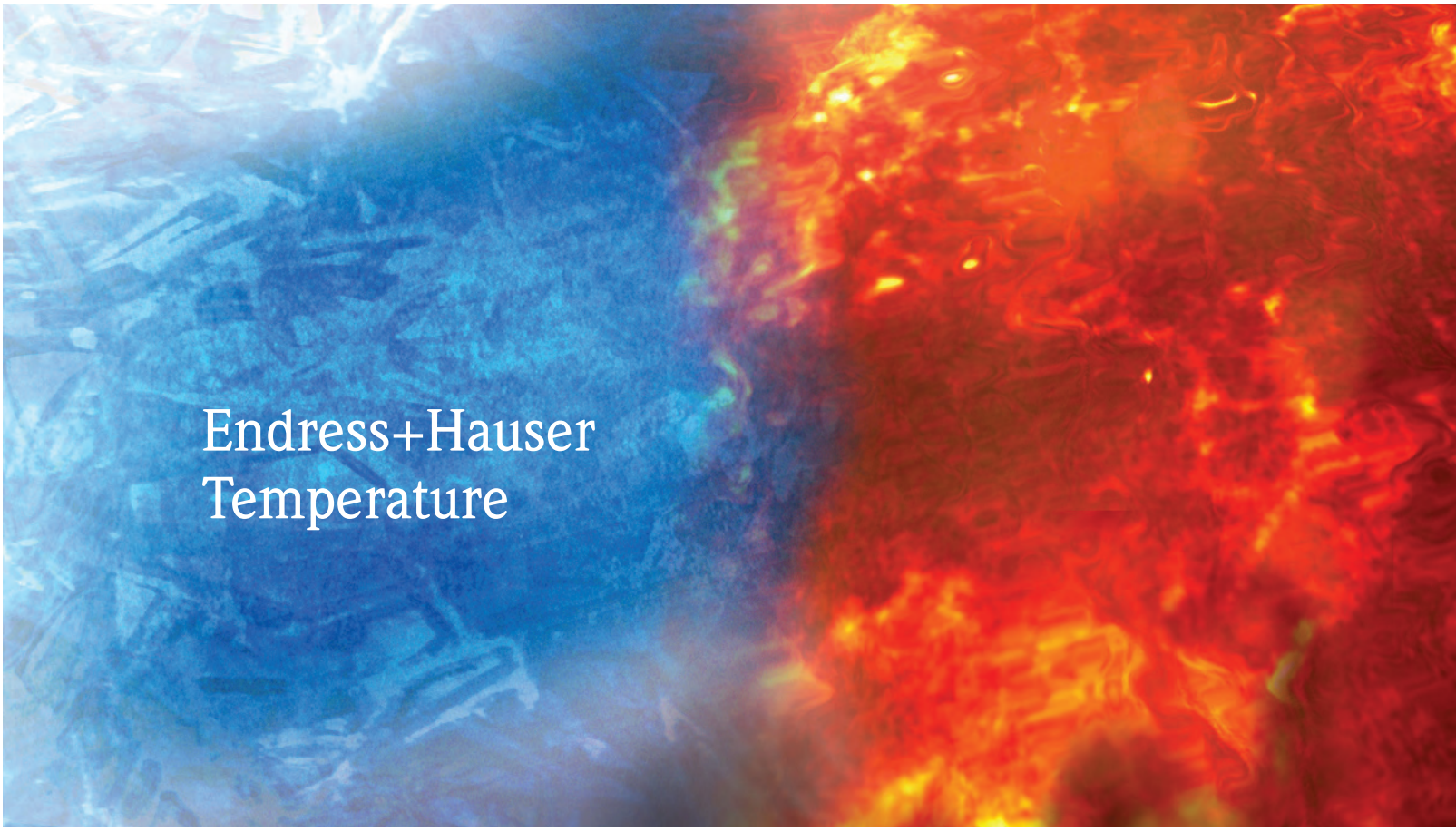
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Temperature Measurement Catalog

Temperature assemblies, transmitters and thermowells



Endress+Hauser

People for Process Automation

Introduction

About our capabilities and locations

Successful as Partners
Our field service engineers and service technicians are available to make a personal contribution to your enterprise's success in 85 countries worldwide. With the experience of more than 10 million equipped measurement points in all types of technical processes and industries we can claim with pride to be the "People for Process Automation".
For us co-operation with our customers consists of more than just selling. Our offer to you is a long-term partnership which arouses enthusiasm and generates creative solutions. The basic idea of this partnership is dialog. As only in dialog can we pass on knowledge and learn from the ideas and requirements of our customers.

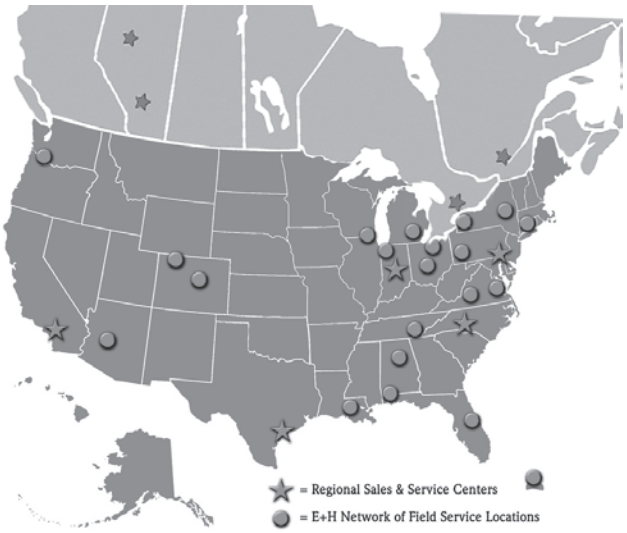
Production close to the market
To be conversant with international requirements and regulations means to take these into account at the product design stage.
We develop powerful product-, production- and logistics concepts for our customers. A competence center optimized on efficiency and quality consistently develops the central components of Endress+Hauser temperature measurement:
- Primary sensor,
- electronics,
- software and
- mechanical precision parts.

Regional production plants use these assemblies and complete them according to your order.

Perfect timing
The desired product at the right time at the right place — worldwide. A masterly performance, that we go through daily, considering the large variety in temperature measurement instrumentation.
With networked systems and efficient logistics partners we deliver equipment whenever you need them.

Smooth project completion
As a reliable partner we understand your processes and your projects as if they were ours.
These experiences, projects dealt with successfully in many dozen countries worldwide, provide you with security. Individual contact persons and experienced project managers are available for you to be successful.

Competent partner with a strong presence near you
The right product at the right time at the right place – worldwide and all over North America!
With a network of sales representatives in all 50 states, regional sales offices, and a centrally located production plant in Greenwood, Indiana, Endress+Hauser delivers temperature measurement instrumentation at the time it is needed.
You are supported by local partners who understand your processes and your projects. Endress+Hauser offers you a long term partnership to generate solutions for saving cost and enhancing productivity and safety on your plant.



As a complete supplier, Endress+Hauser is a reliable partner in all areas of temperature measurement, all over North America and at the right time

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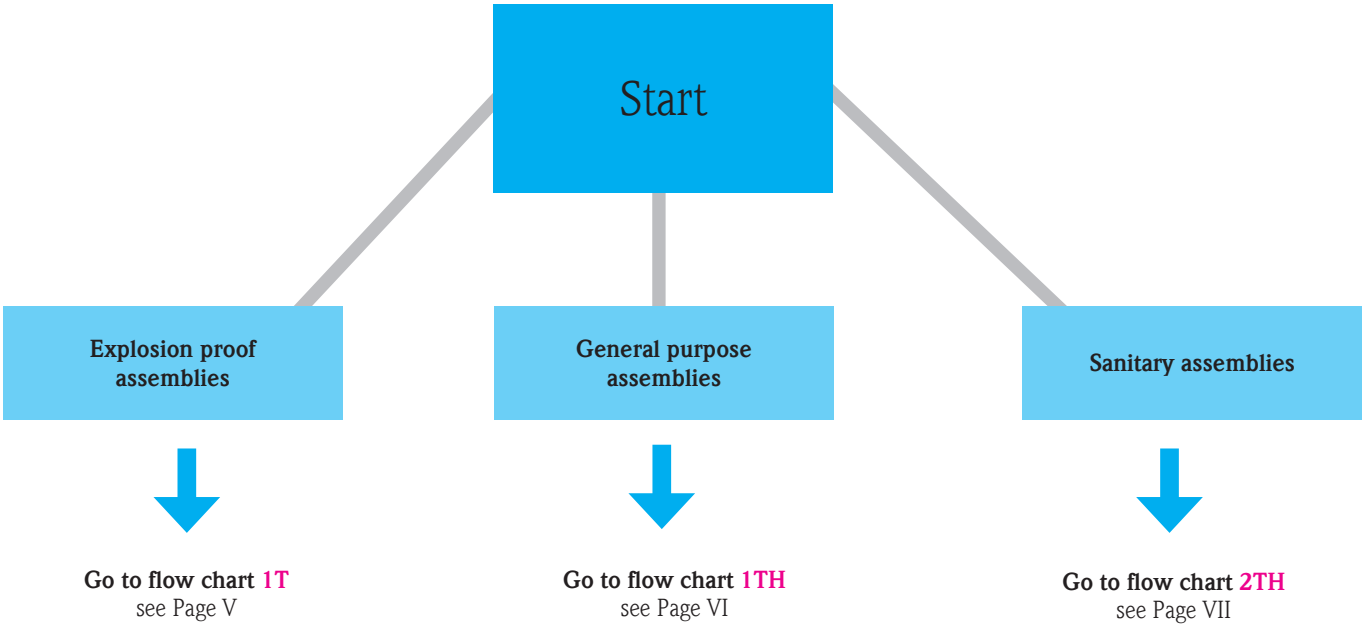
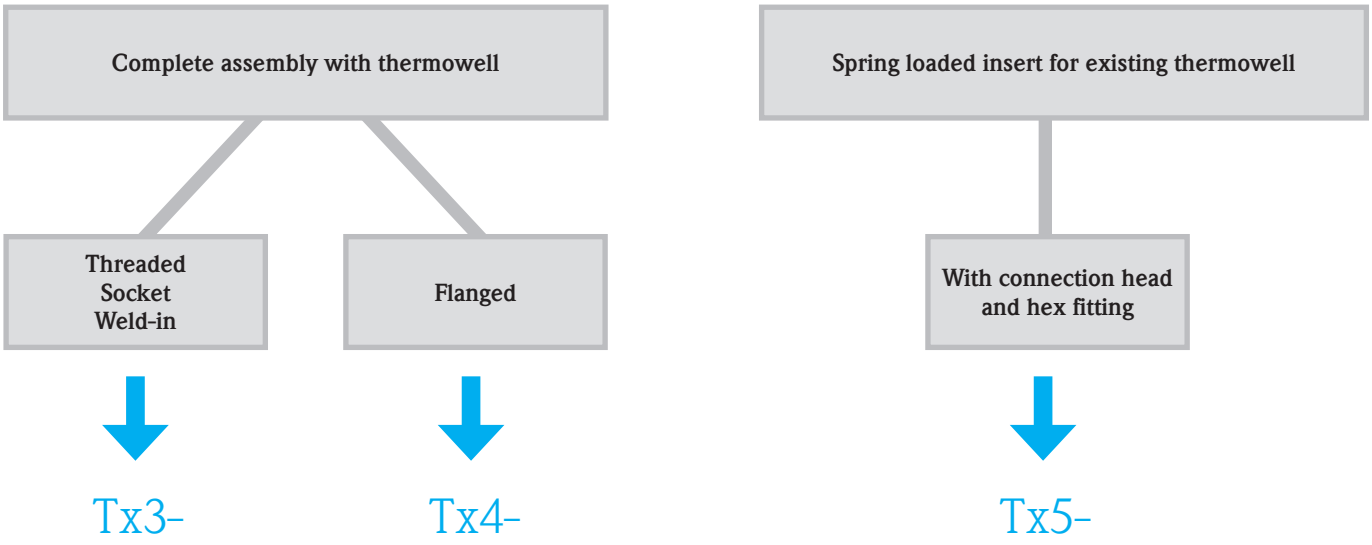
How to select the right assembly?

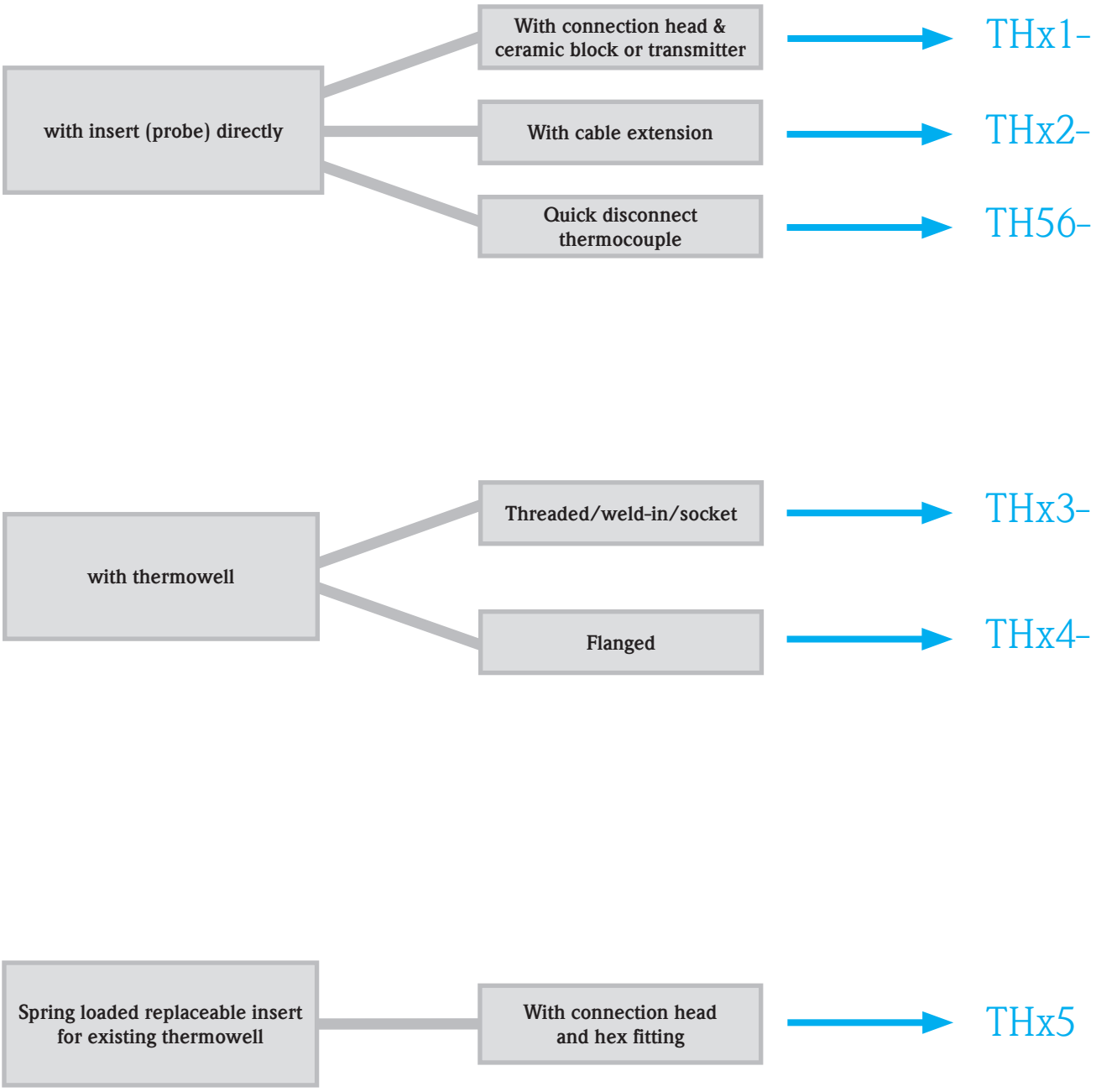


1T – Explosion proof assemblies



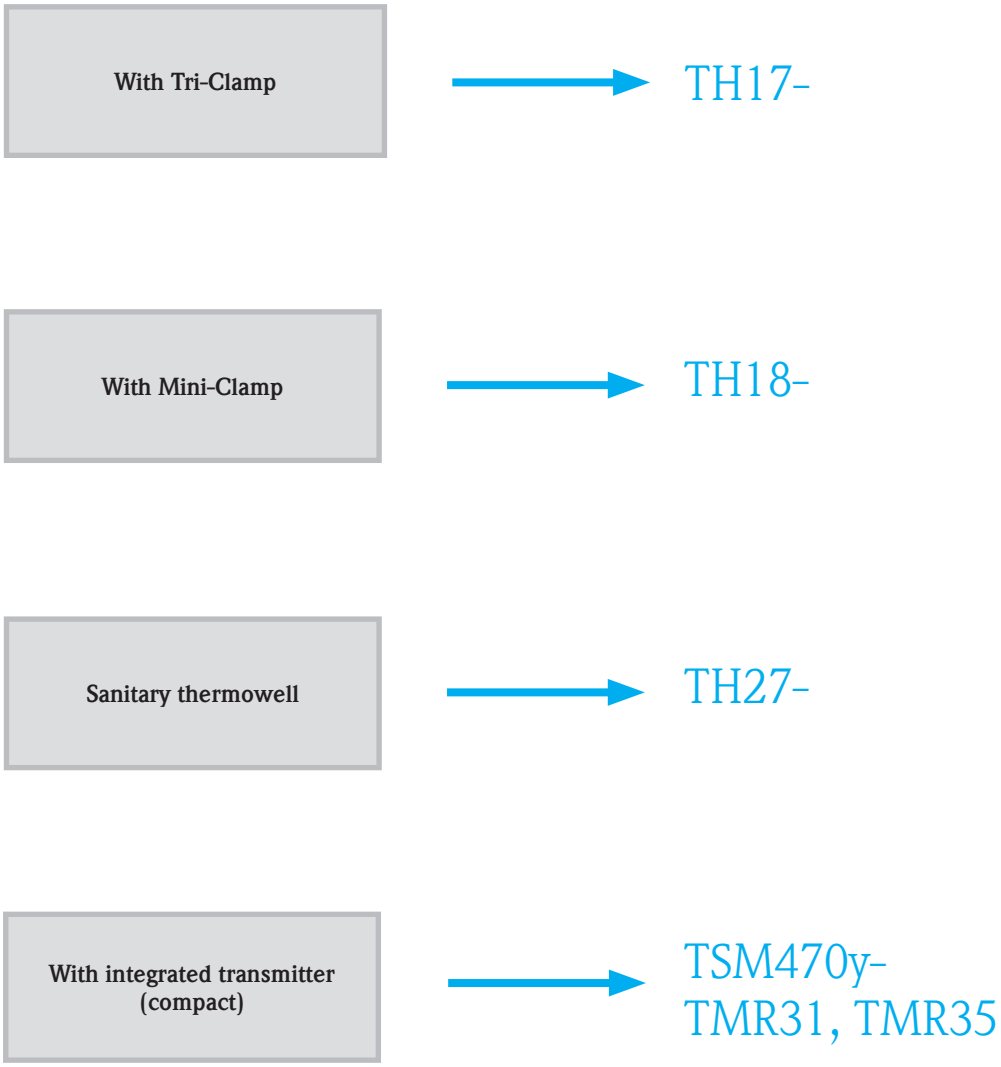
x = 1 for RTD
x = 5 for TC

1TH - General purpose assemblies



x = 1 for RTD
x = 5 for TC

2TH - Sanitary assemblies



y = G for threaded process connection
y = F (food) for Tri-clamp process connection
y = P (pharma) for Mini-clamp process connection

General specifications of GP and XP temperature assemblies

Sensor Styles: As per ASTM 14.03, E230	**RTD:** Single or dual element (3 wire only) Pt 100, class A or class B -50 to +260 °C (-58 to 500 °F), low temp -50 to +200 °C (-58 to 390 °F), in continuous operation -200 to +600 °C (-328 to 1110 °F), high temp **T/C:** Type J, type K, type E, type N or type T Ungrounded, grounded, single or dual Type J 0 to +760 °C (+32 to 1400 °F) Type K -200 to +1260 °C (-328 to 2300 °F) Type E -200 to +870 °C (-328 to 1600 °F) Type N -200 to +1260 °C (-328 to 2300 °F) Type T -200 to +370 °C (-328 to 700 °F)
Process connection:	Flanged, socket weld, weld in or threaded thermowell
Thermowell style:	Tapered, straight, or stepped bar stock. Straight and reduced fabricated thermowells and protection tubes
Materials:	Standard is 316SS, available materials include Chrom Moly steels, Nickel alloys, Titanium etc. For a complete list see chapter 'Thermowells: Material availability guide'
Pressure rating:	Up to 2500 lbs ASME VIII & ANSI B16.5 (with flanged connection)
Electrical approvals:	CSA, FM, ATEX, NEPSI, JIS – options
Welding:	ASME IX

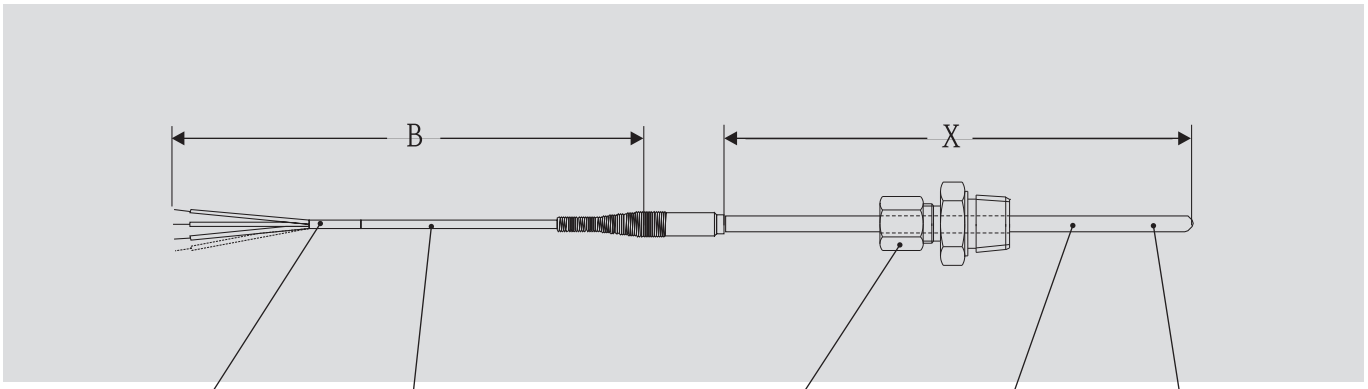
Options include:

- Material Certificate
- Silicon free assemblies
- Dye penetrant tests
- PMI (Positive Material Identification) testing
- Surface finishing to 3A and ASME BPE (animal fat free)
- Ultrasonic, hydrostatic testing
- NIST traceable calibration
- Oxygen service cleaning
- Customer specific tagging
- Callendar/Van Dusen sensor transmitter matching for RTD's

TH12 RTD with fiberglass, braided or armored extension lead wire, for use without thermowell or with remote installations

This is a common type of sensor in temperature applications such as ovens and furnaces. We use the strain relief spring design as a standard thus ensuring superior performance and long life. We use heavy duty RTD and extension grade wires, individually tested and inspected to deliver the highest quality product. The options found in the order code represent common industrial requirements. Custom built and other terminations and option are available on request.

- Different process connection such as compression fittings and bayonet fittings.
- Grounded and ungrounded thermocouples available as standard.
- Surface-mount options available.



Wire length, B
48”
72”
120”
12”–3600” (specify)

Wire type
Teflon strand
Teflon strand; SS Flex Armor

Compression fitting
1/8” NPT one-time
1/8” NPT re-adjustable
¼” NPT one-time
¼” NPT re-adjustable

Sheath O.D.
1/8” 316 SS
3/16” 316 SS
¼” 316 SS
3/8” 316 SS

Immersion length, X
6”, 9”, 12”, 24” (standard)
2” to 96” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, General Purpose RTD with cable, TH12

TH12-	**General Purpose RTD with cable, TH12**										
	Process Connection										
	A	Not selected									
	C	Comp. fitting 1/8" NPT 316 SS, one time									
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable									
	E	Comp. fitting ¼" NPT 316 SS, one time									
	F	Comp. fitting ¼" NPT 316 SS, re adjustable									
	Y	Bayonet and other Fittings available, consult your E+H sales representative									
		Immersion Length (X) 2 to 96"									
		1	6" "X" Dimension								
		2	12" "X" Dimension								
		3	18" "X" Dimension								
		4	24" "X" Dimension								
		8	.... " (Specify increment 0.5")								
		9	Longer lengths available - consult your E+H sales representative								
			Sheath Diameter; Material								
			A	1/8"; 316 SS							
			B	3/16"; 316 SS							
			C	¼"; 316 SS							
			F	1/8" reduced 3/16"; 316 SS							
				Sensor Type							
				E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)						
				F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)						
				G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)						
				H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)						
				J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)						
				K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)						
				L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)						
				M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)						
					Wire/cable length (B)						
					A	48"					
					B	72"					
					C	120"					
					X	.... " (Specify increment 12") (max 360", Consult E+H Sales representative for longer lengths)					
						Wire type					
						1	Teflon strand				
						2	Teflon strand, SS flex armor				
							Leadwire Termination				
							B	Leads stripped 2" + fork lugs			
								Documentation requirements			
								1	Standard		
									Additional option 1		
									A	Not selected	
									B	Sensor calibration certificate	
										Version	
										K	Standard
											Additional option 2
											1 Not selected
TH12-							**B**	**1**		**K**	**1** **Enter desired product structure**

TH1x General Purpose, economical RTD assembly with weatherproof heads

The TH1x is a simple to configure, complete RTD assembly, for all temperature monitoring needs.

Key features include:
- Ultra low copper heads with dual epoxy powder coats ensures high resistance to corrosive environments like salt water
- Patented Endress+Hauser design heads for easy wiring.
- Highly reliable and individually tested sensor.
- Use of high quality certified materials such as MgO cable, Pipes and Bar stock.
- Economical thin film sensor for application in the temperature range from –50 °C to +260 °C.
- Robust wire wound sensor for applications requiring a wide temperature range of –200 °C to +600 °C.

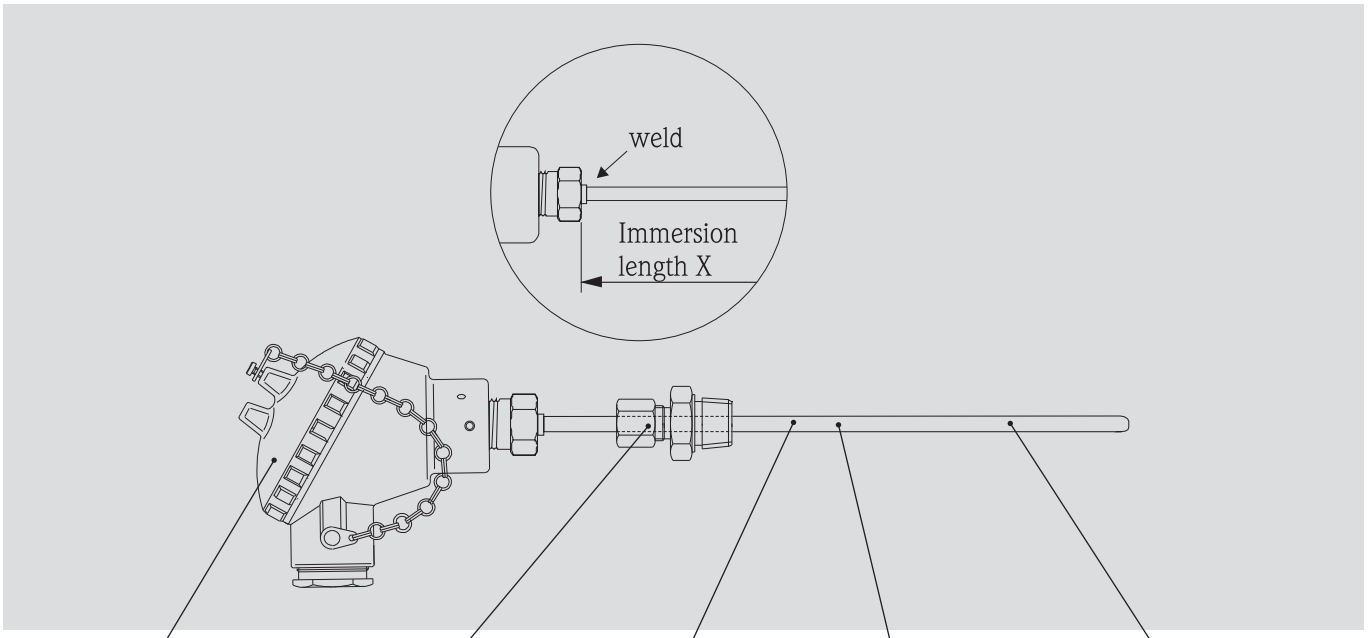
This style of TH1x assemblies offer the advantage of high quality measurement instrument with a low total cost of ownership, making them the perfect choice for all your monitoring applications.

The assemblies are available with Endress+Hauser's robust TMT series of In-head DIN B size temperature transmitters with 4-20 mA, HART, Profibus PA and FOUNDATION™ Fieldbus outputs.

Customers with high pressure applications such as boilers and vessels will appreciate the pressure calculations available for the CRN registered designs.

TH11 RTD General Purpose

Welded insert, economical RTD assembly with weatherproof heads for direct measurement



Enclosure (Terminal head)
Aluminum
Polypropylene
(NEMA 4X)

Process connection
½" NPT
¼" NPT
1/8" NPT

Material
316 SS

Sheath O.D.
1/8"
3/16"
¼"
3/8"

Immersion length, X
4", 6", 9", 12" (standard)
2" to 96" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

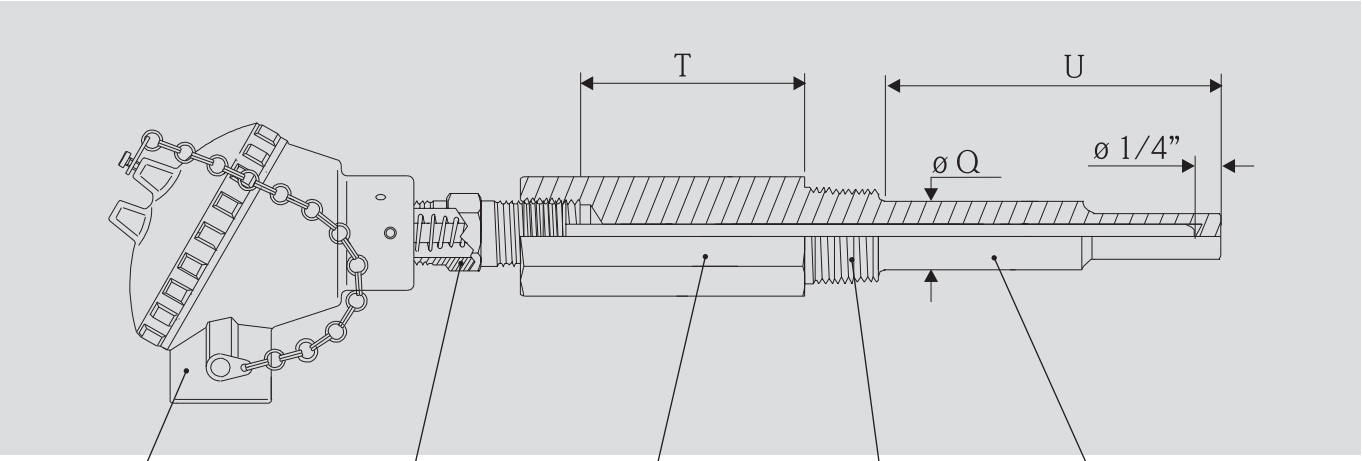
Ordering Information

Product Structure, General Purpose RTD with connection head, TH11

TH11-	**General Purpose RTD with connection head, TH11**										
	Process Connection										
	A	Not selected									
	B	½ " NPT, 316 SS									
	C	Comp. fitting 1/8 NPT 316 SS, one time									
	D	Comp. fitting 1/8 NPT 316 SS, re adjustable									
	E	Comp. fitting ¼ NPT 316 SS, one time									
	F	Comp. fitting ¼ NPT 316 SS, re adjustable									
		Immersion Length (X) 2 to 96"									
		1	4" "X" Dimension								
		2	6" "X" Dimension								
		3	9" "X" Dimension								
		4	12" "X" Dimension								
		8	.... " (Specify increment 0.5")								
			Sheath Diameter; Material								
			A	1/8"; 316 SS							
			B	3/16"; 316 SS							
			C	¼"; 316 SS							
			F	1/8" reduced 3/16"; 316 SS							
				Sensor Type							
				E	1 x Pt100, class B, -50-200°C (-58 to 392 °F)						
				F	1 x Pt100, class B, -200-600°C (-328 to 1112 °F)						
				G	1 x Pt100, class A, -50-200°C (-58 to 392 °F)						
				H	1 x Pt100, class A, -200-600°C (-328 to 1112 °F)						
				J	2 x Pt100, class B, -50-200°C (-58 to 392 °F)						
				K	2 x Pt100, class B, -200-600°C (-328 to 1112 °F)						
				L	2 x Pt100, class A, -50-200°C (-58 to 392 °F)						
				M	2 x Pt100, class A, -200-600°C (-328 to 1112 °F)						
					Enclosure; Cable entry						
					A	Not selected					
					B	Alu, E+H blue Al + cover; NPT ½"					
					C	Alu, E+H blue Al + cover; NPT ¾"					
					D	Plastic PP white; NPT ½"					
					E	Plastic PP white; NPT ¾"					
					1	Alu, E+H blue + flip cover, ½" NPT					
					Y	Special version - consult E+H sales representative for more options					
						Electrical connection					
						A	Programmable RTD TMT180				
						C	Programmable TMT181				
						D	Programmable TMT181 FM IS				
						E	Programmable TMT181 CSA IS				
						P	HART TMT182				
						R	HART TMT182 FM IS				
						T	HART TMT182 CSA IS				
						U	FF Head Transmitter DINB, GP				
						V	FF Head Transmitter DINB, FM/CSA IS				
						2	Flying leads				
						3	Terminal block				
						4	Profibus PA Head Transmitter DIN B, GP				
						5	Profibus PA Head Transmitter DIN B, FM/CSA IS				
							Documentation required				
							1	Not selected			
								Additional option 1			
								A	Not selected		
								B	Sensor calibration certificate		
									Version		
									K	Standard	
									P	Polished (Ra 32 µ-inch)	
										Additional option 2	
										1	Not selected
										2	PROFIBUS PA plug M12
										3	Foundation Fieldbus plug 7/8"
										4	Plastic cable gland
TH11-											**Enter desired product structure**

TH13 RTD General Purpose

Threaded thermowell, economical RTD assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5” (std.)
2” to 18” (specify)

Stem shape
Straight
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

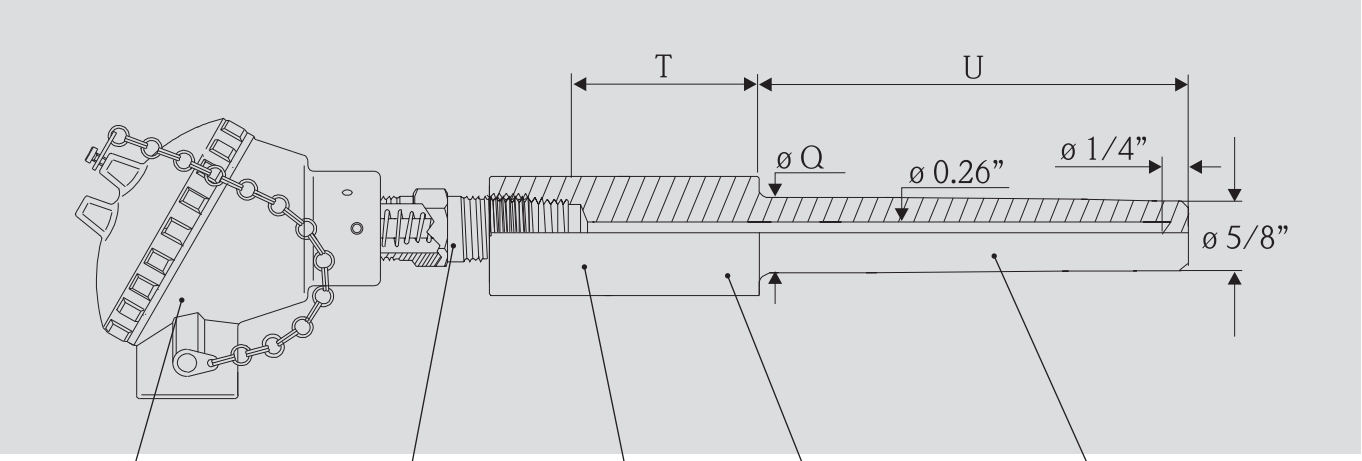
Ordering Information

Product Structure, General RTD Assembly, TH13

TH13	**General RTD Assembly with Thermowell, US Style, TH13**											
	TW Immersion length (U)											
	1	2½"										
	2	4½"										
	3	7½"										
	4	10½"										
	5	13½"										
	6	16½"										
	7	22½"										
	8	.... " (Specify increment 0.5") (2" to 18")										
	9	Longer lengths available - consult your E+H sales representative										
		Process Connection; Material of Construction										
		A1	½" NPT, 316 SS									
		A2	¾" NPT, 316 SS									
		A3	1" NPT, 316 SS									
			Thermowell shape									
			2	Stepped, Standard Duty								
			3	Tapered, Heavy Duty								
				Thermowell Lag (T)								
				A	None							
				E	3"							
				X	specify							
					Extension (E)							
					1	Hex nipple 316 SS, E=1"						
					2	Nipple+Union+Nipple 316 SS, E=4"						
					3	Hex nipple Steel, E=1"						
					4	Nipple+Union+Nipple Steel, E=4"						
					5	Nipple+Union+Nipple Steel, E=7"						
					6	Nipple+Union+Nipple 316 SS, E=7"						
						Sensor Type						
						E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
						F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
						G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
						H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
						J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
						K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
						L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
						M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
							Enclosure; Cable entry					
							A	Not selected				
							B	Alu, E+H blue Al + cover; NPT ½"				
							C	Alu, E+H blue Al + cover; NPT ¾"				
							Y	Special version - consult E+H sales representative for more options				
								Electrical connection				
								A	Programmable RTD TMT180			
								C	Programmable TMT181			
								D	Programmable TMT181 FM IS			
								E	Programmable TMT181 CSA IS			
								P	HART TMT182			
								R	HART TMT182 FM IS			
								T	HART TMT182 CSA IS			
								U	FF Head Transmitter DINB, GP			
								V	FF Head Transmitter DINB, FM/CSA IS			
								2	Flying leads			
								3	Terminal block			
								4	Profibus PA Head Transmitter DINB, GP			
								5	Profibus PA Head Transmitter DINB, FM/CSA IS			
									Additional option			
									1	Not selected		
									2	PROFIBUS PA plug M12		
									3	Foundation Fieldbus plug 7/8"		
									4	Plastic cable gland		
										Test; Calibration		
										A	Not selected	
										B	Sensor calibration certificate	
										C	Material traceability certificate	
											Version	
											K	Standard
											L	With Certificate of Compliance
TH13-												**Enter desired product structure**

TH13 RTD General Purpose

Weld-in / socket weld thermowell, economical RTD assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld in
1” weld in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5” (std.)
2” to 18” (specify)

