb (0.23 kg)	
	United States	UL Listed, CCN XAPX, File E27734; to UL 60730-1; and IEC 60730-2-13. Plenum rated (UL 2043)	
	Canada	cUL Listed, CCN XAPX7, File E27734; to CAN/CSA E60730-1; and CAN/CSA-E60730-2-13	
	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	

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**

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