TEMPERATURE SENSORS

SPECIFICATIONS	Supersedes 450.30-S5 (1100)	Form 450.30-S5 (1005)

Sensors are available in the following types: 1k ohm thin-film nickel, 1k ohm nickel averaging, 1k ohm thin-film platinum and 1k platinum equivalent averaging.

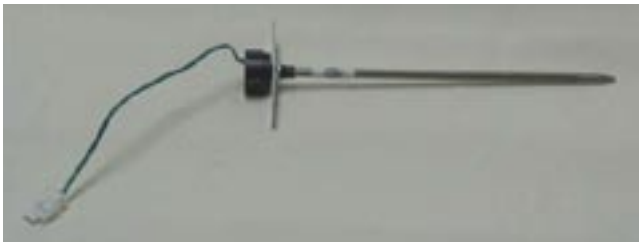

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FIG. 1 – TEMPERATURE SENSORS

PRODUCT OVERVIEW

Duct probe sensor includes:

- 8 in. nickel, platinum, or thermistor sensor
- quick mount sensor holder with retainer
- integral 1/2 in. NPT adaptor

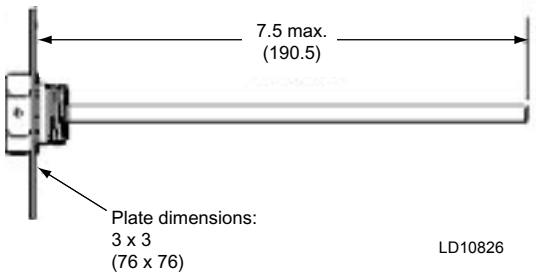

FIG. 2 – DUCT PROBE SENSOR - IN./(MM)

Duct averaging sensor includes:

- 8 or 17 ft nickel, or 10 or 20 ft platinum sensor
- quick mount sensor holder with retainer
- metal mounting plate with screws (4) and lock-nuts
- conduit enclosure with cover
- integral 1/2 in. NPT adaptor
- wire nuts (2)

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FIG. 3 – DUCT AVERAGING SENSOR - IN./(MM)

Well insertion sensor includes:

- 6 or 8 in. nickel or platinum, or 8 in. thermistor sensor
- quick mount sensor holder with retainer
- conduit enclosure with cover
- 1/2 in. integral NPT adaptor
- wire nuts (2)

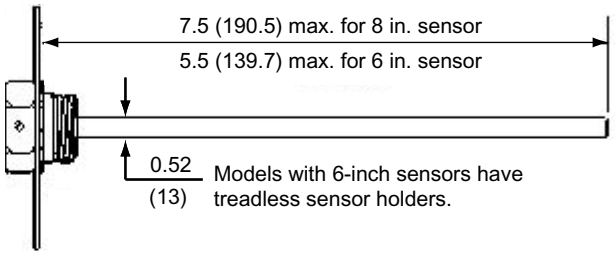


FIG. 4 – WELL INSERTION SENSOR - IN./(MM)

Outdoor air sensor includes:

- 3 in. nickel, platinum, or thermistor sensor
- outdoor air shield
- conduit enclosure with cover
- integral 1/2 in. NPT adaptor
- wire nuts (2)

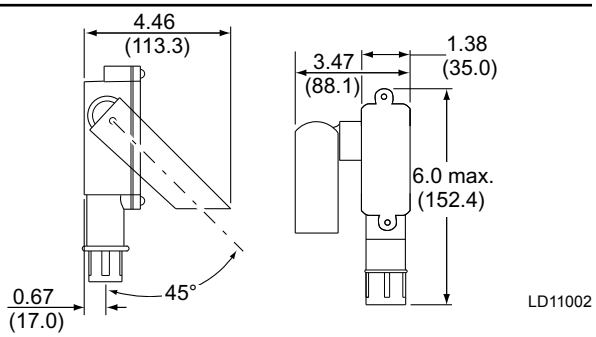


FIG. 5 – OUTDOOR AIR SENSOR - IN./(MM)

AVERAGING SENSING

Four, nine, sixteen, or more sensors may be wired in a series parallel arrangement to provide an average temperature reading in an area.

