



# techsystem

automatyka klimatyzacja wentylacja

▸ zapoznaj się z naszą ofertą

# TS-9100 and TE-9100 Temperature Sensors and Transducers

The TS / TE-9100 series of electronic temperature sensors and transducers provides a passive or active signal that corresponds with the air or water temperature in heating, ventilating and air conditioning applications.

They provide either a 0...10 VDC signal directly proportional to the sensed temperature, or a passive resistive signal NTC or Pt100 or Pt1000.

They are primarily designed to be used as an input to a digital controller of the System 9100 series, TC-8900 series and Facility Explorers series, but can be used with other electronic devices.



Rod TS-910x-82xx with and without well  
(immersion or duct applications)  
Rod fast response TS-910x-83xx



Immersion well for cable sensor TE-910x-850x  
Ceiling model TS-910x-870x



Rod fast response model TS-910x-835x  
with duct flange TS-9100-8950

- **Wide range of enclosures and signal outputs**

Flexible applications

- **PG 13.5 cable inlet for all models with makrolon housing**

Protection against humidity and firm fixation of cable

- **For immersion applications, well can be mounted before rod sensor is mounted**

Easy installation and servicing

Allows more flexibility in sensor selection

- **Rubber gasket and reduced tube diameter for "rod" and "fast rod response" sensors**

Tight fixation to duct and easy installation

- **Different length of tubes and wells for duct and immersion applications**

Senses the temperature at the desired location

## Application overview

The TS-9100 series of electronic room temperature sensors and transducers provide, depending on the selected models:

- a 0...10 VDC signal directly proportional to the sensed temperature
- a NTC K2 resistance signal
- a NTC K10 resistance signal
- a Pt100 resistance signal
- a Pt1000 resistance signal

The various TS-9100 output versions can be connected to Johnson Controls controllers of:

- System 9100 series
- TC-8900 series
- Facility Explorer Series

The 0...10 VDC temperature transducers receive a +15 VDC supply voltage, available from the system 9100 controllers.

## Ordering Codes

Feature					Suitability to Controllers							
Ordering Code	Output signal	Mounting	Probe Length in mm	Temperature range	Facility Explorer Controllers (FX16 MC, etc)	DX-9100, DC-910, TC-9100, SC-910 *	TC-9102 SC-9100	TC-8900, SC-9100	Controllers or electronic devices with Pt100 inputs	Controllers or electronic devices with Pt1000 inputs		
TS-9101-8101	0...10 VDC	Remote element	---	-40...50 °C	■	■	---	---	---	---		
TS-9101-8103				0...40 °C	■	■	---	---	---	---		
TS-9101-8104				0...100 °C	■	■	---	---	---	---		
TS-9101-8212		Rod **	160	-20...40 °C	■	■	---	---	---	---		
TS-9101-8213				0...40 °C	■	■	---	---	---	---		
TS-9101-8214				0...100 °C	■	■	---	---	---	---		
TS-9101-8222				200	-20...40 °C	■	■	---	---	---	---	
TS-9101-8223					0...40 °C	■	■	---	---	---	---	
TS-9101-8224					0...100 °C	■	■	---	---	---	---	
TS-9101-8225			0...150 °C		■	■	---	---	---	---		
TS-9101-8226			20...120 °C		■	■	---	---	---	---		
TS-9101-8227			50...150 °C		■	■	---	---	---	---		
TS-9101-8232			300		-20...40 °C	■	■	---	---	---	---	
TS-9101-8233					0...40 °C	■	■	---	---	---	---	
TS-9101-8234				0...100 °C	■	■	---	---	---	---		
TS-9101-8235				0...150 °C	■	■	---	---	---	---		
TS-9101-8252			500	-20...40 °C	■	■	---	---	---	---		
TS-9101-8253				0...40 °C	■	■	---	---	---	---		
TS-9101-8254				0...100 °C	■	■	---	---	---	---		
TS-9101-8312			Rod fast response	160	-20...40 °C	■	■	---	---	---	---	
TS-9101-8313					0...40 °C	■	■	---	---	---	---	
TS-9101-8314					0...100 °C	■	■	---	---	---	---	
TS-9101-8322					200	-20...40 °C	■	■	---	---	---	---
TS-9101-8323		0...40 °C				■	■	---	---	---	---	
TS-9101-8324		0...100 °C				■	■	---	---	---	---	
TS-9101-8325		0...150 °C		■		■	---	---	---	---		
TS-9101-8326		20...120 °C		■		■	---	---	---	---		
TS-9101-8327		50...150 °C		■		■	---	---	---	---		
TS-9101-8332		300		-20...40 °C		■	■	---	---	---	---	
TS-9101-8333				0...40 °C		■	■	---	---	---	---	
TS-9101-8334				0...100 °C	■	■	---	---	---	---		
TS-9101-8335				0...150 °C	■	■	---	---	---	---		
TS-9101-8352		500		-20...40 °C	■	■	---	---	---	---		
TS-9101-8353				0...40 °C	■	■	---	---	---	---		
TS-9101-8354				0...100 °C	■	■	---	---	---	---		
TS-9101-8401		Outdoor		Outdoor	---	-40...50 °C	■	■	---	---	---	---
TS-9101-8402		Outdoor		Outdoor	---	-20...40 °C	■	■	---	---	---	---
TS-9101-8602		Strap-on		Strap-on	---	-20...40 °C	■	■	---	---	---	---
TS-9101-8604		Strap-on		Strap-on	---	0...100 °C	■	■	---	---	---	---
TS-9101-8703		Ceiling	Ceiling	---	0...40 C°	■	■	---	---	---	---	