Shape
Straight
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

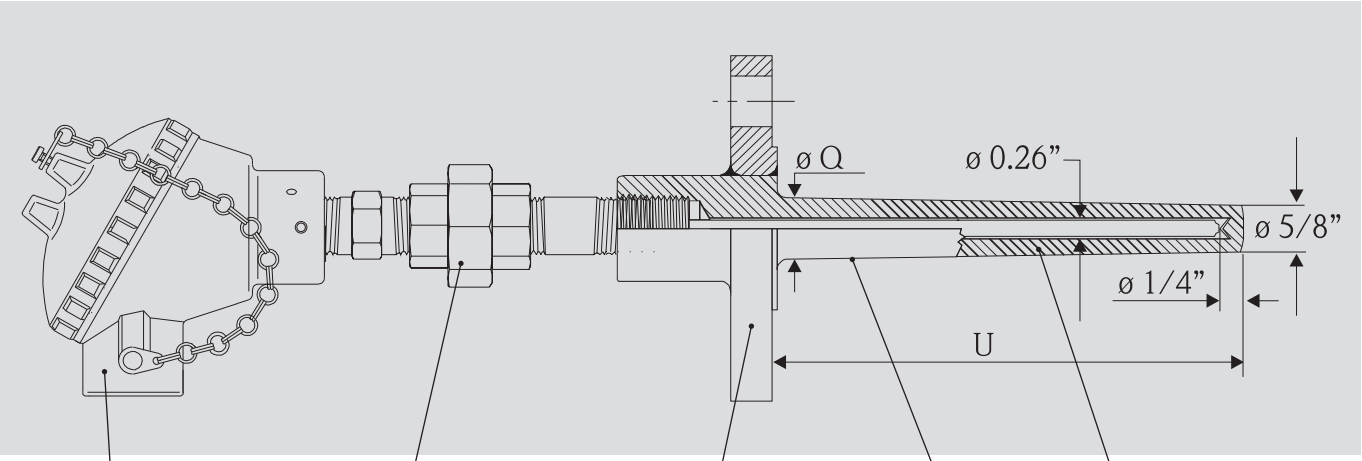
Ordering Information

Product Structure, General RTD Assembly, TH13

TH13	**General RTD Assembly with Thermowell, US Style, TH13**											
	TW Immersion length (U)											
	1	2½"										
	2	4½"										
	3	7½"										
	4	10½"										
	5	13½"										
	6	16½"										
	7	22½"										
	8	.... " (Specify increment 0.5") (2" to 18")										
	9	Longer lengths available - consult your E+H sales representative										
		Process Connection; Material of Construction										
		B1	Socket weld ¾", 316 SS									
		B2	Socket weld 1", 316 SS									
		C1	Weld-in ¾", 316 SS									
		C2	Weld-in 1", 316 SS									
		YY	For other sizes and materials, consult your E+H sales representative									
			Thermowell shape									
			2	Stepped, Standard Duty								
			3	Tapered, Heavy Duty								
				Thermowell Lag (T)								
				A	None							
				E	3"							
				X	specify							
					Extension (E)							
					1	Hex nipple 316 SS, E=1"						
					2	Nipple+Union+Nipple 316 SS, E=4"						
					3	Hex nipple Steel, E=1"						
					4	Nipple+Union+Nipple Steel, E=4"						
					5	Nipple+Union+Nipple Steel, E=7"						
					6	Nipple+Union+Nipple 316 SS, E=7"						
						Sensor Type						
						E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
						F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
						G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
						H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
						J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
						K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
						L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
						M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
							Enclosure; Cable entry					
							A	Not selected				
							B	Alu, E+H blue Al + cover; NPT ½"				
							C	Alu, E+H blue Al + cover; NPT ¾"				
							Y	Special version - consult E+H sales representative for more options				
								Electrical connection				
								A	Programmable RTD TMT180			
								C	Programmable TMT181			
								D	Programmable TMT181 FM IS			
								E	Programmable TMT181 CSA IS			
								P	HART TMT182			
								R	HART TMT182 FM IS			
								T	HART TMT182 CSA IS			
								U	FF Head Transmitter DINB, GP			
								V	FF Head Transmitter DINB, FM/CSA IS			
								2	Flying leads			
								3	Terminal block			
								4	Profibus PA Head Transmitter DINB, GP			
								5	Profibus PA Head Transmitter DINB, FM/CSA IS			
									Additional option			
									1	Not selected		
									2	PROFIBUS PA plug M12		
									3	Foundation Fieldbus plug 7/8"		
									4	Plastic cable gland		
										Test; Calibration		
										A	Not selected	
										B	Sensor calibration certificate	
										C	Material traceability certificate	
											Version	
											K	Standard
											L	With Certificate of Compliance
TH13-												**Enter desired product structure**

TH14 RTD General purpose

flanged thermowell, economical RTD assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316SS
NUN E=4”	
NUN E=7”	

Flange size
1” 316SS
1½” 316SS
2” 316SS

Rating
150 psi RF
300 psi RF
600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

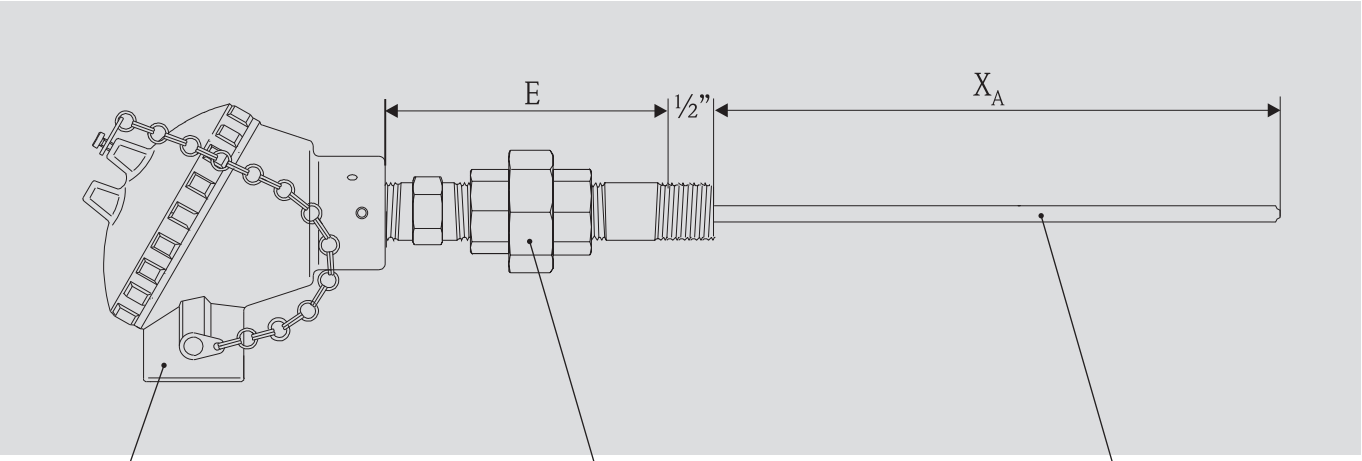
Ordering Information

Product Structure, general flanged RTD assembly, TH14

TH14	**General flanged RTD assembly with thermowell, US Style, TH14**												
	TW Immersion length (U)												
	1	2”											
	2	4”											
	3	7”											
	4	10”											
	5	13”											
	6	16”											
	7	22”											
	8	.... “ (Specify increment 0.5”)											
		Flange size; TW Material of Construction											
		A	1”, 316 SS										
		B	1-½”, 316 SS										
		C	2”, 316 SS										
		Y	For larger sizes/different construction materials - consult your E+H sales representative										
			Rating; Flange Type										
			1	150 psi; RF									
			2	300 psi; RF									
			3	600 psi; RF									
			Y	higher ratings available on request- consult your E+H sales representative									
				Shape of TW; Welding option									
				1	Straight; Standard								
				2	Tapered; Standard								
					TW Lag length (T)								
					A	None							
					B	3”							
					X	Specify							
						Extension length (E)							
						1	Hex nipple 316 SS, E=1”						
						2	Nipple+Union+Nipple 316 SS, E=4”						
						3	Hex nipple Steel, E=1”						
						4	Nipple+Union+Nipple Steel, E=4”						
						5	Nipple+Union+Nipple Steel, E=7”						
						6	Nipple+Union+Nipple 316 SS, E=7”						
							Sensor Type						
							E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
							F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
							G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
							H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
							J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
							K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
							L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
							M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
								Enclosure; Cable entry					
								A	Not selected				
								B	Alu, E+H blue ; NPT ½”				
								C	Alu, E+H blue ; NPT ¾”				
								1	Alu, E+H blue + flip cover, 1/2” NPT				
								Y	Special version - consult E+H sales representative for more options				
									Electrical connection				
									A	Programmable RTD TMT180			
									C	Programmable TMT181			
									D	Programmable TMT181 FM IS			
									E	Programmable TMT181 CSA IS			
									P	HART TMT182			
									R	HART TMT182 FM IS			
									T	HART TMT182 CSA IS			
									U	FF Head Transmitter DINB, GP			
									V	FF Head Transmitter DINB, FM/CSA IS			
									2	Flying leads			
									3	Terminal block			
									4	Profibus PA Head Transmitter DINB, GP			
									5	Profibus PA Head Transmitter DINB, FM/CSA IS			
										Additional option			
										1	Not selected		
										2	PROFIBUS PA plug M12		
										3	Foundation Fieldbus plug 7/8”		
										4	Plastic cable gland		
										9	Special version		
											Test; Calibration		
											A	Not selected	
											B	Sensor calibration certificate	
											C	Material traceability certificate	
												Version	
												K	Standard
												L	With Certificate of Compliance
TH14-													**Enter desired product structure**

TH15 RTD General Purpose

spring loaded element, economical RTD assembly with weatherproof heads for existing thermowells



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel, 316SS
NUN E=4"	
NUN E=7"	

Immersion length, X_A
2", 6", 9", 12", 14" (standard)
4" to 30" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, General RTD Assembly, spring-loaded insert TH15

TH15-	**General RTD Assembly without Thermowell, spring-loaded insert, US Style, TH15**									
	Immersion length (X_A)									
	1	4”								
	2	6”								
	3	9”								
	4	12”								
	5	14”								
	8	.... “ (Specify increment 0.5”)								
		Sheath diameter								
		A	¼”, 316 SS							
			Extension (E)							
			1	Hex nipple 316 SS, E=1”						
			2	Nipple+Union+Nipple 316 SS, E=4”						
			3	Hex nipple Steel, E=1”						
			4	Nipple+Union+Nipple Steel, E=4”						
			5	Nipple+Union+Nipple Steel, E=7”						
			6	Nipple+Union+Nipple 316 SS, E=7”						
				Sensor Type						
				E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
				F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
				G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
				H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
				J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
				K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
				L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
				M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
					Enclosure; Cable entry					
					A	Not selected				
					B	Alu, E+H blue Al + cover; NPT ½”				
					C	Alu, E+H blue Al + cover; NPT ¾”				
					D	Plastic PP white; NPT ½”				
					E	Plastic PP white; NPT ¾”				
					F	SS304 (TA20J); NPT ½”				
					G	SS304 (TA20J) LC display; NPT ½”				
					1	AL, E+H blue + flip cover, 1/2” NPT				
					Y	Special version - consult E+H sales representative for more options				
						Electrical connection				
						A	Programmable RTD TMT180			
						C	Programmable TMT181			
						D	Programmable TMT181 FM IS			
						E	Programmable TMT181 CSA IS			
						P	HART TMT182			
						R	HART TMT182 FM IS			
						T	HART TMT182 CSA IS			
						U	FF Profibus PA Head Transmitter DINB, GP			
						V	FF Head Transmitter DINB, FM/CSA IS			
						2	Flying leads			
						3	Terminal block			
						4	Profibus PA Head Transmitter DINB, GP			
						5	Profibus PA Head Transmitter DINB, FM/CSA IS			
							Documentation required			
							1	Not selected		
							2	with Certificate of Conformance		
								Test; Calibration		
								A	Not selected	
								B	Sensor calibration certificate	
								C	Material traceability certificate	
									Version	
									K	Standard
										Additional option
										1 Not selected
										2 PROFIBUS PA plug M12
										3 Foundation Fieldbus plug 7/8”
										4 Plastic cable gland
TH15-		**A**							**K**	**Enter desired product structure**

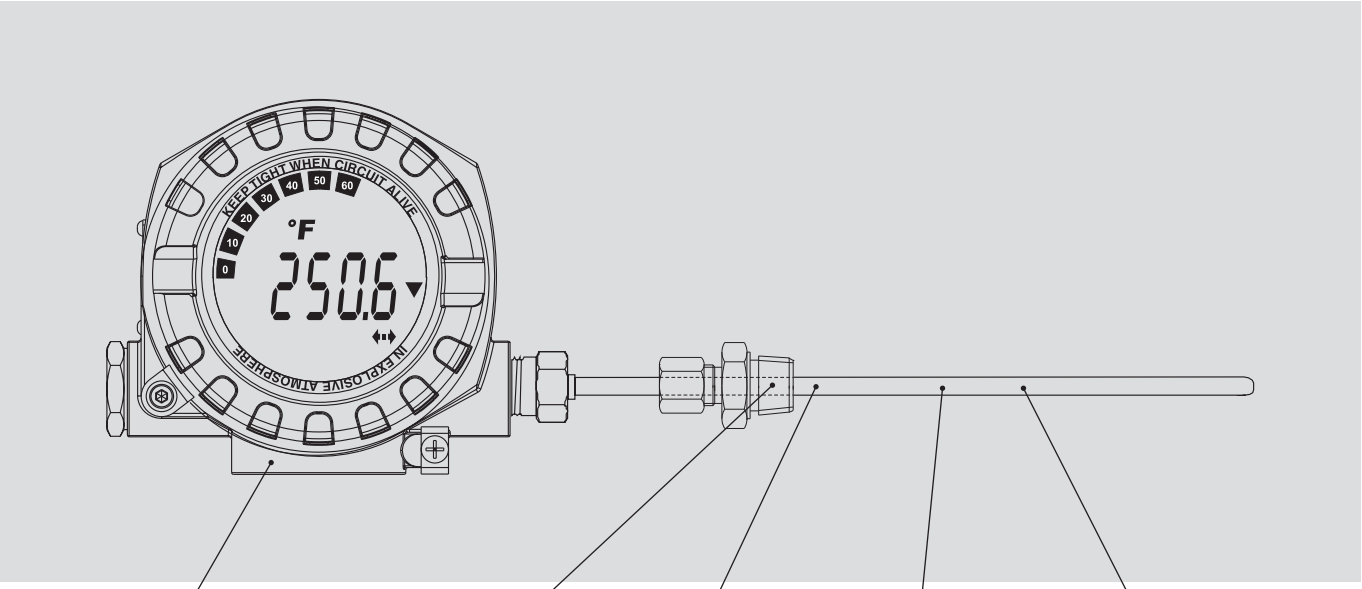
TH1x RTD assembly with advanced TMT162 transmitters for critical control applications

- The TMT162 gives temperature measurement instruments unique technological advantages.
- The assembly offers improved safety and ease of installation through dual compartment transmitter housing design.
- The completely potted electronics allow seamless operation in extreme temperatures and high precipitation & condensation areas.
- The best in class accuracy and performance with zero-corrosion* gold plated terminals, ultra low copper content, dual epoxy coating and specially coated threads offer a robust instrument that stands up to the harshest environments.
- This transmitter is also available in cast 316L stainless steel for offshore applications.
- The accuracy can be optimized through loop calibration and sensor-transmitter-matching.
- Customers with high pressure applications such as boilers and vessels will appreciate the pressure calculations available for the CRN registered designs.

* Gold plating ensures virtually no corrosion.

TH11 RTD General Purpose

welded insert, RTD assembly with advanced TMT162 transmitters for critical control applications



Enclosure
Aluminum field housing (TMT162)

Process connection
½" NPT
¼" NPT
1/8" NPT

Material
316 SS

Sheath O.D.
1/8"
3/16"
¼"
3/8"

Immersion length, X
4", 6", 9", 12" (std.)
2" to 96" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

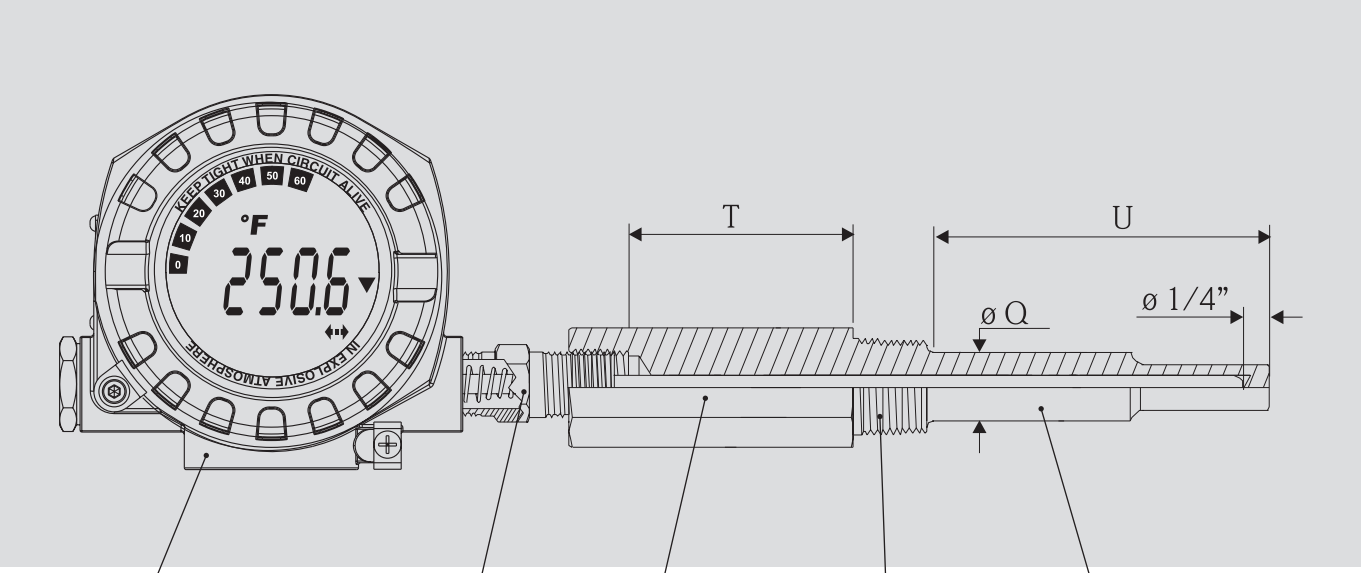
Ordering Information

Product Structure, General Purpose RTD assembly with advanced TMT162, TH11

TH11-	**General Purpose RTD with field housing, TH11**										
	Process Connection										
	A	Not selected									
	B	½" NPT, 316 SS									
	C	Comp. fitting 1/8" NPT 316 SS, one time									
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable									
	E	Comp. fitting ¼" NPT 316 SS, one time									
	F	Comp. fitting ¼" NPT 316 SS, re adjustable									
		Immersion Length (X) 2 to 96"									
		1	4" "X" Dimension								
		2	6" "X" Dimension								
		3	9" "X" Dimension								
		4	12" "X" Dimension								
		8	.... " (Specify increment 0.5")								
			Sheath Diameter; Material								
			C	¼"; 316 SS							
			F	3/8" reduced 3/16"; 316 SS							
				Sensor Type							
				E	1 x Pt100, class B, -50-200°C (-58 to 392 °F)						
				F	1 x Pt100, class B, -200-600°C (-328 to 1112 °F)						
				G	1 x Pt100, class A, -50-200°C (-58 to 392 °F)						
				H	1 x Pt100, class A, -200-600°C (-328 to 1112 °F)						
				J	2 x Pt100, class B, -50-200°C (-58 to 392 °F)						
				K	2 x Pt100, class B, -200-600°C (-328 to 1112 °F)						
				L	2 x Pt100, class A, -50-200°C (-58 to 392 °F)						
				M	2 x Pt100, class A, -200-600°C (-328 to 1112 °F)						
					Enclosure; Cable entry						
					J	AL field housing; 2 x Input + NPT ½" + HART					
					K	AL field housing; NPT ½" + HART + 2 x Input + display					
					L	AL field housing; 2 x Input + FF + NPT ½"					
					M	AL field housing; NPT ½" + FF + 2 x Input + display					
						Electrical connection					
						I	TMT162, dual compartment				
						J	TMT162, FM IS, dual compartment				
						K	TMT162, CSA IS, dual compartment				
							Documentation required				
							1	Not selected			
								Additional option 1			
								A	Not selected		
								B	Sensor calibration certificate		
									Version		
									K	Standard	
									P	Polished (Ra 32 µ-inch)	
										Additional option 2	
										1	Not selected
										2	PROFIBUS PA plug M12
										3	Foundation Fieldbus plug 7/8"
										4	Plastic cable gland
TH11-											**Enter desired product structure**

TH13 RTD General Purpose

Threaded thermowell, RTD assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel, 316SS
NUN E=4"	
NUN E=7"	

Lag, T
3" (standard)
1 to 6" (specify)

Process connection
½" NPT threaded
¾" NPT threaded
1" NPT threaded

Immersion length, U
2.5", 4.5", 7.5", 10.5" (std.)
2" to 18" (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

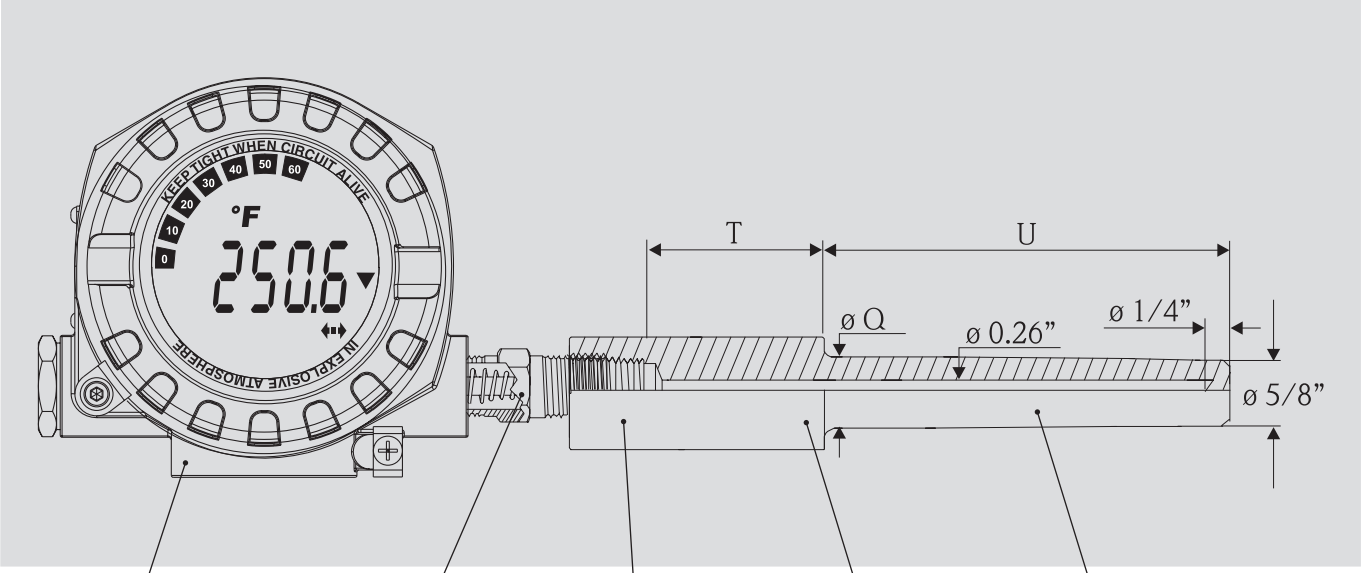
Ordering Information

Product Structure, General Purpose RTD assembly with advanced TMT162, TH13

TH13	**General RTD Assembly with Thermowell, US Style, TH13**											
	TW Immersion length (U)											
	1	2½"										
	2	4½"										
	3	7½"										
	4	10½"										
	5	13½"										
	6	16½"										
	7	22½"										
	8	.... " (Specify increment 0.5") (2" to 18")										
	9	Longer lengths available - consult your E+H sales representative										
		Process Connection; Material of Construction										
		A1	½" NPT, 316 SS									
		A2	¾" NPT, 316 SS									
		A3	1" NPT, 316 SS									
			Thermowell shape									
			2	Stepped, Standard Duty								
			3	Tapered, Heavy Duty								
				Thermowell Lag (T)								
				A	None							
				E	3"							
				X	specify							
					Extension (E)							
					1	Hex nipple 316 SS, E=1"						
					2	Nipple+Union+Nipple 316 SS, E=4"						
					3	Hex nipple Steel, E=1"						
					4	Nipple+Union+Nipple Steel, E=4"						
					5	Nipple+Union+Nipple Steel, E=7"						
					6	Nipple+Union+Nipple 316 SS, E=7"						
						Sensor Type						
						E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
						F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
						G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
						H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
						J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
						K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
						L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
						M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
							Enclosure; Cable entry					
							J	AL field housing; 2 x Input + NPT ½" + HART				
							K	AL field housing; NPT ½" + HART + 2 x Input + display				
							L	AL field housing; 2 x Input + FF + NPT ½"				
							M	AL field housing; NPT ½" + FF + 2 x Input + display				
								Electrical connection				
									For single compartment- consult your E+H sales representative			
								I	TMT162, dual compartment			
								J	TMT162, FM IS, dual compartment			
								K	TMT162, CSA IS, dual compartment			
									Additional option			
									1	Not selected		
									2	PROFIBUS PA plug M12		
									3	Foundation Fieldbus plug 7/8"		
									4	Plastic cable gland		
										Test; Calibration		
										A	Not selected	
										B	Sensor calibration certificate	
										C	Material traceability certificate	
											Version	
											K	Standard
											L	With Certificate of Compliance
TH13-												**Enter desired product structure**

TH13 RTD General Purpose

Weld-in / socket weld thermowell RTD assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld in
1” weld in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5” (std.)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

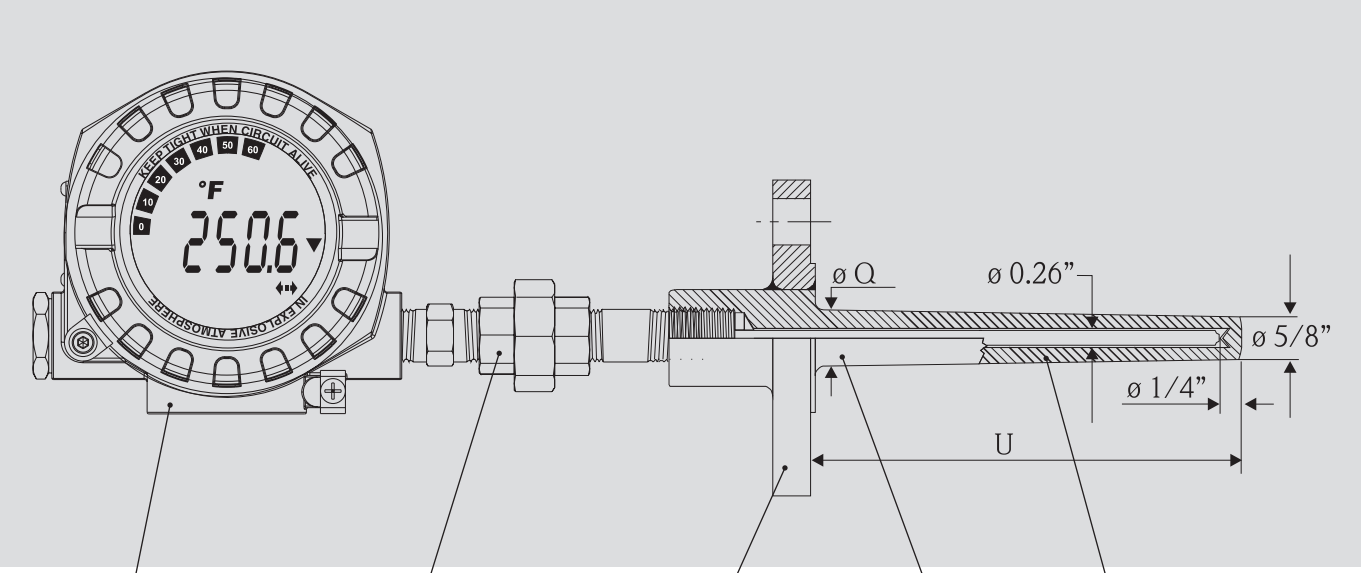
Ordering Information

Product Structure, General Purpose RTD assembly with advanced TMT162, TH13

TH13	**General RTD Assembly with Thermowell, US Style, TH13**											
	TW Immersion length (U)											
	1	2½"										
	2	4½"										
	3	7½"										
	4	10½"										
	5	13½"										
	6	16½"										
	7	22½"										
	8	.... " (Specify increment 0.5") (2" to 18")										
	9	Longer lengths available - consult your E+H sales representative										
		Process Connection; Material of Construction										
		B1	Socket weld ¾", 316 SS									
		B2	Socket weld 1", 316 SS									
		C1	Weld-in ¾", 316 SS									
		C2	Weld-in 1", 316 SS									
			Thermowell shape									
			2	Stepped, Standard Duty								
			3	Tapered, Heavy Duty								
				Thermowell Lag (T)								
				A	None							
				E	3"							
				X	specify							
					Extension (E)							
					1	Hex nipple 316 SS, E=1"						
					2	Nipple+Union+Nipple 316 SS, E=4"						
					3	Hex nipple Steel, E=1"						
					4	Nipple+Union+Nipple Steel, E=4"						
					5	Nipple+Union+Nipple Steel, E=7"						
					6	Nipple+Union+Nipple 316 SS, E=7"						
						Sensor Type						
						E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
						F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
						G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
						H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
						J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
						K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
						L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
						M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
							Enclosure; Cable entry					
							J	AL field housing; 2 x Input + NPT ½" + HART				
							K	AL field housing; NPT ½" + HART + 2 x Input + display				
							L	AL field housing; 2 x Input + FF + NPT ½"				
							M	AL field housing; NPT ½" + FF + 2 x Input + display				
								Electrical connection				
									For single compartment- consult your E+H sales representative			
								I	TMT162, dual compartment			
								J	TMT162, FM IS, dual compartment			
								K	TMT162, CSA IS, dual compartment			
									Additional option			
									1	Not selected		
									2	PROFIBUS PA plug M12		
									3	Foundation Fieldbus plug 7/8"		
									4	Plastic cable gland		
										Test; Calibration		
										A	Not selected	
										B	Sensor calibration certificate	
										C	Material traceability certificate	
											Version	
											K	Standard
											L	With Certificate of Compliance
TH13-												**Enter desired product structure**

TH14 RTD General purpose

flanged thermowell RTD assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
NUN E=4”	
NUN E=7”	

Flange size
1” 316 SS
1½” 316 SS
2” 316 SS

Rating
150 psi RF
300 psi RF
600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

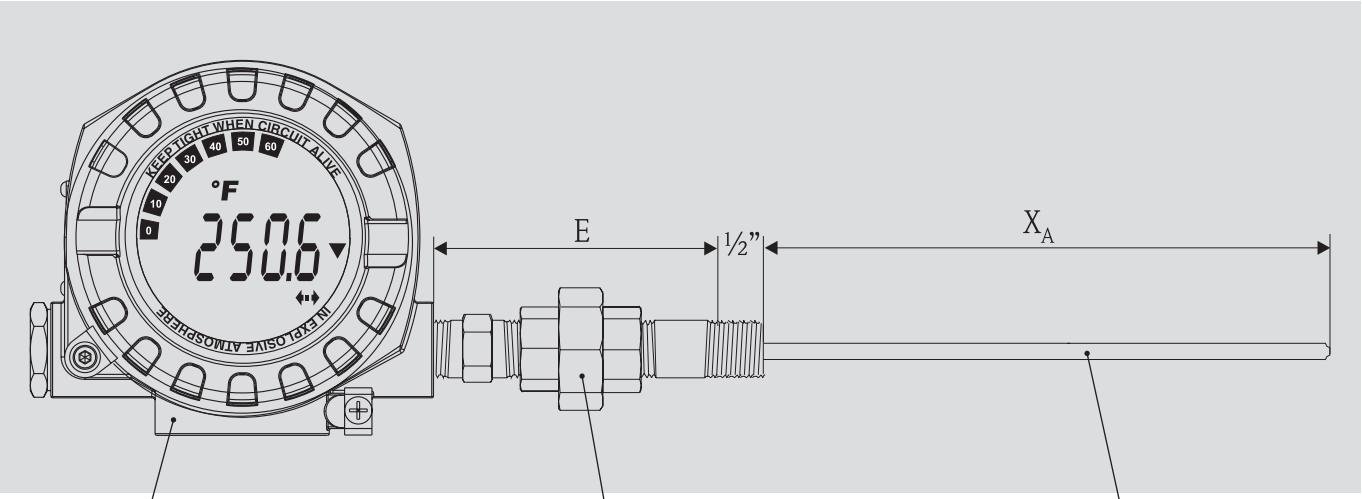
Ordering Information

Product Structure, General Purpose RTD flanged assembly with advanced TMT162, TH14

TH14	**General flanged RTD assembly with thermowell, US Style, TH14**											
	TW Immersion length (U)											
	1	2”										
	2	4”										
	3	7”										
	4	10”										
	5	13”										
	6	16”										
	7	22”										
	8	.... “ (Specify increment 0.5”), max. 18”										
		Flange size; TW Material of Construction										
		A	1”, 316 SS									
		B	1-½”, 316 SS									
		C	2”, 316 SS									
		Y	For larger sizes/different construction materials - consult your E+H sales representative									
			Rating; Flange Type									
			1	150 psi, RF								
			2	300 psi, RF								
			3	600 psi; RF								
			Y	higher ratings available on request- consult your E+H sales representative								
				Shape of TW; Welding option								
				1	Straight; Standard							
				2	Tapered; Standard							
					TW Lag length (T)							
					A	None						
					B	3”						
					X	Specify						
						Extension length (E)						
						1	Hex nipple 316 SS, E=1”					
						2	Nipple+Union+Nipple 316 SS, E=4”					
						3	Hex nipple Steel, E=1”					
						4	Nipple+Union+Nipple Steel, E=4”					
						5	Nipple+Union+Nipple Steel, E=7”					
						6	Nipple+Union+Nipple 316 SS, E=7”					
							Sensor Type					
							E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)				
							F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)				
							G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)				
							H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)				
							J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)				
							K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)				
							L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)				
							M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)				
								Enclosure; Cable entry				
								J	Alu field housing; 2 x Input + NPT ½” + HART			
								K	Alu field housing; NPT ½” + HART + 2 x Input + display			
								L	Alu field housing; 2 x Input + FF + NPT ½”			
								M	Alu field housing; NPT ½” + FF + 2 x Input + display			
									Electrical connection			
										For single compartment- consult your E+H sales representative		
									I	TMT162, dual compartment		
									J	TMT162, FM IS, dual compartment		
									K	TMT162, CSA IS, dual compartment		
										Additional option		
										1	Not selected	
										2	PROFIBUS PA plug M12	
										3	Foundation Fieldbus plug 7/8”	
										4	Plastic cable gland	
										9	Special version	
											Test; Calibration	
											A	Not selected
											B	Sensor calibration certificate
											C	Material traceability certificate
												Version
												K Standard
												L With Certificate of Compliance
TH14-												**Enter desired product structure**

TH15 RTD General Purpose

spring loaded element with advanced TMT162 transmitter for critical control applications (for existing thermowells)



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel 316 SS
NUN E=4"	
NUN E=7"	

Immersion length, X_A
2", 6", 9", 12", 14" (standard)
4" to 30" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

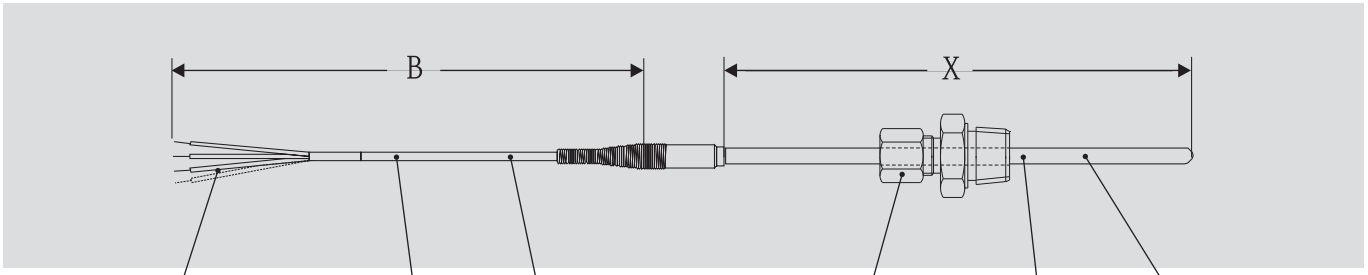
Ordering Information

Product Structure, General RTD assembly with advanced TMT162, spring-loaded insert, TH15

TH15-	**General RTD assembly without thermowell, spring-loaded insert, US Style, TH15**									
	Immersion length (X_A)									
	1	4”								
	2	6”								
	3	9”								
	4	12”								
	5	14”								
	8	.... “ (Specify increment 0.5”)								
		Sheath diameter								
		A	¼”, 316 SS							
			Extension (E)							
			1	Hex nipple 316 SS, E=1”						
			2	Nipple+Union+Nipple 316 SS, E=4”						
			3	Hex nipple Steel, E=1”						
			4	Nipple+Union+Nipple Steel, E=4”						
			5	Nipple+Union+Nipple Steel, E=7”						
			6	Nipple+Union+Nipple 316 SS, E=7”						
				Sensor Type						
				E	1 x Pt100, class B, 4 wire, -50-200°C (-58 to 392 °F)					
				F	1 x Pt100, class B, 4 wire, -200-600°C (-328 to 1112 °F)					
				G	1 x Pt100, class A, 4 wire, -50-200°C (-58 to 392 °F)					
				H	1 x Pt100, class A, 4 wire, -200-600°C (-328 to 1112 °F)					
				J	2 x Pt100, class B, 3 wire, -50-200°C (-58 to 392 °F)					
				K	2 x Pt100, class B, 3 wire, -200-600°C (-328 to 1112 °F)					
				L	2 x Pt100, class A, 3 wire, -50-200°C (-58 to 392 °F)					
				M	2 x Pt100, class A, 3 wire, -200-600°C (-328 to 1112 °F)					
					Enclosure; Cable entry					
					J	Alu field housing; 2 x Input + NPT ½” + HART				
					K	Alu field housing; NPT ½” + HART + 2 x Input + display				
					L	Alu field housing; 2 x Input + FF + NPT ½”				
					M	Alu field housing; NPT ½” + FF + 2 x Input + display				
						Electrical connection				
							For single compartment- consult your E+H sales representative			
						I	TMT162, dual compartment			
						J	TMT162, FM IS, dual compartment			
						K	TMT162, CSA IS, dual compartment			
							Documentation required			
							1	Not selected		
							2	with Certificate of Conformance		
								Test; Calibration		
								A	Not selected	
								B	Sensor calibration certificate	
								C	Material traceability certificate	
									Version	
									K	Standard
										Additional option
										1 Not selected
										2 PROFIBUS PA plug M12
										3 Foundation Fieldbus plug 7/8”
										4 Plastic cable gland
TH15-		**A**							**K**	**Enter desired product structure**

TH52 General Purpose, MgO insulated thermocouple with fiberglass braided or armored leads with optional male plug

The TH52 offers **a thermocouple element with extension cable** for process application that required fast response time and extension cable.



