

Your Global Automation Partner

TURCK

The Full Range For Temperature Sensors



A Global Leader in Industrial Automation

Turck's sensors, connectivity, and fieldbus technology products are built to be the best. As one of the most **prominent** sensor manufacturers **in the world**, we even back our sensors with a **lifetime warranty**. Turck works by bringing **rugged engineering** solutions to your industrial automation applications.

85,000+
SOLUTIONS

50+
YEARS OF INNOVATION

2,000+
EXPERIENCED SALES REPRESENTATIVES

Pioneer in non-contact
sensing technology

Developed innovative **connectivity**
solutions in response to our customers' needs

Recognized the need for advanced **I/O solutions**
in harsh duty environments

**SUPPORT &
DEDICATED SERVICE**

EXTENSIVE WARRANTY



4,000+
APPLICATION EXPERTS

RESPOND
and SOLVE over **1,200** inquiries
per day



Strategically placed manufacturing facilities in the

USA with **30** GLOBAL
SUBSIDIARIES

GLOBAL BUT LOCAL...

60 representations worldwide

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What is Temperature?

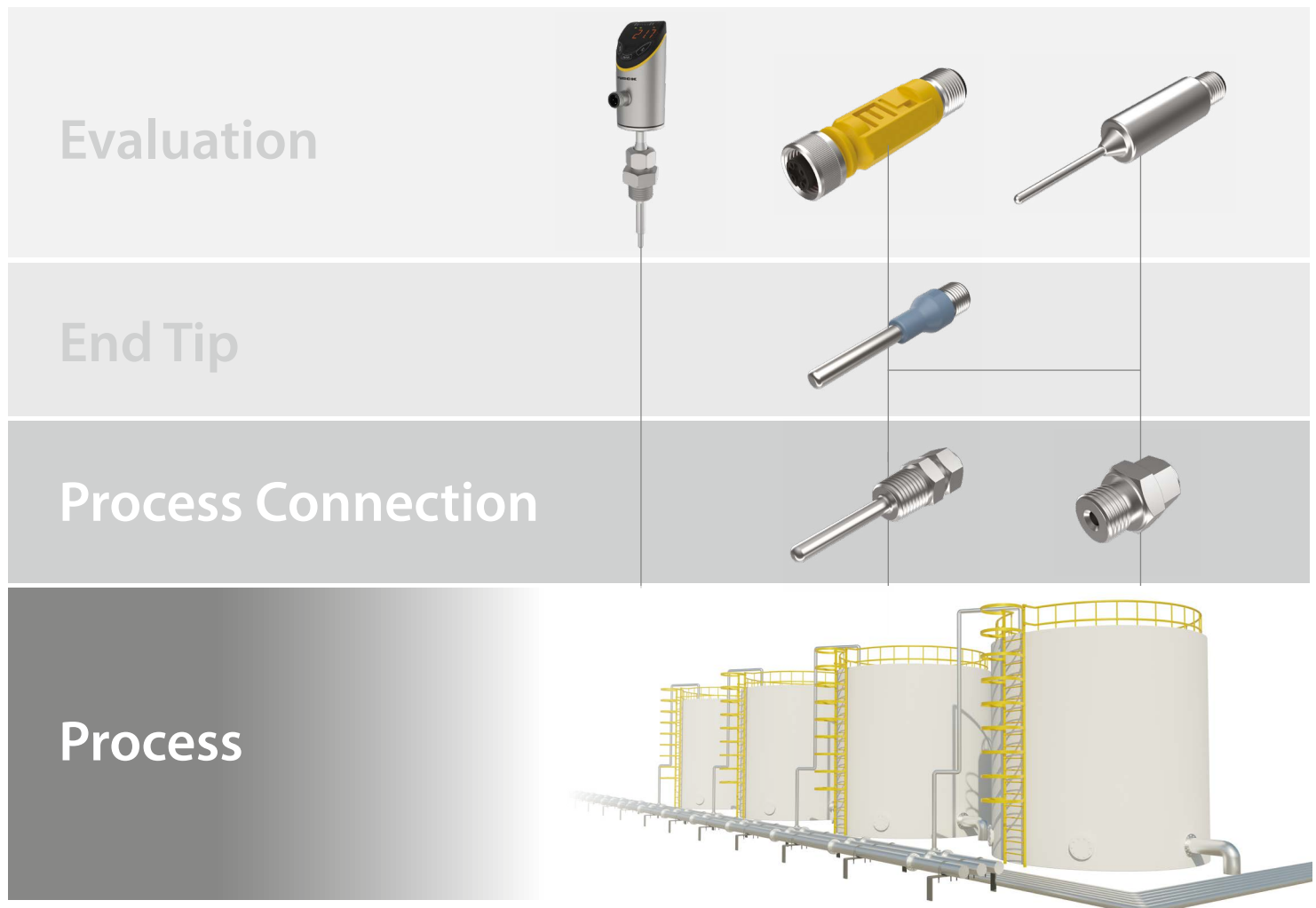
Temperature is a physical property of all solid and non-solid matter that describes how much heat, or lack thereof, is contained within it. From a temperate summer day to an ice-cold glass of water and everything in between, we all experience temperature throughout our daily lives. In the automation world, temperature is a critical factor to measure to validate or maintain a successful process as well as verifying machine or component health.

Temperature measurement falls into two main categories: contact and non-contact measurement. Contact measurement types such as RTDs or thermocouples need to be physically exposed to the medium to register a temperature whereas non-contact measurement types are capable of measuring temperature from some distance away.

Turck's temperature sensing portfolio deals exclusively with contact measurement types, offering both RTD based temperature sensors

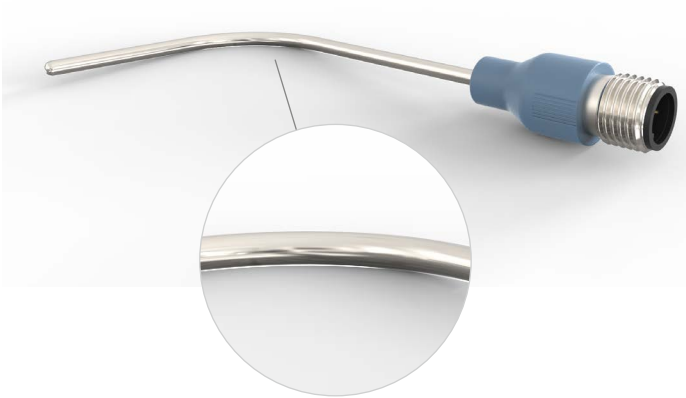
as well as thermocouples. An RTD (resistance temperature detector) is a simple device that uses a changing resistance value across a thin platinum disc to register temperatures. This resistance value can be further conditioned in either a packaged or modular system to offer a standard switching or analog output. Thermocouples are another type of contact temperature measurement that relies on a voltage differential produced by varying temperatures across two dissimilar, bonded alloys.

In addition to the typical analog output options, Turck also offers a fully programmable devices to specify custom analog spans, switching outputs, or IO-Link communication for an enhanced level of device communication. Aside from the full line of available temperature sensors, Turck also offers a comprehensive line of mounting and installation accessories to cater to any application.



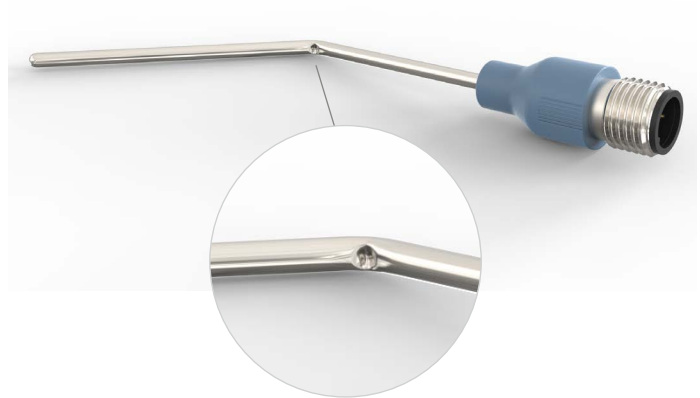
Probe Bending

Correct Bend



Smooth, sweeping radius with no probe deformation.

Incorrect Bend










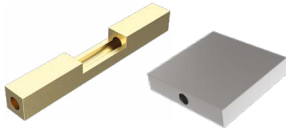

Kinked probe sheath will lead to lower sensor lifespan and erratic function.

Bending temperature probes is often a good idea in an application when there is an excessive protrusion of the temperature sensor from the process. This protrusion is common, as temperature sensor length is usually slightly oversized from the customer-specified insertion depth to ensure proper device function. This overhanging material can become a trip or impact hazard for employees as well as exposing the sensor to potential damage from unintended collisions. By bending the overhanging material to match the profile of the installation location, these hazards can be minimized.

When considering bending a TP or TTM temperature sensor, it is important to adhere to the following best practices:

- Never bend the probe within 30mm of the tip or where the probe shaft meets the electrical connector
- Bending radius must not exceed 3x the OD of the probe
- If bending without the use of specialty tools, take care not to “kink” the shaft of the probe
- If applicable, pre-install the compression fitting, ferrule, and nut as they may not slide on smoothly once the probe is bent

Observing these best practices is critical in preventing device damage when bending temperature sensors. Adhering to the 30mm minimum distance for bending will help protect both the sensing element of the probe itself which is located at the tip of the probe, as well as preventing stress on the solder joints where the lead wires for the temperature sensor connect to the pins on the electrical connector. Damage at either of these two points will often lead to immediate device failure, or a drastic shortening of the lifespan of the sensor. Avoiding “kinks” as well as excessive bending radius serves to protect the lead wires from being stretched or severed, which too will lead to either immediate device failure or diminished sensor life span.