TE-9100-8501	NTC K2	Cable sensor	-20...40 °C	■	---	■	---	---	---			
TS-9103-8210		Rod **	160	0...40 °C	■	---	■	---	---			
TS-9103-8220			200		■	---	■	---	---			
TS-9103-8230			300		■	---	■	---	---			
TS-9103-8250			500		■	---	■	---	---			
TS-9103-8310			Rod fast response		160	■	---	■	---	---		
TS-9103-8320		200			■	---	■	---	---			
TS-9103-8330		300			■	---	■	---	---			
TS-9103-8350		500			■	---	■	---	---			
TS-9103-8400		Outdoor	---		■	---	■	---	---			
TS-9103-8600		Strap-on	---		■	---	■	---	---			
TS-9103-8700		Ceiling	---		■	---	■	---	---			
TE-9100-8502		NTC K10	Cable sensor		-20...40 °C	■	---	---	■	---	---	
TS-9104-8210			Rod **		160	0...120 °C	■	---	---	■	---	---
TS-9104-8220	200				■		---	---	■	---	---	
TS-9104-8230	300			■	---		---	■	---	---		
TS-9104-8250	500			■	---		---	■	---	---		
TS-9104-8310	Rod fast response			160	■		---	---	■	---	---	
TS-9104-8320			200	■	---		---	■	---	---		
TS-9104-8330			300	■	---		---	■	---	---		
TS-9104-8350			500	■	---		---	■	---	---		
TS-9104-8400	Outdoor		---	■	---		---	■	---	---		
TS-9104-8600	Strap-on		---	■	---		---	■	---	---		
TS-9104-8700	Ceiling		---	■	---		---	■	---	---		
TS-9105-8220	Pt100		Rod **	200	-20...150 °C		---	---	---	---	■	---
TS-9105-8230				300			---	---	---	---	■	---
TS-9105-8250		500		---			---	---	---	■	---	
TS-9105-8400		Outdoor		-40...50 °C		---	---	---	---	■	---	
TS-9105-8600		Strap-on		-20...100 °C		---	---	---	---	■	---	
TS-9105-8700		Ceiling		0...40 °C		---	---	---	---	■	---	
TS-9106-8210	Pt1000	Rod **	160	-20...150 °C	■	■	---	---	---	■		
TS-9106-8220			200		■	■	---	---	---	---	■	
TS-9106-8230			300		■	■	---	---	---	---	■	
TS-9106-8250			500		■	■	---	---	---	---	■	
TS-9106-8310			Rod fast response		160	■	■	---	---	---	---	■
TS-9106-8320		200			■	■	---	---	---	---	■	
TS-9106-8330		300			■	■	---	---	---	---	■	
TS-9106-8350		500			■	■	---	---	---	---	■	
TS-9106-8400		Outdoor	---		-40...50 °C	■	■	---	---	---	■	
TS-9106-8600		Strap-on	---		-20...100 °C	■	■	---	---	---	■	
TS-9106-8700		Ceiling	---		0...40 °C	■	■	---	---	---	■	

