TE-6300 Series Temperature Sensors

The TE-6300 Temperature Sensor line offers an economical solution for a wide variety of temperature sensing needs, including wall mount, outdoor air, duct, well, duct averaging, and Variable Air Volume (VAV) applications.

Sensors are available in the following types:

- *1 k ohm thin-film nickel*
- *1 k ohm nickel averaging*
- *1 k ohm thin-film platinum*
- *100 ohm platinum equivalent averaging*
- *1 k ohm platinum equivalent averaging*
- *2.2 k ohm thermistor*
- *10 k ohm thermistor*

Each sensor is packaged with the necessary mounting accessories to maximize ordering and installation ease and reduce both commissioning time and cost.

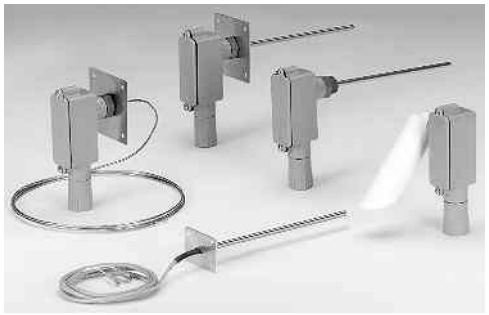

Figure 1: TE-6300 Series Temperature Sensors

Features and Benefits	
❑ **Full Line of Versatile Sensors**	Supports all your temperature sensing needs from a single supplier: wall mount, outdoor air, duct, duct averaging, well insertion, and VAV box duct probe
❑ **Single Assembly Ordering**	Simplifies ordering; provides a complete assembly in one box
❑ **Integral National Pipe Thread (NPT) Adaptor**	Increases sensor connection strength; eliminates the need for a special adaptor
❑ **Noncorrosive Thermoplastic Enclosure**	Resists environmental effects with a durable, easy-to-use, standard conduit enclosure
❑ **Stainless Steel Sensor Probe**	Protects the sensor while increasing corrosion resistance
❑ **Retainer for the Sensor Holder**	Locks the sensor holder into the conduit box

Product Overview

IMPORTANT: Use this TE-6300 Series Temperature Sensor only to provide an input to equipment under normal operating conditions. Where failure or malfunction of the TE-6300 sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the 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 TE-6300 sensor.

The thin-film nickel sensors have a reference resistance of 1 k ohms at 70°F (21°C) and a resistance change of approximately 3 ohms/F° (5 ohms/C°). They have white leads.

The platinum and platinum equivalent averaging sensors have a reference resistance of either 100 or 1 k ohms at 32°F (0°C) and meet the current DIN standard. The 1 k-ohm platinum sensors are identified by white leads with a blue stripe. The 1 k ohm platinum equivalent averaging sensors have blue leads, and the 100-ohm platinum equivalent averaging sensors have red leads.

See Table 1 or Figure 2 for Resistance (**R**) values at selected Temperatures (**T**) for nickel, platinum, and platinum equivalent sensors.

Thermistor sensors have a negative temperature coefficient. They have a reference resistance of either 2,252 (2.2 k) or 10 k ohms at 77°F (25°C), and match Fenwal® unicurve characteristics. (See Table 1 and Figure 4 or Figure 5 for resistance values at selected temperatures.) The 2.2 k-ohm thermistor sensors have white leads with a green stripe, and all VAV models, including the 10 k ohm thermistor sensors have white leads.

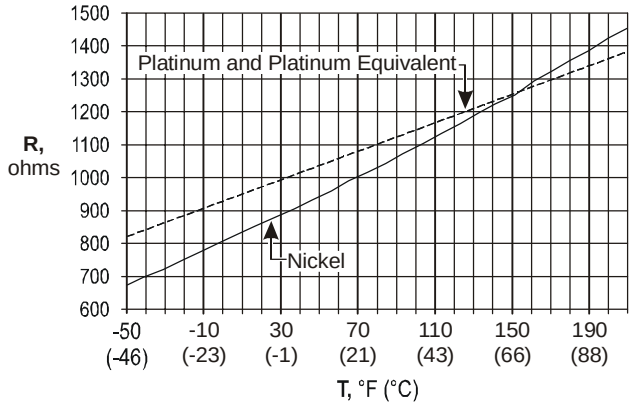

Figure 2: R vs. T: Nickel, Platinum, and Platinum Equivalent Sensors

Averaging Sensing

Series/parallel wiring arrangements of four, nine, sixteen, or more sensors provide an average temperature reading in an area. (See Figure 3.)