	Features	Page
	<ul style="list-style-type: none"> Fully programmable outputs Rugged 316 stainless steel IP69K rotatable housing Integrated or remote mount temperature probe options IO-Link 	7
	<ul style="list-style-type: none"> Programmable analog span or switch point Available in a variety of insertion lengths Bendable probe (up to 3x outer diameter) Thermowell or compression fitting process connection Overmolded or stainless steel body IO-Link 	9
	<ul style="list-style-type: none"> Factory set analog span Available in a variety of insertion lengths Bendable probe (up to 3x outer diameter) Thermowell or compression fitting process connection Overmolded or stainless steel body 	11
	<ul style="list-style-type: none"> Programmable analog span or switch point For connection to external temperature probes Overmolded or stainless steel body IO-Link 	13
	<ul style="list-style-type: none"> 4-wire PT100 RTD or Type K thermocouple Available in a variety of insertion lengths up to 1 meter Bendable probe (up to 3x outer diameter) Thermowell or compression fitting process connection Overmolded or stainless steel body 	15
	<ul style="list-style-type: none"> Available in a variety of process connection and insertion length options 316 stainless steel body Ideal mounting accessory for liquid vessels 	22
	<ul style="list-style-type: none"> Available in a variety of process connection options Allows for variable insertion depth 316 stainless steel body 	25
	<ul style="list-style-type: none"> Assorted mounting accessories 	27
	<ul style="list-style-type: none"> For remote RTD or thermocouple signal evaluation in hazardous areas 	28

TS+ Programmable Temperature Sensor

The TS+ programmable sensor features a completely sealed capacitive touch-pad interface with a multicolor display for local indication of temperature. Programmable switching, analog and IO-Link outputs available for additional system control.

- TS700 with integrated temperature probe and process connection or TS720 with remote temperature probe
- PNP/NPN normally open/normally closed switching outputs
- IO-Link 1.1 with variable data mapping across all variants



Performance Data

Programmable Output Type 2UPN8	2X PNP/NPN N.O./N.C.
Programmable Output Type LI2UPN8	**4 -20 mA, 0 - 20 mA, 0 - 10 V, 1 - 6 V, 0 - 5 V and 1X PNP/NPN N.O./N.C or 2X PNP/NPN N.O./N.C.
Measuring Range	
	TS700 -50 to 150 °C
	TS720 Determined by temperature probe connected to the sensor
Accuracy	± (0.15 °C + 0.002 * t) within range of -30 to 300 °C
Set Point Accuracy	± 0.2 K
Response Time	
	TS720 Determined by temperature probe connected to the sensor
Process Pressure	
	TS700 300 bar
	TS720 Determined by temperature probe and mounting accessory

Electrical Data

Operating Voltage	
	2UPN8 10-33 VDC
	LI2UPN8 17-33 VDC
Switching Current	250 mA
Voltage Drop	≤ 2v
Short Circuit / Reverse Polarity Protection	Yes/Yes
IO-Link	Version 1.1

Environmental Data

Ambient Temperature	-40 to 80 °C
Storage Temperature	-40 to 85 °C
Housing Materials	316L stainless steel/polyarylamide 50% GF UL 94-V-0
Wetted Materials	316L stainless steel/FKM, AFM flat seal
Protection Type	IP6K6K/6K7/6K9K
LED Measuring Value	4 digit 12 segment rotatable, red or green

**Inverse analog signals are programmable; example 4-20mA or 20 - 4mA

Part Number Key

TS 700 - L016 - 16 - 2UPN8 - H1141

Function

TS = Temperature sensor with display

Mechanical Design

700 = Integrated temperature probe with process connection adapter
 720 = M12 connection for remote temperature probe

Probe Length

L016 = 16mm
 L050 = 50mm
 Blank = M12 for remote probe connection (TS720 only)

Electrical Connection

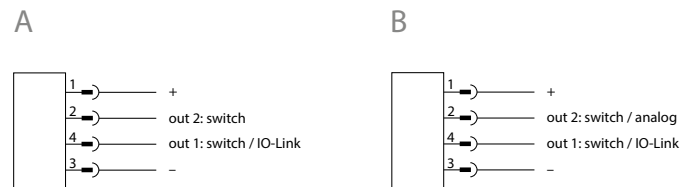
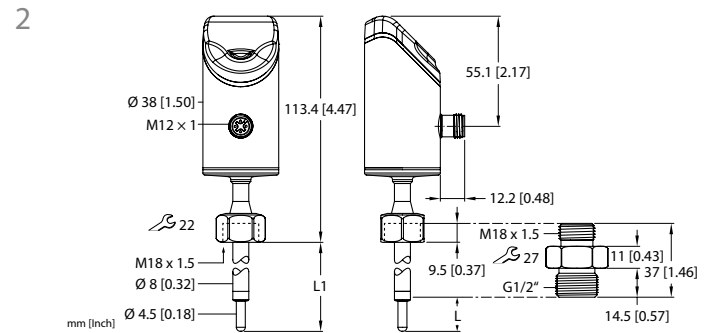
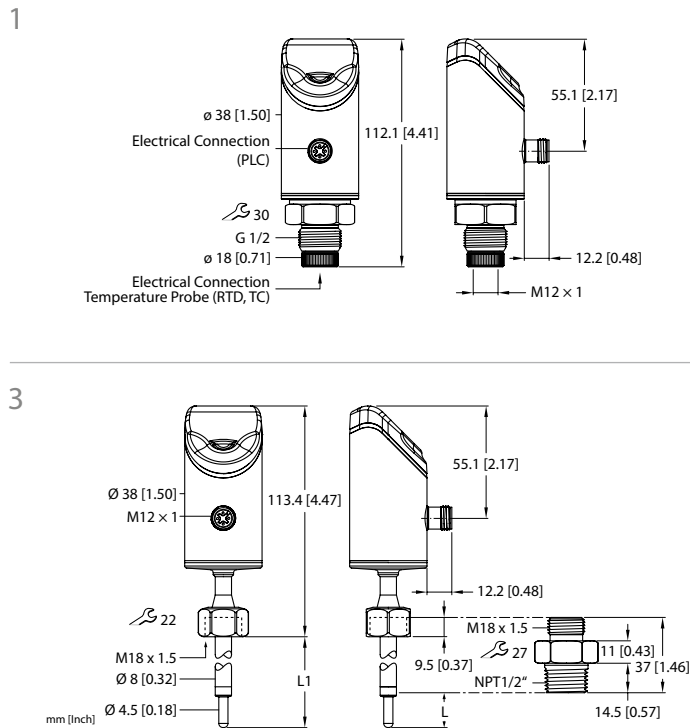
M12 x 1

Electrical Version

2UPN8 = Dual switch point
 LI2UPN8 = Analog voltage/current + switch point or dual switch point

Process Connection

16 = 1/2 NPT
 30 = G1/2



Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

Material #	Description	Integrated Probe	Process Connection	Output Type	Dimension Drawing	Wiring Diagram
100003640	TS720-LI2UPN8-H1141	No	-	Analog + IO-Link	1	B
100003633	TS720-2UPN8-H1141	No	-	Switching + IO-Link	1	A
100004381	TS700-L050-30-LI2UPN8-H1141	Yes - 50 mm	G1/2 Male	Analog + IO-Link	2	B
100004378	TS700-L050-30-2UPN8-H1141	Yes - 50 mm	G1/2 Male	Switching + IO-Link	2	A
100004382	TS700-L050-16-LI2UPN8-H1141	Yes - 50 mm	1/2" NPT Male	Analog + IO-Link	3	B
100004379	TS700-L050-16-2UPN8-H1141	Yes - 50 mm	1/2" NPT Male	Switching + IO-Link	3	A
100003641	TS700-L016-30-LI2UPN8-H1141	Yes - 16 mm	G1/2 Male	Analog + IO-Link	2	B
100003635	TS700-L016-30-2UPN8-H1141	Yes - 16 mm	G1/2 Male	Switching + IO-Link	2	A
100004380	TS700-L016-16-LI2UPN8-H1141	Yes - 16 mm	1/2" NPT Male	Analog + IO-Link	3	B
100004377	TS700-L016-16-2UPN8-H1141	Yes - 16 mm	1/2" NPT Male	Switching + IO-Link	3	A
100003640	TS700-L050-30-LI2UPN8-H1141	Yes - 50 mm	G 1/2 Male	Analog + IO-Link	2	B

TTM Temperature Transmitter w/ IO-Link

The TTM Temperature Transmitter with IO-Link is a compact and versatile sensor that can be programmed to function as an analog temperature transmitter, temperature switch, or digital sensor using IO-Link process data. Available with an integrated temperature probe the TTM with IO-Link is easily configured to meet application requirements.