\* Or other electronic devices with 0...10 V inputs

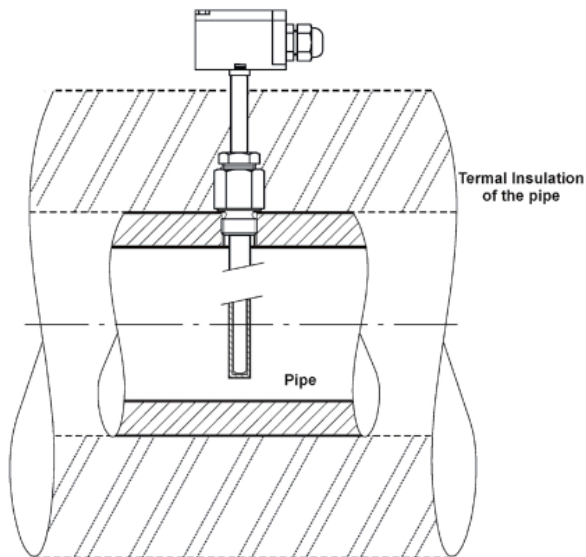
\*\* Rod sensor can either be for: - Duct applications (alone)  
- Immersions applications (with well); See dimensions drawings on page 6 and 7

## Accessories (order separately)

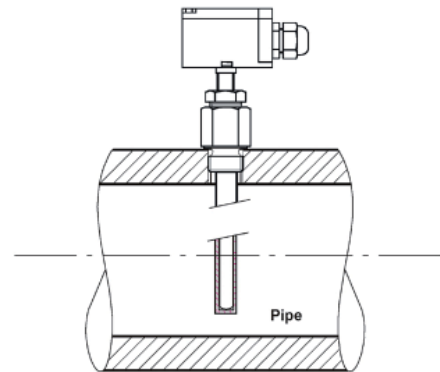
Ordering Code	Description				
TS-9100-8950	Duct mounting flange				
Ordering Code	Description	Material	Thread	Lenght (mm)	External Diam. (mm)
TS-9100-8905	Immersion well	Copper	R1/2"	50	9
TS-9100-8901				120	12
TS-9100-8907				150	
TS-9100-8902				200	
TS-9100-8903				260	
TS-9100-8925		Stainless steel		50	
TS-9100-8921				120	12
TS-9100-8927				150	
TS-9100-8922				200	
TS-9100-8923				260	
TS-9100-8915		Stainless steel	G1/2"	50	
TS-9100-8911				120	12
TS-9100-8917				150	
TS-9100-8912				200	
TS-9100-8913				260	

## Selection of immersion wells

	No space for pipe insulation	Space for pipe insulation
<b>Immersion well length</b>	<b>120 mm</b>	<b>120 mm</b>
Item Code Well	TS-9100-89x1	TS-9100-89x1
<b>Rod sensor length</b>	<b>160 mm</b>	<b>200 mm</b>
Item Code Sensor	TS-9100-821x	TS-910x-822x
<b>Immersion well length</b>	<b>150 mm</b>	<b>200 mm</b>
Item Code Well	TS-9100-89x7	TS-910x-89x2
<b>Rod sensor length</b>	<b>200 mm</b>	<b>300 mm</b>
Item Code Sensor	TS-910x-822x	TS-910x-823x
<b>Immersion well length</b>	<b>260 mm</b>	---
Item Code Well	TS-9100-89x3	---
<b>Rod sensor length</b>	<b>300 mm</b>	---
Item Code Sensor	TS-910x-823x	---



**Fig. 1: Rod sensor with immersion wells, with pipe insulation**



**Fig. 2: Rod sensor with immersion wells, without pipe insulation**

## Mounting

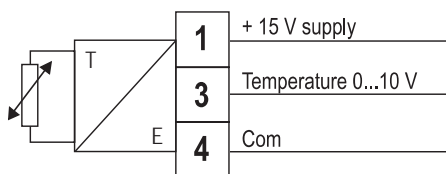
The TS 9100 can be mounted in virtually any position. For mounting follow the instructions below:

- Locate the sensors, where they will be exposed to representative conditions.
- Avoid non-representative air draughts, direct sunlight, etc.
- For strap-on models use a thermal conductive paste between well or pipe and sensor to improve reaction times.
- The sensor should not be exposed to direct radiation (lamps, radiators, etc.) or to the sun, since it would lead to incorrect measurement.