Lead wire termination
Standard plug
Standard plug + jack
Mini plug
Mini plug + jack
Standard plug, high temp.
Standard plug + jack, high temp.
Leads stripped 2”
Leads stripped 2” + spade plugs

Wire length, B
48”
72”
120”
12”-3600” (specify)

Wire type
Fiberglass solid - 900 °F
Fiberglass strand - 900 °F
Teflon solid - 900 °F
Teflon strand - 400 °F
Fiberglass strand; SS flex armor - 900 °F
Teflon Strand; SS flex armor - 400 °F

Compression fitting
1/8” NPT one-time
1/8” NPT re-adjustable
¼” NPT one-time
¼” NPT re-adjustable

Immersion length, X
6”, 12”, 18”, 24” (std.)
2” to 96” (specify)

Sheath O.D.
1/16”; 316SS
1/8”; 316SS
3/16”; 316SS
¼”; 316SS
1/16”; Inconel 600
1/8”; Inconel 600
3/16”; Inconel 600
¼”; Inconel 600

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

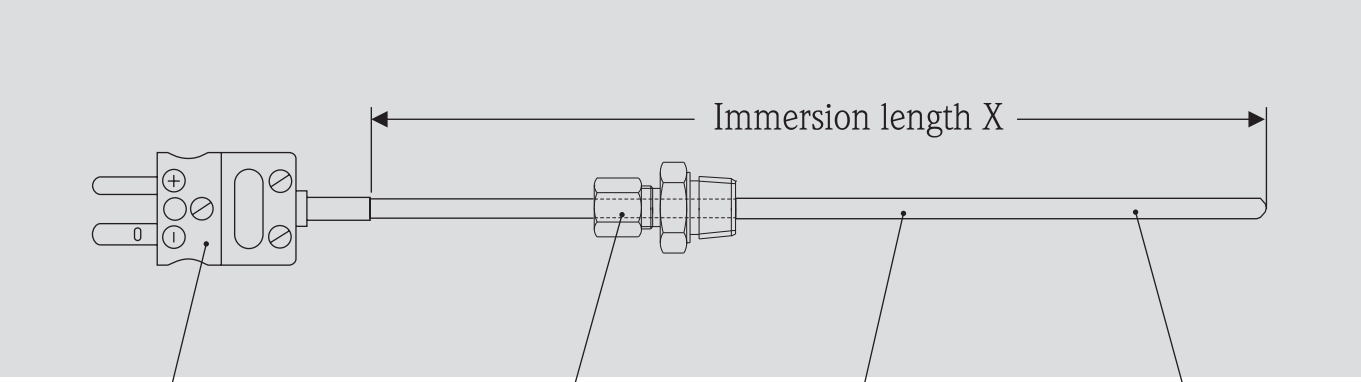
Product Structure, General thermocouple assembly with cable, TH52

TH52-	**General Thermocouple Assembly with cable, TH52**												
	Process connection												
	A	Not selected											
	C	Comp. fitting 1/8" NPT 316 SS, one time											
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable											
	E	Comp. fitting ¼ NPT 316 SS, one time											
	F	Comp. fitting ¼ NPT 316 SS, re adjustable											
	Y	Bayonet and other Fittings available, consult your E+H sales representative											
		Immersion length (X), 2 to 96"											
		1	6"										
		2	12"										
		3	18"										
		4	24"										
		8	.... " (Specify increment 0.5")										
		9	Special version and longer lengths available- consult your E+H sales rep										
			Sheath diameter; Material										
			A	1/16"; 316 SS									
			B	1/8"; 316 SS									
			C	3/16"; 316 SS									
			E	¼"; 316 SS									
			H	1/16"; Inconel 600									
			J	1/8"; Inconel 600									
			K	3/16"; Inconel 600									
			L	¼"; Inconel 600									
				Sensor Type; Class									
				A	1 x J; 2 - -standard accuracy								
				B	2 x J; 2								
				E	1 x K; 2								
				F	2 x K; 2								
				J	1 x E; 2								
				K	2 x E; 2								
				N	1 x N; 2								
				O	2 x N; 2								
				R	1 x T; 2								
				S	2 x T; 2								
				Y	Special version, combinations, and special accuracy available on request								
					Junction Style								
					1	Grounded							
					2	Ungrounded							
						Wire length							
						A	48"						
						B	72"						
						C	120"						
						X	.... " (Specify increment 12")						
						Y	Special version						
							Wire Type						
							1	Fiberglass solid					
							2	Fiberglass strand					
							3	Teflon solid					
							4	Teflon strand					
							5	Fiberglass strand, SS flex armor					
							6	Teflon strand, SS flex armor					
								Leadwire termination					
								A	Standard plug				
								B	Standard plug + female jack				
								C	Mini plug				
								D	Mini plug + female jack				
								E	High temperature standard plug				
								G	High temperature standard plug + female jack				
								H	Stripped 2"				
									Documentation required				
									1	Not selected			
										Test; Calibration			
										A	Not selected		
										B	Sensor calibration certificate		
											Version		
											K	Standard	
												Additional option	
												1	Not selected
TH52-									**1**		**K**	**1**	**Enter desired product structure**

TH56 General Purpose, quick disconnect MgO insulated thermocouple with male plug

The TH56 offers a thermocouple probe with quick disconnect plugs for process application such as heat treatment ovens and furnaces. We use heavy duty thermocouple and extension grade wires, individually tested and inspected to deliver the highest quality product. The options found in the order code represent common industrial requirements. Standard plus withstand temperatures up to 200 °C and for higher temperatures the heavy duty plugs that withstand 400 °C are recommended.
Custom built and other terminations and option are available on request.

This series also offers the advanced Type N thermocouple that has superior drift resistance to any other TC type available.



Connector style
Standard plug
Standard plug + jack
Mini plug
Mini plug + jack
Standard plug, high temp.
Standard plug + jack, high temp.
Leads stripped 2”
Leads stripped 2” + lugs

Compression fitting
1/8” NPT one-time
1/8” NPT re-adjustable
¼” NPT one-time
¼” NPT re-adjustable

Sheath O.D.
1/16”; 316SS
1/8”; 316SS
3/16”; 316SS
¼”; 316SS
1/16”; Inconel 600
1/8”; Inconel 600
3/16”; Inconel 600
¼”; Inconel 600

Immersion length, X
12”, 18”, 24”, 48”, 72”, 96” (std.)
2” to 96” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, General thermocouple assembly with direct plug, TH56

TH56-	**General Thermocouple Assembly with direct plug, TH56**										
	Process connection										
	A	Not selected									
	C	Comp. fitting 1/8" NPT 316 SS, one time									
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable									
	E	Comp. fitting ¼ NPT 316 SS, one time									
	F	Comp. fitting ¼ NPT 316 SS, re adjustable									
	Y	Bayonet and other Fittings available, consult your E+H sales representative									
		Immersion length (X), 2 to 96"									
		1	12"								
		2	18"								
		3	24"								
		4	48"								
		5	72"								
		6	96"								
		8	.... " (Specify increment 0.5")								
		9	Special version and longer lengths available- consult your E+H sales rep								
			Sheath diameter; Material								
			A	1/16"; 316 SS							
			B	1/8"; 316 SS							
			C	3/16"; 316 SS							
			E	¼"; 316 SS							
			H	1/16"; Inconel 600							
			J	1/8"; Inconel 600							
			K	3/16"; Inconel 600							
			L	¼"; Inconel 600							
				Sensor Type; Class							
				A	1 x J; 2						
				C	1 x J; 1						
				E	1 x K; 2						
				G	1 x K; 1						
				J	1 x E; 2						
				L	1 x E; 1						
				N	1 x N; 2						
				P	1 x N; 1						
				R	1 x T; 2						
				T	1 x T; 1						
				Y	Special version, combinations, and special accuracy available on request						
					Junction style						
					1	Grounded					
					2	Ungrounded					
						Connector style					
						A	Standard plug				
						B	Standard plug + female jack				
						C	Mini plug				
						D	Mini plug + female jack				
						E	High temperature standard plug				
						G	High temperature standard plug + female jack				
							Documentation required				
							1	Not selected			
								Test; Calibration			
								A	Not selected		
								B	Sensor calibration certificate		
									Version		
									K	Standard	
										Additional option	
										1	Not selected
TH56-							**1**		**K**	**1**	**Enter desired product structure**

TH5x General Purpose, economical TC assembly with weatherproof heads

The TH5x is a simple to configure, complete thermocouple assembly, for all temperature monitoring needs.

Key features include:
- Ultra low copper heads with dual epoxy powder coats ensures high resistance to corrosive environments like salt water
- Patented Endress+Hauser design heads for easy wiring.
- Highly reliable and individually tested sensor.
- Use of high quality certified materials such as MgO cable, pipes and bar stock.
- Robust thermocouple wire for applications requiring a wide temperature range.

This style of TH5x assemblies offer the advantage of high quality measurement instrument with a low total cost of ownership, making them the perfect choice for all your monitoring applications.

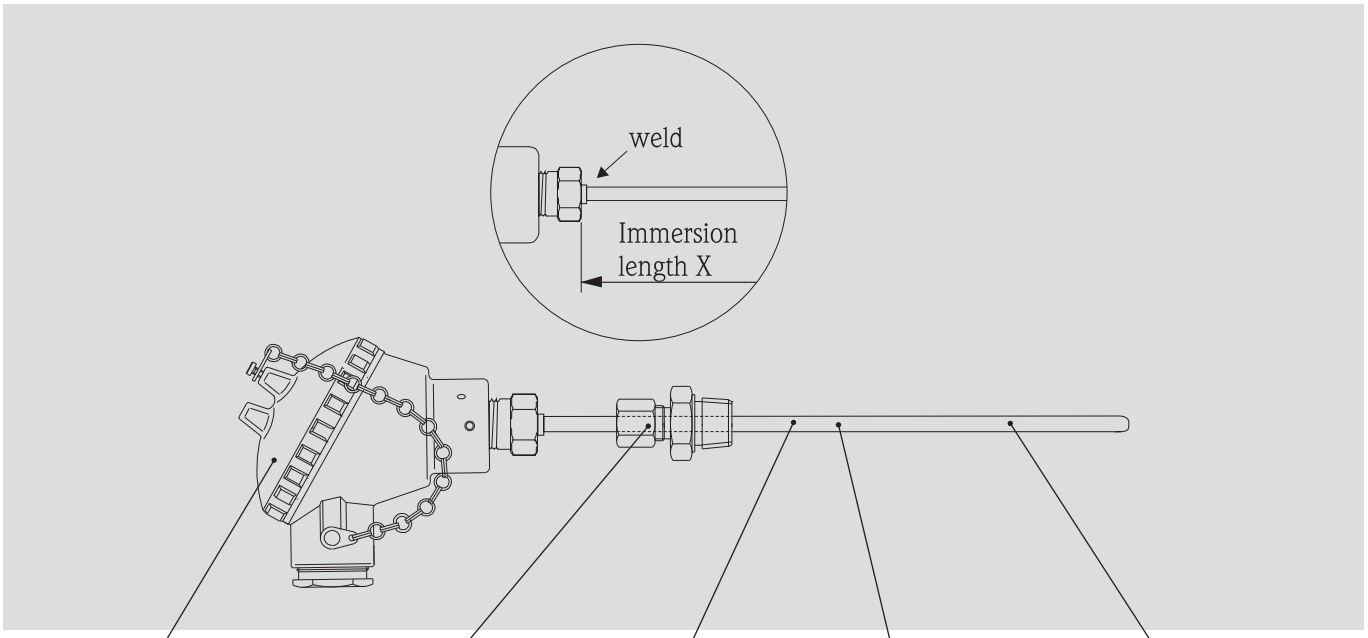
The assemblies are available with Endress+Hauser's robust TMT series of In-head DIN B size temperature transmitters with 4-20 mA, HART, Profibus PA and FOUNDATION™ Fieldbus outputs.

We offer the Type N thermocouple as a standard. Type N was designed for aerospace applications and finds excellent used in cyclic temperature applications such as mining and primary industries. It has the best stability among all thermocouple types available on the market.

Customers with high pressure applications such as boilers and vessels will appreciate the pressure calculations available for the CRN registered designs.

TH51 TC General Purpose

welded insert, economical TC assembly with weatherproof heads for direct measurement



Enclosure (Terminal head)
Aluminum
Polypropylene
(NEMA 4X)

Process connection
½" NPT
¼" NPT
1/8" NPT

Material
316 SS
Inconel 600

Sheath O.D.
1/8"
3/16"
¼"
3/8"

Immersion length, X
4", 6", 9", 12" (standard)
2" to 96" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

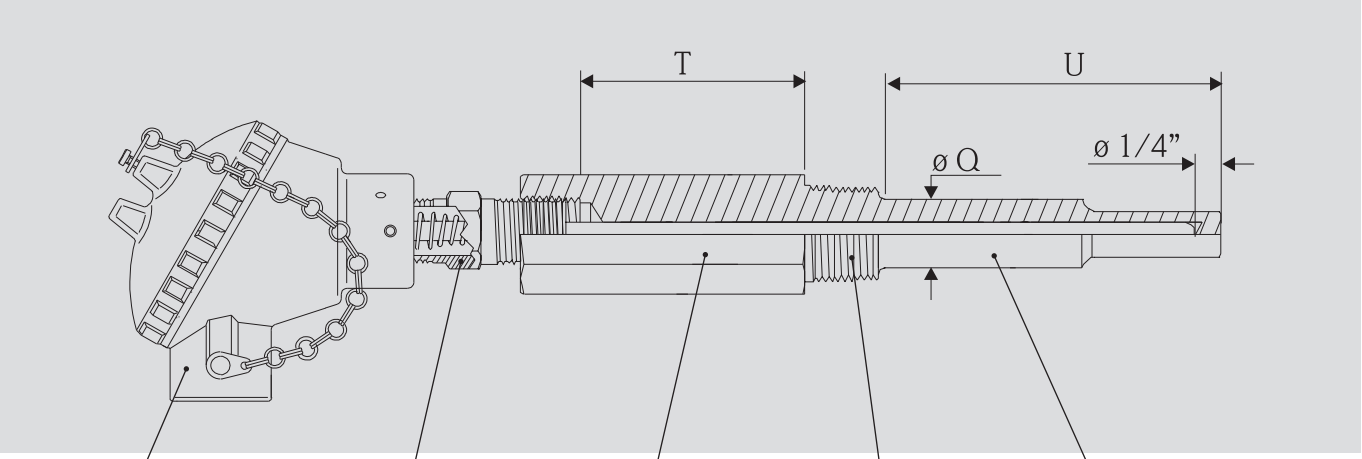
Ordering Information

Product Structure, General Thermocouple assembly with connection head, TH51

TH51-	**General Thermocouple Assembly with connection head, TH51**											
	Process connection											
	A	Not selected										
	B	½" NPT, 316 SS										
	C	Comp. fitting 1/8" NPT 316 SS, one time										
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable										
	E	Comp. fitting ¼" NPT 316 SS, one time										
	F	Comp. fitting ¼" NPT 316 SS, re adjustable										
		Immersion length (X), 2 to 96"										
		1	4"									
		2	6"									
		3	9"									
		4	12"									
		8	.... " (Specify increment 0.5")									
			Sheath diameter; Material									
			B	1/8"; 316 SS								
			C	3/16"; 316 SS								
			E	¼"; 316 SS								
			F	3/8"; 316 SS								
			J	1/8"; Inconel 600								
			K	3/16"; Inconel 600								
			L	¼"; Inconel 600								
			M	3/8"; Inconel 600								
				Sensor Type; Class (standard accuracy)								
				A	1 x J; std.							
				B	2 x J; std.							
				E	1 x K; std.							
				F	2 x K; std.							
				J	1 x E; std.							
				K	2 x E; std							
				N	1 x N; std.							
				O	2 x N; std							
				R	1 x T; std							
				S	2 x T; std							
				Y	For Special version/ (TC combinations and special accuracy available, consult E+H sales representative)							
					Junction Style							
					1	Grounded						
					2	Ungrounded						
						Enclosure; Cable entry						
						A	Not selected					
						B	Alu, E+H blue Al + cover; NPT ½"					
						C	Alu, E+H blue Al + cover; NPT ¾"					
						Y	Special version – consult E+H sales representative for more options					
							Electrical connection					
							C	Programmable TMT181				
							D	Programmable TMT181 FM IS				
							E	Programmable TMT181 CSA IS				
							P	HART TMT182				
							R	HART TMT182 FM IS				
							T	HART TMT182 CSA IS				
							Y	Special version				
							2	Flying leads				
							3	Terminal block				
								Documentation required				
								1	Not selected			
								9	Special version			
									Test; Calibration			
									A	Not selected		
									B	Sensor calibration certificate		
									Y	Special version		
										Version		
										K	Standard	
										Y	Special version	
											Additional option	
											1	Not selected
											2	PROFIBUS PA plug M12
											3	Foundation Fieldbus plug 7/8"
											4	Plastic cable gland
											9	Special version
TH51-												**Enter desired product structure**

TH53 TC General Purpose

threaded thermowell, economical TC assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (std.)
2” to 18” (specify)

Shape
Straight
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

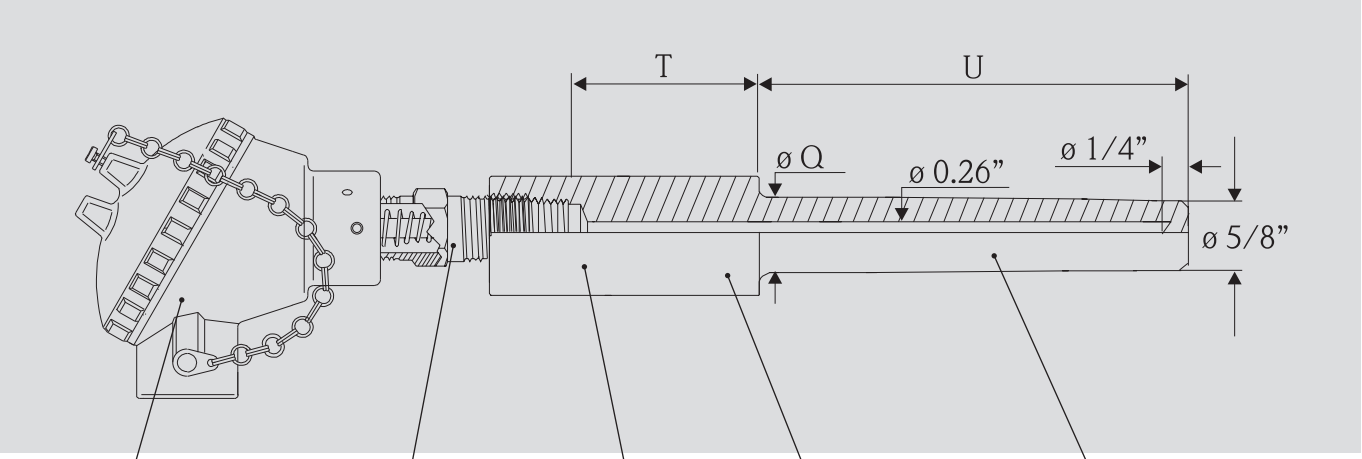
Ordering Information

Product Structure, general thermocouple assembly, TH53

TH53	**General thermocouple assembly with thermowell, US Style, TH53**												
	TW Immersion length (U)												
	1	2½"											
	2	4½"											
	3	7½"											
	4	10½"											
	5	13½"											
	6	16½"											
	7	22½"											
	8	.... " (Specify increment 0.5")											
	Y	Special version - longer lengths up to 108" are available on request											
		Process Connection; Material of Construction											
		A1	½" NPT, 316 SS										
		A2	¾" NPT, 316 SS										
		A3	1" NPT, 316 SS										
		YY	Many other sizes and materials available, consult you E+H sales representative										
			Thermowell shape										
			2	Stepped, Standard Duty									
			3	Tapered, Heavy Duty									
				Thermowell Lag (T)									
				A	None								
				E	3"								
				X	....." (specify increment 0.5")								
					Extension (E)								
					1	Hex nipple 316 SS, E=1"							
					2	Nipple+Union+Nipple 316 SS, E=4"							
					3	Hex nipple Steel, E=1"							
					4	Nipple+Union+Nipple Steel, E=4"							
					5	Nipple+Union+Nipple Steel, E=7"							
					6	Nipple+Union+Nipple 316 SS, E=7"							
						Sensor Type; Class; Material							
						A	1 x J; 2; Insert 316SS						
						B	2 x J; 2; Insert 316SS						
						E	1 x K; 2, Insert Inconel 600						
						F	2 x K; 2, Insert Inconel 600						
						J	1 x E; 2, Insert Inconel 600						
						K	2 x E; 2, Insert Inconel 600						
						N	1 x N; 2, Insert Inconel 600						
						O	2 x N; 2, Insert Inconel 600						
						R	1 x T; 2, Insert 316SS						
						S	2 x T; 2, Insert 316SS						
							Junction style						
							1	Grounded					
							2	Ungrounded					
								Enclosure; Cable entry					
								A	Not selected				
								B	Alu, E+H blue Al + cover; NPT ½"				
								C	Alu, E+H blue Al + cover; NPT ¾"				
								1	Alu, E+H blue + flip cover, ½" NPT				
								Y	Special version - consult E+H sales representative for more options				
									Electrical connection				
									C	Programmable TMT181			
									D	Programmable TMT181 FM IS			
									E	Programmable TMT181 CSA IS			
									P	HART TMT182			
									R	HART TMT182 FM IS			
									T	HART TMT182 CSA IS			
									U	FF Head Transmitter DINB, GP			
									V	FF Head Transmitter DINB, FM/CSA IS			
									2	Flying leads			
									3	Terminal block			
									4	Profibus PA Head Transmitter DINB, GP			
									5	Profibus PA Head Transmitter DINB, FM/CSA IS			
										Additional option			
										1	Not selected		
										2	PROFIBUS PA plug M12		
										3	Foundation Fieldbus plug 7/8"		
										4	Plastic cable gland		
											Test; Calibration		
											A	Not selected	
											B	Sensor calibration certificate	
											C	Material traceability certificate	
												Version	
												K	Standard
												L	With Certificate of Compliance
TH53-													**Enter desired product structure**

TH53 TC General Purpose

weld in / socket weld thermowell, economical TC assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld in
1” weld in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (std.)
2” to 18” (specify)

Shape
Straight
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

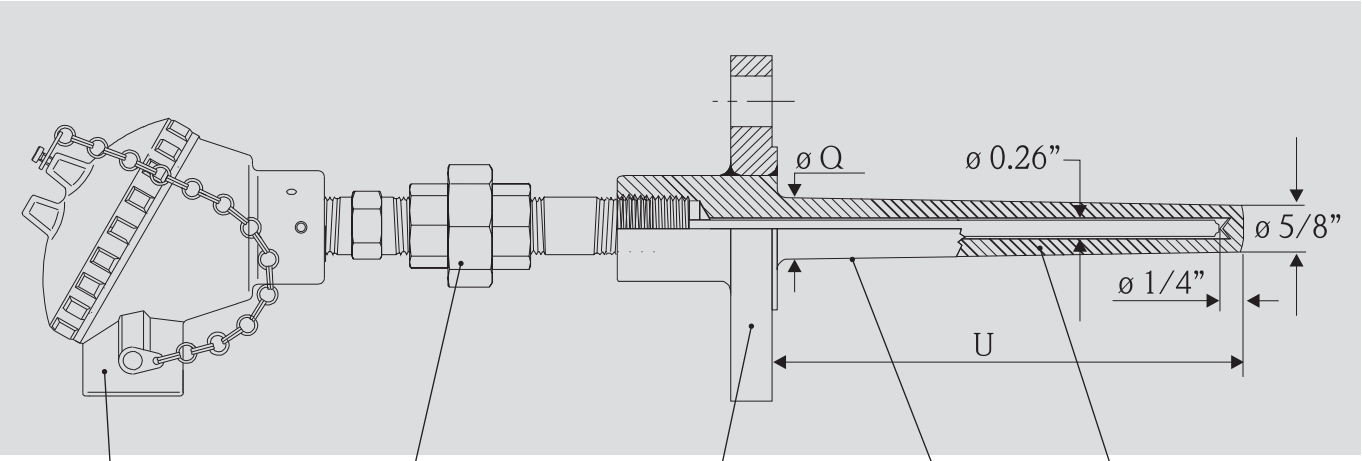
Ordering Information

Product Structure, general thermocouple assembly, TH53

TH53	**General thermocouple assembly with thermowell, US Style, TH53**												
	TW Immersion length (U)												
	1	2½"											
	2	4½"											
	3	7½"											
	4	10½"											
	5	13½"											
	6	16½"											
	7	22½"											
	8	.... " (Specify increment 0.5")											
	Y	Special version - longer lengths up to 108" are available on request											
		Process Connection; Material of Construction											
		B1	Socket weld ¾", 316 SS										
		B2	Socket weld 1", 316 SS										
		C1	Weld-in ¾", 316 SS										
		C2	Weld-in 1", 316 SS										
		YY	Many other sizes and materials available, consult you E+H sales representative										
			Thermowell shape										
			2	Stepped, Standard Duty									
			3	Tapered, Heavy Duty									
				Thermowell Lag (T)									
				A	None								
				E	3"								
				X	....." (specify increment 0.5")								
					Extension (E)								
					1	Hex nipple 316 SS, E=1"							
					2	Nipple+Union+Nipple 316 SS, E=4"							
					3	Hex nipple Steel, E=1"							
					4	Nipple+Union+Nipple Steel, E=4"							
					5	Nipple+Union+Nipple Steel, E=7"							
					6	Nipple+Union+Nipple 316 SS, E=7"							
						Sensor Type; Class; Material							
						A	1 x J; 2; Insert 316SS						
						B	2 x J; 2; Insert 316SS						
						E	1 x K; 2, Insert Inconel 600						
						F	2 x K; 2, Insert Inconel 600						
						J	1 x E; 2, Insert Inconel 600						
						K	2 x E; 2, Insert Inconel 600						
						N	1 x N; 2, Insert Inconel 600						
						O	2 x N; 2, Insert Inconel 600						
						R	1 x T; 2, Insert 316SS						
						S	2 x T; 2, Insert 316SS						
							Junction style						
							1	Grounded					
							2	Ungrounded					
								Enclosure; Cable entry					
								A	Not selected				
								B	Alu, E+H blue Al + cover; NPT ½"				
								C	Alu, E+H blue Al + cover; NPT ¾"				
								1	Alu, E+H blue + flip cover, ½" NPT				
								Y	Special version - consult E+H sales representative for more options				
									Electrical connection				
									C	Programmable TMT181			
									D	Programmable TMT181 FM IS			
									E	Programmable TMT181 CSA IS			
									P	HART TMT182			
									R	HART TMT182 FM IS			
									T	HART TMT182 CSA IS			
									U	FF Head Transmitter DINB, GP			
									V	FF Head Transmitter DINB, FM/CSA IS			
									2	Flying leads			
									3	Terminal block			
									4	Profibus PA Head Transmitter DINB, GP			
									5	Profibus PA Head Transmitter DINB, FM/CSA IS			
										Additional option			
										1	Not selected		
										2	PROFIBUS PA plug M12		
										3	Foundation Fieldbus plug 7/8"		
										4	Plastic cable gland		
											Test; Calibration		
											A	Not selected	
											B	Sensor calibration certificate	
											C	Material traceability certificate	
												Version	
												K	Standard
												L	With Certificate of Compliance
TH53-													**Enter desired product structure**

TH54 TC General Purpose

flanged thermowell, economical TC assembly with weatherproof heads



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
NUN E=4”	
NUN E=7”	

Flange size
1” 316 SS
1½” 316 SS
2” 316 SS

Rating
150 psi RF
300 psi RF
600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

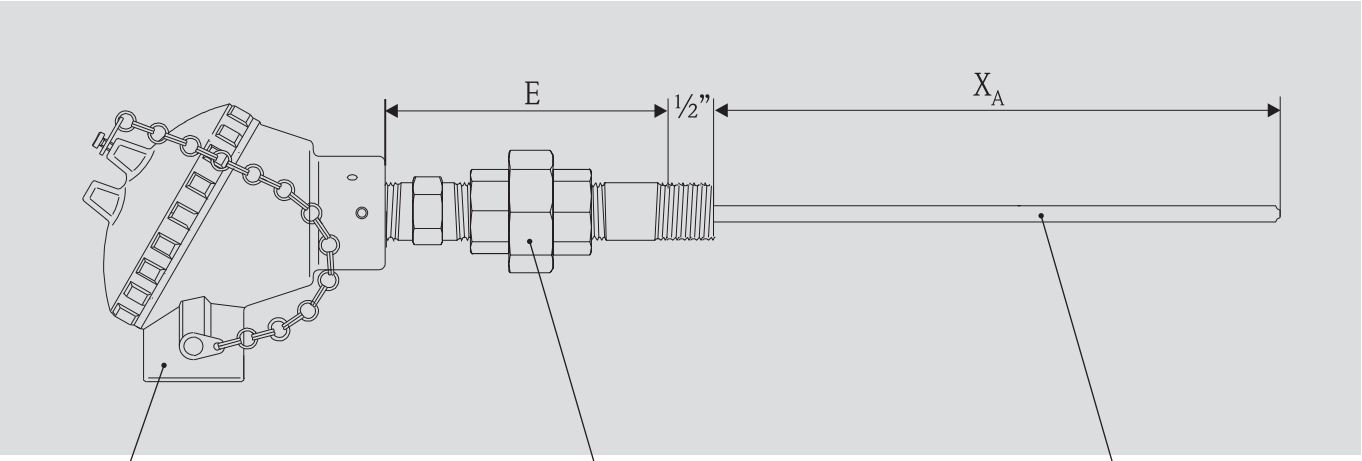
Ordering Information

Product Structure, general flanged thermcouple assembly, TH54

TH54	**General flanged thermocouple assembly with thermowell, US Style, TH54**													
	TW Immersion length (U)													
	1	2”												
	2	4”												
	3	7”												
	4	10”												
	5	13”												
	6	16”												
	7	22”												
	8	.... “ (Specify increment 0.5”)												
		Flange size; TW Material												
		A	1”, 316 SS											
		B	1½”, 316 SS											
		C	2”, 316 SS											
		Y	For larger sizes/different construction materials - consult your E+H sales representative											
			Rating; Flange Type											
			1	150 psi, RF										
			2	300 psi, RF										
			3	600 psi; RF										
			Y	higher ratings available on request- consult your E+H sales representative										
				Thermowell shape; Welding										
				1	Straight; Standard									
				2	Tapered; Standard									
					TW Lag length (T)									
					A	None								
					X	....” (increment 0.5”)								
					Y	Special version, specify								
						Extension (E)								
						1	Hex nipple 316 SS, E=1”							
						2	Nipple+Union+Nipple 316 SS, E=4”							
						3	Hex nipple Steel, E=1”							
						4	Nipple+Union+Nipple Steel, E=4”							
						5	Nipple+Union+Nipple Steel, E=7”							
						6	Nipple+Union+Nipple 316 SS, E=7”							
							Sensor Type							
							A	1 x J; class 2, Insert 316SS						
							B	2 x J; class 2, Insert 316SS						
							E	1 x K; class 2, Insert Inconel 600						
							F	2 x K; class 2, Insert Inconel 600						
							J	1 x E; class 2, Insert Inconel 600						
							K	2 x E; class 2, Insert Inconel 600						
							N	1 x N; class 2, Insert Inconel 600						
							O	2 x N; class 2, Insert Inconel 600						
							R	1 x T; class 2, Insert 316SS						
							S	2 x T; class 2, Insert 316SS						
								Junction style						
								1	Grounded					
								2	Ungrounded					
									Enclosure; Cable entry					
									A	Not selected				
									B	Alu, E+H blue ; NPT ½”				
									C	Alu, E+H blue ; NPT ¾”				
									1	Alu, E+H blue + flip cover, ½” NPT				
									Y	Several other options available, consult your E+H sales representative				
										Electrical connection				
										C	Programmable TMT181			
										D	Programmable TMT181 FM IS			
										E	Programmable TMT181 CSA IS			
										P	HART TMT182			
										R	HART TMT182 FM IS			
										T	HART TMT182 CSA IS			
										U	FF Head Transmitter DINB, GP			
										V	FF Head Transmitter DINB, FM/CSA IS			
										2	Flying leads			
										3	Terminal block			
										4	Profibus PA Head Transmitter DINB, GP			
										5	Profibus PA Head Transmitter DINB, FM/CSA IS			
											Additional option			
											1	Not selected		
											2	PROFIBUS PA plug M12		
											3	Foundation Fieldbus plug 7/8”		
											4	Plastic cable gland		
												Additional option 2		
												A	Not selected	
												B	Sensor calibration certificate	
												C	Material traceability certificate	
													Version	
													K	Standard
													L	With Certificate of Compliance
TH54-														**Enter desired product structure**

TH55 TC General Purpose

spring loaded insert, economical TC assembly with weatherproof heads for existing thermowells



Enclosure (Terminal head)
Aluminum
Polypropylene
Stainless steel
(NEMA 4X)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel, 316SS
NUN E=4"	
NUN E=7"	

Immersion length, X_A
4", 6", 9", 12", 14" (standard)
4" to 30" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, general thermocouple assembly, spring-loaded TH55

TH55-	**General thermocouple assembly without thermowell, spring-loaded, US Style, TH55**											
	Immersion length (A)											
	1	4”										
	2	6”										
	3	9”										
	4	12”										
	5	14”										
	8	.... “ (Specify increment 0.5”)										
		Sheath diameter										
		A	¼”, 316 SS									
		B	¼”, Inconel 600									
			Extension (E)									
			1	Hex nipple 316 SS, E=1”								
			2	Nipple+Union+Nipple 316 SS, E=4”								
			3	Hex nipple Steel, E=1”								
			4	Nipple+Union+Nipple Steel, E=4”								
			5	Nipple+Union+Nipple Steel, E=7”								
			6	Nipple+Union+Nipple 316 SS, E=7”								
				Sensor Type								
				A	1x J; class 2							
				B	2x J; class 2							
				E	1x K; class 2							
				F	2x K; class 2							
				J	1x E; class 2							
				K	2x E; class 2							
				N	1x N; class 2							
				O	2x N; class 2							
				R	1x T; class 2							
				S	2x T; class 2							
					Junction style							
					1	Grounded						
					2	Ungrounded						
						Enclosure; Cable entry						
						A	Not selected					
						B	Alu, E+H blue Al + cover; NPT ½”					
						C	Alu, E+H blue Al + cover; NPT ¾”					
						D	Plastic PP white; NPT ½”					
						E	Plastic PP white; NPT ¾”					
						F	SS304 (TA20J); NPT ½”					
						G	SS304 (TA20J) LC display; NPT ½”					
						1	AL, E+H blue + flip cover, NPT ½”					
						Y	Special version - consult E+H sales representative for more options					
							Electrical connection					
							C	Programmable TMT181				
							D	Programmable TMT181 FM IS				
							E	Programmable TMT181 CSA IS				
							P	HART TMT182				
							R	HART TMT182 FM IS				
							T	HART TMT182 CSA IS				
							U	FF Head Transmitter DINB, GP				
							V	FF Head Transmitter DINB, FM/CSA IS				
							2	Flying leads				
							3	Terminal block				
							4	Profibus PA Head Transmitter DINB, GP				
							5	Profibus PA Head Transmitter DINB, FM/CSA IS				
								Documentation required				
								1	Not selected			
								2	with Certificate of Conformance			
									Additional option 1			
									A	Not selected		
									B	Sensor calibration certificate		
										Version		
										K	Standard	
											Additional option 2	
											1	Not selected
											2	PROFIBUS PA plug M12
											3	Foundation Fieldbus plug 7/8”
											4	Plastic cable gland
TH55-										**K**		**Enter desired product structure**

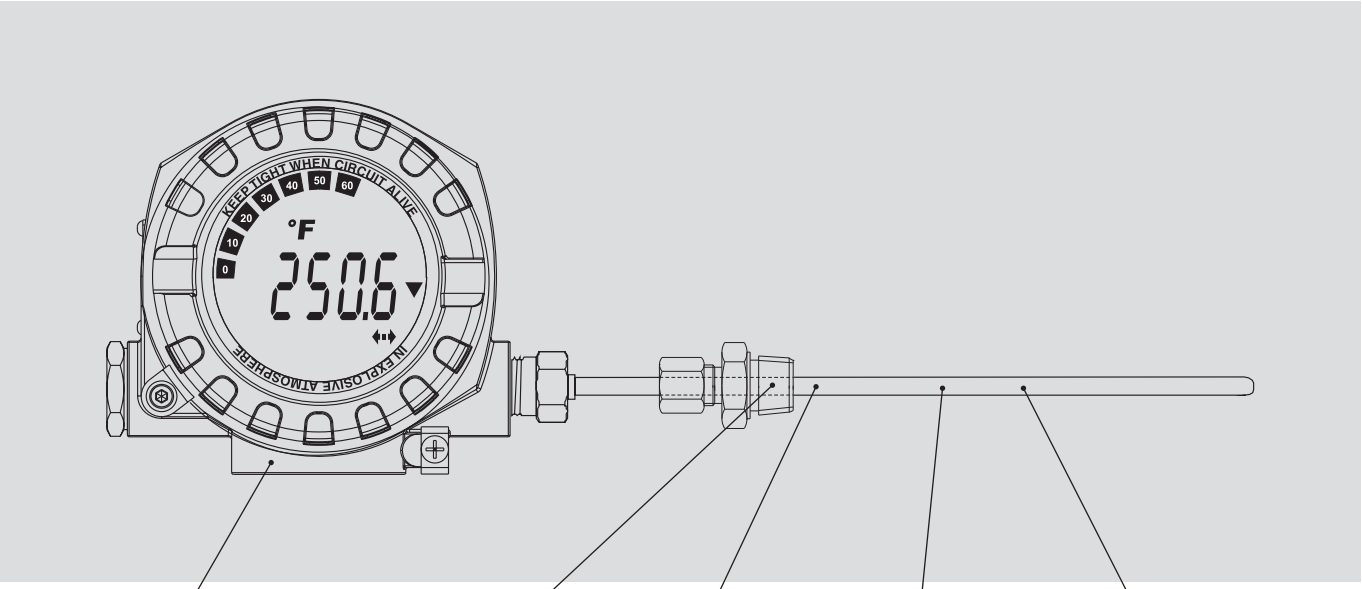
TH5x TC assembly with advanced TMT162 transmitters for critical control and safety applications

- The TMT162 gives temperature measurement instrument unique technological advantages.
- The assembly offers improved safety and ease of installation through dual compartment transmitter housing design.
- The completely potted electronics allow seamless operation in extreme temperatures and high precipitation & condensation areas.
- The best in class accuracy and performance with zero-corrosion* gold plated terminals, ultra low copper content, dual epoxy coating and coated threads offers a robust instrument that stands up to harshest environments.
- This transmitter is also available in cast 316L stainless steel for highly corrosive environments.
- Customers with high pressure applications such as boilers and vessels will appreciate the pressure calculations available for the CRN registered designs.

* Gold plating ensures virtually no corrosion.