- Span programmable via IO-Link
- Compact overmolded or stainless steel housing with integral or remote temperature probe
- Programmable as a 4-20mA Loop transmitter, PNP/NPN switch, or IO-Link digital device
- Mineral filled bendable probe



Performance Data

Programmable Output		Programmable NO/NC PNP/NPN switch or 4-20mA loop power
Measuring Range		-210 to 650 °C *
Factory Setting		0 to 150 °C
Analog Accuracy		
	Integrated probe	±0.15°C + 0.002 * [t] within range of -30 to 300 °C
Repeatability		0.1K
Measuring Element		Integral PT100 RTD probe
Process Pressure		Determined by temperature probe and mounting accessory
Response Time		
	3mm probe	t 0.5= 1.5s, t0.9= 6.0s in water at 0.2M/S
	6mm probe	t 0.5= 6s, t0.9= 15s in water flowing at 0.2M/S
Set Point Accuracy		± 0.3K
Set Point Range		-200 to 650 °C
Reset Point Range		-210 to 640 °C
Temperature Coefficient Zero Point		± 0.1% of full scale/10K
Temperature Coefficient Span		± 0.1% of full scale/10K

Electrical Data

Operating Voltage	15 - 30 VDC
Current Consumption	≤ 20mA
Switching Current	150 mA
Voltage Drop	≤ 2 VDC
Short Circuit/Reverse Polarity Protection	Yes/Yes
IO-Link	V1.1

Environmental Data

Ambient Temperature	-40 to 80 °C
Storage Temperature	-40 to 80 °C
Housing Materials	316L stainless steel, plastic
Wetted Materials	316L stainless steel, 1.4404
Protection Type	IP67

*Maximum temperature at the electrical connection must be 80° C or below

Part Number Key

TTM - 203A - CF - LIUPN - H1140 - L100

Function

TTM = Temperature transmitter
 TTMS = Temperature transmitter miniature with stainless housing

Probe

103A = 3mm OD RTD probe with integrated process connection
 203A = 3mm OD RTD probe for compression fitting mounting
 206A = 6mm OD RTD probe for compression fitting mounting

Process Connection

G1/8 = G1/8 male thread (103A only)
 N1/4 = 1/4 NPT male thread (103A only)
 CF = For use with compression fitting or thermowell (203A and 206A only)

** Not all combinations are feasible. Consult with the factory for additional information

Probe Length

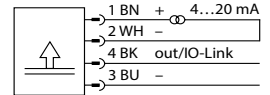
L013 = 13mm
 L024 = 24mm
 L050 = 50mm
 L100 = 100mm
 L150 = 150mm
 L200 = 200mm
 L300 = 300mm
 **

Electrical Connection

M12x1

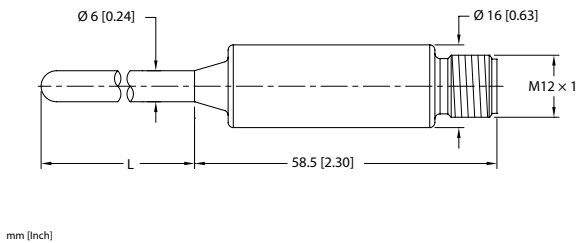
Electrical Version

4-20mA loop power, PNP/NPN switch,
 IO-link programmable

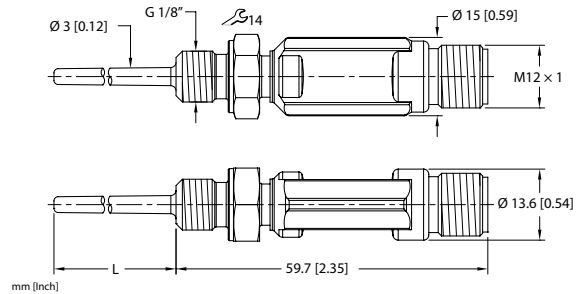


Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

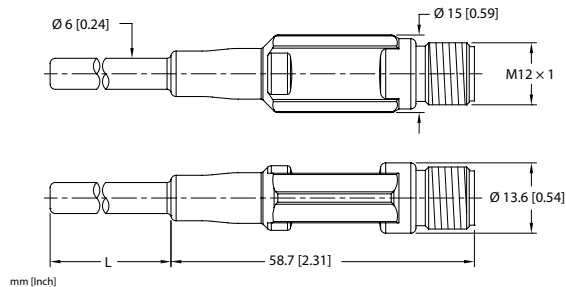
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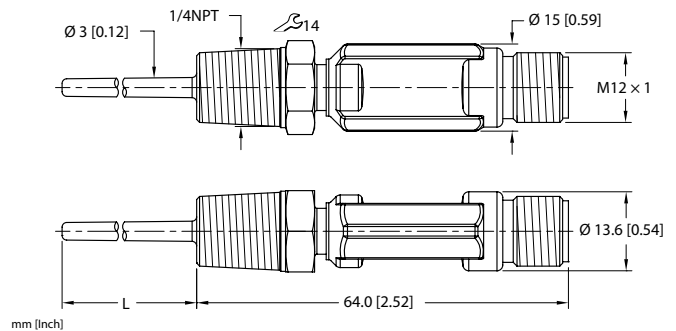
2



3



4



Recommended cordset RK 4.4T-*/S618

Material #	Description	Dimension L (Insertion depth)	Probe Diameter	Process Connection	Dimension Drawing
9910656	TTMS-203A-CF-LIUPN-H1140-L100	100 mm	3 mm	Compression fitting	1
9910660	TTMS-206A-CF-LIUPN-H1140-L100	100 mm	6 mm	Compression fitting	1
100001104	TTM-206A-CF-LIUPN-H1140-L300	300 mm	6 mm	Compression fitting	3
9910620	TTM-203A-CF-LIUPN-H1140-L100	100 mm	3 mm	Compression fitting	3
9910626	TTM-206A-CF-LIUPN-H1140-L150	150 mm	6 mm	Compression fitting	3
9910628	TTM-103A-G1/8-LIUPN-H1140-L013	13 mm	3 mm	G1/8 male	2
9910630	TTM-103A-G1/8-LIUPN-H1140-L024	24 mm	3 mm	G1/8 male	2
9910814	TTM-103A-N1/4-LIUPN-H1140-L013	13 mm	3 mm	1/4" NPT male	4
9910815	TTM-103A-N1/4-LIUPN-H1140-L024	24 mm	3 mm	1/4" NPT male	4

TTM Analog Temperature Transmitter

The Analog TTM is a standard analog temperature transmitter that converts measured temperature into an analog 4-20mA signal. The compact overmolded or stainless steel housing and stainless steel temperature probe make this a good choice for reliable operation in harsh industrial applications.

- Compact design for industrial applications
- Factory set temperature span
- Mineral filled bendable probes



Performance Data

Output	4-20mA loop power
Analog Accuracy	± 0.2K
Repeatability	0.1K
Process Pressure	Determined by temperature probe and mounting accessory
Response Time	
	3 mm probe t 0.5 = 1.5 s / t 0.9 = 6.0 s in water at 0.2 m/s
	6 mm probe t 0.5 = 6 s / t 0.9 = 15 s in water at 0.2 m/s
Temperature Coefficient Zero Point	± 0.1% of full scale/10K
Temperature Coefficient Span	± 0.1% of full scale/10K

Electrical Data

Operating Voltage	10 to 24 VDC
Analog Load	≤ 0.7 kΩ
Short Circuit/Reverse Polarity Protection	Yes/Yes
IO-Link	V1.1
Current Consumption	≤ 20 mA

Environmental Data

Ambient Temperature	-40 to 80 °C
Storage Temperature	-40 to 80 °C
Housing Materials	316 stainless steel, plastic
Wetted Materials	316L Stainless Steel, 1.4404
Protection Type	IP67

*Maximum temperature at the electrical connection must be 80 °C or below

Part Number Key

TTM - 100C - 203A - CF - LI6 - H1140 - L100 -50/50C

Function

TTM = Temperature transmitter miniature
 TTMS = Analog temperature transmitter with stainless steel housing

Temperature Range

(superceded by Special Temperature Range if applicable)

050C = 0 to 50 °C
 100C = 0 to 100 °C
 150C = 0 to 150 °C

Probe

103A = 3mm OD RTD probe with integrated process connection
 203A = 3mm OD RTD probe for compression fitting mounting
 206A = 6mm OD RTD probe for compression fitting mounting

Process Connection

G1/8 = G1/8 male thread (103A only)
 N1/4 = 1/4 NPT male thread (103A only)
 CF = For use with compression fitting or thermowell (203A and 206A only)

** Not all combinations are feasible. Consult with the factory for additional information

Special Temperature Range

-50/50 °C = -50 to 50 °C
 -50/150 °C = -50 to 150 °C

Probe Length

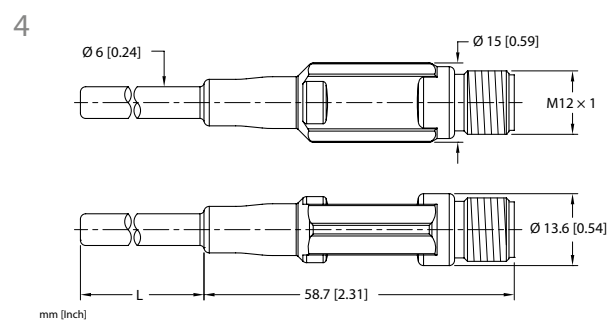
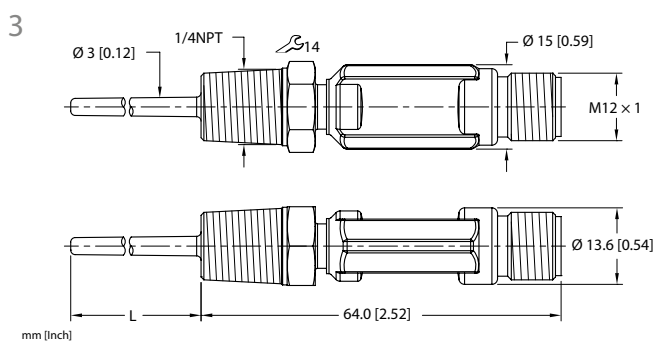
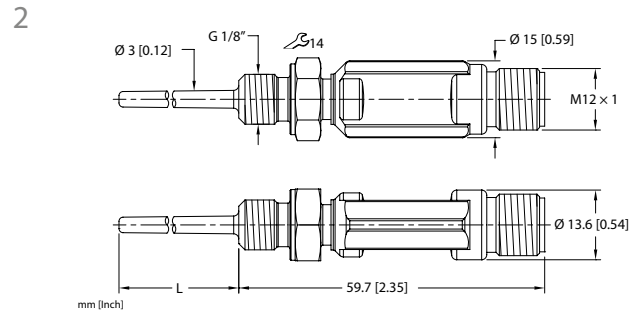
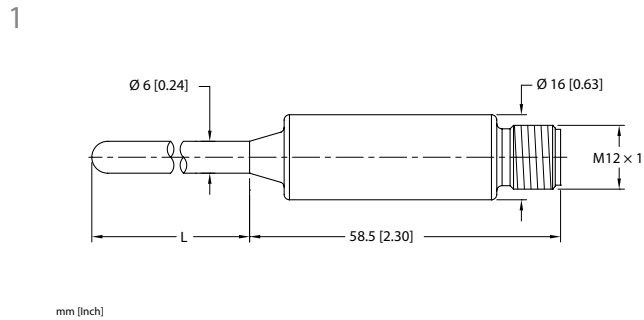
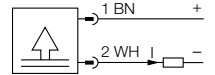
L013 = 13mm
 L024 = 24mm
 L050 = 50mm
 L100 = 100mm
 L150 = 150mm
 L200 = 200mm
 L300 = 300mm
 **

