Product Technical Information
DS_RS10_2209_EN

Series T-Kelvin, Model RS10

RTD temperature probe
Threaded process connection. Connection block ISO4400

Application

The model RS10 is manufactured with resistance sensor, Pt100, Pt1000 or PTC1000@25ºC insulated and encapsulated in a Aisi 316L protective tube.

As standard process connection, the RS10 can be supplied with BSPP, NPT welded threads or by compression fitting, allowing the user an adjustable immersion length in site.

Are available a wide range of sensor configuration and types, giving to RS10 a huge versatility for many industrial branches and environmental conditions.
If requested, can be supplied with temperature transmitter with analogue output, according to customer requested range.

Low cost and reliable, ideal for common applications in cement, ship building and steel plants auxiliary process pipes and tanks, as well in other branches, with process temperature up to +200ºC.

Your Advantages

Class A sensor as standard
Wet parts and body in Aisi 316L
Up to 200ºC
Standard single or double sensor
OEM customization

Overview

Informative Signs

	Information	This symbol contains device-oriented information which does not result in personal injury.
	Checking	This symbol contains procedures and other facts to get the most of the device and which do not result in personal injury.
	Caution	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in damaged device and which do not result in personal injury.
	Warning	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	Danger	This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

Product Overview

The T-Kelvin RS10 is a RTD temperature probe with threaded process connection and popular connection block ISO4400 for electrical wirings. All wetted parts and probe body are in corrosion resistant stainless steel 316L.
The sensor is PFA wired, epoxy sealed and depending on sensor configuration and stem diameter is compacted by mineral powder. This model has no replaceable measuring insert.

The measurement principle of an RTD (Resistance Temperature Detector) consists of the sensor element with an electrical resistance that varies with temperature. In the case of the Pt100 sensor, it has a resistance of 100 Ω at 0ºC, increasing this value with increasing temperature, due to the characteristic of the platinum coefficient used in this type of sensor. Extremely linear, it makes temperature probes based on this measurement principle the most used in the industry, by complying with IEC 60751 with a coefficient α = 3.85 * 10-3 ºC-1, calculated between 0 and 100ºC.
The sensor element is available in two versions, Thin-film (TF) or ceramic (Wire Wound), the second with a wider measurement range, greater long-term stability and better accuracy.
If there are vibrations, the Thin-film (TF) sensor can offer advantages, but its behaviour depends on the intensity, direction and frequency of the main harmonic of the vibration. This type of sensor also presents a faster response time when assembled in a similar way to the ceramic sensor.
The most used configurations are for single elements with 2, 3 and 4 wires and with redundancy, double elements with 4 and 6 wires. The 4-wire configuration guarantees the best accuracy, due to impedance full compensation introduced by the signal transmission cables, or even by the connections within an extended length immersion sheath, which in the case of the configuration single to two wires or double to 4 wires adds to the resistive value of the Pt100, contributing to the loss of accuracy. In single 3-wire or double 6-wire configurations, the associated error is practically null.

For the range of -200ºC to 0ºC we have: For the range of 0ºC to 850ºC we have:
$R_t = R_0[1 + At + Bt^2 + C(t - 100°C)\ t^3]$ $R_t = R_0(1 + At + Bt^2)$