TH51 TC General Purpose

welded insert, TC assembly with advanced TMT162 transmitter for critical control applications (for direct measurement)



Enclosure
Aluminum field housing (TMT162)

Process connection
½” NPT
¼” NPT
1/8” NPT

Material
316 SS

Sheath O.D.
1/8”
3/16”
¼”
3/8”

Immersion length, X
4”, 6”, 9”, 12” (std.)
2” to 96” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

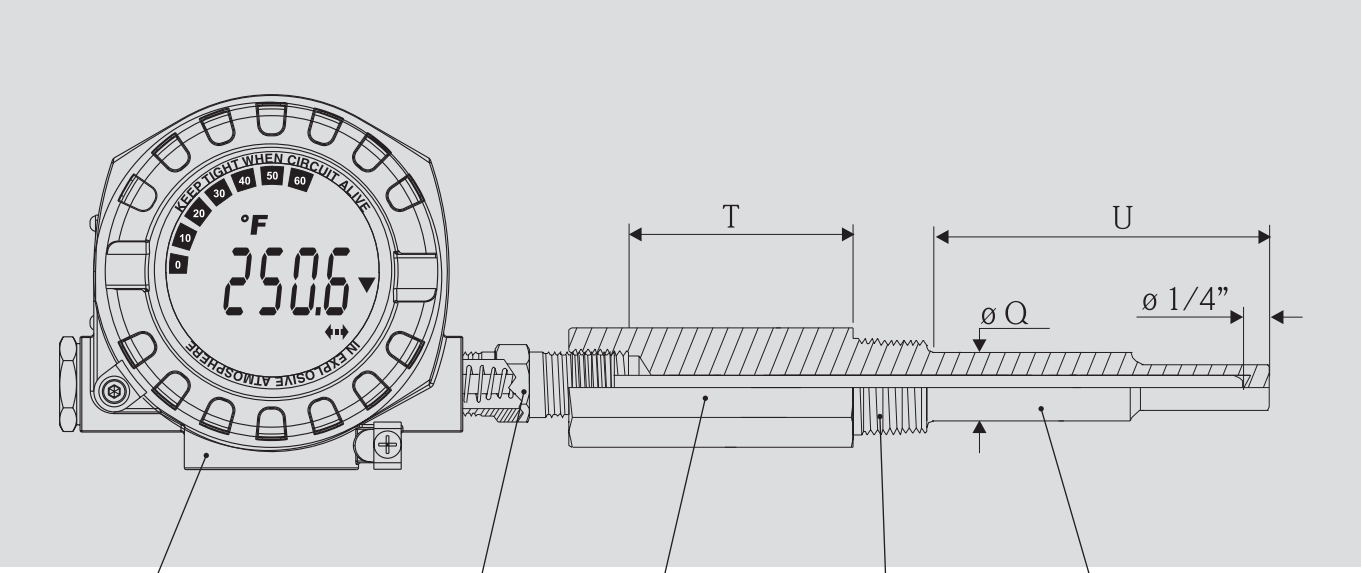
Ordering Information

Product Structure, General Purpose TC assembly with advanced TMT162, TH51

TH51-	**General thermocouple assembly with field housing, TH51**										
	Process connection										
	A	Not selected									
	B	½" NPT, 316 SS									
	C	Comp. fitting 1/8" NPT 316 SS, one time									
	D	Comp. fitting 1/8" NPT 316 SS, re adjustable									
	E	Comp. fitting ¼" NPT 316 SS, one time									
	F	Comp. fitting ¼" NPT 316 SS, re adjustable									
		Immersion length (X), 2 to 96"									
		1	4"								
		2	6"								
		3	9"								
		4	12"								
		8	.... " (Specify increment 0.5")								
			Sheath diameter; Material								
			B	1/8"; 316 SS							
			C	3/16"; 316 SS							
			E	¼"; 316 SS							
			F	3/8"; 316 SS							
			J	1/8"; Inconel 600							
			K	3/16"; Inconel 600							
			L	¼"; Inconel 600							
			M	3/8"; Inconel 600							
				Sensor Type; Class (standard accuracy)							
				A	1 x J; std.						
				B	2 x J; std.						
				E	1 x K; std.						
				F	2 x K; std.						
				J	1 x E; std.						
				K	2 x E; std						
				N	1 x N; std.						
				O	2 x N; std						
				R	1 x T; std						
				S	2 x T; std						
				Y	For Special version/ (TC combinations and special accuracy available, consult E+H sales representative)						
					Junction Style						
					1	Grounded					
					2	Ungrounded					
						Enclosure; Cable entry					
						J	Alu field housing; 2 x Input + NPT ½" + HART				
						K	Alu field housing; NPT ½" + HART + 2 x Input + display				
						L	Alu field housing; 2 x Input + FF + NPT ½"				
						M	Alu field housing; NPT ½" + FF + 2 x Input + display				
							Electrical connection				
								for single compartment, consult E+H Sales representative			
							I	TMT162, dual compartment			
							J	TMT162, FM IS, dual compartment			
							K	TMT162, CSA IS, dual compartment			
								Documentation required			
								1	Not selected		
								9	Special version		
									Test; Calibration		
									A	Not selected	
									B	Sensor calibration certificate	
										Version	
										K	Standard
										Y	Special version
											Additional option
											1 Not selected
											2 PROFIBUS PA plug M12
											3 Foundation Fieldbus plug 7/8"
											4 Plastic cable gland
											9 Special version
TH51-											**Enter desired product structure**

TH53 TC General Purpose

threaded thermowell, TC assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (std.)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

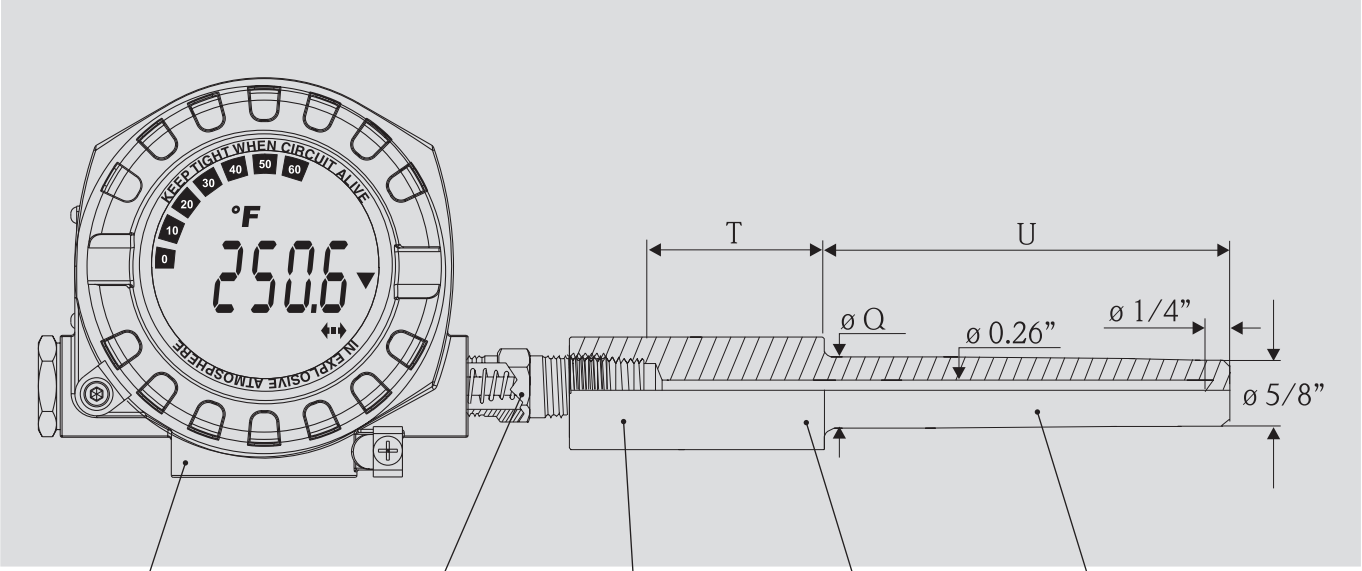
Ordering Information

Product Structure, General Purpose TC assembly with advanced TMT162, TH53

TH53	**General thermocouple assembly with thermowell, US Style, TH53**												
	TW Immersion length (U)												
	1	2½"											
	2	4½"											
	3	7½"											
	4	10½"											
	5	13½"											
	6	16½"											
	7	22½"											
	8	.... " (Specify increment 0.5")											
	Y	Special version - longer lengths up to 108" are available on request											
		Process Connection; Material of Construction											
		A1	½" NPT, 316 SS										
		A2	¾" NPT, 316 SS										
		A3	1" NPT, 316 SS										
		YY	Many other sizes and materials available, consult you E+H sales representative										
			Thermowell shape										
			2	Stepped, Standard Duty									
			3	Tapered, Heavy Duty									
				Thermowell Lag (T)									
				A	None								
				E	3"								
				X	....." (specify increment 0.5")								
					Extension (E)								
					1	Hex nipple 316 SS, E=1"							
					2	Nipple+Union+Nipple 316 SS, E=4"							
					3	Hex nipple Steel, E=1"							
					4	Nipple+Union+Nipple Steel, E=4"							
					5	Nipple+Union+Nipple Steel, E=7"							
					6	Nipple+Union+Nipple 316 SS, E=7"							
						Sensor Type; Class; Material							
						A	1 x J; 2; Insert 316SS						
						B	2 x J; 2; Insert 316SS						
						E	1 x K; 2, Insert Inconel 600						
						F	2 x K; 2, Insert Inconel 600						
						J	1 x E; 2, Insert Inconel 600						
						K	2 x E; 2, Insert Inconel 600						
						N	1 x N; 2, Insert Inconel 600						
						O	2 x N; 2, Insert Inconel 600						
						R	1 x T; 2, Insert 316SS						
						S	2 x T; 2, Insert 316SS						
							Junction style						
							1	Grounded					
							2	Ungrounded					
								Enclosure; Cable entry					
								J	Alu field housing; 2 x Input + NPT ½" + HART				
								K	Alu field housing; NPT ½" + HART + 2 x Input + display				
								L	Alu field housing; 2 x Input + FF + NPT ½"				
								M	Alu field housing; NPT ½" + FF + 2 x Input + display				
									Electrical connection				
									I	TMT162, dual compartment			
									J	TMT162, FM IS, dual compartment			
									K	TMT162, CSA IS, dual compartment			
										Additional option			
										1	Not selected		
										2	PROFIBUS PA plug M12		
										3	Foundation Fieldbus plug 7/8"		
										4	Plastic cable gland		
											Test; Calibration		
											A	Not selected	
											B	Sensor calibration certificate	
											C	Material traceability certificate	
												Version	
												K	Standard
												L	With Certificate of Compliance
TH53-													**Enter desired product structure**

TH53 TC General Purpose

weld-in / socket thermowell, TC assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
NUN E=4”	
NUN E=7”	

Lag, T
3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld in
1” weld in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (std.)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

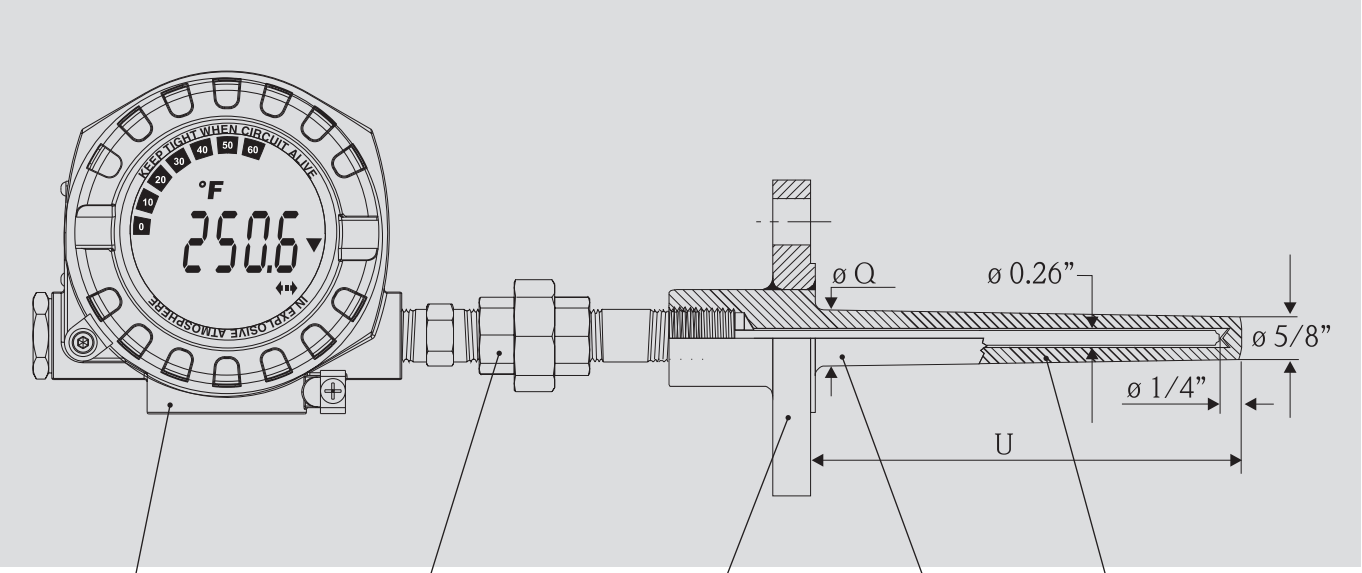
Ordering Information

Product Structure, General Purpose TC assembly with advanced TMT162, TH53

TH53	**General thermocouple assembly with thermowell, US Style, TH53**											
	TW Immersion length (U)											
	1	2½”										
	2	4½”										
	3	7½”										
	4	10½”										
	5	13½”										
	6	16½”										
	7	22½”										
	8	.... “ (Specify increment 0.5”)										
	Y	Special version - longer lengths up to 108” are available on request										
		Process Connection; Material of Construction										
		B1	Socket weld ¾”, 316 SS									
		B2	Socket weld 1”, 316 SS									
		C1	Weld-in ¾”, 316 SS									
		C2	Weld-in 1”, 316 SS									
		YY	Many other sizes and materials available, consult you E+H sales representative									
			Thermowell shape									
			2	Stepped, Standard Duty								
			3	Tapered, Heavy Duty								
				Thermowell Lag (T)								
				A	None							
				E	3”							
				X	.....” (specify increment 0.5”)							
					Extension (E)							
					1	Hex nipple 316 SS, E=1”						
					2	Nipple+Union+Nipple 316 SS, E=4”						
					3	Hex nipple Steel, E=1”						
					4	Nipple+Union+Nipple Steel, E=4”						
					5	Nipple+Union+Nipple Steel, E=7”						
					6	Nipple+Union+Nipple 316 SS, E=7”						
						Sensor Type; Class; Material						
						A	1 x J; 2; Insert 316SS					
						B	2 x J; 2; Insert 316SS					
						E	1 x K; 2, Insert Inconel 600					
						F	2 x K; 2, Insert Inconel 600					
						J	1 x E; 2, Insert Inconel 600					
						K	2 x E; 2, Insert Inconel 600					
						N	1 x N; 2, Insert Inconel 600					
						O	2 x N; 2, Insert Inconel 600					
						R	1 x T; 2, Insert 316SS					
						S	2 x T; 2, Insert 316SS					
							Junction style					
							1	Grounded				
							2	Ungrounded				
								Enclosure; Cable entry				
								J	Alu field housing; 2 x Input + NPT ½” + HART			
								K	Alu field housing; NPT ½” + HART + 2 x Input + display			
								L	Alu field housing; 2 x Input + FF + NPT ½”			
								M	Alu field housing; NPT ½” + FF + 2 x Input + display			
									Electrical connection			
									I	TMT162, dual compartment		
									J	TMT162, FM IS, dual compartment		
									K	TMT162, CSA IS, dual compartment		
										Additional option		
										1	Not selected	
										2	PROFIBUS PA plug M12	
										3	Foundation Fieldbus plug 7/8”	
										4	Plastic cable gland	
											Test; Calibration	
											A	Not selected
											B	Sensor calibration certificate
											C	Material traceability certificate
												Version
												K	Standard
												L	With Certificate of Compliance
TH53-													**Enter desired product structure**

TH54 TC General Purpose

flanged thermowell, TC assembly with advanced TMT162 transmitter for critical control applications



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel, 316 SS
NUN E=4"	
NUN E=7"	

Flange size	Rating
1" 316 SS	150 psi RF
1½" 316 SS	300 psi RF
2" 316 SS	600 psi RF

Shank O. D.
7/8"
1-1/16"
1-1/16"

Immersion length, U
2", 4", 7", 10", 13", 16", 22" (standard)
2" to 18" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

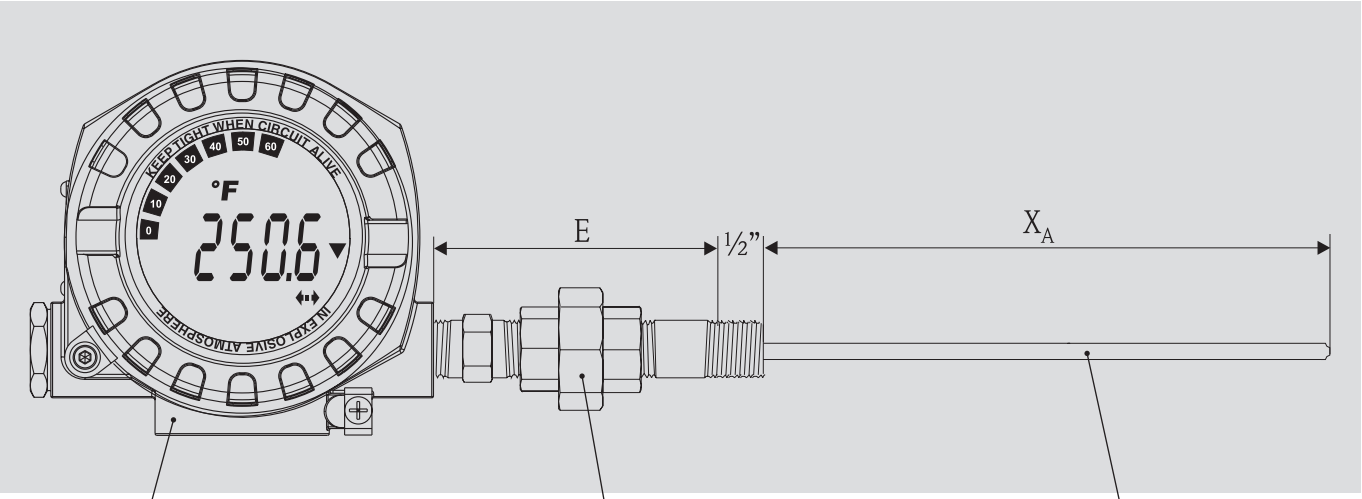
Ordering Information

Product Structure, general flanged thermcouple assembly, TH54

TH54	**General flanged thermocouple assembly with thermowell, US Style, TH54**												
	TW Immersion length (U)												
	1	2”											
	2	4”											
	3	7”											
	4	10”											
	5	13”											
	6	16”											
	7	22”											
	8	.... “ (Specify increment 0.5”)											
		Flange size; TW Material											
		A	1”, 316 SS										
		B	1½”, 316 SS										
		C	2”, 316 SS										
		Y	For larger sizes/different construction materials - consult your E+H sales representative										
			Rating; Flange Type										
			1	150 psi, RF									
			2	300 psi, RF									
			3	600 psi; RF									
			Y	higher ratings available on request- consult your E+H sales representative									
				Thermowell shape; Welding									
				1	Straight; Standard								
				2	Tapered; Standard								
					TW Lag length (T)								
					A	None							
					X	....” (increment 0.5”)							
						Extension (E)							
						1	Hex nipple 316 SS, E=1”						
						2	Nipple+Union+Nipple 316 SS, E=4”						
						3	Hex nipple Steel, E=1”						
						4	Nipple+Union+Nipple Steel, E=4”						
						5	Nipple+Union+Nipple Steel, E=7”						
						6	Nipple+Union+Nipple 316 SS, E=7”						
							Sensor Type						
							A	1 x J; class 2, Insert 316SS					
							B	2 x J; class 2, Insert 316SS					
							E	1 x K; class 2, Insert Inconel 600					
							F	2 x K; class 2, Insert Inconel 600					
							J	1 x E; class 2, Insert Inconel 600					
							K	2 x E; class 2, Insert Inconel 600					
							N	1 x N; class 2, Insert Inconel 600					
							O	2 x N; class 2, Insert Inconel 600					
							R	1 x T; class 2, Insert 316SS					
							S	2 x T; class 2, Insert 316SS					
								Junction style					
								1	Grounded				
								2	Ungrounded				
									Enclosure; Cable entry				
									J	Alu field housing; 2 x Input + NPT ½” + HART			
									K	Alu field housing; NPT ½” + HART + 2 x Input + display			
									L	Alu field housing; 2 x Input + FF + NPT ½”			
									M	Alu field housing; NPT ½” + FF + 2 x Input + display			
										Electrical connection			
										I	TMT162, dual compartment		
										J	TMT162, FM IS, dual compartment		
										K	TMT162, CSA IS, dual compartment		
											Additional option		
											1	Not selected	
											2	PROFIBUS PA plug M12	
											3	Foundation Fieldbus plug 7/8”	
											4	Plastic cable gland	
												Additional option 2	
												A	Not selected
												B	Sensor calibration certificate
												C	Material traceability certificate
													Version
													K	Standard
													L	With Certificate of Compliance
TH54-													**Enter desired product structure**

TH55 TC General Purpose

spring loaded insert, TC assembly with advanced TMT162 transmitter for critical control applications (for existing thermowells)



Enclosure
Aluminum field housing (TMT162)

Extension	
Type	**Material**
Hex Nipple E=1"	Steel, 316 SS
NUN E=4"	
NUN E=7"	

Immersion length, X_A
4", 6", 9", 12", 14" (standard)
4" to 30" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, general thermocouple assembly, spring-loaded TH55

TH55-	**General thermocouple assembly without thermowell, spring-loaded, US Style, TH55**										
	Immersion length (X_A)										
	1	4”									
	2	6”									
	3	9”									
	4	12”									
	5	14”									
	8	.... “ (Specify increment 0.5”)									
		Sheath diameter									
		A	¼”, 316 SS								
		B	¼”, Inconel 600								
			Extension (E)								
			1	Hex nipple 316 SS, E=1”							
			2	Nipple+Union+Nipple 316 SS, E=4”							
			3	Hex nipple Steel, E=1”							
			4	Nipple+Union+Nipple Steel, E=4”							
			5	Nipple+Union+Nipple Steel, E=7”							
			6	Nipple+Union+Nipple 316 SS, E=7”							
				Sensor Type							
				A	1x J; class 2						
				B	2x J; class 2						
				E	1x K; class 2						
				F	2x K; class 2						
				J	1x E; class 2						
				K	2x E; class 2						
				N	1x N; class 2						
				O	2x N; class 2						
				R	1x T; class 2						
				S	2x T; class 2						
					Junction style						
					1	Grounded					
					2	Ungrounded					
						Enclosure; Cable entry					
						J	Alu field housing; 2 x Input + NPT ½” + HART				
						K	Alu field housing; NPT ½” + HART + 2 x Input + display				
						L	Alu field housing; 2 x Input + FF + NPT ½”				
						M	Alu field housing; NPT ½” + FF + 2 x Input + display				
							Electrical connection				
							I	TMT162, dual compartment			
							J	TMT162, FM IS, dual compartment			
							K	TMT162, CSA IS, dual compartment			
								Documentation required			
								1	Not selected		
								2	with Certificate of Conformance		
									Additional option 1		
									A	Not selected	
									B	Sensor calibration certificate	
										Version	
										K	Standard
											Additional option 2
											1 Not selected
											2 PROFIBUS PA plug M12
											3 Foundation Fieldbus plug 7/8”
											4 Plastic cable gland
TH55-									**K**		**Enter desired product structure**

Explosion proof assemblies

Your safety is of paramount importance to us at Endress+Hauser.

Approved enclosure (terminal head), electrical connection and transmitter (when required)

+

Flame proof lamination union

+

Pipe nipple or nipple union nipple (NUN) with special thread tolerances

+

At least 5 threads must engage between nipple and thermowell

=

Explosion proof design

Explosion proof design + Transmitters with SIL2 & advanced diagnostics + Endress+Hauser quality manufacturing = Safe + Reliable

As costs continue to rise and liabilities extend into the future, plant safety and reliability demands focus and expert attention.
The Explosion proof temperature assemblies are manufactured as per stringent requirements of FM & CSA, referenced to NEC 500 (USA) & CEC sec 18 (Canada) codes, respectively. They are assembled under highest quality standards.

Endress+Hauser can provide you with correctly designed, manufactured and documented measurement points.

Your advantage? A safer and more reliable plant. Lower risk and higher productivity!

Hazardous area classifications in North America (FM/CSA)

Class

I	Flammable gases or vapors are present in the air in quantities sufficient to produce explosive or ignitable mixtures.
II	Combustible or conductive dusts are present.
III	Ignitable fibers or flyings are present, but not likely to be in suspension in sufficient quantities to produce ignitable mixtures. (Group classifications are not applied to this class.)

Division

1	The substance referred to by class is present during normal conditions.
2	The substance referred to by class is present only in abnormal conditions, such as a container failure or system breakdown.

Zone

0	Ignitable mixture present for long periods
1	Ignitable mixture present intermittently
2	Ignitable mixture not normally present

Group

A	Acetylene
B	Hydrogen (or gases of equivalent hazard)
C	Ethylene (or gases of equivalent hazard)
D	Gasoline (or gases of equivalent hazard)
E	Metal Dust
F	Coal Dust
G	Grain Dust

Temperature

	°F	°C
T1	842	450
T2	572	300
T3	392	200
T4	275	135
T5	212	100
T6	185	85

T1x Explosion Proof, thermowell, RTD assembly with heavy duty connection heads

Demanding monitoring and controlling temperature measurement applications require the heavy-duty T1x assembly. This product is especially manufactured for the chemical, oil & gas, petrochemical and refinery applications.

Material selection
Especially designed heavy duty heads with ultra low copper ensures high corrosion resistance in saline and harsh environments. Additionally the ergonomic design eases installation and wiring on site. The use of 316 SS as a standard, high purity ceramics and carefully tested sensors and cables further enhances the durability of the product.

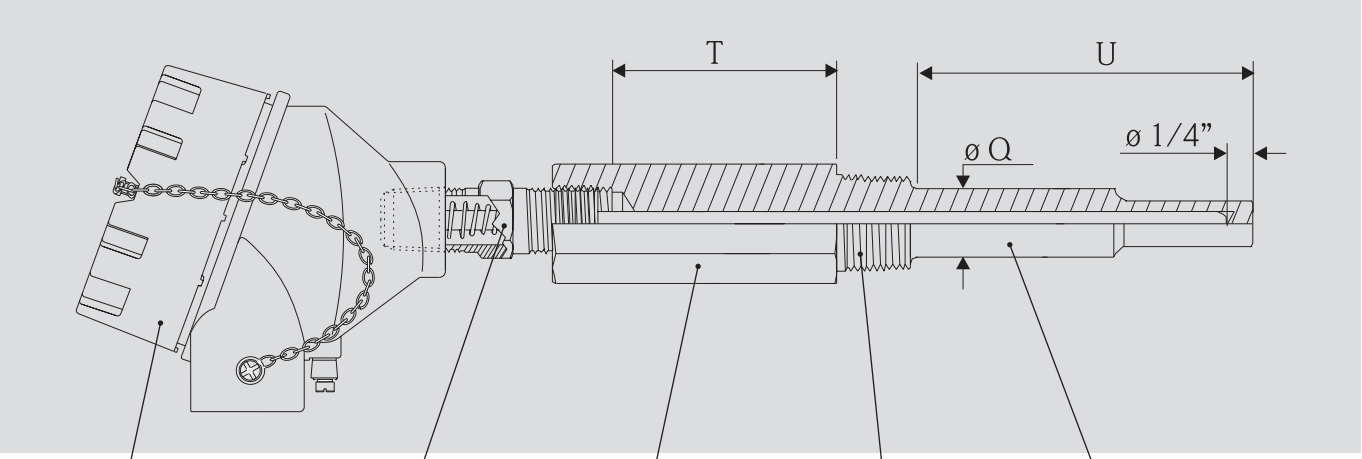
Design
Correct design of components and parts help avoid accidents and contain damage in the event of an explosion.

Details
The special molybdenum based coat on threads ensures that threads don't lock up in harsh environments.

Signal immunity and measurement performance
The assemblies are available with Endress+Hauser's robust TMT series of In-head DIN B size temperature transmitters with 4-20 mA, HART, Profibus PA and FOUNDATION™ Fieldbus outputs. These offer 2 kV of galvanic isolation and a highly accurate measurement.

T13 Explosion proof RTD assembly

Threaded thermowell, with heavy duty connection heads



Enclosure / Terminal head
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

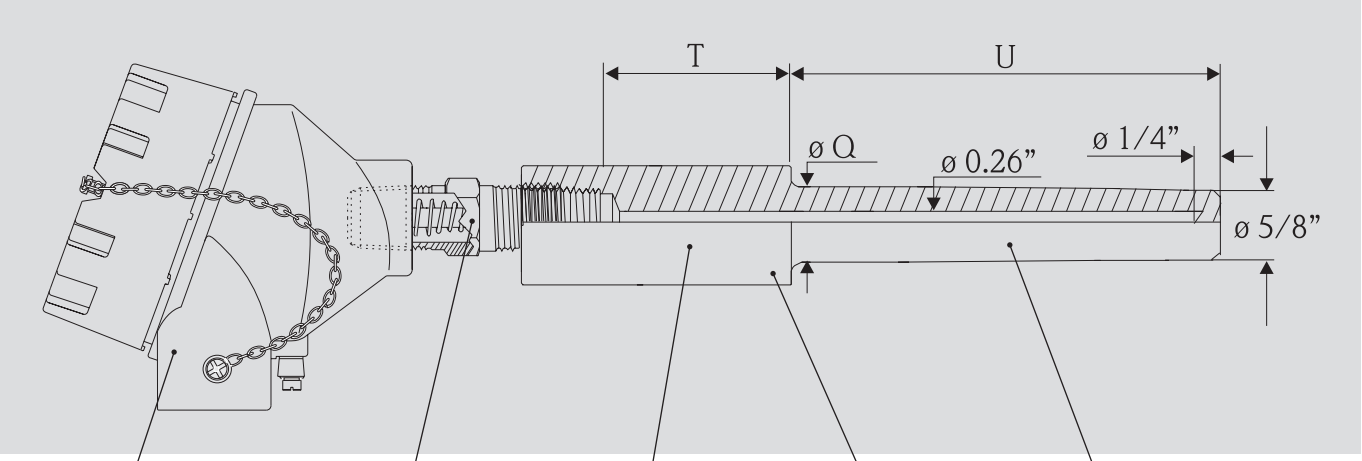
Ordering Information

Product Structure, Explosion proof RTD assembly, T13

T13-	**RTD assembly, TW-Type XP U.S. Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape:											
		2	Stepped										
		3	Tapered										
			Process Connection:										
			A1	Thread ½" NPT; 316 SS									
			A2	Thread ¾" NPT; 316 SS									
			A3	Thread 1" NPT; 316 SS									
				Immersion length (U); 2-18" available for quick order; longer lengths available on request									
				1	2.5"								
				2	4.5"								
				3	7.5"								
				4	10.5"								
				5	13.5"								
				6	16.5"								
				7	22.5"								
				8	....." (2-18" incr. 0.5")								
				9	Longer lengths available - consult your E+H sales representative								
					Thermowell Lag, T: (1-6")								
					A	not selected							
					E	3"							
					X	....." (0.5" increments)							
						Extension:							
						1	Hex nipple steel E=1"						
						2	Hex nipple SS316 E=1"						
						3	Nipple+Union+Nipple steel E=4"						
						4	Nipple+Union+Nipple SS316 E=4"						
						5	Nipple+Union+Nipple steel E=7"						
						6	Nipple+Union+Nipple SS316 E=7"						
							Sensor Type:						
							E	1 Pt100 class B; 4 wire, -50 to 200 °C					
							F	1 Pt100 class B; 4 wire, -200 to 600 °C					
							G	1 Pt100 class A; 4 wire, -50 to 200 °C					
							H	1 Pt100 class A; 4 wire, -200 to 600 °C					
							J	2 Pt100 class B; 3 wire, -50 to 200 °C					
							K	2 Pt100 class B; 3 wire, -200 to 600 °C					
							L	2 Pt100 class A; 3 wire, -50 to 200 °C					
							M	2 Pt100 class A; 3 wire, -200 to 600 °C					
								Enclosure; Cable Entry:					
								A	Alu, E+H blue + cover, ½" NPT, Grp.A-G				
								B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G				
								C	Alu, grey + cover, ½" NPT, Grp.B-G				
								D	Alu, grey + cover, ¾" NPT, Grp.B-G				
								E	SS316 + cover, ½" NPT, Grp.B-G				
								F	SS316 + cover, ¾" NPT, Grp.B-G				
									Electrical Connection:				
									A	programmable RTD TMT180			
									B	programmable TMT181			
									C	HART TMT182			
									M	In Head DIN B FF			
									N	In Head Profibus PA			
									Y	Special version, to be specified			
									2	Flying leads			
									3	Terminal block			
										Version:			
										K	Standard, North American region		
											Additional Option 1:		
											A	not selected	
											B	Sensor calibration certificate	
											C	Material Tracebility Cerificate (MTR)	
												Additional Option 2:	
												1	not selected
												9	Additional options required- consult factory
T13-										**K**			**Enter desired product structure**

T13 Explosion proof RTD assembly

Weld-in / socket weld thermowell, with heavy duty connection heads



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld-in
1” weld-in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

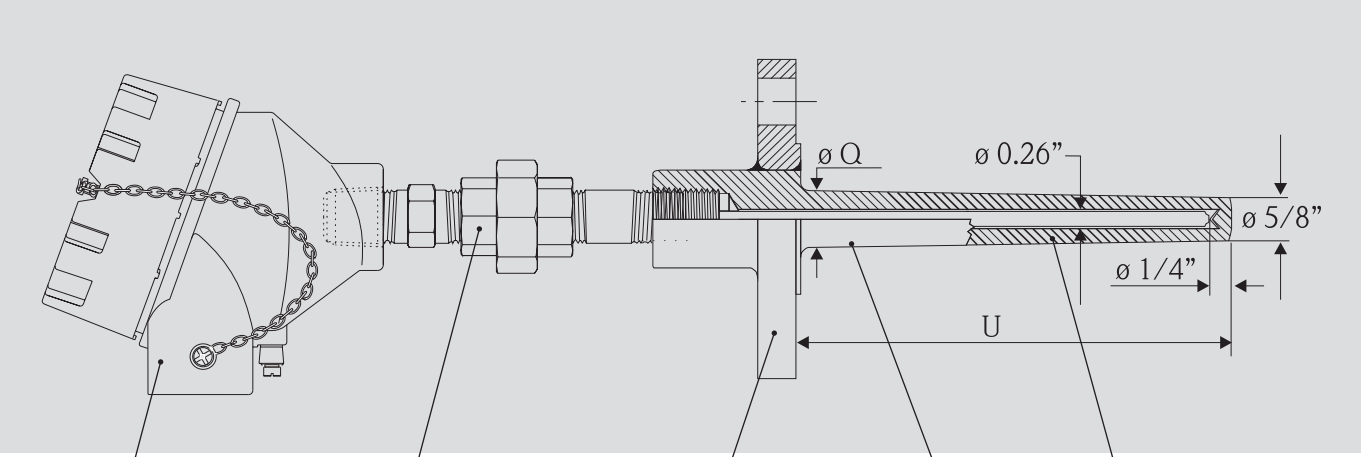
Ordering Information

Product Structure, Explosion proof RTD assembly, T13

T13-	**RTD assembly, TW-Type XP U.S. Style**											
	Approval:											
	D	FM XP DIP Class I,II,III Div. 1+2										
	E	FM XP NI DIP Class I,II,III Div. 1+2										
	F	CSA XP DIP Class I,II,III Div. 1+2										
	G	CSA XP NI DIP Class I,II,III Div. 1+2										
	J	FM/CSA XP DIP Class I,II,III Div. 1+2										
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2										
		Thermowell Shape:										
		2	Stepped									
		3	Tapered									
			Process Connection:									
			B1	Socket weld ¾" NPS; 316 SS								
			B2	Socket weld 1" NPS; 316 SS								
			C1	Weld-in ¾" NPS; 316 SS								
			C2	Weld-in 1" NPS; 316 SS								
				Immersion length (U); 2-18" available for quick order; longer lengths available on request								
				1	2.5"							
				2	4.5"							
				3	7.5"							
				4	10.5"							
				5	13.5"							
				6	16.5"							
				7	22.5"							
				8	....." (2-18" incr. 0.5")							
				9	Longer lengths available - consult your E+H sales representative							
					Thermowell Lag, T: (1-6")							
					A	not selected						
					E	3"						
					X	....." (0.5" increments)						
						Extension:						
						1	Hex nipple steel E=1"					
						2	Hex nipple SS316 E=1"					
						3	Nipple+Union+Nipple steel E=4"					
						4	Nipple+Union+Nipple SS316 E=4"					
						5	Nipple+Union+Nipple steel E=7"					
						6	Nipple+Union+Nipple SS316 E=7"					
							Sensor Type:					
							E	1 Pt100 class B; 4 wire, -50 to 200 °C				
							F	1 Pt100 class B; 4 wire, -200 to 600 °C				
							G	1 Pt100 class A; 4 wire, -50 to 200 °C				
							H	1 Pt100 class A; 4 wire, -200 to 600 °C				
							J	2 Pt100 class B; 3 wire, -50 to 200 °C				
							K	2 Pt100 class B; 3 wire, -200 to 600 °C				
							L	2 Pt100 class A; 3 wire, -50 to 200 °C				
							M	2 Pt100 class A; 3 wire, -200 to 600 °C				
								Enclosure; Cable Entry:				
								A	Alu, E+H blue + cover, ½" NPT, Grp.A-G			
								B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G			
								C	Alu, grey + cover, ½" NPT, Grp.B-G			
								D	Alu, grey + cover, ¾" NPT, Grp.B-G			
								E	SS316 + cover, ½" NPT, Grp.B-G			
								F	SS316 + cover, ¾" NPT, Grp.B-G			
									Electrical Connection:			
									A	programmable RTD TMT180		
									B	programmable TMT181		
									C	HART TMT182		
									M	In Head DIN B FF		
									N	In Head Profibus PA		
									Y	Special version, to be specified		
									2	Flying leads		
									3	Terminal block		
										Version:		
										K	Standard, North American region	
											Additional Option 1:	
											A	not selected
											B	Sensor calibration certificate
											C	Material Tracebility Cerificate (MTR)
												Additional Option 2:
												1 not selected
												9 Additional options required- consult factory
T13-										**K**		**Enter desired product structure**

T14 Explosion proof RTD assembly

Flanged thermowell, with heavy duty connection heads



Enclosure / Terminal head
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Flange size
1” 316 SS
1½” 316 SS
2” 316 SS

Rating
150 psi RF
300 psi RF
600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

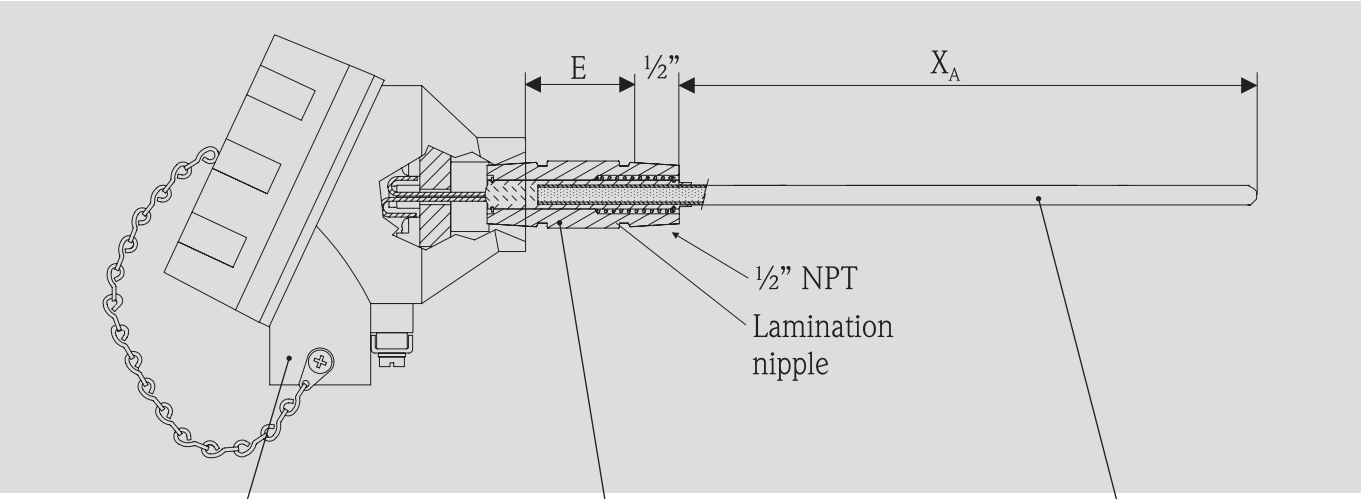
Ordering Information

Product Structure, Explosion proof RTD assembly, T14

T14-	**RTD assembly, flanged TW-Type XP U.S.Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape; Welding:											
		1	Straight; standard weld										
		2	Tapered; standard weld										
		3	Straight; full penetration										
		4	Tapered; full penetration										
			Flange Size; Thermowell Material:										
			A	1"; SS316									
			B	1.5"; SS316									
			C	2"; SS316									
			Y	Larger sizes available - consult your E+H sales representative									
				Rating, Flange type									
				1	150 psi; RF								
				2	300 psi; RF								
				3	600 psi; RF								
				9	Higher ratings up to 2500 and other types of faces available on request, please consult your E+H representative								
					Immersion length (U) 2-18" available for quick order; longer lengths available on request								
					1	2"							
					2	4"							
					3	7"							
					4	10"							
					5	13"							
					6	16"							
					7	22"							
					8	....." (2-18" incr. 0.5")							
					9	For longer lengths - Consult your E+H sales representative							
						Thermowell Lag, T: (1-6")							
						A	not selected						
						X	"(0.5" increment)						
							Extension:						
							1	Hex nipple steel E=1"					
							2	Hex nipple SS316 E=1"					
							3	Nipple+Union+Nipple steel E=4"					
							4	Nipple+Union+Nipple SS316 E=4"					
							5	Nipple+Union+Nipple steel E=7"					
							6	Nipple+Union+Nipple SS316 E=7"					
								Sensor Type:					
								E	1 Pt100 class B; 4 wire, -50 to 200 °C				
								F	1 Pt100 class B; 4 wire, -200 to 600 °C				
								G	1 Pt100 class A; 4 wire, -50 to 200 °C				
								H	1 Pt100 class A; 4 wire, -200 to 600 °C				
								J	2 Pt100 class B; 3 wire, -50 to 200 °C				
								K	2 Pt100 class B; 3 wire, -200 to 600 °C				
								L	2 Pt100 class A; 3 wire, -50 to 200 °C				
								M	2 Pt100 class A; 3 wire, -200 to 600 °C				
									Enclosure; Cable Entry:				
									A	Alu, E+H blue + cover, ½" NPT, Grp. A-G			
									B	Alu, E+H blue + cover, ¾" NPT, Grp. A-G			
									C	Alu, grey + cover, ½" NPT, Grp.B-G			
									D	Alu, grey + cover, ¾" NPT, Grp.B-G			
									E	SS316 + cover, ½" NPT, Grp.B-G			
									F	SS316 + cover, ¾" NPT, Grp.B-G			
										Electrical Connection:			
										A	programmable RTD TMT180		
										B	programmable TMT181		
										C	HART TMT182		
										M	In Head DIN B FF		
										N	In Head Profibus PA		
										Y	Special version, to be specified		
										2	Flying leads		
										3	Terminal block		
											Version:		
											K	Standard, North American region	
												Additional Option 1:	
												A	not selected
												B	Sensor calibration certificate
												C	Material Tracebility Cerificate (MTR)
T14-													**Enter desired product structure**

T15 Explosion proof RTD assembly

spring loaded sensor, with heavy duty connection heads and lamination nipple
The unique design of this assembly allows you to retain approvals even if the thermowell exists on site and was not purchased according to the requirements of the electrical code.
What's more it allows you to assemble the connection head or transmitter on site without infringing the approval.