Electrical Connection

H1141 = M12x1

Electrical Version

LI6 = 4-20mA loop power

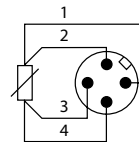
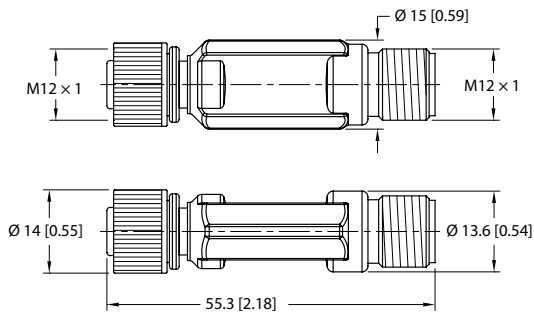


Material #	Description	Dimension L (Insertion depth)	Probe Diameter	Process Connection	Custom Span	Dimension Drawing
9910550	TTM050C-103A-G1/8-LI6-H1140-L013-50/50°C	13 mm	3 mm	G1/8 male	-50 - 50 °C	2
100001381	TTM050C-103A-N1/4-LI6-H1140-L024-50/50°C	24 mm	3 mm	1/4" NPT male	-50 - 50 °C	3
9910548	TTM050C-206A-CF-LI6-H1140-L150-50/50°C	150 mm	6 mm	Compression fitting	-50 - 50 °C	4
9910666	TTM100C-103A-N1/4-LI6-H1140-L024	24 mm	3 mm	1/4" NPT male	No	3
9910647	TTM100C-206A-CF-LI6-H1140-L050	50 mm	6 mm	Compression fitting	No	4
9910537	TTM150C-203A-CF-LI6-H1140-L100-50/150°C	100 mm	3 mm	Compression fitting	-50 - 150 °C	2
9910536	TTM150C-203A-CF-LI6-H1140-L150	150 mm	3 mm	Compression fitting	No	2
100004227	TTMS-206A-CF-LI6-H1140-L100-50/150	100 mm	6 mm	Compression fitting	-50 - 150 °C	1
9910815	TTM-103A-N1/4-LIUPN-H1140-L024	24 mm	3 mm	1/4" NPT male	No	3

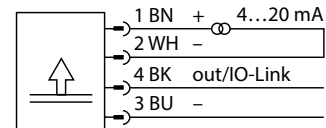
Miniature TTM Transmitter w/ IO-Link

The TTM with IO-Link is a compact and versatile sensor that can be programmed to function as an analog temperature transmitter, temperature switch, or digital sensor using IO-Link process data. Once paired with an external temperature probe, the TTM with IO-Link is easily configured to meet application requirements.

- Span programmable via IO-Link
- Compact overmolded or stainless steel housing for pairing with remote temperature probe
- Programmable as a 4-20mA loop transmitter, PNP/NPN switch, or IO-Link digital device.



RTD side wiring diagram



Panel side wiring diagram

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

Performance Data

Programmable Output	Programmable NO/NC PNP/NPN switch or 4-20mA loop power
Measuring Range	-210 to 650 °C
Factory Setting	0 to 150 °C
Analog Accuracy	± 0.3K, 0.1% full scale for temperatures above 300 °C
Repeatability	0.1K
Measuring Element	Dependent on temperature probe
Process Pressure	Determined by temperature probe and mounting accessory
Response Time	Dependent on temperature probe
Set Point Accuracy	±0.3K
Set Point Range	-200 to 650 °C
Reset Point Range	-210 to 640 °C
Temperature Coefficient Zero Point	± 0.1% of full scale/10K
Temperature Coefficient Span	± 0.1% of full scale/10K

Electrical Data

Operating Voltage	15 to 30 VDC
Current Consumption	≤ 20 mA
Switching Current	150 mA
Voltage Drop	≤ 2 VDC
Short Circuit/Reverse Polarity Protection	Yes/Yes
IO-Link	V1.1

Environmental Data

Ambient Temperature	-40 to 80 °C
Storage Temperature	-40 to 80 °C
Housing Materials	316 stainless steel, plastic
Protection Type	IP67

Temperature Probe

The TP line of RTDs are the crucial components that will physically measure the temperature of the process. As a stand alone device it will offer a resistance value that will fluctuate with the temperature experienced at the tip of the probe. Pairs with a TTM transmitter or a TS+ sensor to enable standard analog, switching, or IO-Link outputs.

- PT100 measuring element
- Standard 4 wire M12 male connection or flying leads
- Overmolded or stainless steel versions
- Can be configured as a 2, 3, or 4-wire device
- Mineral filled bendable probe



TP	-	203A	-	CF	-	H1141	L050
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Function

TP = Temperature probe, overmolded body
 TPS = Temperature probe, stainless steel body

Probe

103A = Tapered RTD probe with integrated process connection
 104A = 4mm OD RTD probe with integrated process connection
 203A = 3mm OD RTD probe for compression fitting mounting
 206A = 6mm OD RTD probe for compression fitting mounting
 206KK1 = 6mm type K thermocouple probe for compression fitting mounting
 306A = 6mm OD RTD probe for compression fitting mounting with integrated cable
 504A = 4mm OD RTD probe with integrated sanitary process connection

Probe Length

L013 = 13mm
 L024 = 24mm
 L050 = 50mm
 L100 = 100mm
 L150 = 150mm
 L200 = 200mm
 L300 = 300mm

Electrical Connection

H1141 = M12x1
 Blank = No electrical quick disconnect

Process Connection

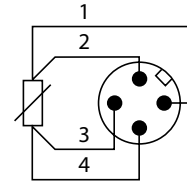
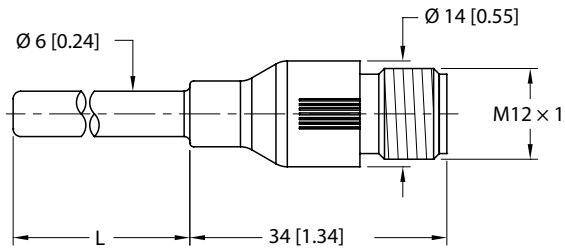
G1/8 = G1/8 male thread
 N1/4 = 1/4 NPT male thread
 CF = For use with compression fitting or thermowell
 TRI3/4 = 3/4" tri clamp
 TRI1.5 = 1.5" tri clamp
 G1/4 = G1/4 male thread

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

*Not all combinations are feasible. Consult with the factory for additional information

*Maximum temperature at the electrical connection must be 80 °C or below

TP-206A



mm [Inch]

Material #	Description	"L" Dimension	Probe Diameter	Body Diameter
9910475	TP-206A-CF-H1141-L100	100 mm	6 mm	14 mm
9910476	TP-206A-CF-H1141-L150	150 mm	6 mm	14 mm
9910477	TP-206A-CF-H1141-L200	200 mm	6 mm	14 mm
9910638	TPS-206A-CF-H1141-L100	100 mm	6 mm	16 mm
9910639	TPS-206A-CF-H1141-L150	150 mm	6 mm	16 mm
9910640	TPS-206A-CF-H1141-L200	200 mm	6 mm	16 mm

Performance Data

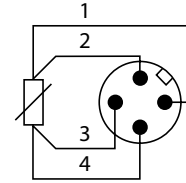
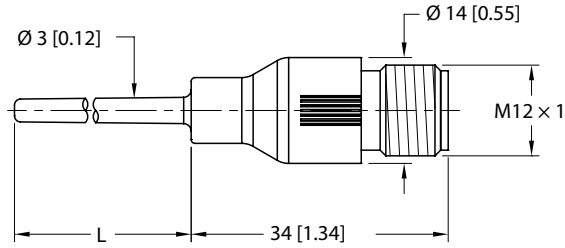
Temperature Operating Range	-50 °C to 500 °C -50 °C to 120 °C for lengths <100mm
Storage Temperature	-40 °C to 85 °C
Measuring Element	Pt-100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 15 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Pressure Rating	Depends on mounting accessory
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K*

Consult factory for more configurations

*Maximum temperature at the electrical connection must be 80 °C or below

TP-203A



mm [Inch]