where:
R_t is the resistance to a temperature t; R_0 is resistance with t = 0ºC

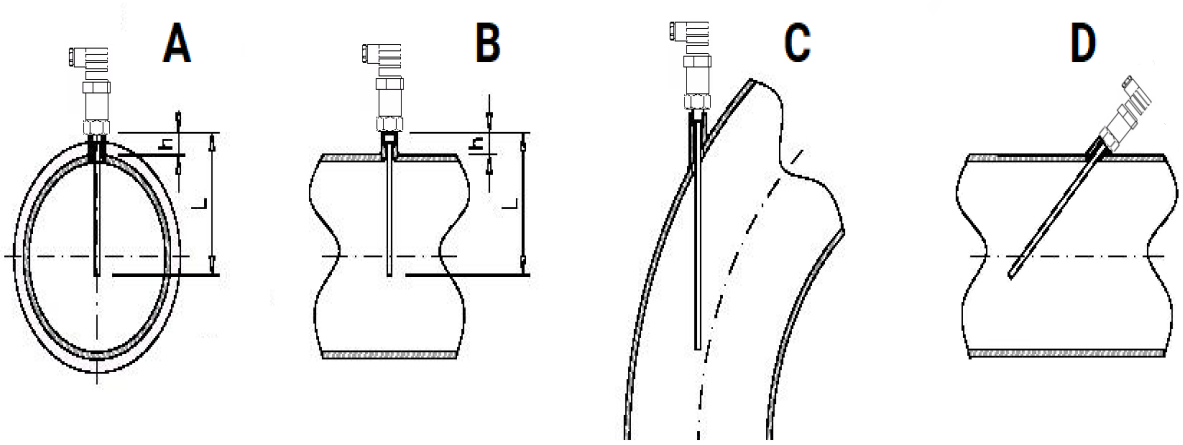
The constants in these equations are:
$A = 3.9083 . 10^{-3}$ ºC^{-1} $B = -5.775 . 10^{-7}$ ºC^{-2} $C = -4.183 . 10^{-12}$ ºC^{-4}

Installation

The thermometers T-Kelvin RS10 are suitable for pipes, tanks or other parts of the process if required.
The immersion length has big influence in the instrument accuracy. If the immersion length is small, an additional error may occur and might not be negligible, if there is a big difference between process temperature and ambient temperature. The temperature dissipation happens between process connection and immersed length.

To minimize this error is recommendable as a rule of sump, the immersion length should be at least 10 times the thermowell diameter. Considering the T-Kelvin probes, the sensor element is installed in 5-10 mm at end of the tip. According that is recommendable to select an immersion length of 100 mm for a temperature thermowell of 6 mm. If this is not possible, should be selected a diameter or immersion length to comply with the rule.

If possible, the immersion length must be slightly greater than pipe radius (see fig. A and B). In the other side, an appropriate thermal insulation can compensate a reduced immersion length or simply mount the assembly on a pipe curve (see fig. C). Other possibility to grant a correct measurement is the assembly mounting with appropriate angle (see fig. D). Be advised if the assembly is to be mounted according fig. C or fig. D, the assembly should be installed against fluid flow.



	This product is not intended to be used in oxygen service or in classified zones under ATEX directive.
	This device is intended to be installed in pipes and tanks with moderate or non-corrosive fluids. If is not the case, we recommend also the use of a thermowell of our BPtemp series.
	Make sure the probe has the correct immersion length when used in conjunction with a thermowell.
	Please pay attention to measuring point if you are measuring a two phased fluid.