A series parallel arrangement requires the same number of parallel-connected legs as there are series connected sensors per leg. For example:

- with four sensors, connect two parallel legs with two sensors in series in each leg
- with nine sensors, connect three parallel legs with three sensors in series in each leg, as shown in Figure 3

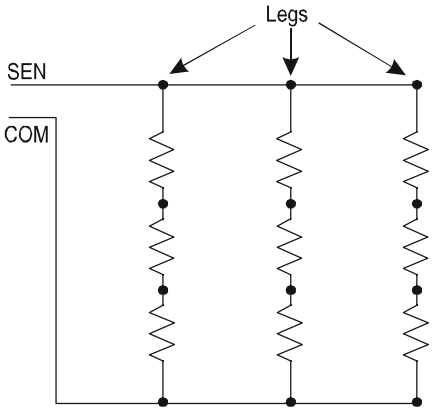

Figure 3: Series Parallel Wiring Arrangement

Table 1: Nominal T vs. R: Nickel (Ni), Platinum or Platinum Equivalent (Pt)*, and Thermistor Sensors

Temperature		Resistance (ohms)			
°F	°C	Ni	Pt*	Thermistor	
				2.2k	10k
-50	-46	674	821	109,905	489,981
-40	-40	699	843	75,487	366,185
-30	-34	725	865	52,584	233,990
-20	-29	751	887	37,123	165,085
-10	-23	777	908	26,544	117,978
0	-18	803	930	19,210	85,349
10	-12	830	952	14,063	62,464
20	-7	858	974	10,408	46,221
30	-1	885	996	7,783	34,562
40	4	914	1,017	5,879	26,103
50	10	942	1,039	4,482	19,903
60	16	971	1,061	3,449	15,313
70	21	1,000	1,082	2,676	11,883
80	27	1,030	1,104	2,094	9,298
90	32	1,060	1,125	1,651	7,333
100	38	1,090	1,147	1,312	5,872
110	43	1,121	1,168	1,050	4,663
120	49	1,152	1,190	846	3,757
130	54	1,184	1,211	686	3,048
140	60	1,216	1,232	560	2,488
150	66	1,248	1,254	460	2,043
160	71	1,281	1,275	380	1,687
170	77	1,314	1,296	315	1,401
180	82	1,348	1,317	263	1,170
190	88	1,382	1,339	221	982
200	93	1,417	1,360	186	828
210	99	1,452	1,381	158	701
220	104	1,487	1,402	134	597

* **R (**100 ohm platinum equiv.) = [**R** (1k ohm platinum)]/10

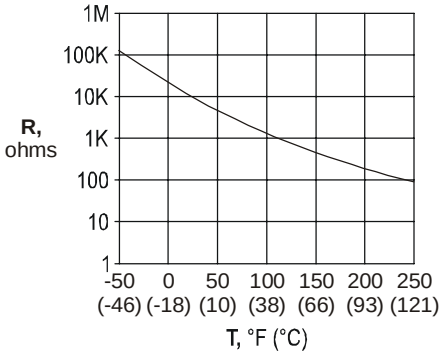

Figure 4: R vs. T: 2.2 k ohm Thermistor Sensors

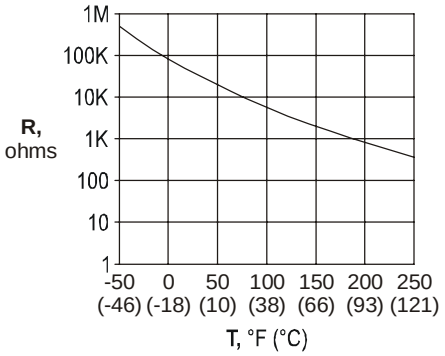

Figure 5: R vs. T: 10 k ohm Thermistor Sensors

Applications

Table 2 specifies the correct model and general characteristics for various applications.