Material #	Description	"L" Dimension	Probe Diameter	Body Diameter
9910645	TP-203A-CF-H1141-L050	50 mm	3 mm	14 mm
9910402	TP-203A-CF-H1141-L100	100 mm	3 mm	14 mm
9910403	TP-203A-CF-H1141-L150	150 mm	3 mm	14 mm
9910482	TP-203A-CF-H1141-L200	200 mm	3 mm	14 mm
9910496	TP-203A-CF-H1141-L1000	1000 mm	3 mm	14 mm

Performance Data

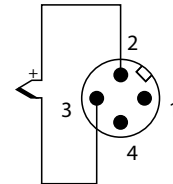
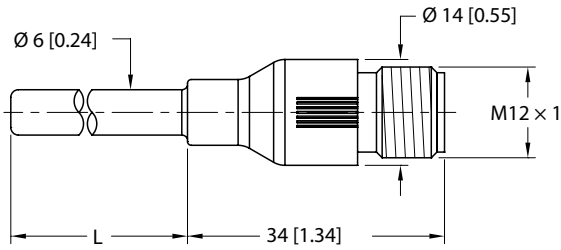
Temperature Operating Range	-50 °C to 500 °C -50 °C to 120 °C for lengths <100mm
Storage Temperature	-40 °C to 85 °C
Measuring Element	Pt -100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 15 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Pressure Rating	Depends on mounting accessory
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

Consult with the factory for more configurations

*Maximum temperature at the electrical connection must be 80 °C or below

TP-206KK1



mm [Inch]

Material #	Description	"L" Dimension	Probe Diameter	Body Diameter
100017085	TP-206KK1-CF-H1141-L100	100 mm	6 mm	14 mm
100017084	TP-206KK1-CF-H1141-L150	150 mm	6 mm	14 mm
100017083	TP-206KK1-CF-H1141-L200	200 mm	6 mm	14 mm
100017082	TP-206KK1-CF-H1141-L500	500 mm	6 mm	14 mm

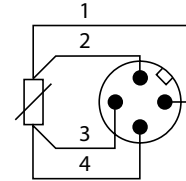
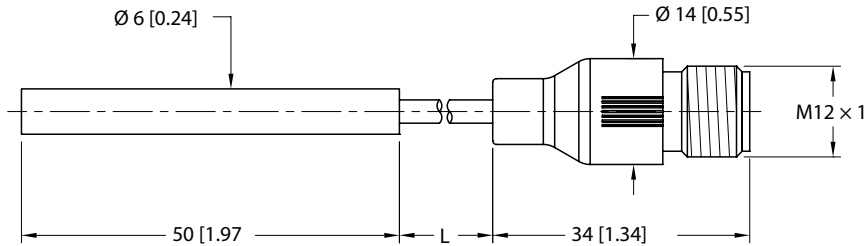
Performance Data

Temperature Operating Range	-40 °C to 1100 °C
Storage Temperature	-40 °C to 85 °C
Measuring Element	Thermocouple type K, DIN EN 60584
Output Function	2-wire
Degree of Protection	IP67
Pressure Rating	Depends on mounting accessory
Accuracy Class	Class 1
Wetted Materials	Inconel 600

Recommended Cordset: RSC 4.4T-*/S1341

Recommended Field wireable: BL67-WAS5-THERMO

TP-306A



mm [Inch]

Material #	Description	"L" Dimension	"I" Dimension	Probe Diameter	Body Diameter
9910479	TP-306A-CF-H1141-L1000	1000 mm	50mm	6 mm	14 mm
9910480	TP-306A-CF-H1141-L2000	2000 mm	50mm	6 mm	14 mm
9910481	TP-306A-CF-H1141-L5000	5000 mm	50mm	6 mm	14 mm
9910648	TP-306A-CF-L2100	2100 mm	50mm	6 mm	-
9910649	TP-306A-CF-L2150	2150 mm	50mm	6 mm	-

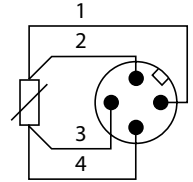
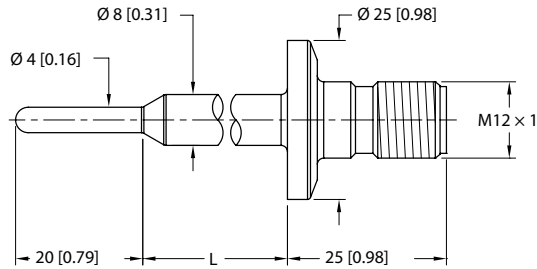
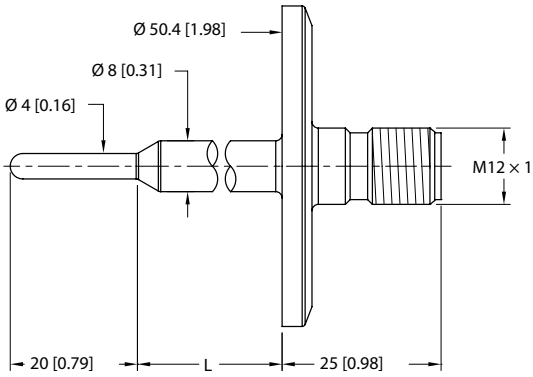
Performance Data

Temperature Operating Range	-50 °C to 105 °C
Storage Temperature	-40 °C - 85 C
Measuring Element	Pt-100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 20 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Pressure Rating	Depends on Mounting Accessory
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

*Maximum temperature at the electrical connection must be 80 °C or below

TP-504A



Material #	Description	"L" Dimension	Tri-Clamp size
9910429	TP-504A-TRI3/4-H1141-L035	35 mm	25 mm (3/4" Tri-Clamp)
9910430	TP-504A-TRI3/4-H1141-L100	100 mm	25 mm (3/4" Tri-Clamp)
9910860	TP-504A-TRI1.5-H1141-L100	100 mm	50.4 mm (1.5" Tri-Clamp)

Performance Data

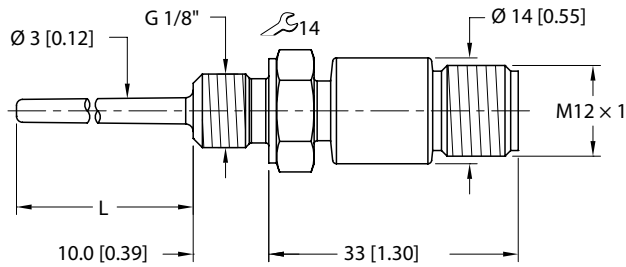
Temperature Operating Range	-50 °C to 120 °C
Storage Temperature	-40 °C to 85 °C
Measuring Element	Pt-100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 15 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

Consult factory for more configurations

*Maximum temperature at the electrical connection must be 80 °C or below

TP-103A



mm [Inch]

Material #	Description	"L" Dimension	Process Connection	Probe Diameter
9910401	TP-103A-G1/8-H1141-L024	24 mm	G1/8	3 mm
9910400	TP-103A-G1/8-H1141-L013	13 mm	G1/8	3 mm

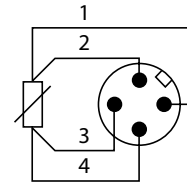
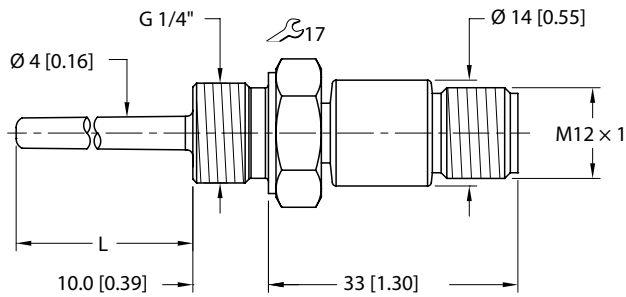
Performance Data

Temperature Operating Range	-50 °C to 120 °C
Storage Temperature	-40 °C - 85 C
Measuring Element	Pt-100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 6.0 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Pressure Rating	100 bar
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

*Maximum temperature at the electrical connection must be 80 °C or below

TP-104A



mm [Inch]

Material #	Description	"L" Dimension	Process Connection
100001432	TP-104A-G1/4-H11141-L015	15 mm	G1/4
9910526	TP-104A-N1/4-H11141-L035	35 mm	1/4" NPT
9910527	TP-104A-G1/4-H11141-L035	35 mm	G1/4
9910664	TP-104A-N1/4-H11141-L005	5 mm	1/4" NPT

Performance Data

Temperature Operating Range	-50 °C to 120 °C
Storage Temperature	-40 °C - 85 C
Measuring Element	Pt-100 probe, DIN EN 60751
Response Time	t 0.5 = 6 s / t 0.9 = 10 s in water at 0.2 m/s
Output Function	4-wire
Degree of Protection	IP67
Pressure Rating	100 bar*
Accuracy Class	Class A
Wetted Materials	Stainless steel, 1.4404 (316L)

Recommended Cordset: EKRT-ESRT-A4.400-GC2K-*

*Maximum temperature at the electrical connection must be 80 °C or below

Thermowell



Thermowells are a versatile accessory in the temperature sensing line that provide value in two main circumstances. First and foremost, when sensing the temperature of liquid within a vessel they allow the temperature sensor to be removed and replaced without requiring an operator to first empty the vessel, saving time and cost. Additionally, they serve to separate the temperature probe from an abrasive media that would otherwise shorten the lifespan of the sensor. Other than identifying the proper process connection, there are two main considerations to keep in mind when selecting a thermowell. The first is diameter – a 6 mm thermowell must be paired with a 6 mm temperature probe and likewise a 3 mm thermowell must be paired

with a 3 mm temperature probe. In addition to diameter, insertion length must be carefully considered. The length of the thermowell is what dictates how far into a process the temperature probe will penetrate. In addition, the length of the temperature probe must be oversized by a minimum of 50 mm compared to the thermowell to ensure that the tip of the probe will fully bottom out within the thermowell. If the same length is selected for both the probe and the thermowell, the resulting combination will have an air gap within the tip of the thermowell that will greatly diminish the response time of the probe.