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1"	Steel, 316 SS
Nipple -XP- Union Nipple E=4"	
Nipple -XP- Union Nipple E=7"	

Immersion length, X_A
2", 6", 9", 12" (standard)
1" to 100" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, Explosion proof RTD assembly, spring-loaded insert T15

T15-	**RTD assembly - replacement assembly for Explosion proof areas for exisiting thermowells**									
	Approval:									
	D	FM XP DIP Class I,II,III Div. 1+2								
	E	FM XP NI DIP Class I,II,III Div. 1+2								
	F	CSA XP DIP Class I,II,III Div. 1+2								
	G	CSA XP NI DIP Class I,II,III Div. 1+2								
	J	FM/CSA XP DIP Class I,II,III Div. 1+2								
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2								
		Immersion length (X_A) (1-100"):								
		1	4"							
		2	6"							
		3	9"							
		4	12"							
		8	....." (increment 0.5")							
			Sheath diameter:							
			A	¼"; SS316						
			C	3/8"; SS316						
				Extension:						
				5	Lam. Nipple SS316					
				6	Lam. Nipple+Union+Nipple SS316, E=4"					
				7	Lam. Nipple+Union+Nipple SS316, E=7"					
					Sensor Type:					
					E	1 Pt100 class B; 4 wire, -50 to 200 °C				
					F	1 Pt100 class B; 4 wire, -200 to 600 °C				
					G	1 Pt100 class A; 4 wire, -50 to 200 °C				
					H	1 Pt100 class A; 4 wire, -200 to 600 °C				
					J	2 Pt100 class B; 3 wire, -50 to 200 °C				
					K	2 Pt100 class B; 3 wire, -200 to 600 °C				
					L	2 Pt100 class A; 3 wire, -50 to 200 °C				
					M	2 Pt100 class A; 3 wire, -200 to 600 °C				
						Enclosure; Cable Entry:				
						A	Alu, E+H blue + cover, ½" NPT, Grp.A-G			
						B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G			
						C	Alu, grey + cover, ½" NPT, Grp.B-G			
						D	Alu, grey + cover, ¾" NPT, Grp.B-G			
						E	SS316 + cover, ½" NPT, Grp.B-G			
						F	SS316 + cover, ¾" NPT, Grp.B-G			
							Electrical Connection:			
							A	programmable RTD TMT180		
							B	programmable TMT181		
							C	HART TMT182		
							M	In Head DIN B FF		
							N	In Head Profibus PA		
							Y	Special version, to be specified		
							2	Flying leads		
							3	Terminal block		
								Version:		
								K	Standard, North American region	
									Additional Option 1:	
									A	not selected
									B	Sensor calibration certificate
									C	Material Tracebility Cerificate (MTR)
										Additional Option 2:
										1 not selected
										9 Additional options required- consult factory
T15-								**K**		**Enter desired product structure**

T1x Explosion proof, thermowell RTD assembly with advanced TMT162 transmitters for critical control and safety applications

The TMT162 gives these measurement instrument unique technological advantages.

The assembly offers improved safety and ease of installation through dual compartment transmitter housing design. The robust design makes it ideal for the demanding application in the petroleum upstream, downstream processes and heavy industries such as underground mining, hazardous chemicals and fossil fuel based power plants.

The completely potted electronics allow seamless operation in extreme temperatures and high precipitation & condensation areas.

The key features are:

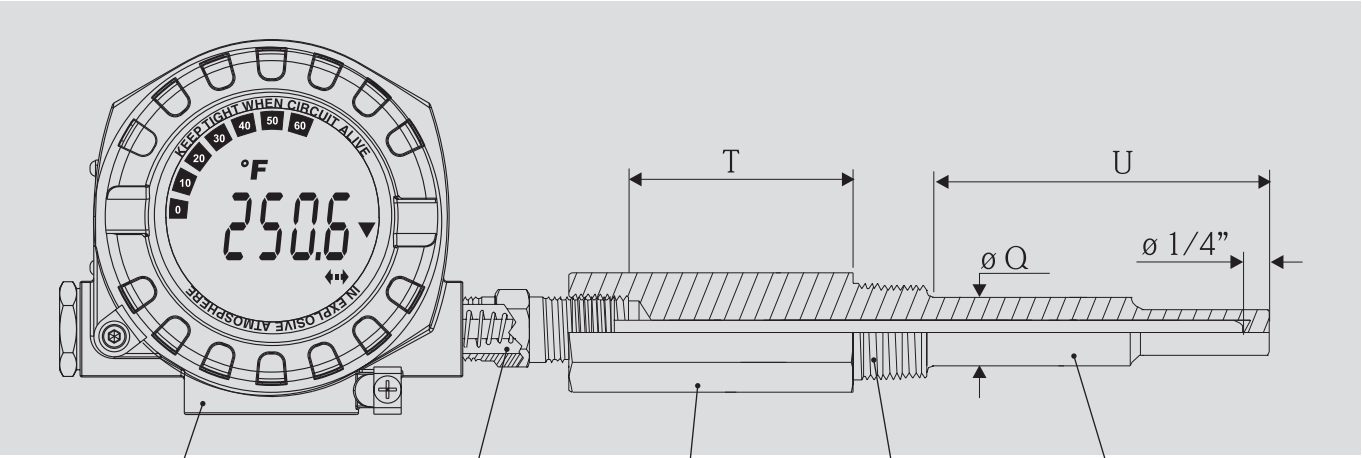
- Dual inputs, for automatic back up.
- Advanced diagnostic features.
- Best in class accuracy.
- Zero-corrosion* gold plated terminals.
- 2 kV galvanic signal isolation.
- Ultra low copper content and powder coating for corrosion resistance.
- Molybdenum based antiseize coating on threads.

All in all a heavy duty instrument built to last and perform! This transmitter is also available in cast 316L stainless steel for offshore applications.

* Gold plating ensures virtually no corrosion.

T13 Explosion proof RTD assembly

Threaded thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing) Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

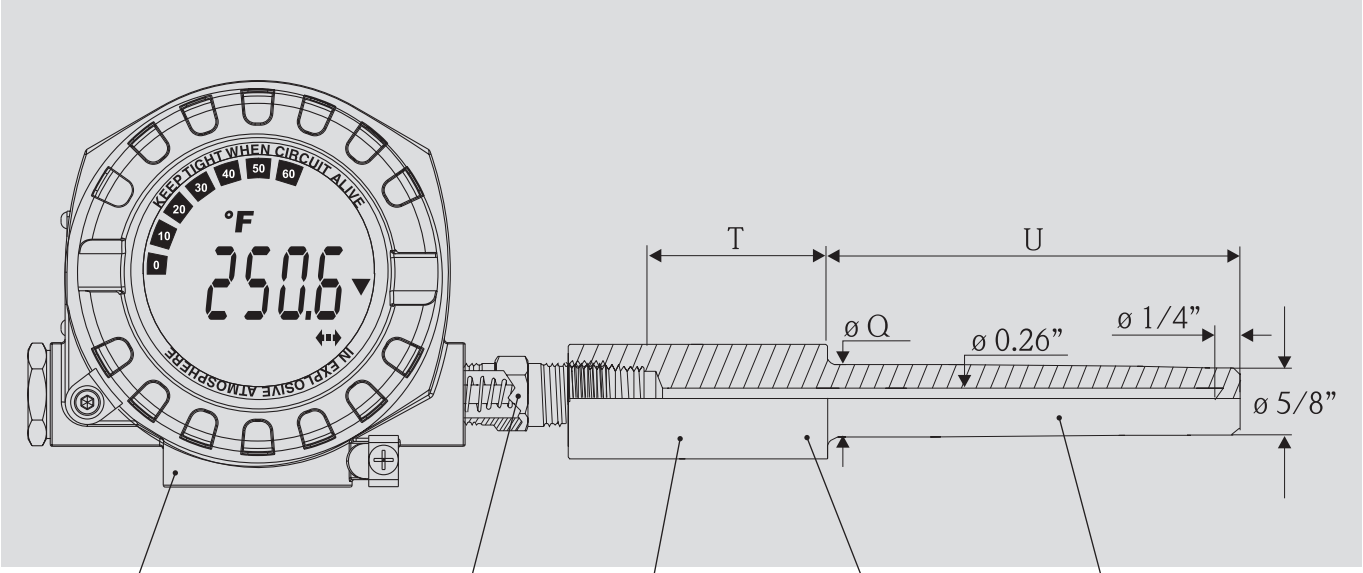
Ordering Information

Product Structure, Explosion proof RTD assembly, T13

T13-	**RTD assembly, TW-Type XP U.S. Style**											
	Approval:											
	D	FM XP DIP Class I,II,III Div. 1+2										
	E	FM XP NI DIP Class I,II,III Div. 1+2										
	F	CSA XP DIP Class I,II,III Div. 1+2										
	G	CSA XP NI DIP Class I,II,III Div. 1+2										
	J	FM/CSA XP DIP Class I,II,III Div. 1+2										
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2										
		Thermowell Shape:										
		2	Stepped									
		3	Tapered									
			Process Connection:									
			A1	Thread ½" NPT; 316 SS								
			A2	Thread ¾" NPT; 316 SS								
			A3	Thread 1" NPT; 316 SS								
				Immersion length (U); 2-18" available for quick order; longer lengths available on request								
				1	2.5"							
				2	4.5"							
				3	7.5"							
				4	10.5"							
				5	13.5"							
				6	16.5"							
				7	22.5"							
				8	....." (2-18" incr. 0.5")							
				9	Longer lengths available - consult your E+H sales representative							
					Thermowell Lag, T: (1-6")							
					A	not selected						
					E	3"						
					X	....." (0.5" increment)						
						Extension:						
						1	Hex nipple steel E=1"					
						2	Hex nipple SS316 E=1"					
						3	Nipple+Union+Nipple steel E=4"					
						4	Nipple+Union+Nipple SS316 E=4"					
						5	Nipple+Union+Nipple steel E=7"					
						6	Nipple+Union+Nipple SS316 E=7"					
							Sensor Type:					
							E	1 Pt100 class B; 4 wire, -50 to 200 °C				
							F	1 Pt100 class B; 4 wire, -200 to 600 °C				
							G	1 Pt100 class A; 4 wire, -50 to 200 °C				
							H	1 Pt100 class A; 4 wire, -200 to 600 °C				
							J	2 Pt100 class B; 3 wire, -50 to 200 °C				
							K	2 Pt100 class B; 3 wire, -200 to 600 °C				
							L	2 Pt100 class A; 3 wire, -50 to 200 °C				
							M	2 Pt100 class A; 3 wire, -200 to 600 °C				
								Enclosure; Cable Entry:				
								G	Alu field housing, ½" NPT, Grp. A-G			
								H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
								I	316L Field Housing, ½" NPT, Grp. A-G			
								J	316L Field Housing, Display, ½" NPT, Grp. A-G			
									Electrical Connection:			
									F	HART TMT162, 1 Input, Dual Compartment		
									G	HART TMT162, 2 Input, Dual Compartment		
									H	FF TMT162, 2 Input, Dual Compartment		
									I	HART TMT142, 1 Input, Single Compartment		
										Version:		
										K	Standard, North American region	
											Additional Option 1:	
											A	not selected
											B	Sensor calibration certificate
											C	Material Tracebility Cerificate (MTR)
												Additional Option 2:
												1 not selected
												9 Additional options required- consult factory
T13-										**K**		**Enter desired product structure**

T13 Explosion proof RTD assembly

Weld-in / socket weld thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing)
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld-in
1” weld-in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

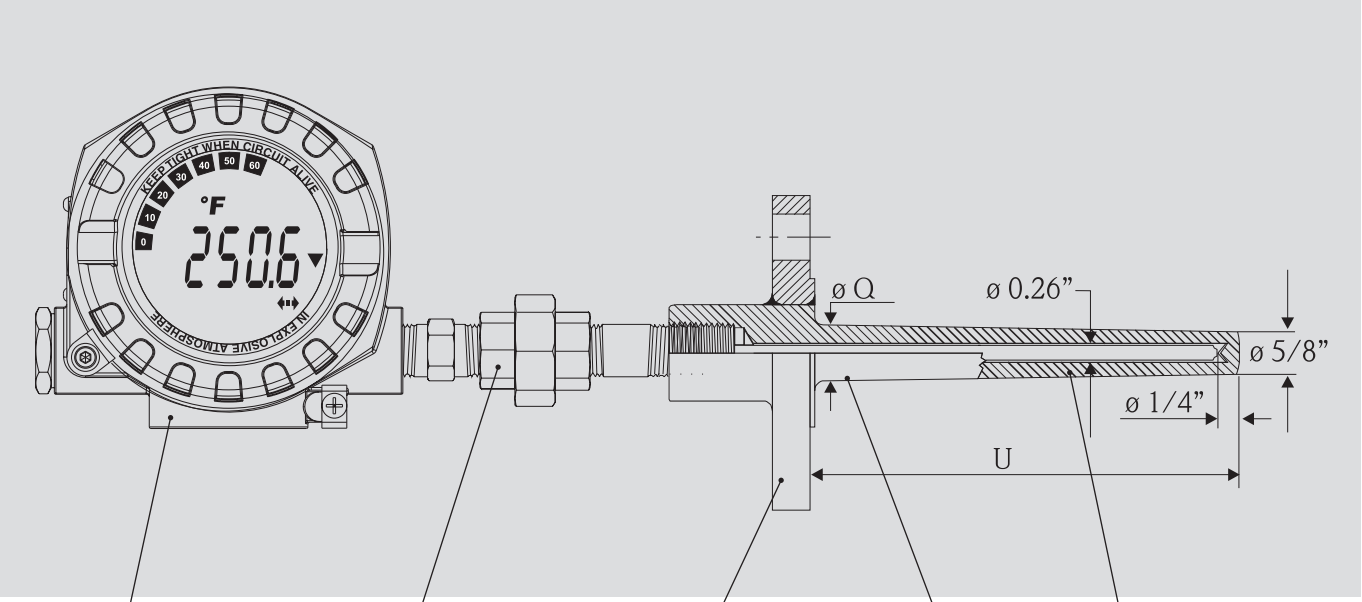
Ordering Information

Product Structure, Explosion proof RTD assembly, T13

T13-	**RTD assembly, TW-Type XP U.S. Style**											
	Approval:											
	D	FM XP DIP Class I,II,III Div. 1+2										
	E	FM XP NI DIP Class I,II,III Div. 1+2										
	F	CSA XP DIP Class I,II,III Div. 1+2										
	G	CSA XP NI DIP Class I,II,III Div. 1+2										
	J	FM/CSA XP DIP Class I,II,III Div. 1+2										
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2										
		Thermowell Shape:										
		2	Stepped									
		3	Tapered									
			Process Connection:									
			B1	Socket weld ¾" NPS; 316 SS								
			B2	Socket weld 1" NPS; 316 SS								
			C1	Weld-in ¾" NPS; 316 SS								
			C2	Weld-in 1" NPS; 316 SS								
				Immersion length (U); 2-18" available for quick order; longer lengths available on request								
				1	2.5"							
				2	4.5"							
				3	7.5"							
				4	10.5"							
				5	13.5"							
				6	16.5"							
				7	22.5"							
				8	....." (2-18" incr. 0.5")							
				9	Longer lengths available - consult your E+H sales representative							
					Thermowell Lag, T: (1-6")							
					A	not selected						
					E	3"						
					X	....." (0.5" increment)						
						Extension:						
						1	Hex nipple steel E=1"					
						2	Hex nipple SS316 E=1"					
						3	Nipple+Union+Nipple steel E=4"					
						4	Nipple+Union+Nipple SS316 E=4"					
						5	Nipple+Union+Nipple steel E=7"					
						6	Nipple+Union+Nipple SS316 E=7"					
							Sensor Type:					
							E	1 Pt100 class B; 4 wire, -50 to 200 °C				
							F	1 Pt100 class B; 4 wire, -200 to 600 °C				
							G	1 Pt100 class A; 4 wire, -50 to 200 °C				
							H	1 Pt100 class A; 4 wire, -200 to 600 °C				
							J	2 Pt100 class B; 3 wire, -50 to 200 °C				
							K	2 Pt100 class B; 3 wire, -200 to 600 °C				
							L	2 Pt100 class A; 3 wire, -50 to 200 °C				
							M	2 Pt100 class A; 3 wire, -200 to 600 °C				
								Enclosure; Cable Entry:				
								G	Alu field housing, ½" NPT, Grp. A-G			
								H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
								I	316L Field Housing, ½" NPT, Grp. A-G			
								J	316L Field Housing, Display, ½" NPT, Grp. A-G			
									Electrical Connection:			
									F	HART TMT162, 1 Input, Dual Compartment		
									G	HART TMT162, 2 Input, Dual Compartment		
									H	FF TMT162, 2 Input, Dual Compartment		
									I	HART TMT142, 1 Input, Single Compartment		
										Version:		
										K	Standard, North American region	
											Additional Option 1:	
											A	not selected
											B	Sensor calibration certificate
											C	Material Tracebility Cerificate (MTR)
												Additional Option 2:
												1 not selected
												9 Additional options required- consult factory
T13-										**K**		**Enter desired product structure**

T14 Explosion proof RTD assembly

Flanged thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing) Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Flange size	Rating
1” 316 SS	150 psi RF
1½” 316 SS	300 psi RF
2” 316 SS	600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

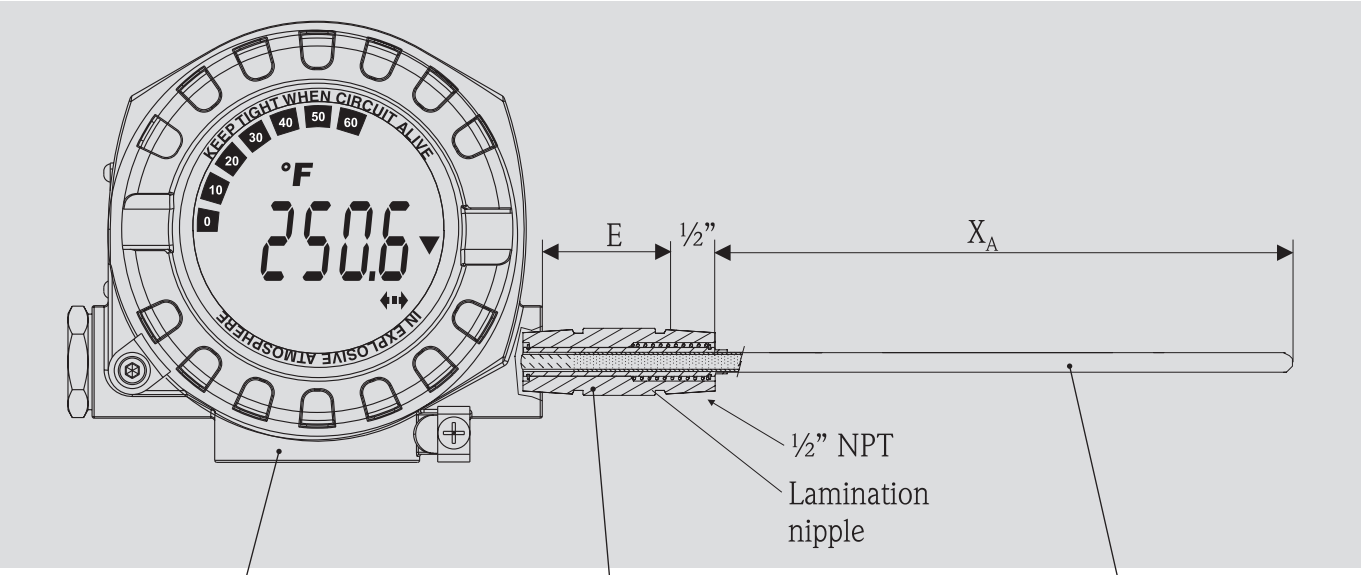
Ordering Information

Product Structure, Explosion proof RTD assembly, T14

T14-	**RTD assembly, flanged TW-Type XP U.S.Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape; Welding:											
		1	Straight; standard weld										
		2	Tapered; standard weld										
		3	Straight; full penetration										
		4	Tapered; full penetration										
			Flange Size; Thermowell Material:										
			A	1"; SS316									
			B	1.5"; SS316									
			C	2"; SS316									
			Y	Larger sizes available - consult your E+H sales representative									
				Rating, Flange type									
				1	150 psi; RF								
				2	300 psi; RF								
				3	600 psi; RF								
				9	Higher ratings up to 2500 and other types of faces available on request, please consult your E+H representative								
					Immersion length (U) 2-18" available for quick order; longer lengths available on request								
					1	2"							
					2	4"							
					3	7"							
					4	10"							
					5	13"							
					6	16"							
					7	22"							
					8	....." (2-18" incr 0.5")							
					9	For longer lengths - Consult your E+H sales representative							
						Thermowell Lag, T: (1-6")							
						A	not selected						
						X	....." (0.5" increment)						
							Extension:						
							1	Hex nipple steel E=1"					
							2	Hex nipple SS316 E=1"					
							3	Nipple+Union+Nipple steel E=4"					
							4	Nipple+Union+Nipple SS316 E=4"					
							5	Nipple+Union+Nipple steel E=7"					
							6	Nipple+Union+Nipple SS316 E=7"					
								Sensor Type:					
								E	1 Pt100 class B; 4 wire, -50 to 200 °C				
								F	1 Pt100 class B; 4 wire, -200 to 600 °C				
								G	1 Pt100 class A; 4 wire, -50 to 200 °C				
								H	1 Pt100 class A; 4 wire, -200 to 600 °C				
								J	2 Pt100 class B; 3 wire, -50 to 200 °C				
								K	2 Pt100 class B; 3 wire, -200 to 600 °C				
								L	2 Pt100 class A; 3 wire, -50 to 200 °C				
								M	2 Pt100 class A; 3 wire, -200 to 600 °C				
									Enclosure; Cable Entry:				
									G	Alu field housing, ½" NPT, Grp. A-G			
									H	Alu field housing, 1x ½" NPT + display			
									J	316L Field Housing, ½" NPT, Grp. A-G			
									I	316L Field Housing, Display, ½" NPT, Grp. A-G			
										Electrical Connection:			
										F	HART TMT162, 1 Input, Dual Compartment		
										G	HART TMT162, 2 Input, Dual Compartment		
										H	FF TMT162, 2 Input, Dual Compartment		
										I	HART TMT142, 1 Input, Single Compartment		
											Version:		
											K	Standard, North American region	
												Additional Option 1:	
												A	not selected
												B	Sensor calibration certificate
												C	Material Tracebility Cerificate (MTR)
T14-													**Enter desired product structure**

T15 Explosion proof RTD assembly

spring loaded sensor, with advanced TMT162 transmitter and lamination nipple for critical control and safety applications
The unique design of this assembly allows you to retain approvals even if the thermowell exists on site and was not purchased according to the requirements of the electrical code.
What's more it allows you to assemble the connection head or transmitter on site without infringing the approval.



Enclosure (Field housing)
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1"	Steel, 316 SS
Nipple -XP- Union Nipple E=4"	
Nipple -XP- Union Nipple E=7"	

Immersion length, X_A
4", 6", 9", 12" (standard)
1" to 100" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, Explosion proof RTD assembly, spring-loaded insert T15

T15-	**RTD assembly - replacement assembly for Explosion proof areas for exisiting thermowells**									
	Approval:									
	D	FM XP DIP Class I,II,III Div. 1+2								
	E	FM XP NI DIP Class I,II,III Div. 1+2								
	F	CSA XP DIP Class I,II,III Div. 1+2								
	G	CSA XP NI DIP Class I,II,III Div. 1+2								
	J	FM/CSA XP DIP Class I,II,III Div. 1+2								
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2								
		Immersion length (X_A) (1-100"):								
		1	4"							
		2	6"							
		3	9"							
		4	12"							
		8	....." (increment 0.5")							
			Sheath diameter:							
			A	¼"; SS316						
			C	3/8"; SS316						
				Extension:						
				5	Lam. Nipple SS316					
				6	Lam. Nipple+Union+Nipple SS316, E=3"					
				7	Lam. Nipple+Union+Nipple SS316, E=6"					
					Sensor Type:					
					E	1 Pt100 class B; 4 wire, -50 to 200 °C				
					F	1 Pt100 class B; 4 wire, -200 to 600 °C				
					G	1 Pt100 class A; 4 wire, -50 to 200 °C				
					H	1 Pt100 class A; 4 wire, -200 to 600 °C				
					J	2 Pt100 class B; 3 wire, -50 to 200 °C				
					K	2 Pt100 class B; 3 wire, -200 to 600 °C				
					L	2 Pt100 class A; 3 wire, -50 to 200 °C				
					M	2 Pt100 class A; 3 wire, -200 to 600 °C				
						Enclosure; Cable Entry:				
						G	Alu field housing, ½" NPT, Grp. A-G			
						H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
						I	316 L, field housing, ½" NPT, Grp. A-G			
						J	316 L, field housing, display, ½" NPT, Grp. A-G			
							Electrical Connection:			
							F	HART TMT162, 1 Input, Dual Compartment		
							G	HART TMT162, 2 Input, Dual Compartment		
							H	FF TMT162, 2 Input, Dual Compartment		
							I	HART TMT142, 1 Input, Single Compartment		
								Version:		
								K	Standard, North American region	
									Additional Option 1:	
									A	not selected
									B	Sensor calibration certificate
									C	Material Tracebility Cerificate (MTR)
										Additional Option 2:
										1 not selected
										9 Additional options required- consult factory
T15-								**K**		**Enter desired product structure**

T5x Explosion proof, thermowell, TC assembly with heavy duty connection heads

Demanding monitoring and controlling temperature measurement applications require the heavy-duty T5x assembly. This product is especially manufactured for the chemical, oil & gas, petrochemical and refinery applications.

Material selection
Especially designed heavy duty heads with ultra low copper ensures high corrosion resistance in saline and harsh environments additionally the ergonomic design eases installation and wiring on site. The use of 316SS as a standard, high purity ceramics and carefully tested sensors and cables further enhances the durability of the product.

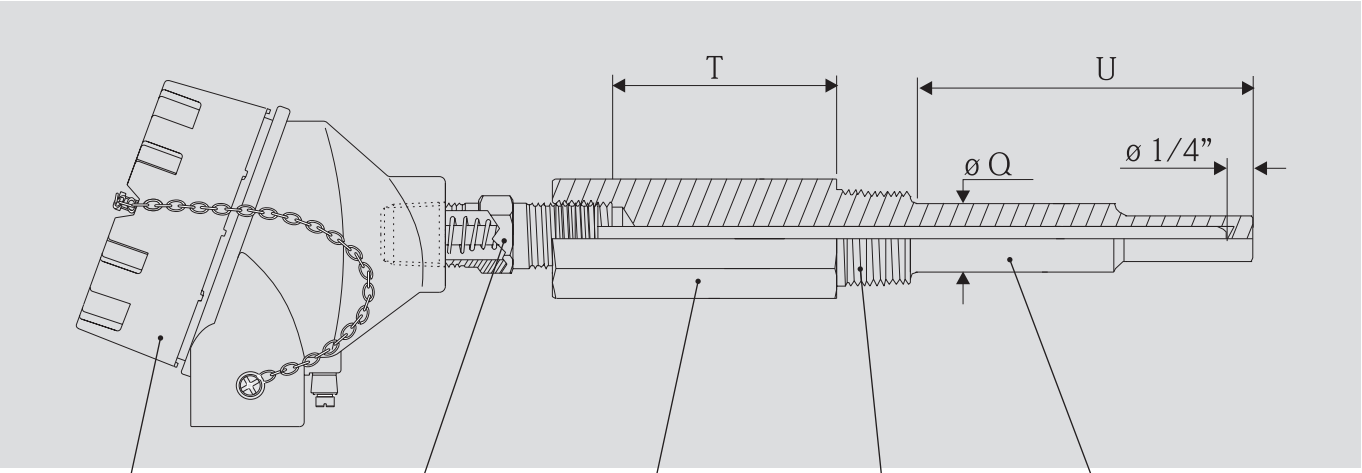
Design
Correct design of components and parts help avoid accidents and contain damage in the event of an explosion.

Details
The special molybdenum based coat on threads ensures that threads don't lock up in harsh environments.

Signal immunity and measurement performance
The assemblies are available with Endress+Hauser's robust TMT series of In-head DIN B size temperature transmitters with 4-20 mA, HART, Profibus PA and FOUNDATION™ Fieldbus outputs. These offer 2 kV of galvanic isolation and a highly accurate measurement.

T53 Explosion proof TC assembly

Threaded thermowell, with heavy duty connection heads



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

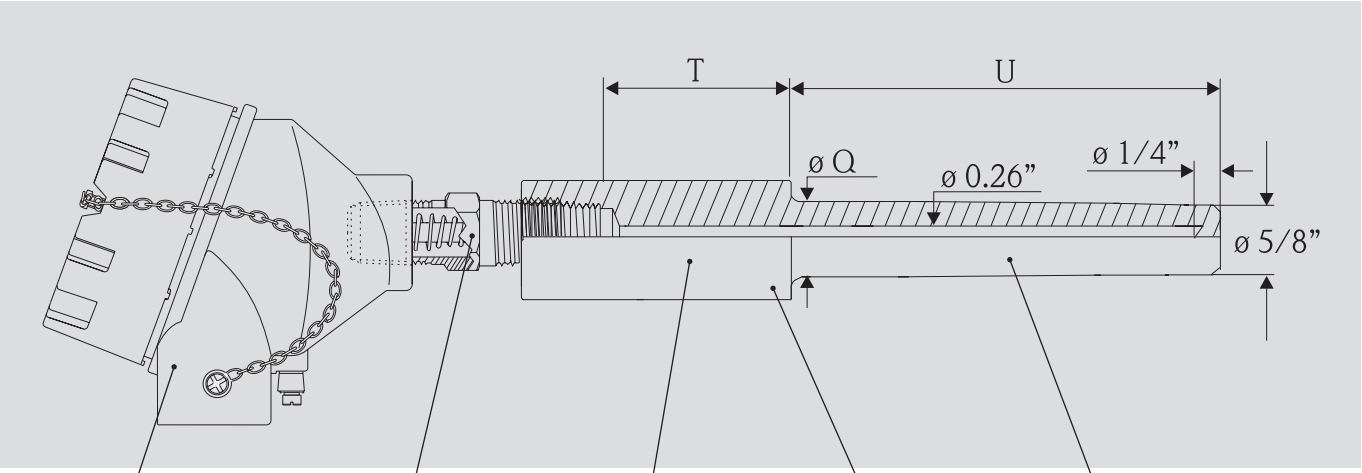
Ordering Information

Product Structure, Explosion proof TC assembly, T53

T53-	**TC assembly, TW-Type XP U.S. Style**										
	Approval:										
	D	FM XP DIP Class I,II,III Div. 1+2									
	E	FM XP NI DIP Class I,II,III Div. 1+2									
	F	CSA XP DIP Class I,II,III Div. 1+2									
	G	CSA XP NI DIP Class I,II,III Div. 1+2									
	J	FM/CSA XP DIP Class I,II,III Div. 1+2									
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2									
		Thermowell Shape:									
		2	Stepped								
		3	Tapered								
			Process Connection:								
			A1	Thread ½" NPT; 316 SS							
			A2	Thread ¾" NPT; 316 SS							
			A3	Thread 1" NPT; 316 SS							
				Immersion length (U); 2-18" available for quick order; longer lengths available on request							
				1	2.5"						
				2	4.5"						
				3	7.5"						
				4	10.5"						
				5	13.5"						
				6	16.5"						
				7	22.5"						
				8	....." (2-18" incr. 0.5")						
				9	Longer lengths available - consult your E+H sales representative						
					Thermowell Lag, T: (1-6")						
					A	not selected					
					E	3"					
					X	....." (0.5" increment)					
						Extension:					
						1	Hex nipple steel E=1"				
						2	Hex nipple SS316 E=1"				
						3	Nipple+Union+Nipple steel E=4"				
						4	Nipple+Union+Nipple SS316 E=4"				
						5	Nipple+Union+Nipple steel E=7"				
						6	Nipple+Union+Nipple SS316 E=7"				
							Sensor Type:				
							A	1 Type J class 2 (Insert SS316)			
							B	2 Type J class 2 (Insert SS316)			
							E	1 Type K class 2 (Insert Inconel 600)			
							F	2 Type K class 2 (Insert Inconel 600)			
							J	1 Type E class 2 (Insert Inconel 600)			
							K	2 Type E class 2 (Insert Inconel 600)			
							N	1 Type N class 2 (Insert Inconel 600)			
							O	2 Type N class 2 (Insert Inconel 600)			
							R	1 Type T class 2 (Insert SS316)			
							S	2 Type T class 2 (Insert SS316)			
								Enclosure; Cable Entry:			
								A	Alu, E+H blue + cover, ½" NPT, Grp.A-G		
								B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G		
								C	Alu, grey + cover, ½" NPT, Grp.B-G		
								D	Alu, grey + cover, ¾" NPT, Grp.B-G		
								E	SS316 + cover, ½" NPT, Grp.B-G		
								F	SS316 + cover, ¾" NPT, Grp.B-G		
									Electrical Connection:		
									A	programmable RTD TMT180	
									B	programmable TMT181	
									C	HART TMT182	
									M	In Head DIN B FF	
									N	In Head Profibus PA	
									Y	Special version, to be specified	
									2	Flying leads	
									3	Terminal block	
										Version:	
										K	Standard, North American region
											Additional Option 1:
											A not selected
											B Sensor calibration certificate
											C Material Tracebility Cerificate (MTR)
T53-										**K**	**Enter desired product structure**

T53 Explosion proof TC assembly

Weld-in / socket weld thermowell, with heavy duty connection heads



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
¾” weld-in
1” weld-in

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

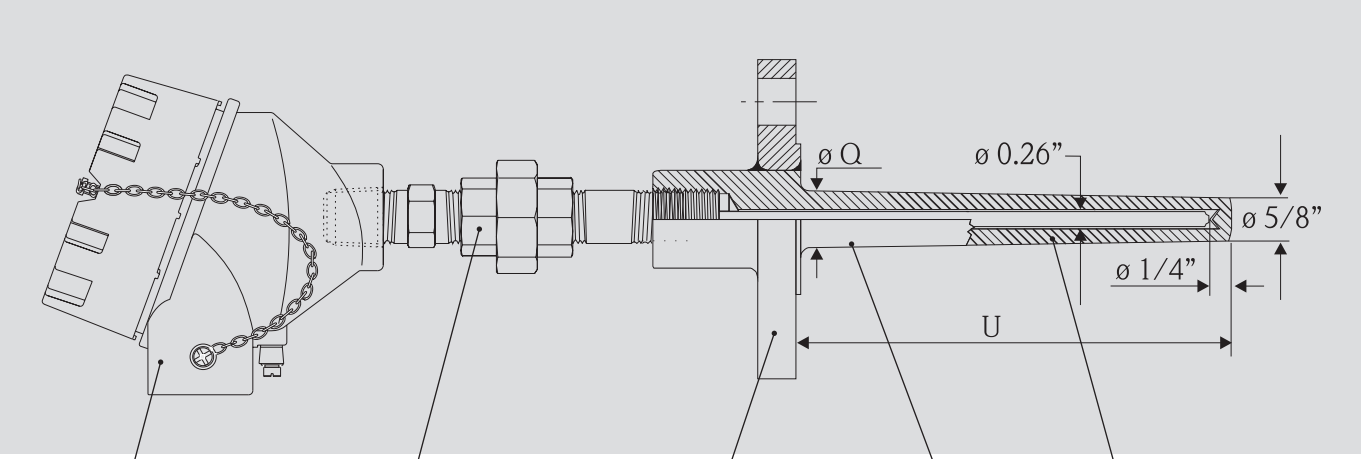
Ordering Information

Product Structure, Explosion proof TC assembly, T53

T53-	**TC assembly, TW-Type XP U.S. Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape:											
		2	Stepped										
		3	Tapered										
			Process Connection:										
			B1	Socket weld ¾" NPS; 316 SS									
			B2	Socket weld 1" NPS; 316 SS									
			C1	Weld-in ¾" NPS; 316 SS									
			C2	Weld-in 1" NPS; 316 SS									
				Immersion length (U); 2-18" available for quick order; longer lengths available on request									
				1	2.5"								
				2	4.5"								
				3	7.5"								
				4	10.5"								
				5	13.5"								
				6	16.5"								
				7	22.5"								
				8	....." (2-18" incr. 0.5")								
				9	Longer lengths available - consult your E+H sales representative								
					Thermowell Lag, T: (1-6")								
					A	not selected							
					E	3"							
					X	....." (0.5" increment)							
						Extension:							
						1	Hex nipple steel E=1"						
						2	Hex nipple SS316 E=1"						
						3	Nipple+Union+Nipple steel E=4"						
						4	Nipple+Union+Nipple SS316 E=4"						
						5	Nipple+Union+Nipple steel E=7"						
						6	Nipple+Union+Nipple SS316 E=7"						
							Sensor Type:						
							A	1 Type J class 2 (Insert SS316)					
							B	2 Type J class 2 (Insert SS316)					
							E	1 Type K class 2 (Insert Inconel 600)					
							F	2 Type K class 2 (Insert Inconel 600)					
							J	1 Type E class 2 (Insert Inconel 600)					
							K	2 Type E class 2 (Insert Inconel 600)					
							N	1 Type N class 2 (Insert Inconel 600)					
							O	2 Type N class 2 (Insert Inconel 600)					
							R	1 Type T class 2 (Insert SS316)					
							S	2 Type T class 2 (Insert SS316)					
								Enclosure; Cable Entry:					
								A	Alu, E+H blue + cover, ½" NPT, Grp.A-G				
								B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G				
								C	Alu, grey + cover, ½" NPT, Grp.B-G				
								D	Alu, grey + cover, ¾" NPT, Grp.B-G				
								E	SS316 + cover, ½" NPT, Grp.B-G				
								F	SS316 + cover, ¾" NPT, Grp.B-G				
									Electrical Connection:				
									A	programmable RTD TMT180			
									B	programmable TMT181			
									C	HART TMT182			
									M	In Head DIN B FF			
									N	In Head Profibus PA			
									Y	Special version, to be specified			
									2	Flying leads			
									3	Terminal block			
										Version:			
										K	Standard, North American region		
											Additional Option 1:		
											A	not selected	
											B	Sensor calibration certificate	
											C	Material Tracebility Cerificate (MTR)	
T53-										**K**			**Enter desired product structure**

T54 Explosion proof TC assembly

Flanged thermowell, with heavy duty connection heads



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Flange size	Rating
1” 316 SS	150 psi RF
1½” 316 SS	300 psi RF
2” 316 SS	600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, Explosion proof TC assembly, T54

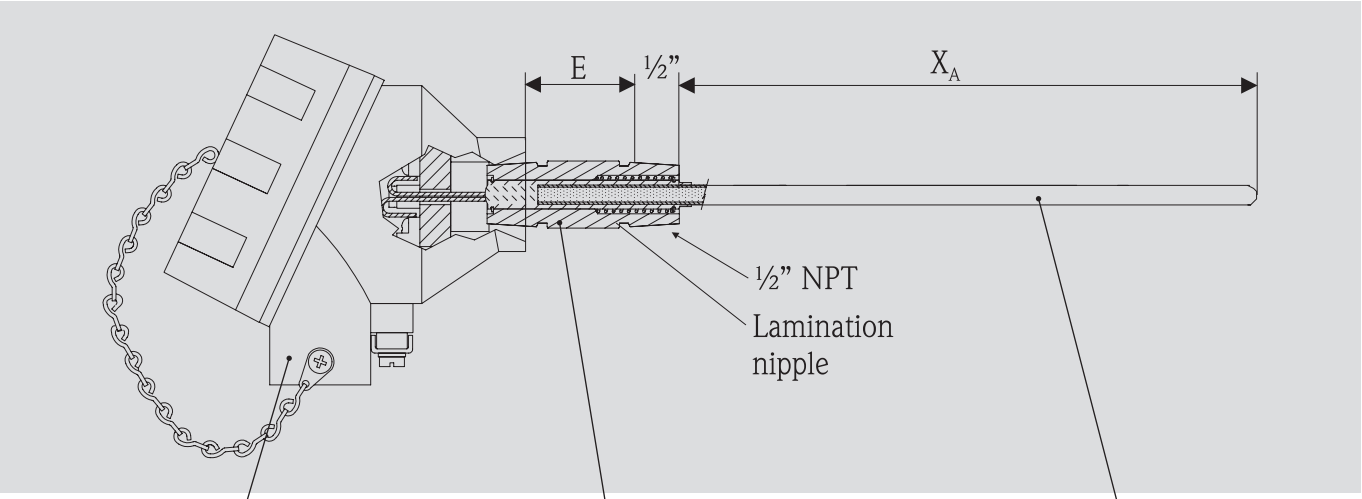
T54-	**TC assembly, flanged TW-Type XP U.S.Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape; Welding:											
		1	Straight; standard weld										
		2	Tapered; standard weld										
		3	Straight; full penetration										
		4	Tapered; full penetration										
			Flange Size; Thermowell Material:										
			A	1"; SS316									
			B	1.5"; SS316									
			C	2"; SS316									
			Y	Larger sizes available - consult your E+H sales representative									
				Rating, Flange type									
				1	150 psi; RF								
				2	300 psi; RF								
				3	600 psi; RF								
				9	Higher ratings up to 2500 and other types of faces available on request, please consult your E+H representative								
					Immersion length (U) 2-18" available for quick order; longer lengths available on request								
					1	2"							
					2	4"							
					3	7"							
					4	10"							
					5	13"							
					6	16"							
					7	22"							
					8	....." (2-18" incr. 0.5")							
					9	For longer lengths - Consult your E+H sales representative							
						Thermowell Lag, T: (1-6")							
						A	not selected						
						X	....." (0.5" increment)						
							Extension:						
							1	Hex nipple steel E=1"					
							2	Hex nipple SS316 E=1"					
							3	Nipple+Union+Nipple steel E=4"					
							4	Nipple+Union+Nipple SS316 E=4"					
							5	Nipple+Union+Nipple steel E=7"					
							6	Nipple+Union+Nipple SS316 E=7"					
								Sensor Type:					
								A	1 Type J class 2 (Insert SS316)				
								B	2 Type J class 2 (Insert SS316)				
								E	1 Type K class 2 (Insert Inconel 600)				
								F	2 Type K class 2 (Insert Inconel 600)				
								J	1 Type E class 2 (Insert Inconel 600)				
								K	2 Type E class 2 (Insert Inconel 600)				
								N	1 Type N class 2 (Insert Inconel 600)				
								O	2 Type N class 2 (Insert Inconel 600)				
								R	1 Type T class 2 (Insert SS316)				
								S	2 Type T class 2 (Insert SS316)				
									Enclosure; Cable Entry:				
									A	Alu, E+H blue + cover, ½" NPT, Grp. A-G			
									B	Alu, E+H blue + cover, ¾" NPT, Grp. A-G			
									C	Alu, grey + cover, ½" NPT, Grp.B-G			
									D	Alu, grey + cover, ¾" NPT, Grp.B-G			
									E	SS316 + cover, ½" NPT, Grp.B-G			
									F	SS316 + cover, ¾" NPT, Grp.B-G			
										Electrical Connection:			
										A	programmable RTD TMT180		
										B	programmable TMT181		
										C	HART TMT182		
										M	In Head DIN B FF		
										N	In Head Profibus PA		
										Y	Special version, to be specified		
										2	Flying leads		
										3	Terminal block		
											Version:		
											K	Standard, North American region	
												Additional Option 1:	
												A	not selected
												B	Sensor calibration certificate
												C	Material Tracebility Cerificate (MTR)
T54-													**Enter desired product structure**

T55 Explosion proof TC assembly

spring loaded sensor, with heavy duty connection heads and lamination nipple

The unique design of this assembly allows you to retain approvals even if the thermowell exists on site and was not purchased according to the requirements of the electrical code.