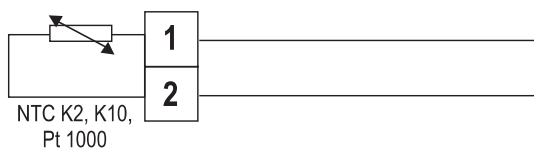
## Wiring instructions

For wiring follow the instructions below:

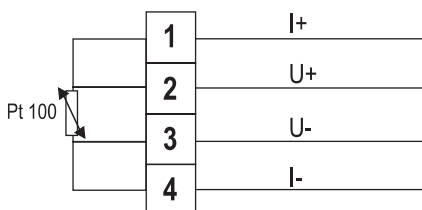
- All wiring must be in accordance with local regulations and national rules.
- Do not attempt field repairs. If the transmitter is not operating properly, even though it is wired correctly, it should be replaced.



### Wiring diagrams active 0... 10 V models



### Wiring diagrams NTC K2, NTC K10 and Pt1000 models



### Wiring diagrams Pt100 models

## Resistance tables

### NTC "K10" models

Temperature in °C	Resistance in $\Omega$
0	32.650
5	25.390
10	19900
15	15710
20	12490
25	10000
30	8057
35	6530
40	5327
45	4370
50	3603
55	2986
60	2488
65	2083
70	1752
75	1479
80	1255
85	1070
90	915.3
95	786.7
100	678.3
105	587.3
110	510.3
115	445.0
120	389.3

### NTC "K2" models

Temperature in °C	Resistance in $\Omega$
0	7352.8
5	5717.8
10	4481.5
15	3537.9
20	2812.8
25	2252.0
30	1814.4
35	1470.6
40	1199.6

### Pt100 models

The Pt100 models are equipped with a resistive Pt 100 element according to IEC 60751. At 0°C the resistance value is 100  $\Omega$ . The accuracy is according to Class A.

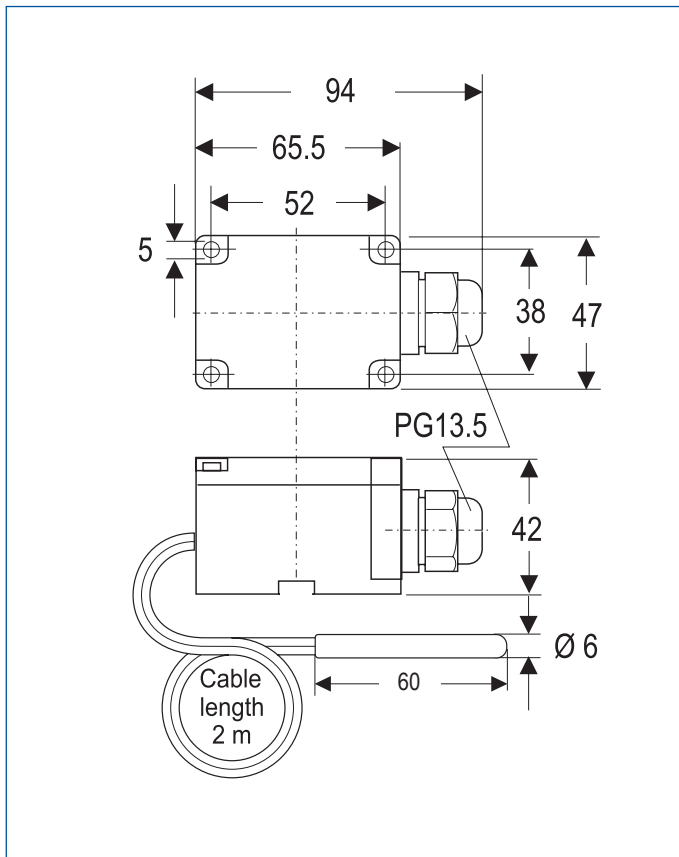
Temperature in °C	Resistance in $\Omega$
-50	80.31
-45	82.29
-40	84.27
-35	86.25
-30	88.22
-25	90.19
-20	92.16
-15	94.12
-10	96.09
-5	98.04
0	100.00
5	101.95
10	103.90
15	105.85
20	107.79
25	109.73
30	111.67
35	113.61
40	115.54
45	117.47
50	119.40
55	121.32
60	123.24
65	125.16
70	127.07
75	128.98
80	130.89
85	132.80
90	134.70
95	136.60
100	138.50
105	140.4
110	142.3
115	144.2
120	146.1
125	147.9
130	149.8
135	151.7
140	153.6
145	155.4
150	157.3