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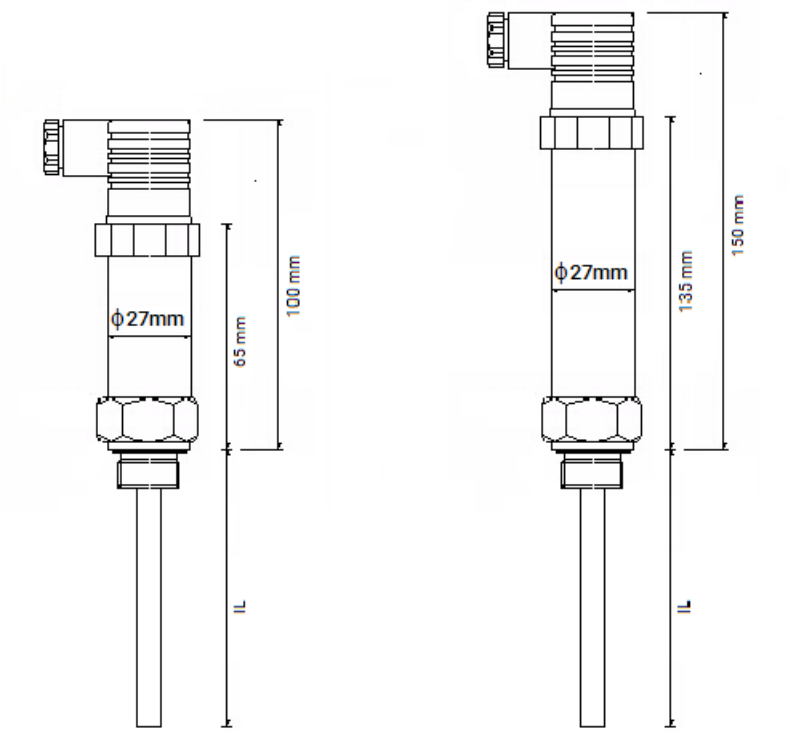
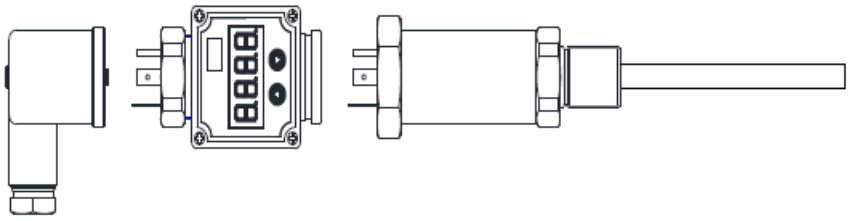
Mechanical Construction

Generic Configuration



Left: Device without temperature transmitter
Right: Device with built-in temperature transmitter

	The reduced tip is not available for stem dimeters less than 4 mm.
	For protective tubes of 6 mm and over the version with two Pt100 sensors are available.
	Is strongly recommended the use of a gasket to ensure the ratted ingress protection. These gaskets are not supplied on basic delivery and are available options through extended fields of order code structure, or as separate/spare parts.
	Double sensors are not available for stem diameters less than 4mm.
	Note that connector ISO 4400 cable socket is not supplied on basic delivery. These components are available options through extended fields of order code structure, or as separate/spare parts.

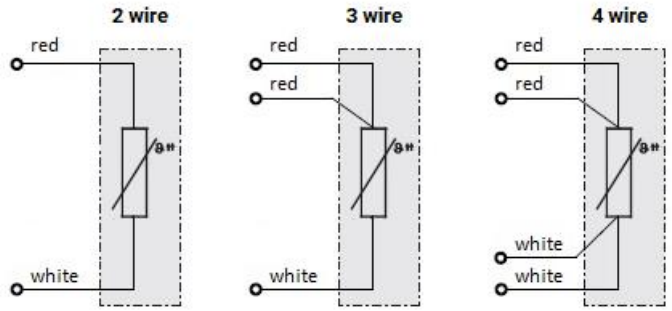


	Above shown LED display is not supplied on basic delivery and is an available option through extended fields of order code structure, or as separate/spare part. Please check details at Accessories, additional information section.

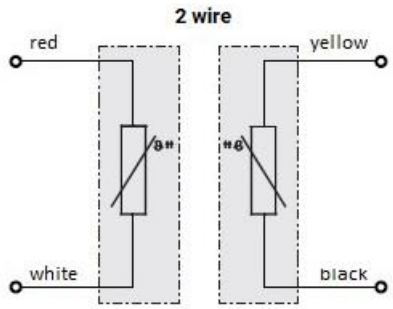
Wirings

The T-Kelvin RS10 is available with 1 single Pt100/Pt1000 or double Pt100 sensor or with 2 single Pt100/Pt1000 sensors. The PTC versions are only available with single sensor 2-wire.