What's more it allows you to assemble the connection head or transmitter on site without infringing the approval.



Enclosure / Terminal head Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1"	Steel, 316 SS
Nipple -XP- Union Nipple E=4"	
Nipple -XP- Union Nipple E=7"	

Immersion length, X_A
4", 6", 9", 12" (standard)
1" to 100" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, Explosion proof TC assembly, spring-loaded insert T55

T55-	**TC assembly - replacement assembly for Explosion proof areas for exisiting thermowells**									
	Approval:									
	D	FM XP DIP Class I,II,III Div. 1+2								
	E	FM XP NI DIP Class I,II,III Div. 1+2								
	F	CSA XP DIP Class I,II,III Div. 1+2								
	G	CSA XP NI DIP Class I,II,III Div. 1+2								
	J	FM/CSA XP DIP Class I,II,III Div. 1+2								
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2								
		Immersion length (X_A) (1-100"):								
		1	4"							
		2	6"							
		3	9"							
		4	12"							
		8	....." (increment 0.5")							
			Sheath diameter:							
			A	¼"; SS316						
			C	3/8"; SS316						
				Extension:						
				5	Lam. Nipple SS316					
				6	Lam. Nipple+Union+Nipple SS316, E=3"					
				7	Lam. Nipple+Union+Nipple SS316, E=6"					
					Sensor Type:					
					A	1 Type J class 2 (Insert SS316)				
					B	2 Type J class 2 (Insert SS316)				
					E	1 Type K class 2 (Insert Inconel 600)				
					F	2 Type K class 2 (Insert Inconel 600)				
					J	1 Type E class 2 (Insert Inconel 600)				
					K	2 Type E class 2 (Insert Inconel 600)				
					N	1 Type N class 2 (Insert Inconel 600)				
					O	2 Type N class 2 (Insert Inconel 600)				
					R	1 Type T class 2 (Insert SS316)				
					S	2 Type T class 2 (Insert SS316)				
						Enclosure; Cable Entry:				
						A	Alu, E+H blue + cover, ½" NPT, Grp.A-G			
						B	Alu, E+H blue + cover, ¾" NPT, Grp.A-G			
						C	Alu, grey + cover, ½" NPT, Grp.B-G			
						D	Alu, grey + cover, ¾" NPT, Grp.B-G			
						E	SS316 + cover, ½" NPT, Grp.B-G			
						F	SS316 + cover, ¾" NPT, Grp.B-G			
							Electrical Connection:			
							A	programmable RTD TMT180		
							B	programmable TMT181		
							C	HART TMT182		
							M	In Head DIN B FF		
							N	In Head Profibus PA		
							Y	Special version, to be specified		
							2	Flying leads		
							3	Terminal block		
								Version:		
								K	Standard, North American region	
									Additional Option 1:	
									A	not selected
									B	Sensor calibration certificate
									C	Material Tracebility Cerificate (MTR)
										Additional Option 2:
										1 not selected
										9 Additional options required- consult factory
T55-								**K**		**Enter desired product structure**

T5x Explosion proof, thermowell TC assembly with advanced TMT162 transmitters for critical control and safety applications

The TMT162 gives these measurement instruments unique technological advantages.

The assembly offers improved safety and ease of installation through dual compartment transmitter housing design. The robust design makes it ideal for the demanding application in the petroleum upstream, downstream processes and heavy industries such as underground mining, hazardous chemicals and fossil fuel based power plants.

The completely potted electronics allow seamless operation in extreme temperatures and high precipitation & condensation areas.

The key features are:

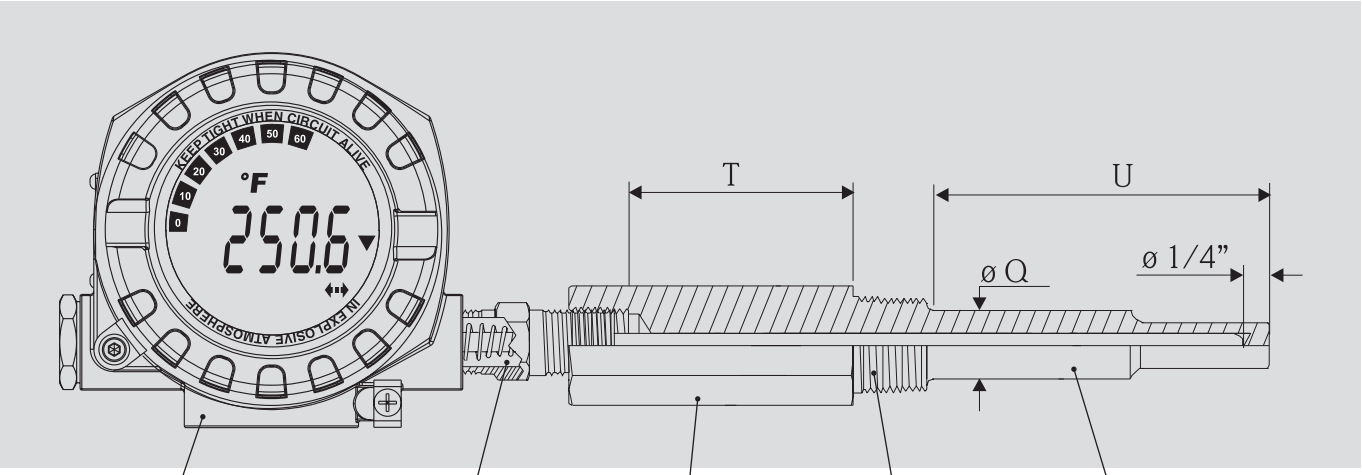
- Dual inputs, for automatic back up.
- Advanced diagnostic features.
- Best in class accuracy.
- Zero-corrosion* gold plated terminals.
- 2 kV galvanic signal isolation.
- Ultra low copper content and powder coating for corrosion resistance.
- Molybdenum based antiseize coating on threads.

All in all a heavy duty instrument built to last and perform! This transmitter is also available in cast 316L stainless steel for offshore applications.

* Gold plating ensures virtually no corrosion.

T53 Explosion proof TC assembly

Threaded thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing) Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

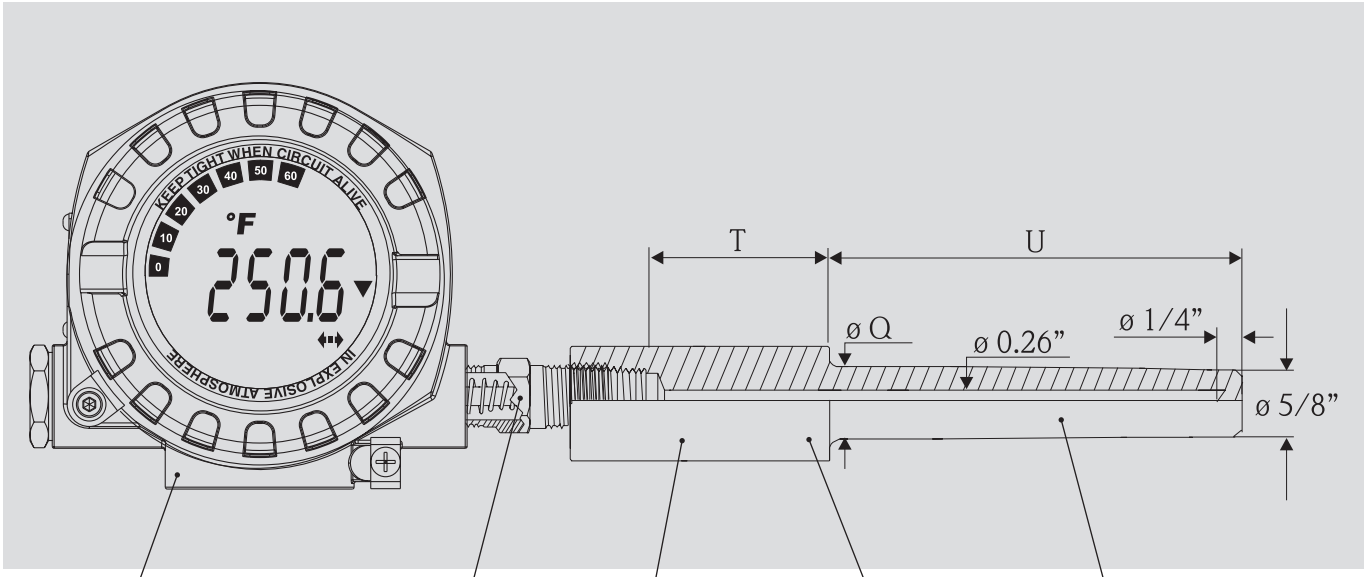
Ordering Information

Product Structure, Explosion proof TC assembly, T53

T53-	**TC assembly, TW-Type XP U.S. Style**											
	Approval:											
	D	FM XP DIP Class I,II,III Div. 1+2										
	E	FM XP NI DIP Class I,II,III Div. 1+2										
	F	CSA XP DIP Class I,II,III Div. 1+2										
	G	CSA XP NI DIP Class I,II,III Div. 1+2										
	J	FM/CSA XP DIP Class I,II,III Div. 1+2										
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2										
		Thermowell Shape:										
		2	Stepped									
		3	Tapered									
			Process Connection:									
			A1	Thread ½" NPT; 316 SS								
			A2	Thread ¾" NPT; 316 SS								
			A3	Thread 1" NPT; 316 SS								
				Immersion length (U); 2-18" available for quick order; longer lengths available on request								
				1	2.5"							
				2	4.5"							
				3	7.5"							
				4	10.5"							
				5	13.5"							
				6	16.5"							
				7	22.5"							
				8	....." (2-18" incr. 0.5")							
				9	Longer lengths available - consult your E+H sales representative							
					Thermowell Lag, T: (1-6")							
					A	not selected						
					E	3"						
					X	....." (0.5" increment)						
						Extension:						
						1	Hex nipple steel E=1"					
						2	Hex nipple SS316 E=1"					
						3	Nipple+Union+Nipple steel E=4"					
						4	Nipple+Union+Nipple SS316 E=4"					
						5	Nipple+Union+Nipple steel E=7"					
						6	Nipple+Union+Nipple SS316 E=7"					
							Sensor Type:					
							A	1 Type J class 2 (Insert SS316)				
							B	2 Type J class 2 (Insert SS316)				
							E	1 Type K class 2 (Insert Inconel 600)				
							F	2 Type K class 2 (Insert Inconel 600)				
							J	1 Type E class 2 (Insert Inconel 600)				
							K	2 Type E class 2 (Insert Inconel 600)				
							O	2 Type N class 2 (Insert Inconel 600)				
							R	1 Type T class 2 (Insert SS316)				
							S	2 Type T class 2 (Insert SS316)				
								Enclosure; Cable Entry:				
								G	Alu field housing, ½" NPT, Grp. A-G			
								H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
								I	316L field housing, ½" NPT, Grp. A-G			
								J	316L field housing, display, ½" NPT, Grp. A-G			
									Electrical Connection:			
									F	HART TMT162, 1 Input, Dual Compartment		
									G	HART TMT162, 2 Input, Dual Compartment		
									H	FF TMT162, 2 Input, Dual Compartment		
									I	HART TMT142, 1 Input, Single Compartment		
										Version:		
										K	Standard, North American region	
											Additional Option 1:	
											A	not selected
											B	Sensor calibration certificate
											C	Material Tracebility Cerificate (MTR)
												Additional Option 2:
												1 not selected
												9 Additional options required- consult factory
T53-										**K**		**Enter desired product structure**

T53 Explosion proof TC assembly

Weld-in / socket weld thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing)
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1"	Steel, 316 SS
Nipple -XP- Union Nipple E=4"	
Nipple -XP- Union Nipple E=7"	

Lag, T
0", 3" (standard)
1 to 6" (specify)

Process connection
¾" socket weld
1" socket weld
¾" weld-in
1" weld-in

Immersion length, U
2.5", 4.5", 7.5", 10.5", 13.5", 16.5", 22.5" (standard)
2" to 18" (specify)

Shape
Stepped
Tapered

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

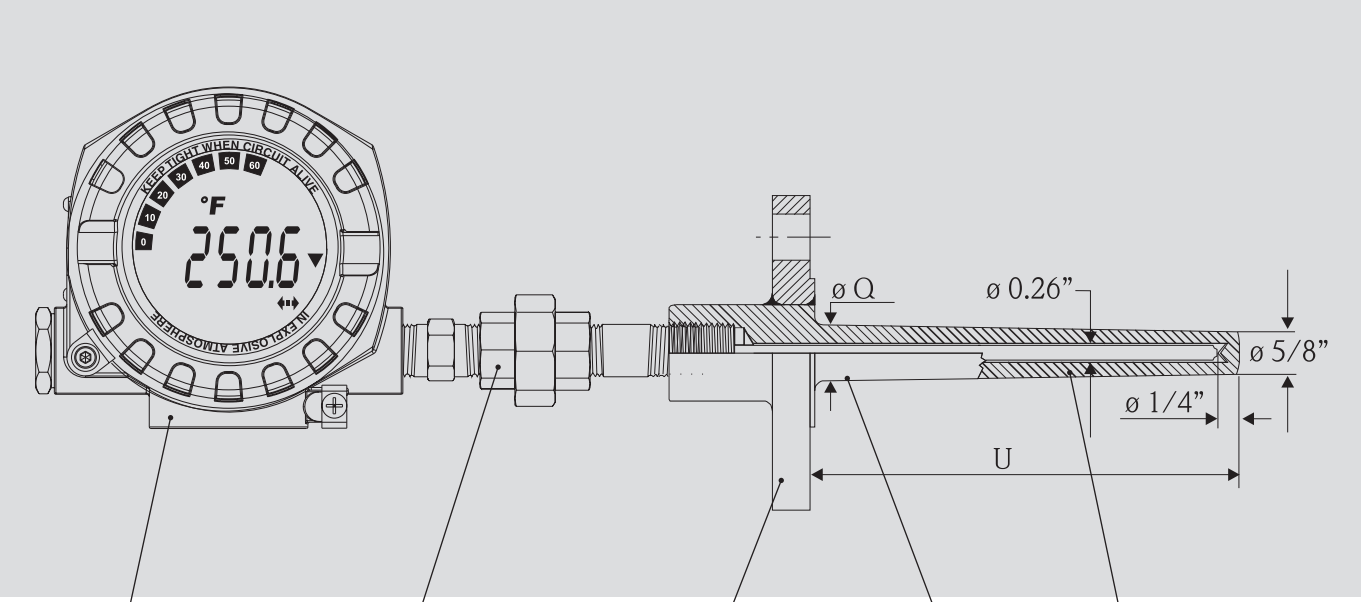
Ordering Information

Product Structure, Explosion proof TC assembly, T53

T53-	**TC assembly, TW-Type XP U.S. Style**											
	Approval:											
	D	FM XP DIP Class I,II,III Div. 1+2										
	E	FM XP NI DIP Class I,II,III Div. 1+2										
	F	CSA XP DIP Class I,II,III Div. 1+2										
	G	CSA XP NI DIP Class I,II,III Div. 1+2										
	J	FM/CSA XP DIP Class I,II,III Div. 1+2										
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2										
		Thermowell Shape:										
		2	Stepped									
		3	Tapered									
			Process Connection:									
			B1	Socket weld ¾" NPS; 316 SS								
			B2	Socket weld 1" NPS; 316 SS								
			C1	Weld-in ¾" NPS; 316 SS								
			C2	Weld-in 1" NPS; 316 SS								
				Immersion length (U); 2-18" available for quick order; longer lengths available on request								
				1	2.5"							
				2	4.5"							
				3	7.5"							
				4	10.5"							
				5	13.5"							
				6	16.5"							
				7	22.5"							
				8	....." (2-18" incr. 0.5")							
				9	Longer lengths available - consult your E+H sales representative							
					Thermowell Lag, T: (1-6")							
					A	not selected						
					E	3"						
					X	"....." (0.5" increment)						
						Extension:						
						1	Hex nipple steel E=1"					
						2	Hex nipple SS316 E=1"					
						3	Nipple+Union+Nipple steel E=4"					
						4	Nipple+Union+Nipple SS316 E=4"					
						5	Nipple+Union+Nipple steel E=7"					
						6	Nipple+Union+Nipple SS316 E=7"					
							Sensor Type:					
							A	1 Type J class 2 (Insert SS316)				
							B	2 Type J class 2 (Insert SS316)				
							E	1 Type K class 2 (Insert Inconel 600)				
							F	2 Type K class 2 (Insert Inconel 600)				
							J	1 Type E class 2 (Insert Inconel 600)				
							K	2 Type E class 2 (Insert Inconel 600)				
							N	1 Type N class 2 (Insert Inconel 600)				
							O	2 Type N class 2 (Insert Inconel 600)				
							R	1 Type T class 2 (Insert SS316)				
							S	2 Type T class 2 (Insert SS316)				
								Enclosure; Cable Entry:				
								G	Alu field housing, ½" NPT, Grp. A-G			
								H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
								I	316L field housing, ½" NPT, Grp. A-G			
								J	316L field housing, display, ½" NPT, Grp. A-G			
									Electrical Connection:			
									F	HART TMT162, 1 Input, Dual Compartment		
									G	HART TMT162, 2 Input, Dual Compartment		
									H	FF TMT162, 2 Input, Dual Compartment		
									I	HART TMT142, 1 Input, Single Compartment		
										Version:		
										K	Standard, North American region	
											Additional Option 1:	
											A	not selected
											B	Sensor calibration certificate
											C	Material Tracebility Cerificate (MTR)
T53-										**K**		**Enter desired product structure**

T54 Explosion proof TC assembly

Flanged thermowell, with advanced TMT162 transmitter for critical control and safety applications



Enclosure (Field housing) Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1”	Steel, 316 SS
Nipple -XP- Union Nipple E=4”	
Nipple -XP- Union Nipple E=7”	

Flange size	Rating
1” 316 SS	150 psi RF
1½” 316 SS	300 psi RF
2” 316 SS	600 psi RF

Shank O. D.
7/8”
1-1/16”
1-1/16”

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

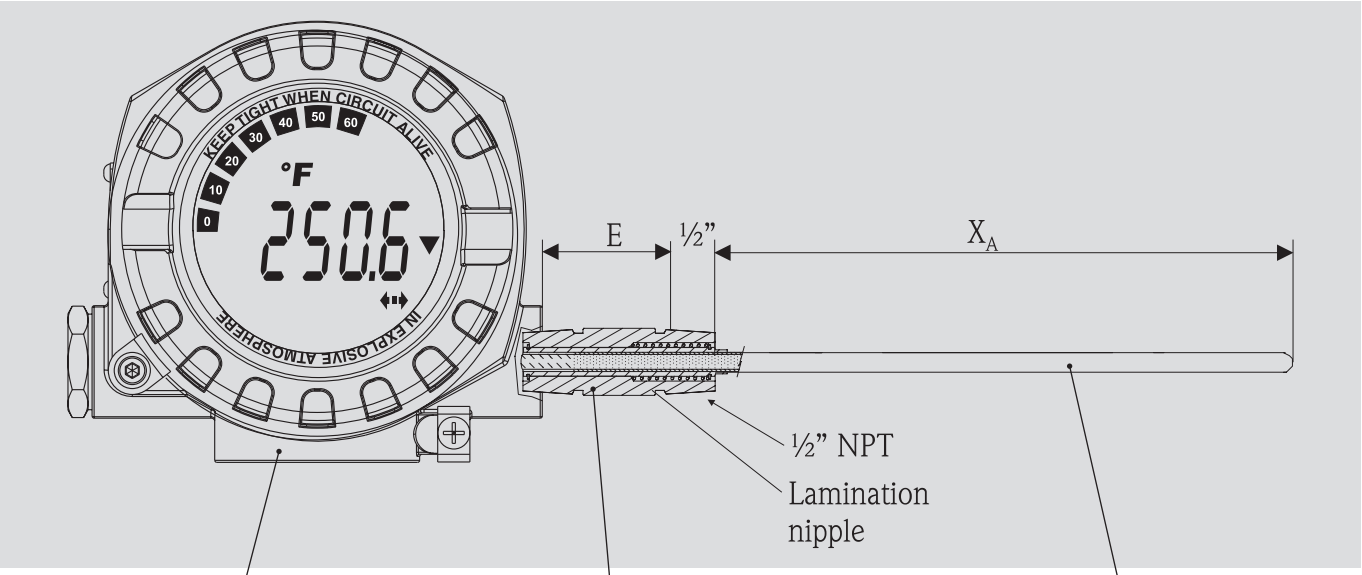
Ordering Information

Product Structure, Explosion proof TC assembly, T54

T54-	**TC assembly, flanged TW-Type XP U.S.Style**												
	Approval:												
	D	FM XP DIP Class I,II,III Div. 1+2											
	E	FM XP NI DIP Class I,II,III Div. 1+2											
	F	CSA XP DIP Class I,II,III Div. 1+2											
	G	CSA XP NI DIP Class I,II,III Div. 1+2											
	J	FM/CSA XP DIP Class I,II,III Div. 1+2											
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2											
		Thermowell Shape; Welding:											
		1	Straight; standard weld										
		2	Tapered; standard weld										
		3	Straight; full penetration										
		4	Tapered; full penetration										
			Flange Size; Thermowell Material:										
			A	1"; SS316									
			B	1.5"; SS316									
			C	2"; SS316									
			Y	Larger sizes available - consult your E+H sales representative									
				Rating, Flange type									
				1	150 psi; RF								
				2	300 psi; RF								
				3	600 psi; RF								
				9	Higher ratings up to 2500 and other types of faces available on request, please consult your E+H representative								
					Immersion length (U) 2-18" available for quick order; longer lengths available on request								
					1	2"							
					2	4"							
					3	7"							
					4	10"							
					5	13"							
					6	16"							
					7	22"							
					8	....." (2-18" incr. 0.5")							
					9	For longer lengths - Consult your E+H sales representative							
						Thermowell Lag, T: (1-6")							
						A	not selected						
						X	....." (0.5" increment)						
						E	3"						
							Extension:						
							1	Hex nipple steel E=1"					
							2	Hex nipple SS316 E=1"					
							3	Nipple+Union+Nipple steel E=4"					
							4	Nipple+Union+Nipple SS316 E=4"					
							5	Nipple+Union+Nipple steel E=7"					
							6	Nipple+Union+Nipple SS316 E=7"					
								Sensor Type:					
								A	1 Type J class 2 (Insert SS316)				
								B	2 Type J class 2 (Insert SS316)				
								E	1 Type K class 2 (Insert Inconel 600)				
								F	2 Type K class 2 (Insert Inconel 600)				
								J	1 Type E class 2 (Insert Inconel 600)				
								K	2 Type E class 2 (Insert Inconel 600)				
								N	1 Type N class 2 (Insert Inconel 600)				
								O	2 Type N class 2 (Insert Inconel 600)				
								R	1 Type T class 2 (Insert SS316)				
								S	2 Type T class 2 (Insert SS316)				
									Enclosure; Cable Entry:				
									G	Alu field housing, ½" NPT, Grp. A-G			
									H	Alu field housing, 1x ½" NPT + display			
									J	316L field housing, ½" NPT, Grp. A-G			
									I	316L field housing, display, ½" NPT, Grp. A-G			
										Electrical Connection:			
										F	HART TMT162, 1 Input, Dual Compartment		
										G	HART TMT162, 2 Input, Dual Compartment		
										H	FF TMT162, 2 Input, Dual Compartment		
										I	HART TMT142, 1 Input, Single Compartment		
											Version:		
											K	Standard, North American region	
												Additional Option 1:	
												A	not selected
												B	Sensor calibration certificate
												C	Material Tracebility Cerificate (MTR)
T54-													**Enter desired product structure**

T55 Explosion proof TC assembly

spring loaded sensor, with advanced TMT162 transmitter and lamination nipple for critical control and safety applications
The unique design of this assembly allows you to retain approvals even if the thermowell exists on site and was not purchased according to the requirements of the electrical code.
What's more it allows you to assemble the connection head or transmitter on site without infringing the approval.



Enclosure (Field housing)
Hazardous area approved GRP A-G
Aluminum (epoxy coated)
316 Stainless steel

Extension (spring loaded)	
Type	**Material**
Self contained Hex Nipple E=1"	Steel, 316 SS
Nipple -XP- Union Nipple E=4"	
Nipple -XP- Union Nipple E=7"	

Immersion length, X_A
4", 6", 9", 12" (standard)
1" to 100" (specify)

X_A = drilled length of existing thermowell.

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, Explosion proof TC assembly, spring-loaded insert T55

T55-	**TC assembly - replacement assembly for Explosion proof areas for exisiting thermowells**									
	Approval:									
	D	FM XP DIP Class I,II,III Div. 1+2								
	E	FM XP NI DIP Class I,II,III Div. 1+2								
	F	CSA XP DIP Class I,II,III Div. 1+2								
	G	CSA XP NI DIP Class I,II,III Div. 1+2								
	J	FM/CSA XP DIP Class I,II,III Div. 1+2								
	K	FM/CSA XP NI DIP Class I,II,III Div. 1+2								
		Immersion length (X_A) (1-100"):								
		1	4"							
		2	6"							
		3	9"							
		4	12"							
		8	....." (increment 0.5")							
			Sheath diameter:							
			A	¼"; SS316						
			C	3/8"; SS316						
				Extension:						
				5	Lam. Nipple SS316, E=1"					
				6	Lam. Nipple+Union+Nipple SS316, E=4"					
				7	Lam. Nipple+Union+Nipple SS316, E=7"					
					Sensor Type:					
					A	1 Type J class 2 (Insert SS316)				
					B	2 Type J class 2 (Insert SS316)				
					E	1 Type K class 2 (Insert Inconel 600)				
					F	2 Type K class 2 (Insert Inconel 600)				
					J	1 Type E class 2 (Insert Inconel 600)				
					K	2 Type E class 2 (Insert Inconel 600)				
					N	1 Type N class 2 (Insert Inconel 600)				
					O	2 Type N class 2 (Insert Inconel 600)				
					R	1 Type T class 2 (Insert SS316)				
					S	2 Type T class 2 (Insert SS316)				
						Enclosure; Cable Entry:				
						G	Alu field housing, ½" NPT, Grp. A-G			
						H	Alu field housing, 1x ½" NPT + display, Grp. A-G			
						I	316 L, field housing, ½" NPT, Grp. A-G			
						J	316 L, field housing, display, ½" NPT, Grp. A-G			
							Electrical Connection:			
							F	HART TMT162, 1 Input, Dual Compartment		
							G	HART TMT162, 2 Input, Dual Compartment		
							H	FF TMT162, 2 Input, Dual Compartment		
							I	HART TMT142, 1 Input, Single Compartment		
								Version:		
								K	Standard, North American region	
									Additional Option 1:	
									A	not selected
									B	Sensor calibration certificate
									C	Material Tracebility Cerificate (MTR)
										Additional Option 2:
										1 not selected
										9 Additional options required- consult factory
T55-								**K**		**Enter desired product structure**

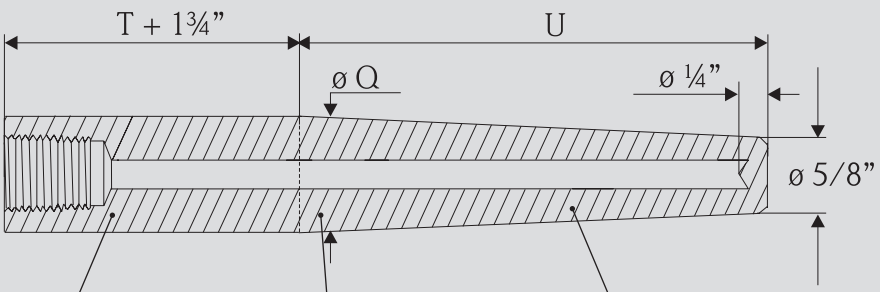
Thermowells

Thermowells are used to protect temperature measuring instruments in process systems. In processes where pressure, velocity, or viscous, abrasive, and corrosive materials are present individually or in combination, the measurement probe can be quickly damaged. Additionally, a thermowell enables removal of the temperature instrument for replacement, repair, or testing without affecting the process system. Thermowells are designed with pressure vessel standards and the ASME PTC19.3 calculation methods.
In Canada manufacturers are required to obtain a Canadian Registration Number (CRN). This requires methodical design and pressure rating calculations based on geometry and dimensions. The manufacturing must be exactly as the registered and approved designs. Endress+Hauser Inc. has CRN approved designs for its complete range of thermowells.

Important terminology to order a thermowell

Process Connection	External means to connect thermowell to process system. Wells can be threaded, bolted (to matching flange), clamped, or welded in place.
Instrument Connection	Internal threads to connect temperature instrument to thermowell.
“U” Dimension	Length of thermowell immersed into process system. Measured from the base of the process connection to the end tip of the well. E+ H order structures are based on this dimension.
“T” Dimension	Also called “lag length” or “lagging extension”. Extends length between the instrument and process connections to accommodate vessel or piping insulation.
“A” Dimension	Instrument insertion length into thermowell. Equal to bore length.
“D” Dimension	Also called “tip diameter”. Diameter of thermowell shank at the end tip of the thermowell. This dimension may vary with process connection and/or shank design.
“Q” Dimension	Also called “root diameter”. Diameter of thermowell shank below the process connection. This dimension may vary with process connection and/or shank design.
Bore Diameter	Dimension of internal bore to match the diameter of the instrument inserted into the thermowell.
Stepped Shank	Also called “reduced tip”. The shank O.D. is reduced over the last 2½” of the “U” dimension from the standard root diameter to ½” O.D. The stepped shank is available with a 0.260” bore diameter only.
Straight Shank	Shank O.D. is the same from the root diameter (“Q” dimension) to the tip diameter (“D” dimension). The straight shank is generally used with a 0.385” or larger bore diameter, but is also available with a 0.260” bore.
Tapered Shank	Shank O.D. is gradually reduced from the root diameter (“Q” dimension) to the tip diameter (“D” dimension). The tapered shank is recommended for heavy duty applications characterized by high vibration, pressure, temperature, and/or velocity

TU51 Weld-in thermowells



Lag, T
2”, 3” (standard)
1 to 6” (specify)

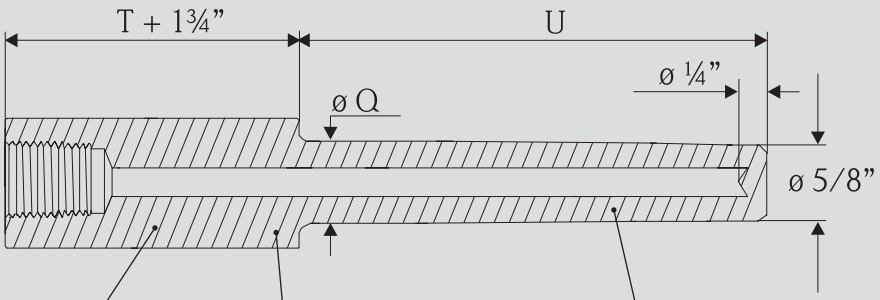
Process connection
¾” weld-in
1” weld-in
Larger sizes on request

Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Ordering Information

TU51 weld in thermowell											
	Instrument connection:										
	1	½"									
	Y	Special version, to be specified									
		Process connection, material:									
		AB	¾" weld-in, 316 SS								
		AC	1" weld-in, 316 SS								
		YY	other material available on request								
			Immersion length (U) 2-18" available for quick order; longer lengths available on request								
			1	2.5"							
			2	4.5"							
			3	7.5"							
			4	10.5"							
			5	13.5"							
			6	16.5"							
			7	22.5"							
			8	....." (2-18" incr. 0.5")							
			9	longer lengths available on request, consult your E+H representative							
				Thermowell Lag, T: (1-6" available on request)							
				3	2"						
				4	3"						
				8	.... (increment 0.25")						
					Surface finish:						
					A	Standard					
					Y	Special version, to be specified					
						Bore Diameter B:					
						1	0.260"				
						9	Special version, to be specified				
							Accessory:				
							A	not selected			
							B	Cap, SS304			
							C	Cap + chain, SS304			
							Y	Special version, to be specified			
								Testing:			
								1	not selected		
								2	Internal hydrost. pressure test		
								5	Special version, to be specified		
									Certificate:		
									A	not selected	
									B	Material Tracebility Cerificate	
									C	Material Tracebility Cerificate, NACE MR0175	
										Additional Option:	
										A	not selected
										B	Stress Calculation PTC 19.3
										C	Oxygen service
										D	*CAD drawing
										Y	Special version, to be specified
											Version:
											K	Standard
											Y	Special version, to be specified
TU51-												**Enter desired product structure**

TU52 Socket weld thermowells



Lag, T
0”, 2”, 3” (standard)
1 to 6” (specify)

Process connection
¾” socket weld
1” socket weld
Larger sizes on request

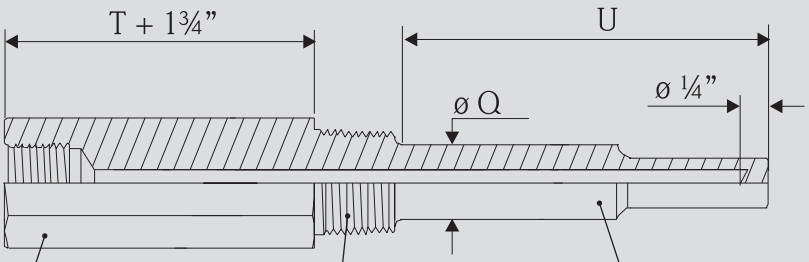
Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Straight
Tapered

Ordering Information

TU52 socket weld thermowell											
	Instrument connection:										
	1	½"									
	Y	Special version, to be specified									
		Process connection, material:									
		AB	Socket weld ¾" NPS, 316 SS								
		AC	Socket weld 1" NPS, 316 SS								
		YY	other material available on request								
			Immersion length (U) 2 to 18" available for quick order; longer lengths available on request								
			1	2.5"							
			2	4.5"							
			3	7.5"							
			4	10.5"							
			5	13.5"							
			6	16.5"							
			7	22.5"							
			8	....." (2 to 18", incr 0.5")							
			9	longer lengths available on request, consult your E+H representative							
				Thermowell Lag, T: (1-6" available on request)							
				1	not selected						
				3	2"						
				4	3"						
				8	..." (1 to 6", incr. 0.25")						
					Shape:						
					A	Stepped					
					B	Straight					
					C	Tapered					
						Bore Diameter B:					
						1	0.260"				
						9	Special version, to be specified				
							Accessory:				
							A	not selected			
							B	Cap, SS304			
							C	Cap + chain, SS304			
							Y	Special version, to be specified			
								Testing:			
								1	not selected		
								2	Internal hydrost. pressure test		
								9	Special version, to be specified		
									Certificate:		
									A	not selected	
									B	Material Tracebility Cerificate	
									C	Material Tracebility Cerificate, NACE MR0175	
										Additional Option:	
										A	not selected
										B	Stress Calculation PTC 19.3
										C	Oxygen service
										Y	Special version, to be specified
											Version:
											K	Standard
											Y	Special version, to be specified
TU52-											**Enter desired product structure**