In a series parallel arrangement, there must always be the same number of parallel-connected legs as there are series connected sensors per leg.

For example: With four sensors, there must be two parallel legs and two sensors connected in series in each leg. With nine sensors, as shown in Figure 6, there must be three parallel legs and three sensors connected in series in each leg.

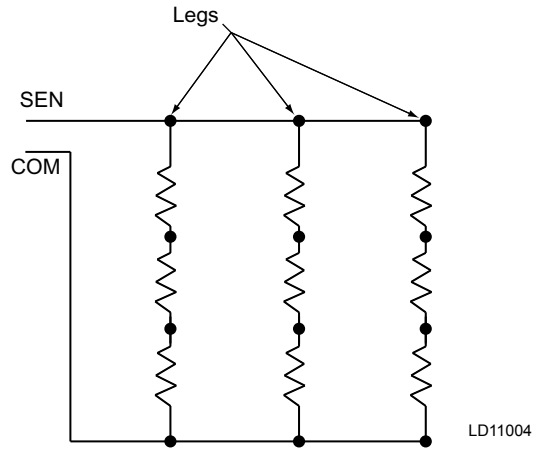


FIG. 6 – SERIES PARALLEL WIRING ARRANGEMENT

THEORY OF OPERATION

All Temperature Sensors are designed for use only in conjunction with operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add safety devices or alarm systems that protect against, and/or warn of, control failure.

The thin-film nickel sensors have a reference resistance of 1k ohms at 70°F (21°C) and a change in resistance 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 1k ohms at 32°F (0°C) and meet the DIN 43760 standard. The 1k ohm platinum sensors are identified by white leads with a blue stripe. The 1k ohm platinum equivalent averaging sensors have blue leads, and the 100 ohm platinum equivalent averaging sensors have red leads.

See Table 1 or Figure 7 for resistance values at selected temperatures for nickel, platinum, and platinum equivalent sensors.

The thermistor sensors have a negative temperature coefficient; and can be identified by white leads with a green stripe. They have a reference resistance of 2.2k ohms at 77°F (25°C), and match Fenwal unicurve characteristics. (See Table 1 or Figure 7 for resistance values at selected temperatures.)

TABLE 1 – NOMINAL TEMPERATURE VS. RESISTANCE FOR NICKEL, PLATINUM, PLATINUM EQUIVALENT*, AND THERMISTOR SENSORS

TEMP.		RESISTANCE (OHMS)		
°F	°C	NICKEL	PLATINUM	THERMISTOR (2.2K)
-50	-46	674	821	109872
-40	-40	699	843	75466
-30	-34	725	865	52571
-20	-29	751	887	37116
-10	-23	777	908	26539
0	-18	803	930	19208
10	-12	830	952	14062
20	-7	858	974	10408
30	-1	885	996	7784
40	4	914	1017	5880
50	10	942	1039	4484
60	16	971	1061	3450
70	21	1000	1082	2678
80	27	1030	1104	2095
90	32	1060	1125	1652
100	38	1090	1147	1313
110	43	1121	1168	1051
120	49	1152	1190	847
130	54	1184	1211	687
140	60	1216	1232	561
150	66	1248	1254	461
160	71	1281	1257	380
170	77	1314	1296	316
180	82	1348	1317	264
190	88	1382	1339	221
200	93	1417	1360	187
210	99	1452	1381	158
220	104	1487	1402	135

*Note:
For 100 ohm platinum equivalent sensors, divide the resistance values for the 1k ohm platinum sensors by 10.