**Pt1000 models**

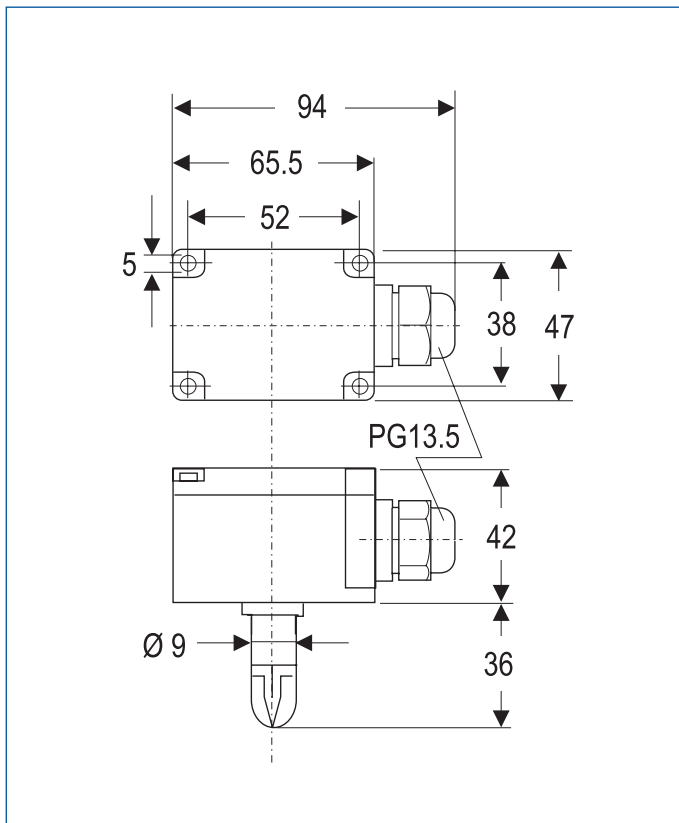
The Pt1000 models are equipped with a resistive Pt1000 element according to EN 60751. At 0°C the resistance value is 1000 Ω. The accuracy is according to Class A.

Temperature in °C	Resistance in Ω
-50	803
-45	823
-40	843
-35	863
-30	882
-25	902
-20	922
-15	941
-10	961
-5	980
0	1000
5	1020
10	1039
15	1058
20	1078
25	1097
30	1117
35	1136
40	1155
45	1175
50	1194
55	1213
60	1232
65	1252
70	1271
75	1290
80	1309
85	1328
90	1347
95	1366
100	1385
105	1404
110	1423
115	1442
120	1461
125	1479
130	1498
135	1517
140	1536
145	1554
150	1573