TU53 Threaded style thermowells



Lag, T
0”, 3” (standard)
1 to 6” (specify)

Process connection
½” NPT threaded
¾” NPT threaded
1” NPT threaded
Larger sizes on request

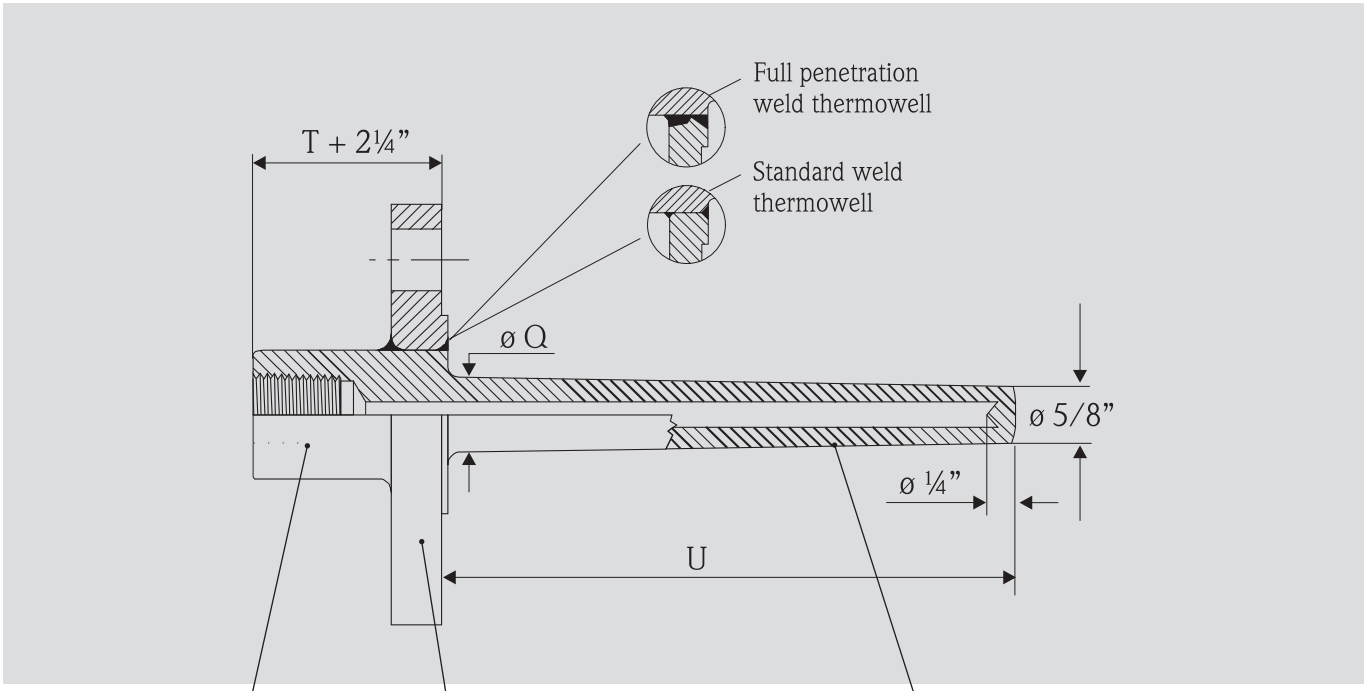
Immersion length, U
2.5”, 4.5”, 7.5”, 10.5”, 13.5”, 16.5”, 22.5” (standard)
2” to 18” (specify)

Shape
Stepped
Straight
Tapered

Ordering Information

TU53 threaded thermowell											
	Instrument connection:										
	1	½"									
	Y	Special version, to be specified									
		Process connection, material:									
		AA	Thread ½" NPT, 316 SS								
		AB	Thread ¾" NPT, 316 SS								
		AC	Thread 1" NPT, 316 SS								
		YY	other material available on request								
			Immersion length (U) 2 to 18" available for quick order; longer lengths available on request								
			1	2.5"							
			2	4.5"							
			3	7.5"							
			4	10.5"							
			5	13.5"							
			6	16.5"							
			7	22.5"							
			8	....." (2 to 18", incr. 0.5")							
			9	longer lengths available on request, consult your E+H representative							
				Thermowell Lag, T: (1 to 6" available on request)							
				1	not selected						
				4	3"						
				8	...." (1 to 6", incr. 0.25")						
					Shape:						
					A	Stepped					
					B	Straight					
					C	Tapered					
						Bore Diameter B:					
						1	0.260"				
						9	Special version, to be specified				
							Accessory:				
							A	not selected			
							B	Cap, SS304			
							C	Cap + chain, SS304			
							Y	Special version, to be specified			
								Testing:			
								1	not selected		
								2	Internal hydrost. pressure test		
								3	External hydrost. pressure test		
								9	Special version, to be specified		
									Certificate:		
									A	not selected	
									B	Material Tracebility Cerificate	
									C	Material Tracebility Cerificate, NACE MR0175	
										Additional Option:	
										A	not selected
										B	Stress Calculation PTC 19.3
										C	Oxygen service
										Y	Special version, to be specified
											Version:
											K Standard
											Y Special version, to be specified
TU53-											**Enter desired product structure**

TU54 Flanged style thermowells



Lag, T
0”, 2”, 3” (standard)
1 to 6” (specify)

Flange size
1”
1½”
2”
larger sizes on request

Rating
150 psi RF
300 psi RF
600 psi RF
higher rating on request (1500 psi, 2500 psi)

Immersion length, U
2”, 4”, 7”, 10”, 13”, 16”, 22” (standard)
2” to 18” (specify)

Shape
Stepped
Straight
Tapered

Ordering Information

TU54 flanged thermowell												
	Flange size:											
	A	1”										
	B	1½”										
	C	2”										
	9	Larger sizes available on request										
		Material:										
		AA	316 SS									
		AB	304 SS									
		YY	other material available on request									
			Rating, Flange type:									
			1	150 psi; RF								
			2	300 psi; RF								
			3	600 psi; RF								
			Y	Higher ratings up to 2500 and other types of faces available on request, please consult your E+H representative								
				Immersion length (U) 2-18” available for quick order; longer lengths available on request								
				1	2”							
				2	4”							
				3	7”							
				4	10”							
				5	13”							
				6	16”							
				7	22”							
				8	.....” (2-18” incr. 0.5”)							
				9	longer lengths available on request, consult your E+H representative							
					Thermowell Lag, T: (1 to 6” available on request)							
					1	not selected						
					2	2”						
					3	3”						
					4	.....” (increment 0.5”)						
						Shape:						
						A	Stepped; standard weld					
						B	Straight; standard weld					
						C	Tapered; standard weld					
						F	Stepped; full penetration					
						G	Straight; full penetration					
						H	Tapered; full penetration					
						Y	Special version, to be specified					
							Bore Diameter B:					
							1	0.260”				
							9	Special version, to be specified				
								Accessory:				
								A	not selected			
								B	Cap, SS304			
								C	Cap + chain, SS304			
								Y	Special version, to be specified			
									Testing:			
									1	not selected		
									2	Internal hydrost. pressure test		
									3	External hydrost. pressure test		
									4	Dye Penetration Test		
									9	Special version, to be specified		
										Certificate:		
										A	not selected	
										B	Material Tracebility Cerificate	
										C	Material Tracebility Cerificate, NACE MR0175	
											Additional Option:	
											A	not selected
											B	Stress Calculation PTC 19.3
											C	Oxygen service
											Y	Special version, to be specified
												Version:
												K Standard
												Y Special version, to be specified
TU54-												**Enter desired product structure**

Material availability guide

Material	Composition	Max temperature	Application
304SS	18% Chromium	900 °C	Offers excellent resistance to many corrosive agents encountered in domestic and industrial use.
310SS	25% Chromium	1148 °C	Good resistance to oxidation at temperatures up to 1148 °C. Good resistance to thermal fatigue and cyclic heating.
316SS	17% Chromium 12% Nickel 2-3% Molybdenum	898 °C	Good resistance to a much larger range of chemicals than 304SS. Withstands sulphurous acid compounds.
321SS	Similar to 304SS but Steel stabilized by Titanium addition	871 °C	Not sensitive to inter-granular corrosion when heated within the carbide precipitation range of 482 °C to 815 °C. Similar in corrosion resistance to 304SS.
347SS	Similar to 304SS but contains Tantalum and is Steel stabilized by Colombium addition	871 °C	Excellent equivalent to 304SS for 426 °C to 815 °C range. Superior to 321SS where service is both corrosive and at an elevated temperature.
304LSS/ 316LSS	Similar to 304SS and 316SS but with reduced carbon (low carbon)	871 °C	Low carbon versions of 304SS and 316SS (maximum of 0.03% carbon). Because of low carbon content the effects of carbide precipitation are reduced.
Inconel 600	76% Nickel	1212 °C	Excellent material for severely corrosive environments. Resistant to oxidation at temperatures up to 1175 °C.- excellent for cement plants.
Inconel 601	60.5% Nickel 23.0% Chromium 1.5% Aluminum	1148 °C	Similar to Inconel 600 however higher chromium content gives superior resistance to oxidizing, carburizing and sulphur containing environments.
Incoloy 800	32.5% Nickel 46% Iron 21% Chromium	1093 °C	Resistant to oxidation and carburization at elevated temperatures. It resists stress - corrosion cracking, sulphur attack, internal oxidation, scaling and corrosion in a wide variety of industrial atmospheres. Sulphurous applications
Monel 400	66% Nickel 31% Copper	537 °C	Highly resistant to corrosion by chlorinated solvents, glass etching agents, Sulphuric and many other acids, and practically all alkalies generally free from stress-corrosion cracking. Good resistant to salt water corrosion. Salination plants.
Hastelloy B	61% Nickel 28% Molybdenum	1204 °C	Good corrosion resistance to hydrochloric, sulphuric, phosphoric, and acetic acids. Excellent corrosion resistance to hydrogen-chloride gas.
Hastelloy C	54% Nickel 16% Molybdenum 15.5% Chromium 4% Tungsten	1204 °C	Good corrosion resistance to many chemical environments, including ferric and cupric chlorides, contaminated mineral acids, wet chlorine gas. Oxidation resistance to 990 °C.
Hastelloy X	47% Nickel 9% Molybdenum 22% Chromium 0.5% Tungsten	1204 °C	Good high temperature strength and resistance to oxidation to 1204 °C. Also good for reducing conditions.
F11 chrom moly	0.5% Molybdenum 1.25% Chromium	575 °C	High strength steels used in pressure vessels and industrial boilers. Resisitant to cleaning agents, chloroform, food products and carbon disulphide. The chrom moly is generally matched to the pipe grade for optimized welds.
F22	1.0% Molybdenum 2.25% Chromium	600 °C	High strength steels used in pressure vessels and industrial boilers. Resisitant to cleaning agents, chloroform, food products and carbon disulphide, F22 has a higher tensile strength than F11. The chrom moly is generally matched to the pipe grade for optimized welds.
F91	1.0% Molybdenum 9.0% Chromium	600 °C	High strength steels used in pressure vessels and industrial boilers. Resisitant to cleaning agents, chloroform, food products and carbon disulphide. F91 has one of the highest available tensile strengths for chrom moly steels. The chrom moly is generally matched to the pipe grade for optimized welds.
HR160	29% Cobalt 28% Chromium max. 2% Iron 2.75% Silicon	1204 °C	A high temperature alloy with outstanding resistance to high temperature corrosion, it has excellent resistance to sulphidation, and chloride attack in both reducing and oxidizing atmospheres. Its resistance to attack by the products of combustion of low-grade fuels make it VERY useful in municipal, industrial, hazardous and nuclear waste incinerators.
Titanium	Ti metal	450 °C	Excellent resistance to oxidizing acids such as nitric or chromic, it is also resistant to inorganic chloride solutions, chlorinated organic compounds and moist chlorine gas. Its good resistance to seawater and salt spray, allows it to be used in off-shore installations
Duplex stainless steel 2205	4.5% Nickel	315 °C	These grades combine high strength with excellent corrosion resistance, especially to chloride stress corrosion cracking, however a tendency to brittleness limits their use to approx 300 to 315 °C maximum, sub-Zero use is also restricted because of brittleness due to the ferrite content. Offshore piplines are the main applications.

Sanitary process instruments

Endress+Hauser is one of the world's leading suppliers of solutions for sanitary process measurements. The designs meet the most stringent requirements of the Food & Beverage, Dairy and the Biopharmaceutical Industries for safety, accuracy and reliability.

Complete compliance
Our experience of over 50 years in process measurement helps us to meet or exceed the performance, reliability, cleanability, sterilization, documentation, validation and environmental requirements.

Well designed products
Our sensor offering has options such as PMO, 3-A and ASME BPE compliance.
We also have solutions for replacing MIGs in cooking retort applications. Our housings are made with specially approved materials and designed with glass free construction and smooth surfaces for sanitary environments.

Special solutions
We even provide special solutions like flush mount sensors, non-intrusive sensors; bio-reactor multi-points and FDA approved Teflon coating.

Traceability
Our advanced web asset management solution or W@M offers complete traceability – including any and every calibration or service event carried out by our trained and authorized team, throughout the Life Cycle of the product.

The range of products and services will convince you that we are the experts you can trust for your stringent sanitary requirements.

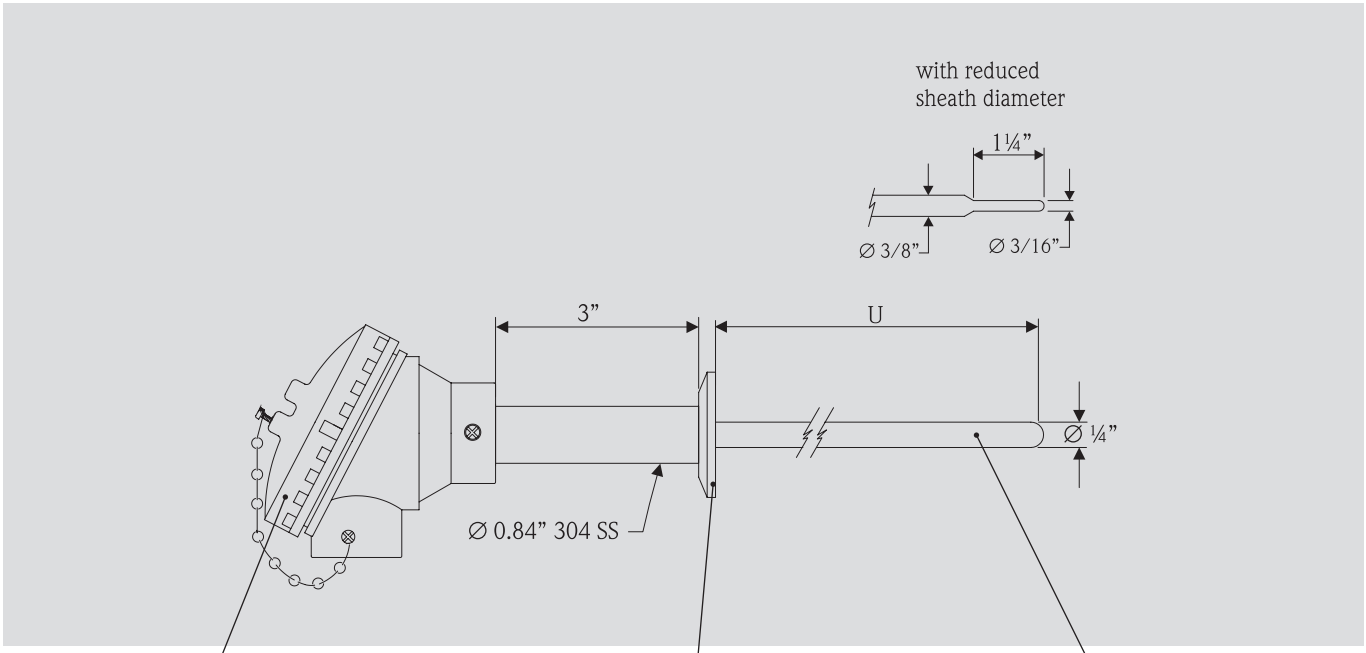
General specifications

Sensor Styles: As per ASTM 14.03, E230	**RTD:** Single or dual element (3 wire only) Pt 100, class A or class B -50 to +260 °C (-58 to 500 °F), low temp -50 to +200 °C (-58 to 390 °F), in continuous operation -200 to +600 °C (-328 to 1110 °F), high temp
Process connection:	Tri-clamp, weld-in (see TH13), UNEF micro threads (see TH15)
Thermowell style:	Straight or stepped bar stock
Materials:	Standard is 316SS

Options include:
- PMO speed of response test
- Sealed electronic enclosures/ connection heads
- Certificate of compliance (EN 3.1)
- Silicon free assemblies
- PMI (Positive Material Testing) testing
- Surface finishing to 3-A and ASME BPE (animal fat free)
- Ultrasonic, hydrostatic testing
- NIST traceable calibration
- Oxygen service cleaning
- Callendar/Van Dusen sensor transmitter matching for RTD's

TH17 sanitary RTD assembly for sanitary process

Economical Tri-clamp, RTD assembly with standard, FDA approved plastic and sanitary 316L SS connection heads for monitoring applications



Enclosure / Terminal head
Polypropylene - FDA approved plastic
Aluminum (epoxy coated)
Sanitary design SS 316L

Tri-clamp flange size
1”/1½”, 316L SS
2”, 316L SS
3”, 316L SS
larger sizes on request

Immersion length, U
2”, 2.5”, 3”, 4”, 5”, 6”, (standard)
2” to 30” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

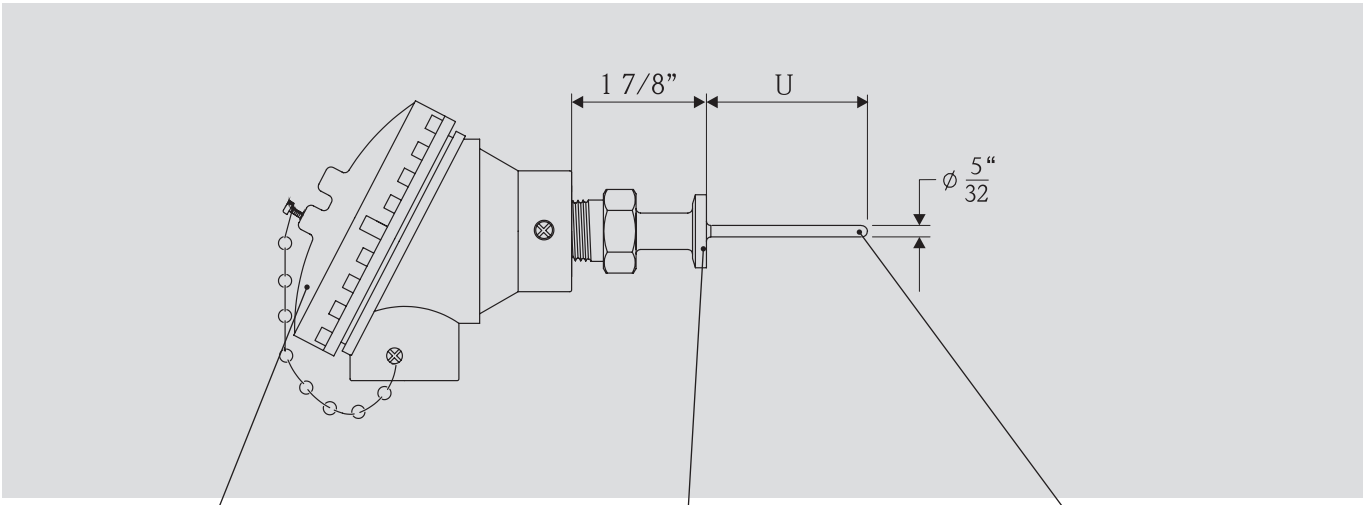
Ordering Information

Product Structure, sanitary RTD assembly, TH17

TH17-	Sanitary RTD assembly, TH17										
	Process Connection; Material of Construction (32 µ-inch surface finish)										
	B	1+1½" Tri-clamp connection; 316L SS									
	C	2" Tri-clamp connection; 316L SS									
	D	2½" Tri-clamp connection; 316L SS									
	E	3" Tri-clamp connection; 316L SS									
		Immersion Length (U) 2 to 30"									
		1	2"								
		2	3"								
		3	4"								
		4	5"								
		5	6"								
		6	2.5"								
		8	.... " (specify, increment 0.5")								
			Tube Outside Diameter, Material of Construction (32 µ-inch surface finish)								
			C	¼" OD; 316L SS							
			F	3/8" OD, reduced 3/16" OD; 316L SS							
			G	¼" OD; 316L SS PMO HTST version							
			H	3/8" OD, reduced 3/16" OD; 316L SS, PMO HTST version							
				Sensor Type							
				C	1 x Pt100, class A, 3 wire						
				G	1 x Pt100, class A, 4 wire						
				L	2 x Pt100, class A, 3 wire						
					Enclosure; Cable entry						
					A	Not selected					
					B	Alu, E+H blue Al + cover; NPT ½"					
					C	Alu, E+H blue Al + cover; NPT ¾"					
					D	Plastic PP white; NPT ½"					
					E	Plastic PP white; NPT ¾"					
					F	316L SS (TA20J); NPT ½"					
					G	316L SS (TA20J) LC display; NPT ½" (only with TMT18x transmitter)					
					1	Alu, E+H blue + flip cover, NPT ½"					
						Electrical connection					
						A	Programmable RTD TMT180				
						C	Programmable TMT181				
						D	Programmable TMT181 FM IS				
						E	Programmable TMT181 CSA IS				
						P	HART TMT182				
						R	HART TMT182 FM IS				
						T	HART TMT182 CSA IS				
						U	FF Head Transmitter DINB, GP				
						V	FF Head Transmitter DINB, FM/CSA IS				
						2	Flying leads				
						3	Terminal block				
						4	Profibus PA Head Transmitter DINB, GP				
						5	Profibus PA Head Transmitter DINB, FM/CSA IS				
							Documentation required				
							1	Not selected			
							2	with 3.1 Certificate of Conformance (includes MTR)			
							3	Material Traceability cert.			
								Additional option 1			
								A	Not selected		
								B	Sensor calibration certificate		
									Version		
									K	Standard, min. 32 Ra surface finish	
									P	Pharameutical, min. 15 Ra surface finish	
										Additional option 2	
										1	Not selected
										2	PROFIBUS PA plug M12
										3	Foundation Fieldbus plug 7/8"
										4	Plastic cable gland
TH17-											**Enter desired product structure**

TH18 sanitary RTD assembly for sanitary process

Economical Tri-clamp, RTD assembly with standard, FDA approved plastic and sanitary 316L SS connection heads for monitoring applications



Enclosure / Terminal head
Polypropylene – FDA approved plastic
Aluminum (epoxy coated)
Sanitary design 316L SS

Tri-clamp flange size
½”, 316L SS
¾”, 316L SS

Immersion length, U
¾”, 1¼”, 2¾” (standard)
1” to 15” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

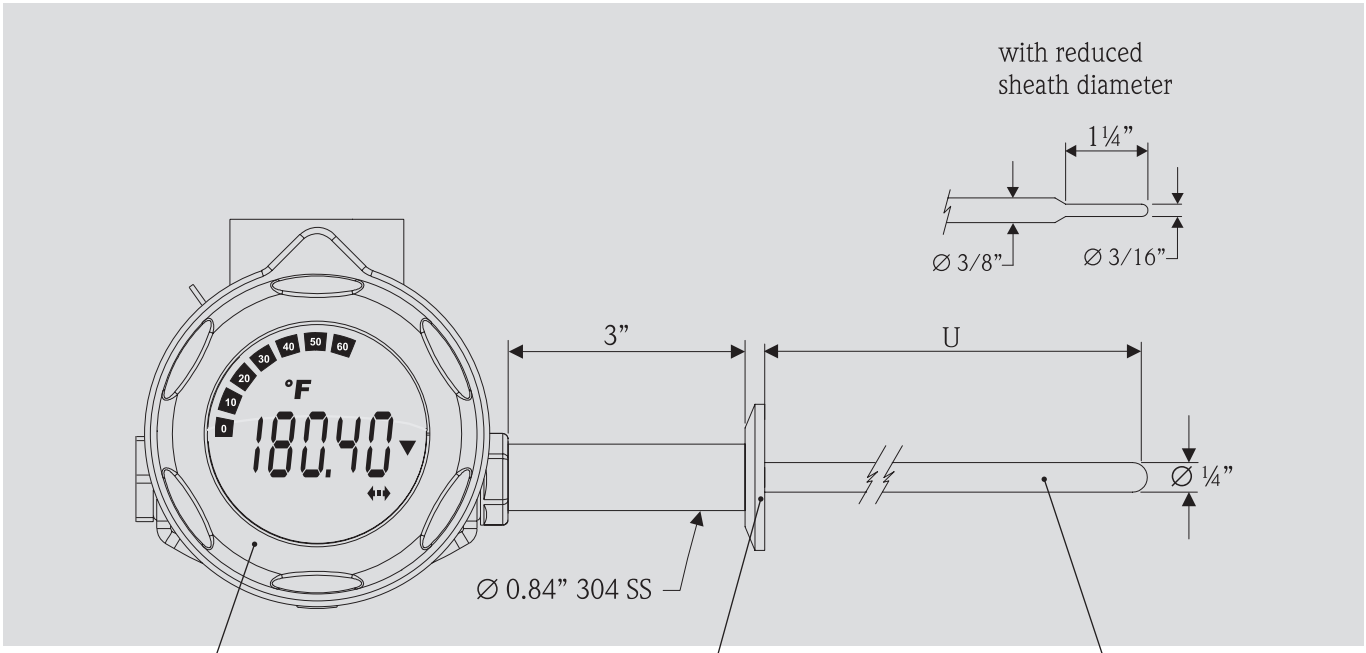
Ordering Information

Product Structure, sanitary RTD assembly, TH18

TH18-	**Sanitary RTD assembly, TH18**									
	Process Connection; Material of Construction (20 µ-inch Ra surface finish)									
	A	½" + ¾" Tri-clamp connection; 316L SS								
	Y	Special version								
		Immersion Length (U) 1 to 15"								
		2	¾"							
		4	1¼"							
		6	2¾"							
		8	...." (specify, increment 0.25")							
			Tube Outside Diameter, Material of Construction (20 µ-inch Ra surface finish)							
			1	5/32" OD; 316 SS						
				Sensor Type						
				C	1 x Pt100, class A, 3 wire					
				G	1 x Pt100, class A, 4 wire					
					Enclosure; Cable entry					
					A	Not selected				
					B	Alu, E+H blue Al + cover; NPT ½"				
					C	Alu, E+H blue Al + cover; NPT ¾"				
					D	Plastic PP white; NPT ½"				
					E	Plastic PP white; NPT ¾"				
					F	316L SS (TA20J); NPT ½"				
					G	316L SS (TA20J) LC display; NPT ½"				
					1	Alu, E+H blue + flip cover, NPT ½"				
						Electrical connection				
						A	Programmable RTD TMT180			
						C	Programmable TMT181			
						D	Programmable TMT181 FM IS			
						E	Programmable TMT181 CSA IS			
						P	HART TMT182			
						R	HART TMT182 FM IS			
						T	HART TMT182 CSA IS			
						U	FF Head Transmitter DINB, GP			
						V	FF Head Transmitter DINB, FM/CSA IS			
						2	Flying leads			
						3	Terminal block			
						4	Profibus PA Head Transmitter DINB, GP			
						5	Profibus PA Head Transmitter DINB, FM/CSA IS			
							Documentation required			
							1	Standard		
							2	Certificate of compliance		
							9	Special version		
								Additional option 1		
								A	Not selected	
									Version	
									K	Standard
									L	Material traceability certificate
										Additional option
										1 Not selected
										2 PROFIBUS PA plug M12
										3 Foundation Fieldbus plug 7/8"
										4 Plastic cable gland
TH18-			**1**				**A**			**Enter desired product structure**

TH17 sanitary RTD assembly for sanitary process

Tri-clamp, RTD assembly with advanced TMT162 transmitter for critical control and safety related applications



Enclosure / Field housing
Field housing 316 L (T17) for sanitary applications

Tri-clamp flange size
1”/1½”, 316L SS
2”, 316L SS
3”, 316L SS
larger sizes on request

Immersion length, U
2”, 2½” 3”, 4”, 5”, 6”, (standard)
2” to 30” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

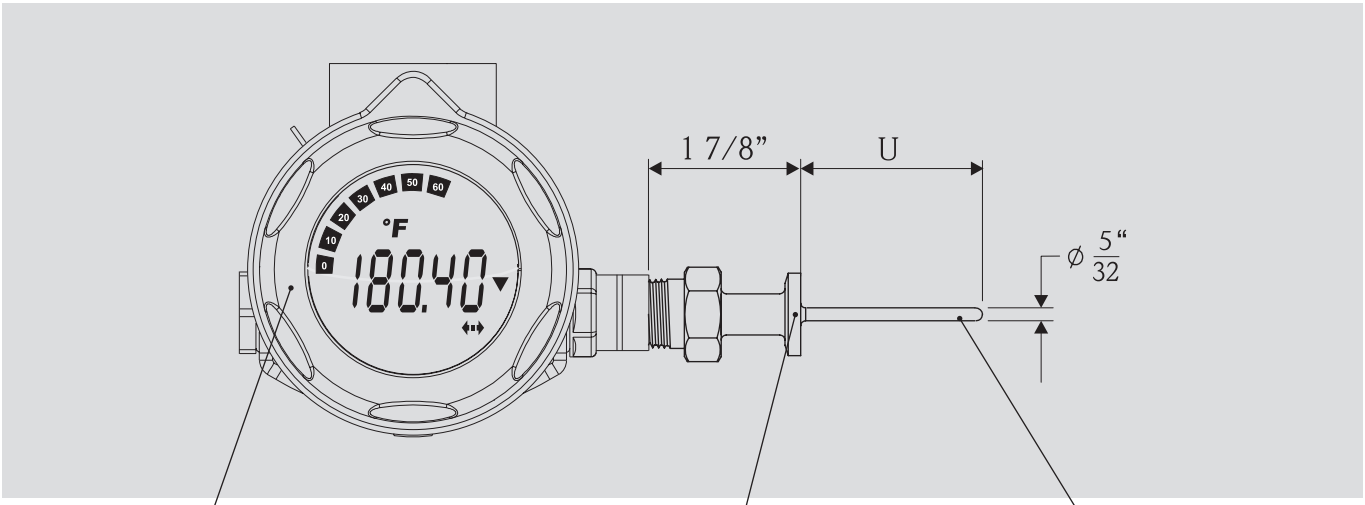
Ordering Information

Product Structure, sanitary RTD assembly, TH17

TH17-	**Sanitary RTD assembly, TH17**									
	Process Connection; Material of Construction (32 µ-inch surface finish)									
	B	1+1½" Tri-clamp connection; 316L SS								
	C	2" Tri-clamp connection; 316L SS								
	D	2½" Tri-clamp connection; 316L SS								
	E	3" Tri-clamp connection; 316L SS								
		Immersion Length (U) 2 to 30"								
		1	2"							
		2	3"							
		3	4"							
		4	5"							
		5	6"							
		6	2.5"							
		8	.... " (specify, increment 0.5")							
			Tube Outside Diameter, Material of Construction (32 µ-inch surface finish)							
			C	¼" OD; 316L SS						
			F	3/8" OD, reduced 3/16" OD; 316L SS						
			G	¼" OD; 316L SS PMO HTST version						
			H	3/8" OD, reduced 3/16" OD; 316L SS, PMO HTST version						
				Sensor Type						
				C	1 x Pt100, class A, 3 wire					
				G	1 x Pt100, class A, 4 wire					
				L	2 x Pt100, class A, 3 wire					
					Enclosure; Cable entry					
					H	316L (T17) field housing; NPT ½" + HART + 1 x Input				
					I	316L (T17) field housing; NPT ½" + HART + 1 x Input + display				
					J	316L (T17) field housing; NPT ½" + HART + 2 x Input				
					K	316L (T17) field housing; NPT ½" + HART + 2 x Input + display				
					L	316L (T17) field housing; 2 x Input + FF + NPT ½"				
					M	316L (T17) field housing; NPT ½" + FF + 2 x Input + display				
						Electrical connection				
						I	TMT162, dual compartment			
						J	TMT162, FM IS, dual compartment			
						K	TMT162, CSA IS, dual compartment			
							Documentation required			
							1	Not selected		
							2	with 3.1 Certificate of Conformance (includes MTR)		
							3	Material Traceability cert.		
								Additional option 1		
								A	Not selected	
								B	Sensor calibration certificate	
									Version	
									K	Standard, min. 32 Ra surface finish
									P	Pharameutical, min. 15 Ra surface finish
										Additional option 2
										1 Not selected
										2 PROFIBUS PA plug M12
										3 Foundation Fieldbus plug 7/8"
										4 Plastic cable gland
TH17-										**Enter desired product structure**

TH18 sanitary RTD assembly for sanitary process

Tri-clamp, RTD assembly with advanced TMT162 transmitter for critical control and safety related applications



Enclosure / Field housing
Field housing 316 L (T17) for sanitary applications

Tri-clamp flange size
½”, 316L SS
¾”, 316L SS

Immersion length, U
¾”, 1¼”, 2¾” (standard)
1” to 15” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

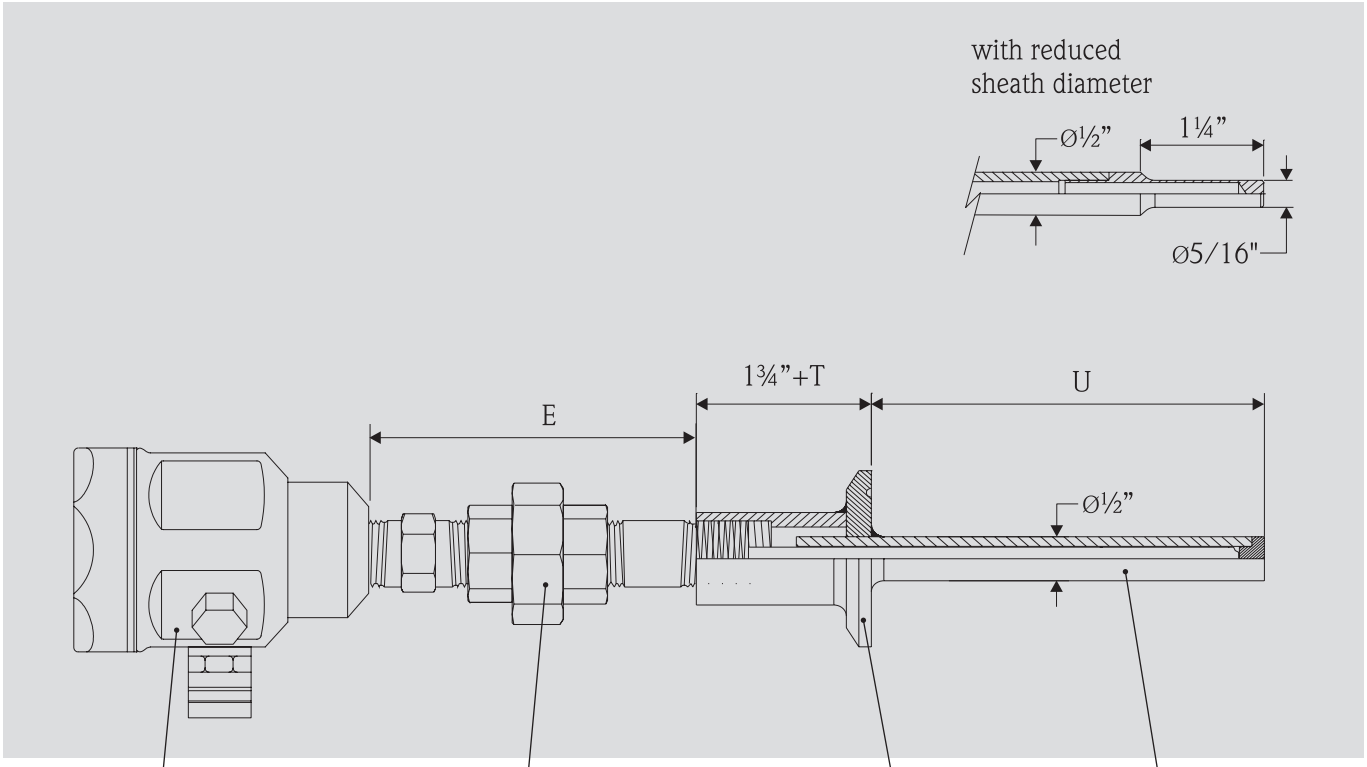
Ordering Information

Product Structure, sanitary RTD assembly, TH18

TH18-	**Sanitary RTD assembly, TH18**									
	Process Connection; Material of Construction (20 µ-inch Ra surface finish)									
	A	½" + ¾" Tri-clamp connection; 316L SS								
	Y	Special version								
		Immersion Length (U) 1 to 15"								
		2	¾"							
		4	1¼"							
		6	2¾"							
		8	...." (specify, increment 0.25")							
			Tube Outside Diameter, Material of Construction (20 µ-inch Ra surface finish)							
			1	5/32" OD; 316 SS						
				Sensor Type						
				C	1 x Pt100, class A, 3 wire					
				G	1 x Pt100, class A, 4 wire					
					Enclosure; Cable entry					
					J	316L (T17) field housing; 2 x Input + NPT ½" + HART				
					K	316L (T17) field housing; NPT ½" + HART + 2 x Input + display				
					L	316L (T17) field housing; 2 x Input + FF + NPT ½"				
					M	316L (T17) field housing; NPT ½" + FF + 2 x Input + display				
						Electrical connection				
						I	TMT162, dual compartment			
						J	TMT162, FM IS, dual compartment			
						K	TMT162, CSA IS, dual compartment			
							Documentation required			
							1	Standard		
							2	Certificate of compliance		
							9	Special version		
								Additional option 1		
								A	Not selected	
									Version	
									K	Standard
									L	Material traceability certificate
										Additional option
										1 Not selected
										2 PROFIBUS PA plug M12
										3 Foundation Fieldbus plug 7/8"
										4 Plastic cable gland
TH18-			**1**					**A**		**Enter desired product structure**

TH27 sanitary RTD assembly for sanitary process

Tri-clamp thermowell, RTD assembly with standard, FDA approved plastic and sanitary 316 SS connection heads for monitoring applications



Enclosure / Terminal head
Polypropylene – FDA approved plastic
Aluminum (epoxy coated)
Sanitary design 316L SS

Extension
Hex Nipple E=1", 316L SS
NUN E=4", 316L SS
NUN E=7", 316L SS

Tri-clamp flange size
1"/1½", 316L SS
2", 316L SS
2½", 316L SS
3", 316L SS
larger sizes on request

Immersion length, U
2½" 3", 4", 4½", 5", 6", (standard)
2" to 30" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