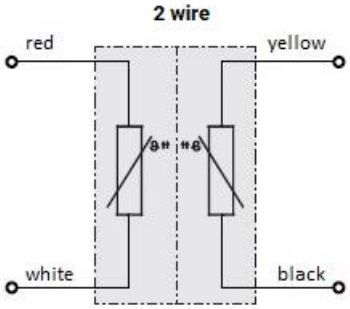
Single Sensor Pt100/Pt1000/PTC1000-2W



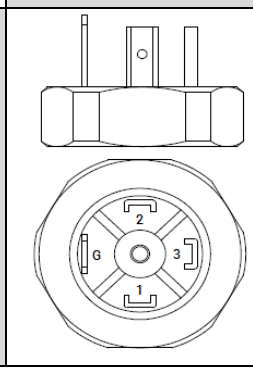
2x Single Sensors Pt100/Pt1000



Double Sensor Pt100



!	With temperature transmitter assembled, make sure power supply is switched off during wiring procedures.
!	This device assembled with PTC/KTY81 is sensitive to Electro Static Discharge (ESD).
!	Check if connection cable is according device connector requirements.
!	Check if maximum load resistance is according device specifications.

		4-20 mA		1-5 Vdc		Pt100/Pt1000/PTC1000						Pt100	
						2-W		3-W		4-W		2x 2-W	
ISO 4400 EN 175301-803-A Form A		1	V+	1	V+	1	WT	1	WT	1	WT	1	WT (S1)
		2	V-	2	V-	2	RD	2	RD	2	RD	2	RD (S1)
		3	N.C.	3	Vout	3	N.C.	3	N.C.	3	WT	3	WT (S2)
		G	N.C.	G	N.C.	G	N.C.	G	RD	G	RD	G	RD (S2)

N.C. = Not Connected
PTC1000 only available in single sensor, 2-wire configuration

Technical Data

Device			
Application	Temperature measurement		
Principle	Resistance		
Types	Pt100, Pt1000; PTC1000@25ºC		
Accuracy	Class A IEC60751; Class AA on demand (RTD's only)		
Configuration	Single 2, 3 and 4 wires or double 2 wires		
Operating temperature	Pt100 and Pt1000	Absolute Min	-50ºC
		Absolute Max	200ºC
	PTC1000	Absolute Min	-55ºC
		Absolute Max	150ºC
Electrical Specifications			
Output signal	Resistance	80,31…175,84 Ω	
	PTC KTY81/110	490 (475) …2211 (2277) Ω	
	4-20 mA	Loop power 2 wires	
	1-5 Vdc	3-wire	
Temperature Transmitter	Mounting	Internal	
	Power supply	10 to 30 Vdc	
	Input	1x Pt100	
	Input accuracy	± 0.2ºC ± 0.05 % of reading	
	Output accuracy	mA output /2000) or 5 µA (Whichever is the greater)	
	Minimum span	25 K	
	Maximum output load [RL]	$[(V_{supply} - 10)/20]$ KΩ	
Sensor insulation Resistance	>100 MΩ/250 Vdc @room temp. or according to IEC 60751, whichever is greater		
Mechanical Characteristics			
Materials	Wetted parts	Aisi 316L	
	Cooling/extension neck	Aisi 316L	
	Connectors	See additional information/accessories section	
Protective Tube Dimensions	Length	30 to 2000 mm, customized; over 2000 mm on request	
	Diameter	From 3 mm to 12 mm	
	RTD Wall thickness	OD 3 mm	0.25 mm
		OD 4 mm	Min 0.35 mm
		OD > 4 mm	Min 1.0 mm
	PTC Wall thickness	OD 6 mm	0.5 mm
		OD > 6 mm	Min 1.0 mm
Connector	Number of poles	3 poles + GND	
	Standards	DIN EN 175 301-803-A, ISO 4400	
Environmental Conditions			
Storage temperature	-30 to 80ºC		
Relative humidity	0 to 90 %RH, non-condensing		
Calibration units	ºC, ºF, K		
Weight	Typically from 250 g to 300 g		
Protection class (complying with EN 60529)	Max. IP65		
Approvals, Certifications	RoHS 2, CE		

Tolerance Classes

The validity temperature ranges of the tolerance classes are classified in the following table.
These tolerances apply to RTD thermometers, according to IEC60751and for any value of R_0.