THW - 6 - N1/2 - A4 - L050

Function

THW = Thermowell accessory

Inside Diameter

3 = 3mm inside diameter
6 = 6mm inside diameter

Insertion Length

- L050 = 50mm
- L100 = 100mm
- L150 = 150mm
- L200 = 200mm
- L250 = 250mm
- L300 = 300mm
- L400 = 400mm
- L500 = 500mm

Housing Material

A4 = Stainless steel, V4A (1.4404)

Process Connection

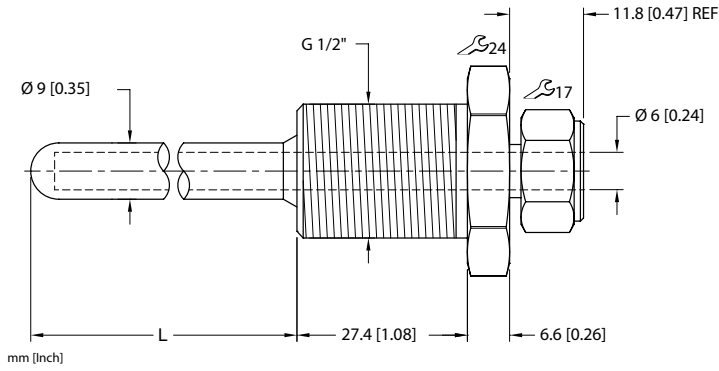
- N1/8 = 1/8 NPT male thread
- N1/4 = 1/4 NPT male thread
- N1/2 = 1/2 NPT male thread
- *G1/8 = G1/8 male thread
- G1/4 = G1/4 male thread
- G1/2 = G1/2 male thread
- TR1/4 = 3/4 Tri-clamp

*UNI25 = 25mm diameter weld in uni-ball

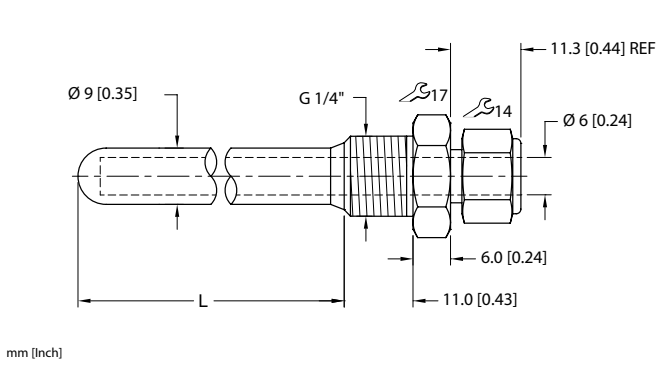
* = Only available in a 3mm inside diameter

Thermowells for 6mm Temperature Probes

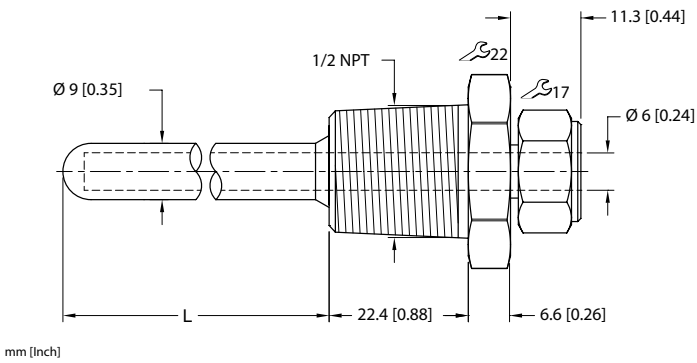
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2



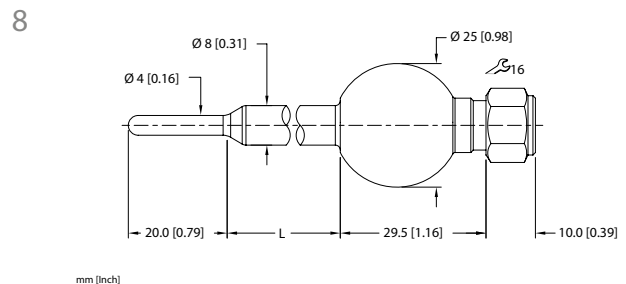
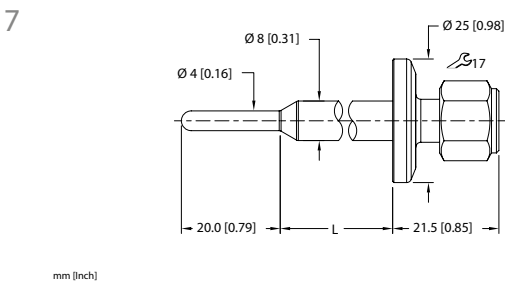
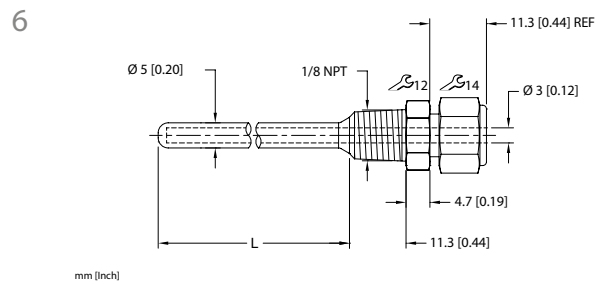
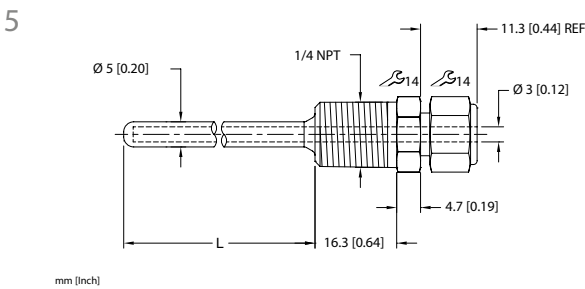
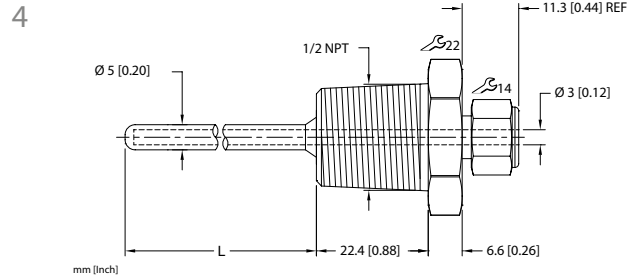
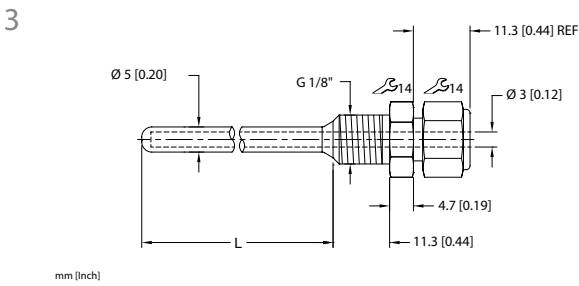
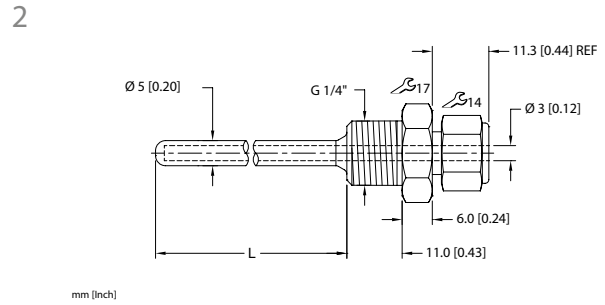
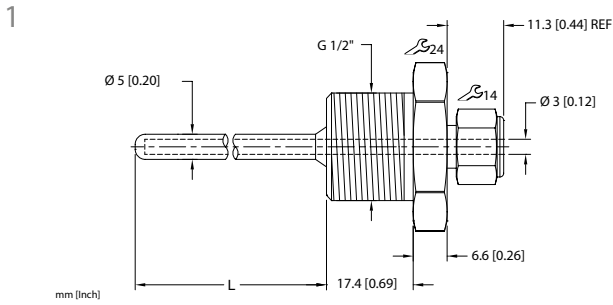
3



Material #	Description	"L" Dimension	Process Connection	Minimum Probe Length	Wetted materials	Dimension Drawing
9910459	THW-6-G1/2-A4-L050	50 mm	G1/2	100 mm	316L Stainless steel	1
9910763	THW-6-G1/4-A4-L150	150 mm	G1/4	200 mm	316L Stainless steel	2
9910464	THW-6-N1/2-A4-L100	100 mm	1/2" NPT	150 mm	316L Stainless steel	3
9910611	THW-6-N1/2-A4-L200	200 mm	1/2" NPT	250 mm	316L Stainless steel	3
9910611	THW-6-N1/2-A4-L200	200 mm	1/2" NPT	250 mm	316L Stainless steel	3
9910611	THW-6-N1/2-A4-L200	200 mm	1/2" NPT	250 mm	316L Stainless steel	3