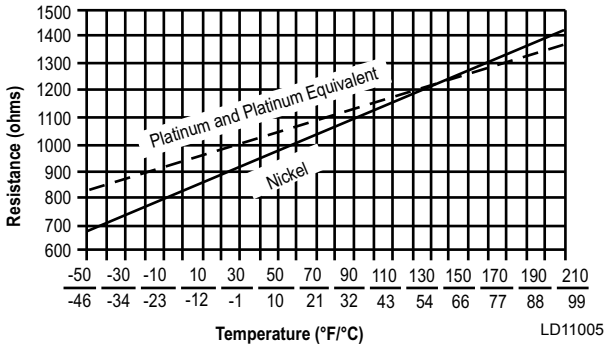


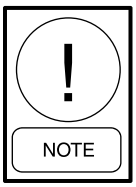
FIG. 7 – TEMPERATURE VS. RESISTANCE FOR THE NICKEL, PLATINUM, AND PLATINUM EQUIVALENT SENSORS

LOCATION CONSIDERATIONS

- Avoid areas subject to excessive vibration or electrical noise.
- **Keep conductors as short as possible** to minimize temperature error. For 1k ohm nickel sensors, wire resistance can cause approximately 1F° error for each 250 ft run of 18 AWG wire (or 100 ft of 22 AWG wire).

  To minimize error caused by field wiring, the total resistance of all **nickel** sensor wiring should be less than 3 ohms, and the total resistance of all **1k ohm platinum** sensor wiring should be less than 2 ohms.

  To minimize wiring error in applications using **100 ohm platinum equivalent** sensors, the 4 to 20 mA transmitter may be used. A 4-wire (Kelvin) connection can also be used to eliminate wiring error.



As long as the errors, due to the wiring, are small (when compared to the change in resistance of the sensor due to a 1F° or 1C° temperature change), the wire run will not significantly affect the temperature reading.

- Install sensors in areas where sufficient mixing of the sensed medium occurs or use an averaging sensor.

SPECIFICATIONS

Product	Temperature Sensors			
Thin-film Nickel Sensor				
Temperature Coefficient	Approximately 3 ohms/F° (5.4 ohms/C°)			
Reference Resistance	1k 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	1k ohms at 70°F (21°C)			
Accuracy	±3.0F° at 70°F (±1.67C° at 21°C)			
Platinum Sensor				
Temperature Coefficient	Approximately 2 ohms/F° (3.9 ohms/C°), meets DIN 43760			
Reference Resistance	1k ohms at 32°F (0°C)			
Accuracy	±0.65F° at 70°F (± 0.36C° at 21°C), DIN Class B			
Platinum Equivalent Sensor	Meets DIN 43760			
Temperature Coefficient	Approximately 2 ohms/F° (3.9 ohms/C°) for 1k ohms at 32°F (0°C)			
Reference Resistance	Approximately 0.2 ohms/F° (0.39 ohms/C°) for 100 ohms at 32°F (0°C)			
Accuracy	Approximately ±1.08F°at 70°F (± 0.56C° at 21°C)			
Temperature Range	Probe Assembly:	-50 to 220°F (-46 to 82°C)		
	Conduit Box:	-50 to 122°F (-46 to 50°C)		
Sensor Construction	Sensor: 1/4 in. O.D. stainless steel probe (except for averaging and wall sensors)			
	Conduit Access Box: Rigid PVC plastic			
Lead Wiring	22 AWG wire, 6 in. (152 mm) leads. (See controller for connection requirements.)			
	Sensor Type	**Lead Color**	**Sensor Type**	**Lead Color**
	Nickel	White	1k ohm Platinum	White w/blue stripe
	1k ohm Platinum Averaging*	Blue	Thermistor	White w/green stripe
	100 ohm Platinum Averaging*	Red	Nickel Averaging*	White * 18 AWG wire
Dimensions (H x W x D)	Wall Mount:	2.13 in. x 3.13 in. x 1.81 in. (53 mm x 79 mm x 46 mm)		
	Duct Mount:	4.47 in. x 1.38 in. x 2.75 in. (114 mm x 35 mm x 70 mm) + adjustable probe depth		
	Well Insertion:	4.47 in. x 1.38 in. x 2.75 in. (114 mm x 35 mm x 70 mm) + adjustable probe depth		
	Outdoor Air:	4.47 in. x 3.47 in. x 4.46 in. (114 mm x 88 mm x 113 mm)		
	Duct Averaging:	4.47 in. x 1.38 in. x 2.75 in. (114 mm x 35 mm x 70 mm) + 8,10,17, or 20 ft element		

Note:
The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local York International Office. York International Corp. shall not be liable for damages resulting from misapplication or misuse of its products.

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