Tolerance Class	Validity Temperature Range [°C]		Tolerance Values 1) [°C]
	Ceramic Sensors WW (Wire Wound)	TF (Thin-Film)	
AA	-50 to +250	0 to +150	±(0.10 + 0.0017 |t|)
A	-100 to +450	-30 to +300	±(0.15 + 0.0020 |t|)
B	-196 to +600	-50 to +500	±(0.30 + 0.0050 |t|)
C	-196 to +600	-50 to +600	±(0.60 + 0.0100 |t|)

1) |t| Temperature modulus in ºC.

Additional Information

Maintenance

The RTD probes of T-Kelvin series do not require a specific maintenance. The only recommendation is to check periodically the sensor integrity and perform an annual recalibration.

Factory Calibration Protocol

This factory quality protocol is supplied with every unit. This acts as an inspection report that shows compliance with DIN/EN 60751 essential points. One measurement point is issued for the effect.

Factory Calibration Certificate

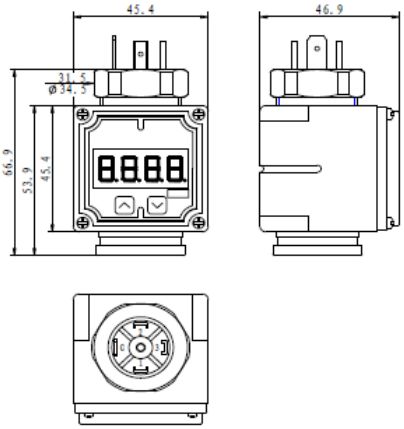
The factory calibration certificate must be ordered with the device. The measurement points according to customer specifications and inside device operating temperature range.

Accessories

Model DVA50	Functionalities
Plug-in 4-digit LED display	Programmable parameters are display zero and span, calibrated range, base point drift, decimal point, linearity correction and filter.

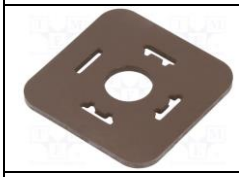
Electrical Specifications	
Display	LED 4 digits
Power supply	4-20mA DC loop powered
Current range	3 - 25 mA
Voltage drop	≤ 3.8 V
Display range	-1999 to 9999
Sampling rate	3 times per second
Electrical connections	ISO 4400, EN 175301-803-A Form A; 3P+G

Performance	
Accuracy	±0.2 %FS
Thermal drift	≤80 ppm/ºC

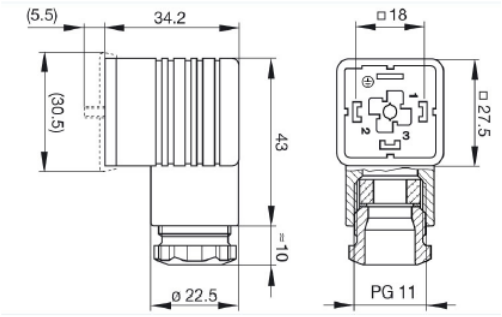


Environmental Conditions	
Operating temperature	-30 to 85ºC
Storage temperature	-40 to 85ºC
Relative humidity	0 to 85 %RH
Shock resistance	5 g, 10 to 200 Hz
Impact	50 g, 11 ms
Weight	Approx. 70 g
Protection class (complying with EN 60529)	IP 65 with plug ISO 4400, EN 175301-803-A Form A

Please note this display is only available for devices with 4-20mA output.

Gaskets connector ISO 4400 EN 175301-803-A Form A					
					
Gasket type	Flat	Gasket type	Flat	Gasket type	Flange
Operating temperature	-40 to 125°C	Operating temperature	-30 to 90°C	Operating temperature	-30 to 90°C
Material	EPDM	Material	NBR	Material	NBR
Article number	1000646	Article number	1001089	Article number	1000648

Cable socket with central screw M3 x 35		
Article number: 1000645	Number of contacts	3 + PE
	Cable gland	Pg11
	Cable external diameter	6 to 9 mm
	Conductor size	≤ 1.5 mm²
	Standards	DIN EN 175 301-803-A, ISO 4400
	Housing color	Black
	Construction	Type A
	Contact surface material	Sn
	Contact bearer material	PA
	Housing material	PA
	Protection class	IP 65 (gasket necessary)
	Temperature range	-40 to 125 °C



Delivery Time

For small quantities, less than 10 pieces with basic options, the delivery times are likely 4 to 5 working days or express manufacturing (48h) with feasibility according configuration and required quantities.