Table 2: TE-6300 Series Temperature Sensor Applications

Application	Suggested Sensor	Description	Application Notes
Wall Mount	TE-6314P-1 TE-6324P-1 TE-6344P-1	Nickel sensor Platinum sensor 2.2 k ohm thermistor	• Two-screw wall plate provided for surface mounting. • White cover provided with separate logo labels for vertically or horizontally mounting. (See Table 6 for additional covers available.)
Outdoor Air	TE-6313P-1 TE-6323P-1 TE-6343P-1	Nickel, 3 in. probe Platinum, 3 in. probe 2.2 k ohm thermistor, 3 in. probe	• Used to sense outside ambient temperature to determine efficient heating and cooling strategies.
Duct Probe	TE-6311P-1 TE-6321P-1 TE-6341P-1	Nickel, 8 in. probe Platinum, 8 in. probe 2.2 k ohm thermistor, 8 in. probe	• Four-screw mounting plate provided for duct mounting. • Suitable for plenum use. • Ideal in freezer lockers or where sensor mounting should be located outside of the sensed area. • 12 in. probe available for use in larger ducts.
Duct Averaging	TE-6315P-1 TE-6316P-1 TE-6327P-1 TE-6328P-1 TE-6337P-1 TE-6338P-1	Nickel, 8 ft averaging element Nickel, 17 ft averaging element Platinum, 1 k ohm, 10 ft avg. element Platinum, 1 k ohm, 20 ft avg. element Platinum, 100 ohm, 10 ft avg. element Platinum, 100 ohm, 20 ft avg. element	• Four-screw mounting plate provided for duct mounting. • Used in duct where average temperature is needed. • Approximately 1 ft of sensor is recommended for each sq. ft of duct cross section. • TE-6001-8 element holder is recommended when installing an averaging sensor in a duct.
Well Insertion*	TE-6312P-1 TE-6322P-1 TE-6342P-1 TE-631AP-1 TE-632AP-1	Nickel, 8 in. probe, threaded holder** Platinum, 8 in. probe, threaded holder** 2.2 k ohm thermistor, 8 in. probe, threaded holder** Nickel, 6 in. probe, threadless holder*** Platinum, 6 in. probe, threadless holder***	• Threaded sensor holder has 1/2 in. NPT threads; threadless holder accommodates setscrews. • Mount thermal well at an angle so condensation runs out of the well. If not possible, seal the sensor holder and the wiring end of the sensor probe with RTV silicone rubber. • 12 in. probe available for use in longer wells. • Compatible Johnson Controls® thermal wells are listed in Table 4 of the *Ordering Information* section.
VAV Duct Probe	TE-6311V-1 TE-6321V-1 TE-6341V-1 TE-6361V-1 TE-631GV-1 TE-632GV-1 TE-634GV-1 TE-636GV-1	Nickel, 8 in. probe Platinum, 8 in. probe 2.2 k ohm thermistor, 8 in. probe 10 k ohm thermistor, 8 in. probe Nickel, 4 in. probe Platinum, 4 in. probe 2.2 k ohm thermistor, 4 in. probe 10 k ohm thermistor, 4 in. probe	• Includes a 4-screw mounting plate for duct mounting. • Equipped with ten-foot plenum rated cable. • Comes with 1/4 in. female quick-connect terminations on leads.

* Well sensor probe lengths are longer than accessory well lengths because part of the probe is in the conduit box and sensor holder.

** Use the 8 in. well insertion probes **only** with the WZ-1000-2 and WZ-1000-4.

*** Use the 6 in. well insertion probes only with the WZ-1000-5.

Ordering Information

To order a replacement TE-6300 Series temperature sensor, contact the nearest Johnson Controls representative. Specify the desired sensor product code number from Table 3 or accessories from Table 4 and covers for wall mounting from Table 6, consulting Table 5 when needed.

Note: To meet plenum rating where UL1995 rating is accepted, replace existing plastic cover with a TE-6001-13 Metal Cover. Use all-metal components to meet International Mechanical Code.