Consult factory for more configurations

Thermowells for 3mm Temperature Probes



Consult factory for more configurations

Material #	Description	"L" Dimension	Process Connection	Minimum Probe Length	Wetted materials	Dimension Drawing
9910443	THW-3-G1/2-A4-L050	50 mm	G1/2	100 mm	316L Stainless steel	1
9910445	THW-3-G1/2-A4-L150	150 mm	G1/2	200 mm	316L Stainless steel	1
9910427	THW-3-G1/4-A4-L200	200 mm	G1/4	250 mm	316L Stainless steel	2
9910425	THW-3-G1/8-A4-L200	200 mm	G1/8	250 mm	316L Stainless steel	2
9910449	THW-3-N1/2-A4-L150	150 mm	1/2" NPT	200 mm	316L Stainless steel	4
9910428	THW-3-N1/4-A4-L200	200 mm	1/4" NPT	250 mm	316L Stainless steel	5
9910414	THW-3-N1/8-A4-L050	50 mm	1/8" NPT	100 mm	316L Stainless steel	6
9910452	THW-3-TRI3/4-A4-L100	100 mm	25 mm (3/4" Tri-Clamp)	150 mm	316L Stainless steel	7
9910454	THW-3-TRI3/4-A4-L250	250 mm	25 mm (3/4" Tri-Clamp)	300 mm	316L Stainless steel	7
9910502	THW-3-UNI25-A4-L035	35 mm	25mm Ø weld-in fitting	100 mm	316L Stainless steel	8
9910503	THW-3-UNI25-A4-L100	100 mm	25mm Ø weld-in fitting	150 mm	316L Stainless steel	8

Compression Fittings

Compression fittings are the most basic accessory used to mount a temperature probe. They connect the probe to the vessel and provide an airtight seal by a compression nut and ferrule combination. One benefit that compression fittings provide is the ability to set custom insertion depths based on how far in the probe is inserted before the compression fitting is torqued down to secure it in place.

When choosing a compression fitting, always select a fitting with the same diameter as the probe. Failure to do so will prevent the ferrule from compressing on the probe and thus properly holding it in place. Once the diameter is chosen then the process connection must be matched to that of the vessel the probe is being mounted in. Turck provides process connection options in many US and European standard sizes.



CF	-	M	-	3	-	G1/8	-	A4
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Compression Fitting

Ferrule Material

M = AISI316L
P = PTFE

Probe Diameter

3 = 3mm outer diameter
6 = 6mm outer diameter

Material

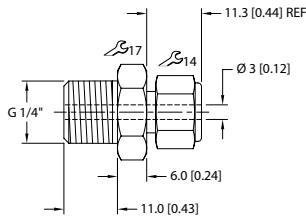
A4 = Stainless steel AISI316L

Process Connection

G1/8 = G1/8 male thread
N1/8 = 1/8 NPT male thread
G1/4 = G1/4 male thread
N1/4 = 1/4 NPT male thread
N1/2 = 1/2 NPT male thread
G1/2 = G1/2 male thread

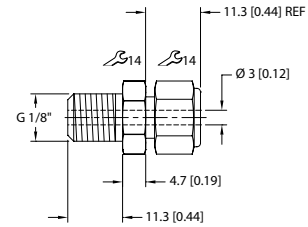
Compression Fittings

1



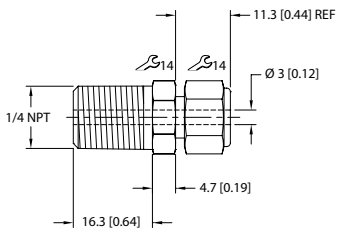
mm [Inch]

2



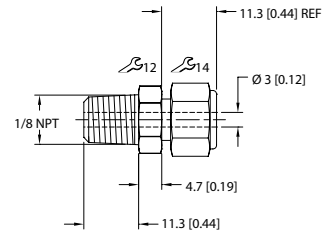
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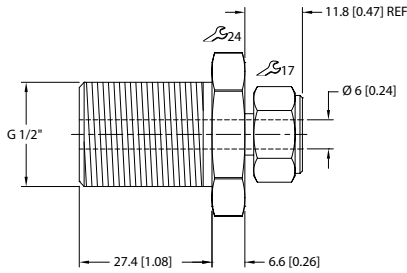
mm [Inch]

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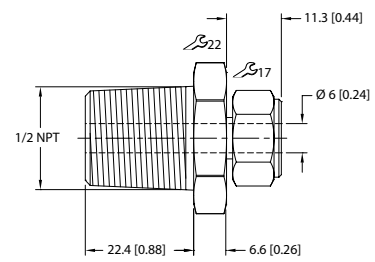
mm [Inch]

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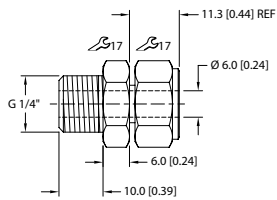
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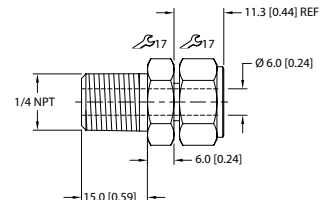
mm [Inch]

7



mm [Inch]

8

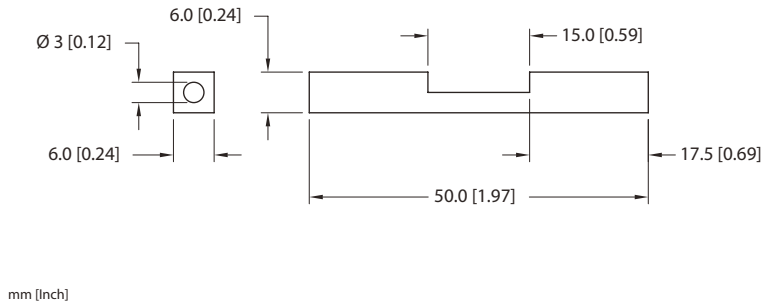


mm [Inch]

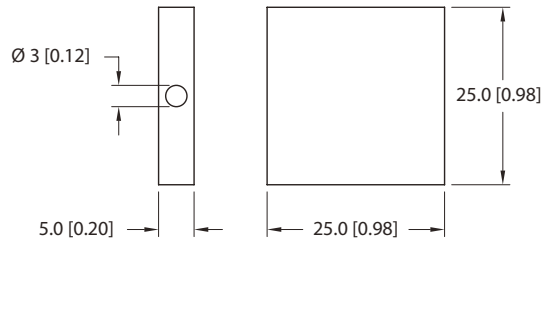
Material #	Description	Ø Probe	Process Connection	Compression ring material	Pressure rating	Wetted materials	Dimension Drawings
9910407	CF-M-3-G1/4-A4	3 mm	G1/4	316L Stainless steel	100 bar	316L Stainless steel	1
9910405	CF-M-3-G1/8-A4	3 mm	G1/8	316L Stainless steel	100 bar	316L Stainless steel	2
9910408	CF-M-3-N1/4-A4	3 mm	1/4" NPT	316L Stainless steel	100 bar	316L Stainless steel	3
9910406	CF-M-3-N1/8-A4	3 mm	1/8" NPT	316L Stainless steel	100 bar	316L Stainless steel	4
9910530	CF-M-6-G1/2-A4	6 mm	G1/2	316L Stainless steel	100 bar	316L Stainless steel	4
9910483	CF-M-6-G1/4-A4	6 mm	G1/4	316L Stainless steel	100 bar	316L Stainless steel	7
9910529	CF-M-6-N1/2-A4	6 mm	1/2" NPT	316L Stainless steel	100 bar	316L Stainless steel	6
9910484	CF-M-6-N1/4-A4	6 mm	1/4" NPT	316L Stainless steel	100 bar	316L Stainless steel	8
9910411	CF-P-3-G1/4-A4	3 mm	G1/4	PTFE	20 bar	316L Stainless steel	1
9910409	CF-P-3-G1/8-A4	3 mm	G1/8	PTFE	20 bar	316L Stainless steel	2
9910412	CF-P-3-N1/4-A4	3 mm	1/4" NPT	PTFE	20 bar	316L Stainless steel	3
9910410	CF-P-3-N1/8-A4	3 mm	1/8" NPT	PTFE	20 bar	316L Stainless steel	4
9910485	CF-P-6-G1/4-A4	6 mm	G1/4	PTFE	20 bar	316L Stainless steel	7
9910486	CF-P-6-N1/4-A4	6 mm	1/4" NPT	PTFE	20 bar	316L Stainless steel	8

Miscellaneous Accessories

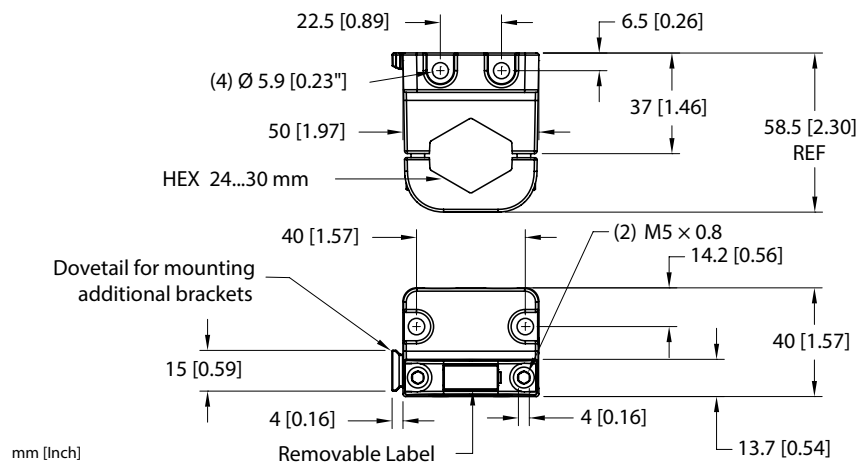
Mounting accessory for pipes TP-MZ-003



Weld-in mounting plate TP-MZ-001



Mounting accessory for TS700 and TS720 FAM-30-PA66



Temperature Converters

Product Overview

What Are Temperature Converters?