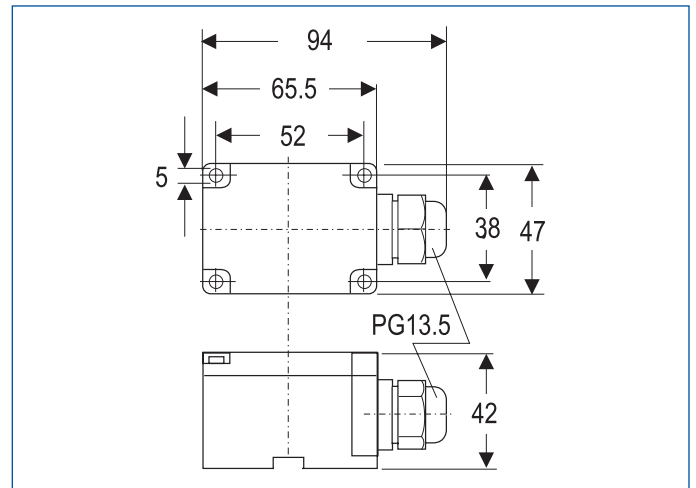
## Dimensions in mm



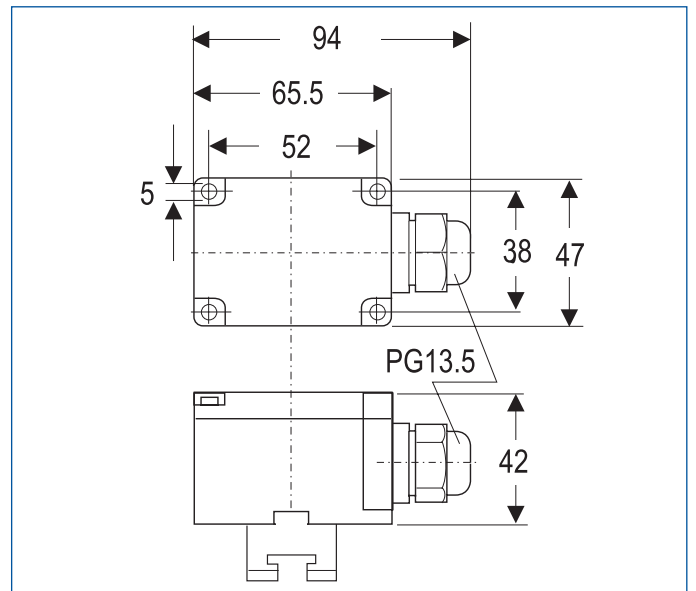
Remote sensor TS-9101-810x



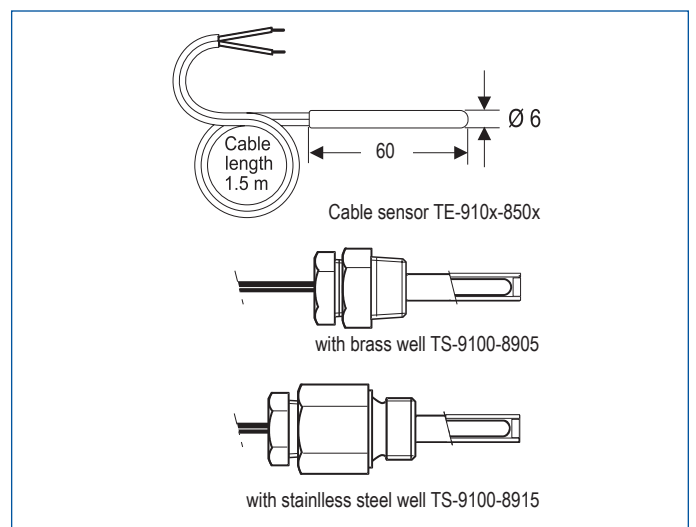
Ceiling sensor TS-910x-870x



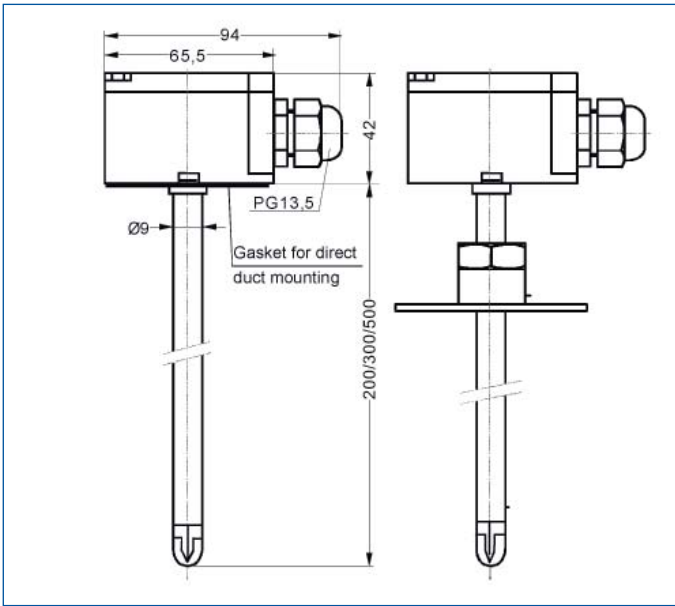
Outdoor sensor TS-910x-840x



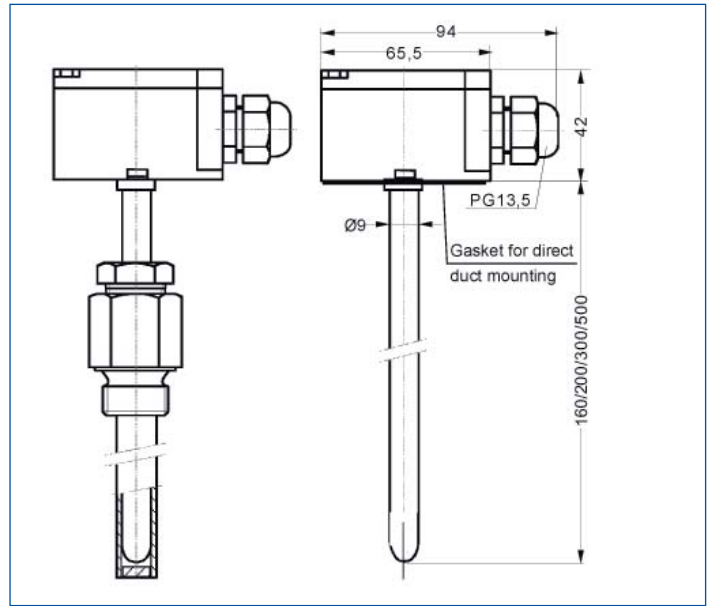
Strap-on sensor TS-910x860x



Cable sensor TE-910x-850

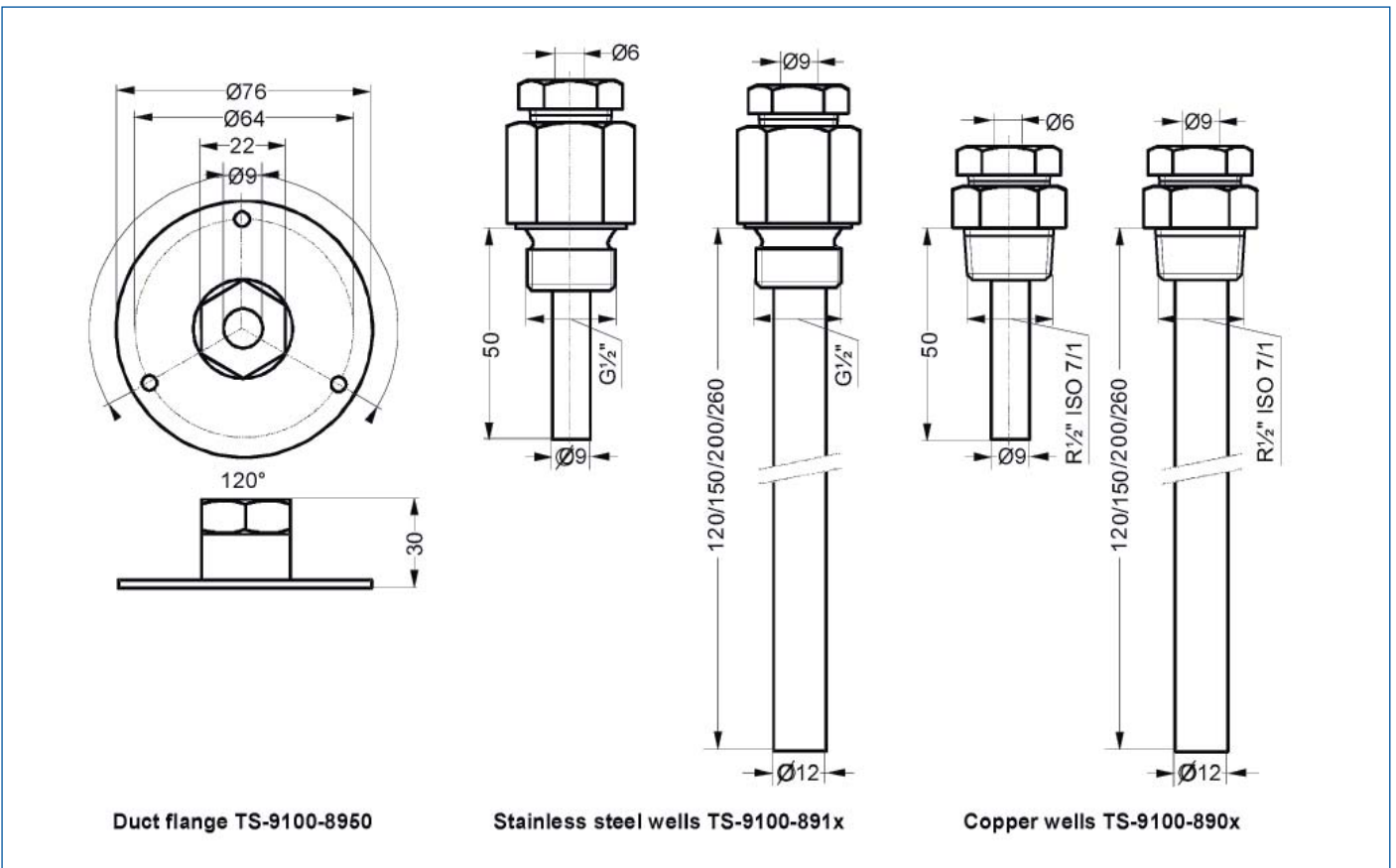


Rod fast response sensor with flange



Rod immersion, with or without well

## Accessories



Duct flange and immersion wells

## Technical Specifications

Sensing Element	0...10 V	NTC K2	NTC K10	Pt100	Pt1000
<b>Supply Voltage</b>	15 VDC $\pm$ 10 %	---	---	---	---
<b>Power Consumption</b>	0.1 VA (5mA) no load	---	---	---	---