Table 3: Product Ordering

Sensor	Mounting Style	Probe Length	Product Code Number
Nickel	Duct	8 in.	TE-6311P-1
	Well	6 in.	TE-631AP-1
		8 in.	TE-6312P-1
	Outdoor Air	3 in.	TE-6313P-1
	Averaging*	8 ft	TE-6315P-1
		17 ft	TE-6316P-1
	Wall**	NA	TE-6314P-1
	VAV Duct Probe	8 in.	TE-6311V-1
		4 in.	TE-631GV-1
Platinum	Duct	8 in.	TE-6321P-1
	Well	6 in.	TE-632AP-1
		8 in.	TE-6322P-1
	Outdoor Air	3 in.	TE-6323P-1
	Wall**	NA	TE-6324P-1
	VAV Duct Probe	8 in.	TE-6321V-1
		4 in.	TE-632GV-1
Platinum Equivalent	1 k ohm Averaging*	10 ft	TE-6327P-1
		20 ft	TE-6328P-1
	100 ohm Averaging*	10 ft	TE-6337P-1
		20 ft	TE-6338P-1
Thermistor (2.2 k ohm)	Duct	8 in.	TE-6341P-1
	Well	8 in.	TE-6342P-1
	Outdoor Air	3 in	TE-6343P-1
	Wall**	NA	TE-6344P-1
	VAV Duct Probe	8 in.	TE-6341V-1
		4 in	TE-634GV-1
Thermistor (10 k ohm)	VAV Duct Probe	8 in.	TE-6361V-1
		4 in	TE-636GV-1

* The TE-6001-8 Element Holder comes with platinum equivalent averaging sensors. Order it separately for use with nickel averaging sensors.

** Order the TE-1800-9600 Mounting Hardware separately when mounting the wall unit to a handy box.

Table 4: Optional Accessories

Product Code Number	Description
TE-6001-8	Element Holder for mounting an averaging sensor (10 per package)
TE-6001-13	Metal Cover and Gasket Kit
TE-1800-9600	Mounting Hardware for mounting the wall mount unit to a handy box
TE-6300-101	12 in. nickel probe (cut to an appropriate length)
TE-6300-102	12 in. (1 k ohm) Platinum Probe (cut to an appropriate length)
TE-6300-104	12 in. (2.2 k ohm) Thermistor Probe (cut to an appropriate length)
TQ-6000-1	4 to 20 mA Output Transmitter for use with the 100 ohm platinum sensor
WZ-1000-2	6-1/2 in. Stainless Steel Well (thermal conductive grease included)
WZ-1000-4	6-1/2 in. Stainless Steel Well
WZ-1000-5*	4-11/16 in. Brass Well
F-1000-182	Thermal Conductive Grease for element wells, (8 oz)

* Use the TE-631AP-1 or TE-632AP-1 with this well.

Note: To order a different cover for the wall mount sensor, see Table 6.

Table 5: Typical Accessory Usage

Accessory* / Sensor	TE-6001-8 Averaging Sensor Bracket	TE-1800-9600 Mounting Hardware for use with 2 in. x 4 in. Electrical Box	TE-6300-101 12 in. Nickel Probe	TE-6300-102 12 in. Platinum Probe	TE-6300-104 12 in. Thermistor Probe	TQ-6000-1 4 to 20 mA Output Transmitter	WZ-1000-2 6-1/2 in. Stainless Steel Well with Thermal Compound	WZ-1000-4 6-1/2 in. Stainless Steel Well	WZ-1000-5 4-11/16 in. Brass Well
TE631AP-1									X
TE6311P-1			X						
TE6312P-1							X	X	
TE6313P-1									
TE6314P-1		X							
TE6315P-1	X								
TE6316P-1	X								
TE632AP-1									X
TE6321P-1				X					
TE6322P-1							X	X	
TE6323P-1									
TE6324P-1		X							
TE6327P-1	X								
TE6328P-1	X								
TE6337P-1	X					X			
TE6338P-1	X					X			
TE6341P-1					X				
TE6342P-1							X	X	
TE6343P-1									
TE6344P-1		X							

* No accessories for TE-63xxV-1 VAV Box Duct Probe models

Table 6: T-4000 Covers Available for the TE-6300 Series

Product Code Number	Horizontal Johnson Controls Logo	Vertical Johnson Controls Logo	Thermometer	Material (Plastic Cover/ Faceplate)
T-4000-2138*				Beige/Brushed Aluminum
T-4000-2139	X			
T-4000-2140	X		X	
T-4000-2144		X		
T-4000-2639	X			Beige/Brown and Gold
T-4000-2640	X		X	
T-4000-2644		X		
T-4000-3139	X			White/Brushed Aluminum
T-4000-3140	X		X	
T-4000-3144		X		

* Without Johnson Controls logo

Repair and Replacement

The TE-6300 Series of products allows for easy replacement of the temperature element. For a replacement sensor, refer to Table 7 and contact the nearest Johnson Controls representative.