Since temperature measurement is common in hazardous areas, Turck's IMX12 temperature converting device may be used to convert a 2, 3 or 4-wire RTD, mV signal or T/C signal in a hazardous area to an analog 4-20 mA signal in a non-hazardous area.



Why Choose IMX12 Temperature Converters?

- Several different inputs may be configured and used with common 4-20 mA analog input control cards.
- Consolidate inventory by eliminating separate RTD, T/C and mV input cards.
- Use of off-the-shelf "Simple Apparatus" components in explosive atmospheres to further reduce installation costs.
- Provides advanced diagnostics, versatility and convenience in an easy-to-use device.

Where can I use IMX12 Temperature Converters?

- Hazardous areas
- Oil and gas processing

Temperature Converters Selection Guide

Part Number	Configuration	Input	Output Relay	Output 0/4-20mA	Terminals
IMX12-TI02-1TCURTD-111R-CO/24VDC	PACTware	Thermocouple, RTD, Resistor	1	1	Screw
IMX12-TI02-1TCURTD-111R-CO/24VDC/CC	PACTware	Thermocouple, RTD, Resistor	1	1	Spring
IMX12-TI01-2RTDR-2I-CO/24VDC	PACTware	RTD, Resistor	No	2	Screw
IMX12-TI01-2RTDR-2I-CO/24VDC/CC	PACTware	RTD, Resistor	No	2	Spring

Glossary

- 2-Wire RTD:** An RTD configuration in which there is only one lead wire on either end of the platinum sensing element – susceptible to lead wire resistance offsets, especially pronounced over long runs of cable. (least accurate).
- 3-Wire RTD:** An RTD configuration in which there is two lead wires on one end of the platinum sensing element and one on the opposite side of the element lead wire resistance on one end of the element can be compensated for to help mitigate resistance spikes over long runs of cable (“middle of the road” accuracy).
- 4-Wire RTD:** An RTD configuration in which there are 2 lead wires on each end of the platinum sensing element. In this configuration, lead wire resistance from both sides of the sensing element can be compensated for – strongly recommended for long runs of cable (most accurate).
- Accuracy:** The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard, typically a nominal value.
- Alpha Value(α):** Also referred to as the temperature coefficient or conductor resistance, is the relation of electrical resistance within a material to the temperature from 0[°C] to 100[°C]. The alpha value for Turck RTDs is 0.00385[$\Omega/\Omega^{\circ}\text{C}$].
- Ambient Temperature:** The air temperature of the environment outside of the measured process temperature while the equipment is on the application.
- Analog Output:** A continuous output that represents multiple variable states such as all increments of a temperature measurement over a specified range, typically 4-20 mA.
- Celsius:** A temperature scale, standard outside the US, that states water freezes at 0° and boils at 100°.
- Compression Fitting:** A compression fitting is a mounting accessory used to install bare temperature probes. Dependent on probe diameter, one end has a compression nut that will grip the base of the probe and the opposite has one of several common thread pitches and diameters.
- Data Mapping:** The process of matching fields of one source data set to a certain destination in a target data set.
- Degree of Protection:** Ingress Protection (IP) rating that describes the enclosures resistance to water and dust intrusion.
- Digital Output:** Represents an item that has only two states, essentially just an “on” or “off” output controlling whether voltage is sent or not.
- Din 60751 Class A:** A standard for defining the accuracy of a temperature sensor. For a class A thin film measuring element, the accuracy is standardized to $\pm (0.15 + 0.002 \times |t|)$ (only applicable from -30 to 300 degrees C)
Example – A reading of -10 degrees Celsius has an accuracy of +/- 0.17 degrees Celsius.
 $> (0.15 + 0.002 \times 10) > (0.15 + .02) > (0.17)$.
NOTE: Don't forget to take the absolute value of a temperature reading = no negative values!
- Din 60751 Class B:** A standard for defining the accuracy of a temperature sensor. For a class B thin film measuring element, the accuracy is standardized to $\pm (0.3 + 0.005 \times |t|)$ (only applicable from -50 to 500 degrees C).
 To use the same example of accuracy above, with a class B measuring element, a temperature of -10 degrees Celsius would have an accuracy deviation of +/- 0.35 degrees Celsius. $> (0.3 + .005 \times 10) > (0.3 + .05) > (0.35)$
NOTE: Don't forget to take the absolute value of a temperature reading = no negative values!
- Fahrenheit:** A temperature scale, standard in the US, that states water freezes at 32° and boils at 212°.
- “G” Process Connection:** The standard used in Europe. These connections have a constant diameter with parallel threads and rely on a separate component to seal, usually either a bonded sealing ring or a flat gasket material.
- Infrared Temperature Sensor:** An optical device that interprets infrared wavelengths reflected by a material given off by a subject to get a temperature output.
- IO-Link:** Point to point hardwired network communications protocol typically used to communicate between sensors and actuators bidirectionally.
- Insertion Depth:** The physical distance (in mm) that the tip of the probe needs to be inserted into the process to reliably detect the temperature of the media.

Glossary

Inside Diameter (ID): A measurement of a hollow circular object describing the distance of a straight line from one point on the inner wall of the object, through its center, to an opposite point on the inside.

Loop Power: A device that derives its power from a signal circuit that carries the 4-20 mA signal and does not need a separate independent power supply to operate. Both the signal and power come from same loop source.

Mineral Insulated Sheath: A Mineral filled sheath is a construction method of temperature sensors in which the hollow sheath that houses the lead wires from the sensing element is packed with a powdered substrate, typically magnesium oxide. This mineral packing serves two purposes. Primarily, it serves to insulate the lead wires from each other as well as the inside of the metal housing so that the housing can be bent to contour an application. Additionally, when there are electrical quick disconnects or evaluation electronics within a sensor assembly, the magnesium oxide serves to insulate the electrical connector or onboard electronics from high process temperatures.

National Pipe Taper (NPT): The most common thread used in the US. There are different types of NPT threads, but all are tapered for sealing. Some require the use of a thread sealant.

NPN: Commonly called a "sinking" output. When an output is triggered, it will connect the output to the positive supply.

Outer Diameter (OD): The outermost diameter of a circular object, measured from two opposing outer edges passing through the center of the object.

PNP: Commonly called a "sourcing" output. When an output is triggered, it will connect the output to the positive supply.

Process Connection: The point at which a sensor physically installs into a process, most commonly a port with a threaded connection.

Process Pressure: The max pressure the device can withstand from the process fluid.

PT100 Measuring Element: A classification of platinum RTD in which a temperature of 0 degrees Celsius will result in a resistance of 100 Ohms. Most commonly found in industrial applications.

PT1000 Measuring Element: A type of platinum RTD in which a temperature of 0 degrees Celsius will result in a resistance of 1000 Ohms. An order of magnitude more accurate than a PT100.

RTD: An RTD (Resistance Temperature Detector) is a device that offers a very reliable, linear change in electrical resistance with changes in temperature. This change in resistance is then interpreted to offer an indication of temperature.

Storage Temperature: The ambient temperature the product is stored at when not currently on an application.

T09 Response Time: A specification used to determine how much time passes before 90% of a temperature increase or decrease is reflected at probe output.

T05 Response Time: A specification used to determine how much time passes before 50% of a temperature increase or decrease is reflected at probe output.

Temperature Coefficient Span Tks: A specification that describes how much the span of a sensor can shift due to thermal fluctuations, given as a formula – e.g. $\pm 0.1\%$ of full scale /10 K *note that this specification is only applicable when evaluation electronics are present that convert the resistance value to analog output – not applicable to passive devices such as an RTD temperature probe.

Temperature Coefficient Zero Point Tk0: A specification that describes how much the zero point of a sensor can shift due to thermal fluctuations, given as a formula – e.g. $\pm 0.1\%$ of full scale /10 K *note that this specification is only applicable when evaluation electronics are present that convert the resistance value to analog output – not applicable to passive devices such as a TP-*

Temperature Probe: Housing for the platinum temperature sensing element used to directly contact the media for immediate temperature change response.

Temperature Sensor: Device used to measure/monitor the temperature of a certain material or fluid media then converts that reading into a usable electrical signal.

Glossary

Temperature Transmitter: An electronic device that converts a resistance value into an analog or switching output for a controller or processing unit.

Thermocouple: A thermocouple is a temperature measurement device whereby two dissimilar metals are bonded together. As this junction is heated and cooled, it creates a voltage that can be used to indicate a temperature.

Thermowell: Probe accessory that threads directly into process connections to house temperature probes within media to prevent damage from the media and allow for easier replacement of future temperature probes. This replaceability allows for the user to replace a broken temperature probe in a liquid vessel without having to drain the container.

NOTE: for all turck sensors, it is required to select a temperature sensor at least 50 mm longer than the length of the thermowell to ensure a correct installation. If this requirement is not observed, an end user will be left with an insulating air gap in the tip of the probe negatively affecting response time.

Wake Frequency Vibration: Wake frequency vibration is a phenomena that occurs when you insert a thin cylindrical object (in this case, a temperature probe) into a flowing media. The object causes vortices to form in the flow that can resonate at the object's natural frequency causing damage to the sensor. For this reason, we do not recommend installing any temperature sensors into a rapidly flowing medium.

Wetted Materials: The portion of the sensor that is in physical contact with the process fluid.

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