How to Order

Sign		Instruction
Tick	✓	Single option selection field necessary
Double tick	✓✓	Multiple option selection field available
Added extra	⊕	Not mandatory selection field

Order Code		Description
RS10-		Temperature Probe Series T-Kelvin Model RS10
010	✓	Type of RTD Sensor, Class, Wiring
A2		1xPt100 single/WW, Cl. A IEC60751, 3 wires
A3		1xPt100 single/TF, Cl. A IEC60751, 3 wires
B3		1xPt100 single/TF, Cl. A IEC60751, 4 wires
C1		1xPt100 double/WW, Cl. A IEC60751, 2x2 wires
K3		1xPt100 single/TF, Cl. A IEC60751, 2 wires
M2		1xPt1000 single/TF, Cl. A IEC60751, 2 wires
P2		1xPTC 1000@25 °C, 2 wires, -55... 150 °C
Y9		Special version on request
Not all options are listed here. Please contact us know current production plan for this device		
020	✓	Shape of the Tip
S		Straight, standard response
R		Swagged tip, length with 30 mm
D		Swagged tip, length with 50 mm
Y		Special version on request
030	✓	Process Immersion Length IL
1		50 mm
2		100 mm
3		150 mm
4		200 mm
5		250 mm
6		300 mm
7		350 mm
8		400 mm
X		Customized length
9		Special version on request
040	✓	Protective Tube Diameter and Material
F3		3 mm, Aisi 316L
F4		4 mm, Aisi 316L
F6		6 mm, Aisi 316L
F8		8 mm, Aisi 316L
F0		9 mm, Aisi 316L
FA		10 mm, Aisi 316L
FC		12 mm, Aisi 316L
Not all options are listed here. Please contact us know current production plan for this device		

How to Order (continuation)

050	✓	Process Connection
00		Without process connection
A1		Welded G 1/2", SS316L
A2		Welded G 3/4", SS316L
A3		Welded G 1", SS316L
A4		Welded 1/2" NPT, SS316L
A5		Welded 3/4" NPT, SS316L
A6		Welded 1" NPT, SS316L
B1		Compression fitting G 1/2" SS316
B2		Compression fitting NPT 1/2" in SS316
B3		Compression fitting G 1/4" SS316
B4		Compression fitting NPT 1/4" in SS316
B5		Compression fitting G 1/8" SS316
B6		Compression fitting NPT 1/8" in SS316
Y9		Special version on request
Not all options are listed here. Please contact us know current production plan for this device		
060	✓	Temperature Transmitter
A0		Not selected
B7		Integrated with RTD input 2/3-wire, output 4-20mA
Y9		Special version on request
070	✓	Electrical Wiring
VM		Plug ISO 4400, Type A, 18mm; PIN 3P+G; IP 65
YY		Special version on request
⊕ 080	✓✓	Additional Accessories
D0		Plug-in display DVA50, 4-20mA loop powered, LED 4 digits
VF		Socket ISO 4400, Type A, 18mm; PIN 3P+G, 1.5mm2; IP 65
YY		Special version on request
⊕ 090	✓	Gasket; Material and Temperature
E		Flat gasket for ISO 4400 connector; EPDM; -40...125°C
F		Flange gasket for ISO 4400 connector; NBR; -30...90°C
N		Flat gasket for ISO 4400 connector; NBR; -30...90°C
⊕ 100	✓	Label and Product Documentation Language
EN		English
FR		French
PT		Portuguese

Selection Example	
Temperature probe with class A sensor, 3-wire configuration with 115 mm of immersion length, stem of 6mm; welded thread of G ½". Socket connector and flange gasket included.	
Order code	RS10-A3SFF6A1A0VM+VFF/115 mm/

Contact

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