Note: No replacement elements exist for the TE-63xxV-1 VAV box duct probe models.

Table 7: Replacement Parts

Product Code Number	Description
TE-6300-601	8 in. Nickel Probe
TE-6300-602	8 in. (1 k ohm) Platinum Probe
TE-6300-606	8 in. Thermistor Probe (2.2 k ohm)
TE-6300-603	3 in. Nickel Probe
TE-6300-604	3 in. (1 k ohm) Platinum Probe
TE-6300-607	3 in. Thermistor Probe (2.2 k ohm)
TE-6300-605	Threaded Sensor Holder with Retainer (10 per package)
TE-6300-609	Threadless Sensor Holder with Retainer (10 per package)

Technical Specifications

Product	TE-6300 Series Temperature Sensors	
Thin-Film Nickel Sensor	Temperature Coefficient**:**	Approximately 3 ohms/F° (5.4 ohms/C°)
	Reference Resistance:	1 k ohms at 70°F (21°C)
	Accuracy:	±0.34F° at 70°F (±0.18C° at 21°C)
Nickel Averaging Sensor	Temperature Coefficient:	Approximately 3 ohms/F° (5.4 ohms/C°)
	Reference Resistance:	1 k ohms at 70°F (21°C)
	Accuracy:	±3.4F° at 70°F (±1.9C° at 21°C)
Platinum Sensor	Temperature Coefficient:	Approximately 2 ohms/F° (3.9 ohms/C°), meets DIN 43760
	Reference Resistance:	1 k ohms at 32°F (0°C)
	Accuracy:	±0.73F° at 70°F (± 0.41C° at 21°C), DIN Class B
Platinum Equivalent Sensor	Temperature Coefficient and Reference Resistance:	Approximately 2 ohms/F° (3.9 ohms/C°) for 1 k ohms at 32°F (0°C), meets DIN 43760 Approximately 0.2 ohms/F° (0.39 ohms/C°) for 100 ohms at 32°F (0°C), meets DIN 43760
	Accuracy:	Approximately ±1.08F°at 70°F (±0.60C° at 21°C)
2.2 k ohm Thermistor Sensor	Temperature Coefficient:	Nonlinear, negative temperature coefficient
	Reference Resistance:	2.25 k ohms at 77°F (25°C)
	Accuracy:	±0.36F° (±0.2C°) in the range: 32 to 158°F (0 to 70°C)
10 k ohm Thermistor Sensor	Temperature Coefficient:	Nonlinear, negative temperature coefficient
	Reference Resistance:	10.0 k ohms at 77°F (25°C)
	Accuracy:	±0.9F° (±0.5C°) in the range: 32 to 158°F (0 to 70°C)
Temperature Range	Probe Assembly:	-50 to 220°F (-46 to 104°C)
	Conduit Box:	-50 to 122°F (-46 to 50°C)
Sensor Construction	Sensor:	1/4 in. O.D. stainless steel probe (except averaging and wall sensors)
	Conduit Access Box:	Rigid thermoplastic
	Mounting Plate:	Stainless steel: TE-63xxV-1 models only Aluminum: All other duct probe or duct averaging models
Mounting Choices	Duct, Well, Outdoor Air, Wall Mount	
Shipping Weight	Wall Mount:	0.2 lb (0.9 kg)
	Duct Mount:	0.4 lb (0.18 kg)
	Well Insertion:	0.35 lb (0.16 kg)
	Outdoor Air:	0.5 lb (0.23 kg)
	Duct Averaging:	0.5 lb (0.23 kg)
	VAV Duct Probe:	0.2 lb (0.9 kg)
Dimensions (H x W x D)	Wall Mount:	2.13 x 3.13 x 1.81 in. (53 x 79 x 46 mm)
	Duct Mount:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) + adjustable probe depth
	Well Insertion:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) + adjustable probe depth
	Outdoor Air:	5.97 x 3.47 x 4.46 in. (152 x 88 x 113 mm)
	Duct Averaging:	5.97 x 1.38 x 2.75 in. (152 x 35 x 70 mm) plus 8,10,17, or 20 ft (2.4, 3.0, 5.2, or 6.1 m) element
	VAV Duct Probe:	2.25 x 1.50 x 8.25 or 4.25 in. (57 x 38 x 210 or 108 mm)

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

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