<b>Output signal</b>	Active 0...10 V linear	Resistive NTC K2 2 252 $\Omega$ = 25 °C	Resistive NTC K10 10 K $\Omega$ = 25 °C	Resistive Pt100 100 $\Omega$ = 0 °C	Resistive Pt1000 1000 $\Omega$ = 0 °C
<b>Output load</b>	max. 2 mA	---	---	---	---
<b>Temp. Ranges</b>	see table on page 8 and 9	0...40 °C	TC-8900: 0...50 °C SC-9100: 20...120 °C	---	---
<b>Accuracy</b>	$\pm$ 1 % full scale	$\pm$ 0.2 K range 0...40 °C	$\pm$ 0.2 K range 0...120 °C	EN 60751, class A	EN 60751, class A
<b>Ambient Operating Conditions</b>	Maximum for electric connection box: 50 °C for transducer (active) 70 °C for sensors (resistive)				
<b>Max. operating temperature</b>	Remote elements (TS-910x-810x) Cable Sensors (TE-9100-850x)				160 °C
	Rod Sensors (TS-910x-820x)				160 °C
	Rod fast response Sensors (TS-910x-830x)				160 °C
	Outdoor Sensors (TS-910x-840x)				60 °C
	Strap-on Sensors (TS-910X-850X)				110 °C
	Ceiling Sensors (TS-910x-870x)				60 °C
<b>Storage Conditions</b>	-40 to 70 °C, 10 to 90 % RH non condensing				
<b>Terminations</b>	Screw terminals for 1 x 1,5 mm <sup>2</sup> / 14 AWG (maximum) cable				
<b>Housing</b>	Protection: IP54				
<b>Dimensions</b>	Depending on model (see dimension drawing on page				
<b>Materials</b>	Rod / outdoor / strap-on / ceiling models:				<b>Housing:</b> Polycarbonate Makrolon <b>Tube:</b> Copper <b>Wells:</b> Copper or stainless steel AISI 304
<b>CE Compliance</b>	EMC (89/336 EEC) according to the standard EN 61000-6-3 and EN 61000-6-1				

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.

All the marks herein are the marks of their respective owners.