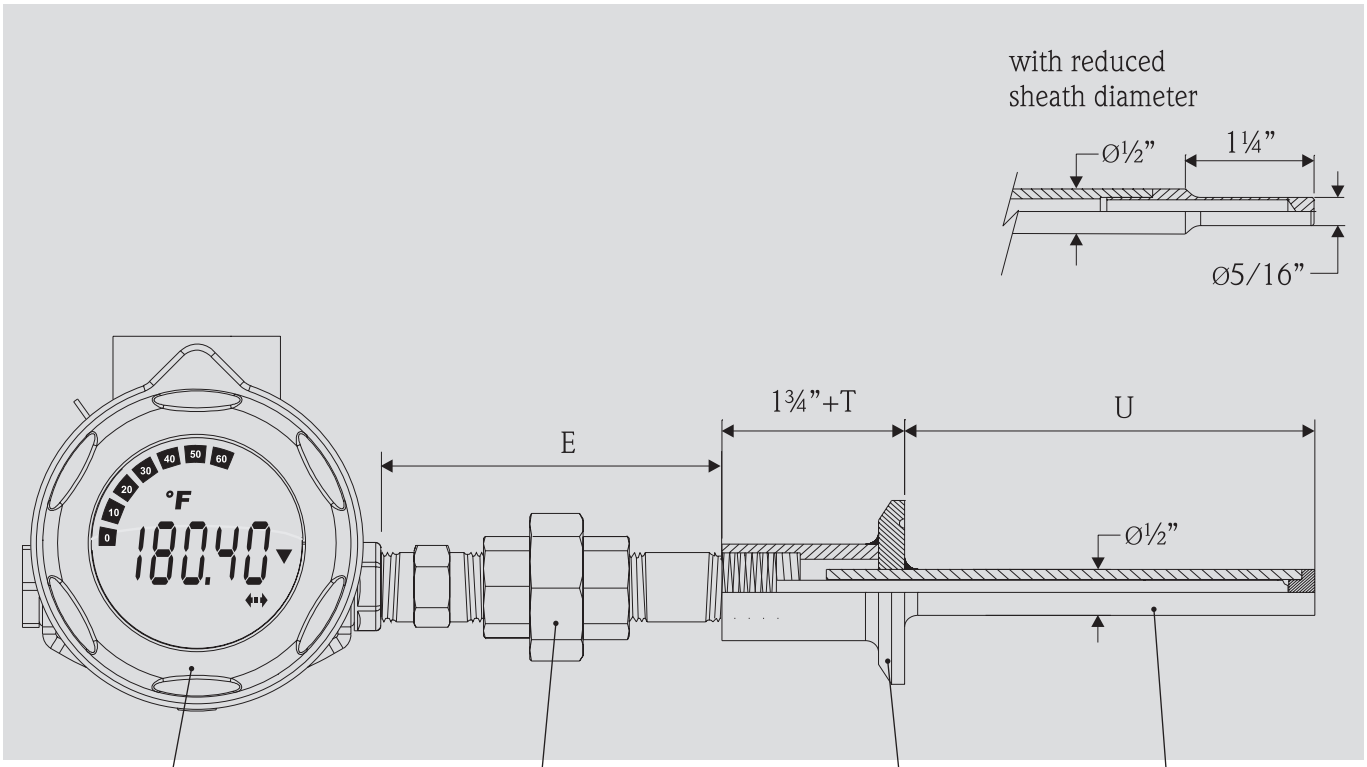
Ordering Information

Product Structure, sanitary RTD assembly, TH27

TH27-	**Hygenic RTD Assembly, US Style, TH27**											
	Process Connection; Material of Construction (32 µ-inch Ra surface finish)											
	B	1+1½" Tri-clamp; 316L SS										
	C	2" Tri-clamp; 316L SS										
	D	2½" Tri-clamp; 316L SS										
	E	3" Tri-clamp; 316L SS										
	Y	Special version										
		Thermowell immersion length U										
		A	3"									
		B	4"									
		C	5"									
		D	6"									
		1	2½"									
		2	4½"									
		3	7½"									
		4	10½"									
		8	.... " (Specify increment 0.5")									
			Thermowell shape; material (32 µ-inch Ra surface finish)									
			1	½" straight; 316L SS								
			2	½" reduced 5/16"; 316L SS								
				Thermowell Lag (T)								
				A	None							
				E	3"							
				X	.... " (Specify increment 0.5")							
					Extension (E)							
					1	Hex nipple 316L SS, E=1"						
					2	Nipple+Union+Nipple 316L SS, E=4"						
					6	Nipple+Union+Nipple 316L SS, E=7"						
						Sensor Type						
						G	1 x Pt100, class A, 4 wire, -50... 260°C					
						H	1 x Pt100, class A, 4 wire, -200... 600°C					
						L	2 x Pt100, class A, 3 wire, -50... 260°C					
						M	2 x Pt100, class A, 3 wire, -200... 600°C					
							Enclosure; Cable entry					
							A	Not selected				
							B	Alu, E+H blue Al + cover; NPT ½"				
							C	Alu, E+H blue Al + cover; NPT ¾"				
							D	Plastic PP white; NPT ½"				
							E	Plastic PP white; NPT ¾"				
							F	SS304 (TA20J); NPT ½"				
							G	SS304 (TA20J) LC display; NPT ½"				
							1	Alu, E+H blue + flip cover; NPT ½"				
								Electrical connection				
								A	Programmable RTD TMT180			
								C	Programmable TMT181			
								D	Programmable TMT181 FM IS			
								E	Programmable TMT181 CSA IS			
								P	HART TMT182			
								R	HART TMT182 FM IS			
								T	HART TMT182 CSA IS			
								U	FF DIN B			
								V	FF DIN B, FM/CSA IS			
								2	Flying leads			
								3	Terminal block			
								F	PROFIBUS PA DIN B			
								G	PROFIBUS PA DIN B, FM/CSA IS			
									Additional option 1			
									1	Not selected		
									2	PROFIBUS PA plug M12		
									3	Foundation Fieldbus plug 7/8"		
									4	Plastic cable gland		
										Additional option 2		
										A	Not selected	
										B	Sensor calibration certificate	
										C	Material traceability certificate	
										D	3.1 Certificate of Conformance (includes MTR)	
										E	Sensor calibration certificate + 3.1 Cer. Of compliance (includes MTR)	
											Version	
											K	Standard 32 Ra
											P	Pharmaceutical 16Ra
TH27-												**Enter desired product structure**

TH27 sanitary RTD assembly for sanitary process

Tri-clamp thermowell, RTD assembly with advanced TMT162 transmitter for critical control and safety related applications



Enclosure / Field housing
Field housing 316 L (T17) for sanitary applications

Extension
Hex Nipple E=1", 316L SS
NUN E=4", 316L SS
NUN E=7", 316L SS

Tri-clamp flange size
1"/1½", 316L SS
2", 316L SS
2½", 316L SS
3", 316L SS
larger sizes on request

Immersion length, U
2½" 3", 4", 4½", 5", 6", 7½", 10½" (standard)
2" to 30" (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, sanitary RTD assembly, TH27

TH27-	**Hygenic RTD Assembly, US Style, TH27**										
	Process Connection; Material of Construction (32 µ-inch Ra surface finish)										
	B	1+1½" Tri-clamp; 316L SS									
	C	2" Tri-clamp; 316L SS									
	D	2½" Tri-clamp; 316L SS									
	E	3" Tri-clamp; 316L SS									
	Y	Special version									
		Thermowell immersion length U									
		A	3"								
		B	4"								
		C	5"								
		D	6"								
		1	2½"								
		2	4½"								
		3	7½"								
		4	10½"								
		8	.... " (Specify increment 0.5")								
			Thermowell shape; material (32 µ-inch Ra surface finish)								
			1	½" straight; 316L SS							
			2	½" reduced 5/16"; 316L SS							
				Thermowell Lag (T)							
				A	None						
				E	3"						
				X	.... " (Specify increment 0.5")						
					Extension (E)						
					1	Hex nipple 316L SS, E=1"					
					2	Nipple+Union+Nipple 316L SS, E=4"					
					6	Nipple+Union+Nipple 316L SS, E=7"					
						Sensor Type					
						G	1 x Pt100, class A, 4 wire, -50... 260°C				
						H	1 x Pt100, class A, 4 wire, -200... 600°C				
						L	2 x Pt100, class A, 3 wire, -50... 260°C				
						M	2 x Pt100, class A, 3 wire, -200... 600°C				
							Enclosure; Cable entry				
							H	316L (T17) field housing; 1 x Input + NPT ½" + HART			
							I	316L (T17) field housing; NPT ½" + HART + 1 x Input + display			
							J	316L (T17) field housing; 2 x Input + NPT ½" + HART			
							K	316L (T17) field housing; NPT ½" + HART + 2 x Input + display			
							L	316L (T17) field housing; 2 x Input + FF + NPT ½"			
							M	316L (T17) field housing; NPT ½" + FF + 2 x Input + display			
								Electrical connection			
								I	TMT162, dual compartment		
								J	TMT162, FM IS, dual compartment		
								K	TMT162, CSA IS, dual compartment		
									Additional option 1		
									1	Not selected	
									2	PROFIBUS PA plug M12	
									3	Foundation Fieldbus plug 7/8"	
									4	Plastic cable gland	
										Additional option 2	
										A	Not selected
										B	Sensor calibration certificate
										C	Material traceability certificate
										D	3.1 Certificate of Conformance (includes MTR)
										E	Sensor calibration certificate + 3.1 Cer. Of compliance (includes MTR)
											Version
											K Standard, min. 32 Ra surface finish
											P Pharmaceutical, min. 16Ra surface finish
TH27-											**Enter desired product structure**

Compact transmitters with integrated sensor probe

TSM470Y and TMR3x
Easytemp compact temperature transmitters combine a four-wire Pt100 class A RTD with the analog output of a transmitter offering an economical and technical alternative to unreliable direct wiring to the control room. The compact, potted design, combined with modern laser welding and a truly fast response sensor ensures a Very accurate – fast and reliable measurement.

In addition this design offers the following advantages:

- Complete stainless steel body makes the design highly resistant to corrosive environments and a perfect fit for clean room, paint booth, industrial robotics and sanitary applications.
- Ergonomic design and easy standard plug termination, means no wiring required and no corrosion of terminals.
- No ingress of moisture during heavy wash downs or highly humid environments such as food and beverage plants.
- High vibration resistance in monitoring of engine temperatures and bearing temperatures on heavy industrial equipment.
- Completely sealed design protects against any dust ingress in dusty environments such as grain silos.
- Highly stable measurement with very low drift and very long stability.
- Matched RTD and transmitter offer high measurement accuracy and fits control and monitoring application.
- Ready to use 4-20 mA signal fits perfectly for OEM & skid applications.

The TMR3x feature the innovative fast response technology from Endress+Hauser. This design has the sensor mounted right near the tip offering additional advantage of the fastest possible response time with the truest measurement for small insertion depths. This offers unbeatable advantages in time response critical processes and small diameter pipes.

This system is also available in a modular design with detachable sensor- transmitter. Consult your Endress+Hauser partner about a solution for you application based on this unique design.

TSM470G

TSM470F

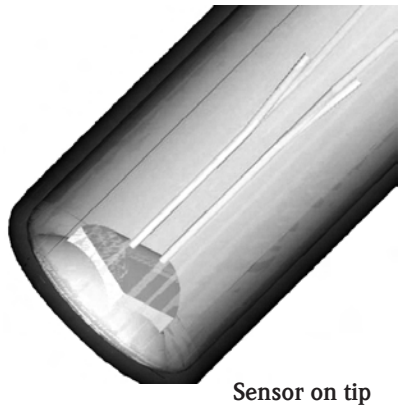
TSM470P

TMR31

TMR35

Fast True Response (FTR) technology or Sensor on tip (SOT)

The measurement element and its thermal coupling to the medium to be measured are primarily responsible for the accuracy, speed of response and trueness of a contact based measurement.
Endress+Hauser has designed an innovative industrial temperature probe with the measurement element soldered directly onto the tip of the measurement insert. This optimized positioning of the sensor significantly improves the measurement quality of the RTD element.

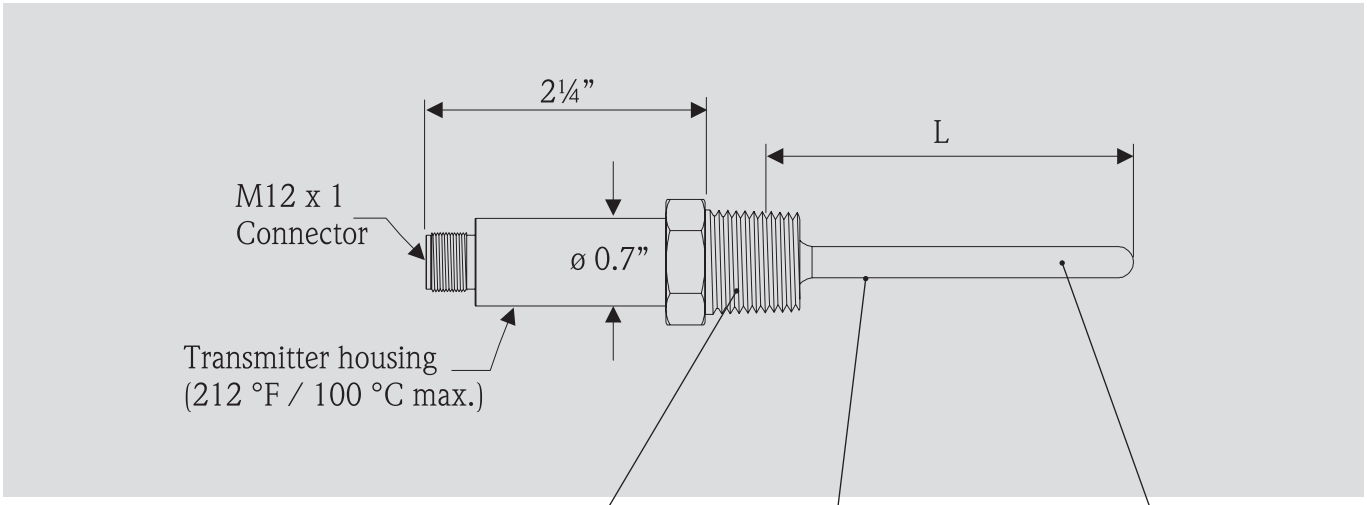


Sensor on tip

This direct contact between sensor and measured medium means that the thermal transition is optimized and extremely fast response times of t90 ≤ 2 s are reached. Additionally true measurement even with small insertion lengths can be achieved as thermal dispersion losses are minimized.

TSM470G compact RTD transmitter

TSM470G, Industrial compact transmitter with integrated sensor, threaded process connection or with compression fittings



Process connection
½” - 14 NPT, 316 L

Tube diameter
¼” OD, 316 L

Immersion length, L
3¼”, 5¼”, 8¼”, (standard)
2” to 30” (specify)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

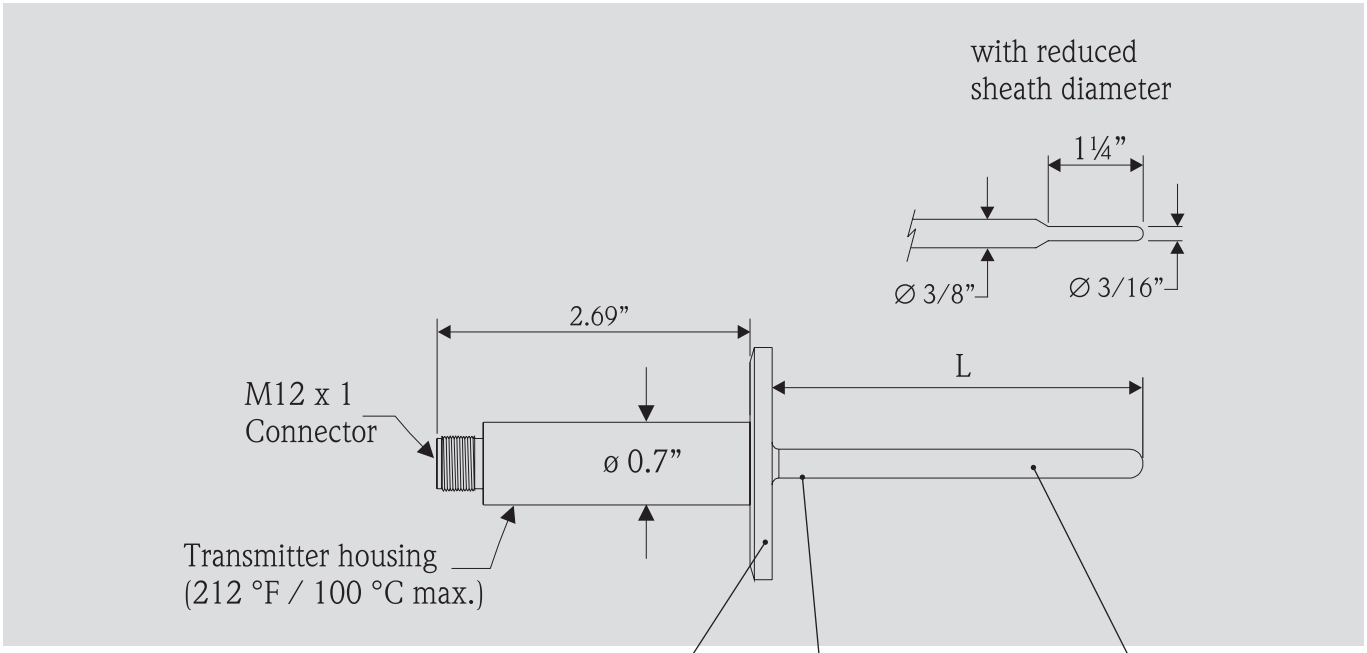
Ordering Information

Product Structure, compact RTD transmitter 4-wire Pt100, class A, TSM470G

TSM470G	**Compact RTD Transmitter 4-wire Pt100, class A, TSM470G**							
	Certification							
	A	Non-hazardous area						
		Process Connection; Material						
		A	½" - 14 NPT, 316L					
		Y	Special version					
			Tube OD diameter					
			1	Diameter ¼" OD, 316L				
			9	Special version				
				Immersion length				
				A	3¼"			
				B	5¼"			
				C	8¼"			
				X	.... " (Specify increment 0.5")			
				Y	Special version			
					Configuration range			
					AA	range 0 to 100 °F		
					AB	range 0 to 200 °F		
					AC	range 0 to 300 °F		
					AD	range -40 to 140 °F		
					AE	range -40 to 200 °F		
					BB	range -40 to 60 °C		
					BC	range -30 to 60 °C		
					BD	range -30 to 150 °C		
					BE	range -30 to 70 °C		
					BG	range -20 to 20 °C		
					BH	range -20 to 60 °C		
					BI	range -10 to 40 °C		
					BK	range 0 to 50 °C		
					BL	range 0 to 100 °C		
					BM	range 0 to 150 °C		
					XX	Customized range		
						Version		
						1	Not selected	
						3	with cable M12x1, L=5 meters (16.4 ft)	
						9	Special version	
							Model	
							K	Standard
TSM470G-	**A**						**K**	**Enter desired product structure**

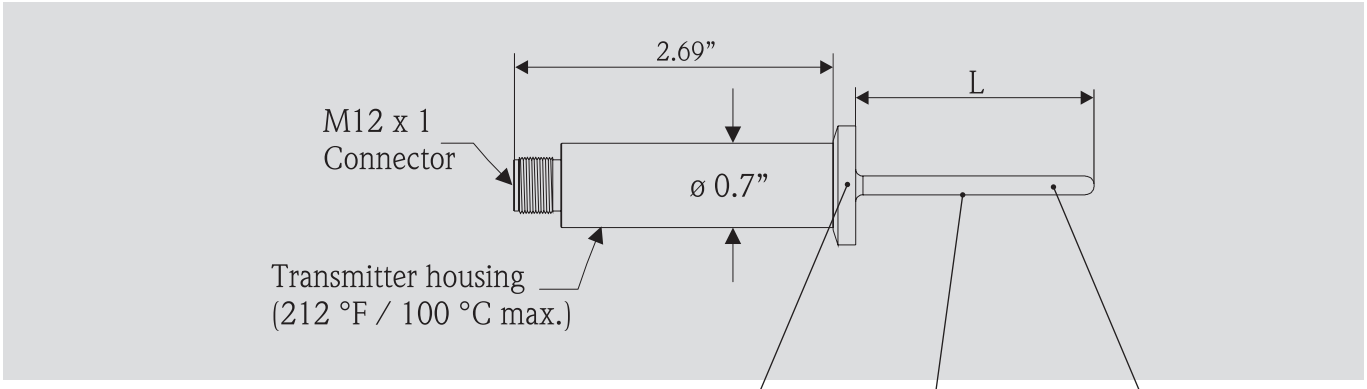
TSM470F/TSM470P sanitary compact RTD transmitter

TSM470F, Sanitary compact transmitter with integrated sensor, Tri-clamp process connection



Process connection	Tube diameter	Immersion length, L
1” & 1½” Tri-clamp, 316 L	¼” OD, 316 L	2”, 4”, 6”, (standard)
2” Tri-clamp, 316 L	3/8” reduced 3/16”, 316 L	2” to 30” (specify)

TSM470P, Sanitary compact transmitter with integrated sensor, Mini-clamp process connection



Process connection	Tube diameter	Immersion length, L
½” & ¾” Mini-clamp, 316 L	5/32” OD, 316 L	1¼”, 2¾”, ¾” (standard)

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

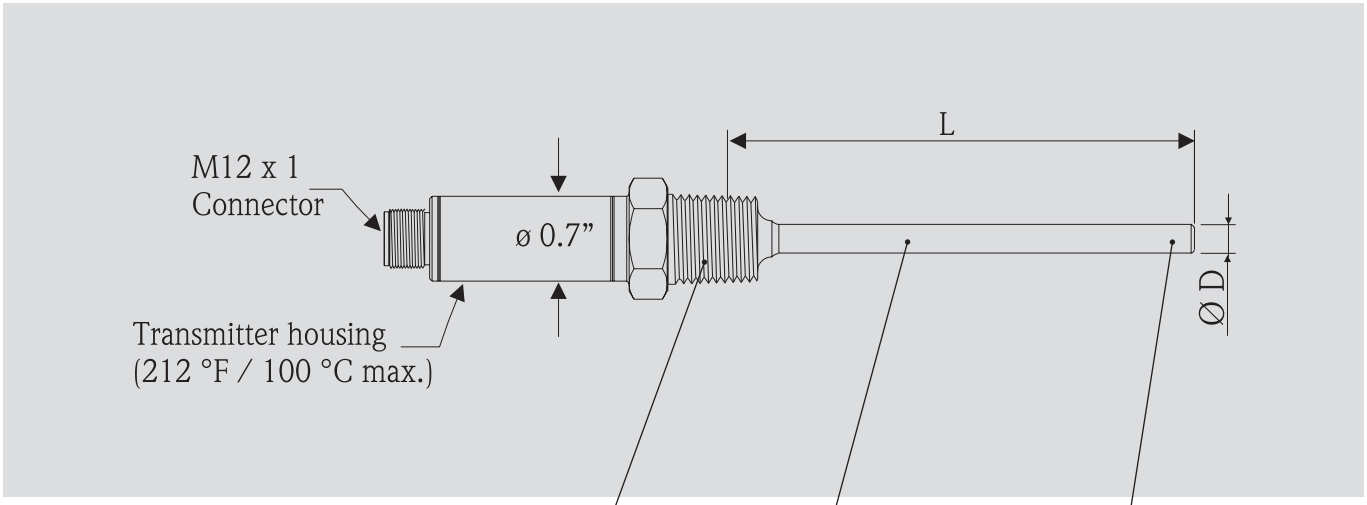
Product Structure, sanitary compact RTD transmitter, 4-wire Pt100, class A

TSM470F	Triclamp compact transmitter 4-wire Pt100, class A, 3-A, 32 Ra						
	Certification						
	A	Non-hazardous area					
		Process Connection; Material					
		B	1" & 1½" Triclamp connection, 316L				
		C	2" Triclamp connection, 316L				
		Y	Special version				
			Tube OD diameter				
			1	Diameter ¼" OD, 316L			
			2	Diameter 3/8" OD reduced 3/16" OD, 316L			
			9	Special version			
				Immersion length, L			
				A	2"		
				B	4"		
				C	6"		
				X	.... " (Specify increment 0.5")		
				Y	Special version		
					Configuration range		
					AA	range 0 to 100 °F	
					AB	range 0 to 200 °F	
					AC	range 0 to 300 °F	
					AD	range -40 to 140 °F	
					AE	range -40 to 200 °F	
					BB	range -40 to 60 °C	
					BC	range -30 to 60 °C	
					BD	range -30 to 150 °C	
					BE	range -30 to 70 °C	
					BG	range -20 to 20 °C	
					BH	range -20 to 60 °C	
					BI	range -10 to 40 °C	
					BK	range 0 to 50 °C	
					BL	range 0 to 100 °C	
					BM	range 0 to 150 °C	
					XX	Customized range	
						Version	
						1	Not selected
						3	with cable M12x1, L=5 meters (16.4 ft)
						9	Special version
							Model
							K Standard
TSM470F-	**A**						**K** **Enter desired product structure**

TSM470P	Miniclamp compact transmitter 4-wire Pt100, class A, 20 Ra							
	Certification							
	A	Non-hazardous area						
		Process Connection; Material						
		B	½" & ¾" Triclamp connection, 316L					
		Y	Special version					
			Tube OD diameter					
			1	5/32" OD, 316L				
			9	Special version				
				Immersion length				
				A	1¼"			
				B	2¾"			
				C	¾"			
				Y	Special version			
					Configuration range			
					AA	range 0 to 100 °F		
					AB	range 0 to 200 °F		
					AC	range 0 to 300 °F		
					AD	range -40 to 140 °F		
					AE	range -40 to 200 °F		
					BB	range -40 to 60 °C		
					BC	range -30 to 60 °C		
					BD	range -30 to 150 °C		
					BE	range -30 to 70 °C		
					BG	range -20 to 20 °C		
					BH	range -20 to 60 °C		
					BI	range -10 to 40 °C		
					BK	range 0 to 50 °C		
					BL	range 0 to 100 °C		
					BM	range 0 to 150 °C		
					XX	Customized range		
						Version		
						1	Not selected	
						2	With certificate of compliance	
						3	With cable M12x1, L=5 meters (16.4 ft)	
						9	Special version	
							Model	
							K	Standard
TSM470P-	**A**						**K**	**Enter desired product structure**

Easytemp® TMR31 compact thermometer

TMR31, Industrial compact transmitters with fast true response sensor, threaded process connection or with compression fittings



Process connection
w/o; compression fitting, 316L, L =>100 mm, compression fitting order separately
Thread ANSI ¼” NPT, 316L
Thread ANSI ½” NPT, 316L
Thread ISO228 G¼”, 316L (as option: thermal isolated)
Thread ISO228 G½”, 316L
Thread BSPT R½”, JIS 0203, 316L
Thread M14x1.5, 316L
Thread M18x1.5, 316L

Insertion length, L
50 mm, 100 mm, 120 mm, 150 mm, 200 mm, 250 mm, 300 mm, 20 mm (standard)
40... 300 mm (specify)
301... 600 mm (specify)

Tube diameter
4 mm (only with L = 20 mm)
6 mm

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

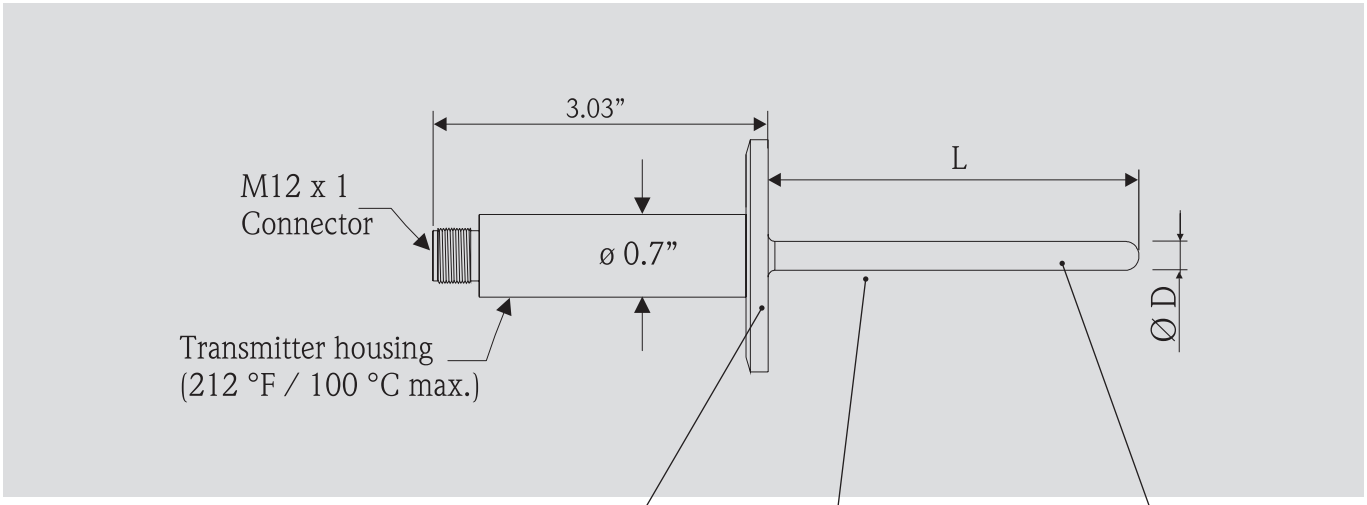
Ordering Information

Product Structure, compact thermometer, 4-wire Pt100, general applications, TMR31

TMR31	**Easytemp® TMR31, compact thermometer**										
	Approval:										
	A	Non-hazardous area									
	Y	Special version to be specified									
		Electrical connection:									
		Y	Special version, to be specified								
		1	Plug M12, IP66/67								
			Output; Measuring range:								
			A	4-20 mA; 0... 100 °C							
			B	4-20 mA; 0... 150 °C							
			C	4-20 mA; -50... 100 °C							
			D	4-20 mA; -50... 150 °C							
			E	4-20 mA; -50... 200 °C							
			F	4-20 mA; 0... 200 °C							
			X	4-20 mA, see additional spec.							
			Y	Special version, to be specified							
			1	Pt100, DIN class A, 4-wire							
				Neck:							
				A	without						
				B	35 mm						
				C	50 mm						
					Process Connection:						
					AA	w/o; Compr. fitting, 316L, L =>100 mm, insertion length; compr. fitting, to order separately					
					AB	Thread ANSI ¼" NPT, 316L					
					AC	Thread ANSI ½" NPT, 316L					
					BA	Thread ISO228 G¼", 316L					
					BB	Thread ISO228 G½", 316L					
					BC	Thread ISO228 G¼",316L,thermal isolatad					
					JA	Thread BSPT R½", JIS 0203, 316L					
					MA	Thread M14x1.5, 316L					
					MB	Thread M18x1.5, 316L					
					YY	Special version, to be specified					
						Insertion Length L; Diameter D:					
						AB	50 mm; 6 mm				
						AC	100 mm; 6 mm				
						AD	120 mm; 6 mm				
						AE	150 mm; 6 mm				
						AG	200 mm; 6 mm				
						AH	250 mm; 6 mm				
						AJ	300 mm; 6 mm				
						AX	..... mm; 6 mm (40... 300 mm)				
						BA	20 mm; 4 mm				
						BX	..... mm; 6 mm (301... 600 mm)				
						YY	Special version, to be specified				
							Material; surface roughness:				
							1	316L; Ra <= 0.8 µm (32 µ-inch)			
							9	special version, to be specified			
								Material certificate:			
								A	without		
								E	EN10204-3.1 cast analysis + surface finish, long form		
								Y	special version, to be specified		
									Calibration:		
									A	without	
									B	Work; 2-points: 0 °C, 1x variable from > 35 mm, -20 °C... 150 °C	
									E	ISO/IEC17025; 3-point: 0 °C; 2x variable from > 40 mm, -20 °C... 150 °C	
									Y	Special version to be specified	
										Version:	
										A	Standard
										Y	Special version to be specified
TMR31-											**Enter desired product structure**

Easytemp® TMR35 sanitary compact thermometer

TMR35, Sanitary compact transmitters with fast true response sensor, tri-clamp and other sanitary process connections



Process connection
w/o adapter, M24x1.5
For Liquiphant (FTL50) weld-in adapter G¾”/D6, 316L, 3A
for Liquiphant (FTL20) weld-in adapter, G¾”/D6, 316L, 3A
Clamp ISO2852 DN25-38, 1-1½”, 316L, 3A, DIN32676 DN25-40
CIamp ISO2852 DN40-51, 2”, 316L, 3A, DIN32676 DN50
Clamp ISO2852 2½”, 316L, 3A
APV-Inline DN50 PN40, 316L, 3A
Varivent F pipe DN25-32, PN40, 316L, 3A
Varivent N pipe DN40-162, PN40, 316L, 3A
Conical metall-metall G½”, 316L
DIN11851 DN25 PN40, 316L, 3A
DIN11851 DN40 PN40, 316L, 3A
DIN11851 DN50 PN40, 316L, 3A

Insertion length, L
30 mm, 50 mm, 100 mm, 120 mm, 150 mm, 200 mm (standard)
38 mm, 83 mm, 68 mm (Version with spring loaded cap-nut G3/8”)
40... 300 mm (specify)
301... 600 mm (specify)

Tube diameter
3 mm (Version with spring loaded cap-nut G3/8”)
6 mm

Options shown are only the most commonly found in processes, if you do not find what you need, please call your Endress+Hauser sales representative, see overview on backpage.

Ordering Information

Product Structure, compact thermometer, 4-wire Pt100, sanitary applications, TMR35

TMR35	**Easytemp® TMR35, compact thermometer**										
	Approval:										
	A	Non-hazardous area									
	Y	Special version to be specified									
		Electrical connection:									
		Y	Special version, to be specified								
		1	Plug M12, IP66/67								
			Output; Measuring range:								
			A	4-20 mA; 0... 100 °C							
			B	4-20 mA; 0... 150 °C							
			C	4-20 mA; -50... 100 °C							
			D	4-20 mA; -50... 150 °C							
			E	4-20 mA; -50... 200 °C							
			F	4-20 mA; 0... 200 °C							
			X	4-20 mA, see additional spec.							
			Y	Special version, to be specified							
			1	Pt100, DIN class A, 4-wire							
				Neck:							
				A	without						
				B	35 mm						
				C	50 mm						
					Process Connection:						
					AA	w/o adapter, M24x1.5					
					AB	For Liquiphant (FTL50) weld-in adapter G¾"/D6, 316L, 3A					
					AC	for Liquiphant (FTL20) weld-in adapter, G¾"/D6, 316L, 3A					
					DB	Clamp ISO2852 DN25-38, 1-1½", 316L,3A, DIN32676 DN25-40					
					DL	Clamp ISO2852 DN40-51, 2", 316L, 3A, DIN32676 DN50					
					DP	Clamp ISO2852 2½", 316L, 3A					
					HL	APV-Inline DN50 PN40, 316L, 3A					
					LB	Varivent F pipe DN25-32, PN40, 316L, 3A					
					LL	Varivent N pipe DN40-162, PN40, 316L, 3A					
					MB	Conical metal-metal G½", 316L					
					PG	DIN11851 DN25 PN40, 316L, 3A					
					PH	DIN11851 DN40 PN40, 316L, 3A					
					PL	DIN11851 DN50 PN40, 316L, 3A					
					YY	Special version, to be specified					
						Insertion Length L; Diameter D:					
						AA	30 mm; 6 mm				
						AB	50 mm; 6 mm				
						AC	100 mm; 6 mm				
						AD	120 mm; 6 mm				
						AE	150 mm; 6 mm				
						AG	200 mm; 6 mm				
						AX	..... mm; 6 mm (40... 300 mm)				
						BA	38 mm; 3 mm				
						BB	83 mm; 3 mm				
						BC	68 mm; 3 mm				
						BX	..... mm; 6 mm (301... 600 mm)				
						YY	Special version, to be specified				
							Material; surface roughness:				
							1	316L; Ra <= 0.8 µm (32 µ-inch)			
							2	316L; Ra <= 0.4 µm (15 µ-inch)			
							3	316 L; Ra <=0.4 µm (15 µ-inch) electro-polished			
							9	special version, to be specified			
								Material certificate:			
								A	without		
								E	EN10204-3.1 cast analysis + surface finish, long form		
								Y	special version, to be specified		
									Calibration:		
									A	without	
									B	Work; 2-points: 0 °C, 1x variable from > 35 mm, -20 °C... 150 °C	
									E	ISO/IEC17025; 3-point: 0 °C; 2x variable from > 40 mm, -20 °C... 150 °C	
									Y	Special version to be specified	
										Version:	
										A	Standard
										Y	Special version to be specified
TMR35-											**Enter desired product structure**

Transmitters: high quality, leading edge technology

TMT162

Designed to perform and built to last!
TMT162 is an advanced, extremely rugged transmitter with very high accuracy. It is convenient to install and highly reliable and safe in operation!

Salient features:
- Dual compartment housing and fully potted electronics
- Blue backlit display (optional). Large digits, visible in the dark or in direct sunlight
- Bar graph and fault condition indication for ease of reading
- Universal input for reduced inventory
- Dual sensor input capability
- 4 to 20 mA, HART, FOUNDATION Fieldbus output options
- Galvanic isolation 2 kV

Advanced features:
- SIL 2, for highest safety to your measurement point
- Sensor backup, avoids otherwise costly unplanned shutdowns
- Drift alarm, to enable a quick maintenance intervention
- Min./max. value log
- Terminal corrosion detection
- Differential temperature or averaging temperature functions for energy applications
- Multi-channel (2+4) display function with FOUNDATION Fieldbus communication option
- Optional, stainless steel housings for sanitary or explosion-proof application

Easy installation:
- Operation, visualization and maintenance with PC, e.g. using Fieldcare™ software, AMS, PDM
- Full support for DTM FDT configuration
- HART® support for handhelds
- Output simulation for a quick and easy check of the loop

Approvals:
- FM and CSA (IS, NI, XP and DIP)
- ATEX (EEx ia, EEx nA, EEx d and dust-Ex)

TMT142

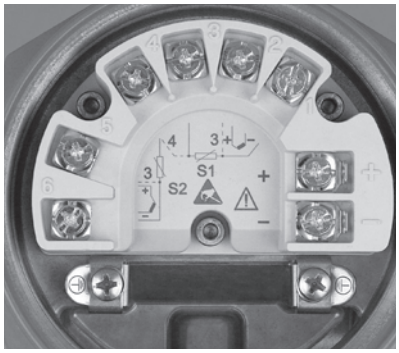
A field transmitter at a competitive price:
- Explosion proof and intrinsically safe approvals
- Single compartment housing

Head mounted (hockey puck) transmitters

- Fully potted electronics
- Advanced diagnostic features

DIN rail

- Universal models or economical RTD/TC
- Slim line housing option for saving space



Protection and simplicity is the prime consideration when designing field housings.

FDT CONNECTED · HART COMMUNICATION PROTOCOL · Fieldbus Foundation · PROFI BUS

Head transmitters

Model	TMT180	TMT181	TMT182	TMT84	TMT85
Special features	Low cost, accurate	PC interface, universal	HART® interface, SIL2, universal	PROFIBUS®-PA, universal	FOUNDATION Fieldbus™, universal
Measurement type	Pt 100	RTD/TC/Ω/mV	RTD/TC/Ω/mV	RTD/TC/Ω/mV	RTD/TC/Ω/mV
Design					
Communication	ReadWin® 2000	ReadWin® 2000	HART®	PROFIBUS®	FOUNDATION Fieldbus™
Number of inputs	1	1	1	2	2
RTD input	Pt50/100 Cu50/100	Pt50/100/500/1000, Ni100/500/1000 Cu50/100	Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000	Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000
TC input	-	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, C, D, R, S, E, J, K, L, N, T, U
Ω input	-	10 to 2000 Ω	10 to 2000 Ω	10 to 2000 Ω	10 to 2000 Ω
mV input	-	-10 to 100 mV	-10 to 75 mV	-10 to 75 mV	-20 to 100 mV
Accuracy (Pt100, -58 to +392°F/-50 to +200°C)	≤0.1 K / 0.08 % (Option)	≤0.2 K	≤0.2 K	≤0.15 K	≤0.15K
Output	4 to 20 mA 20 to 4 mA	4 to 20 mA 20 to 4 mA	4 to 20 mA 20 to 4 mA	PROFIBUS®-PA	FOUNDATION Fieldbus™
Power supply (DC)	10 to 35 V	8 to 35 V	11.5 to 35 V	Powered by PROFIBUS®-PA	9 to 32 V
Galvanic isolation 2 kV	-	Yes	Yes	Yes	Yes
Approvals	CSA, UL	FM, CSA, UL, ATEX			

Rail mounted / Field transmitters

Model	TMT121/122	RIT261	TMT162	TMT142
Special features	PC interface/HART® interface, SIL2, universal	Field display with built-in head transmitter	Safe, illuminated display, 2 compartment housing, SIL 2, universal	Safe, illuminated display, universal
Measurement type	RTD/TC/Ω/mV	RTD/TC/mV	RTD/TC/Ω/mV	RTD/TC/Ω/mV
Design				
Communication	ReadWin® 2000, HART®	ReadWin® 2000, HART®	HART®, FOUNDATION Fieldbus™	HART®
Number of inputs	1	1	2	1
RTD input	Pt100/500/1000 Ni100/500/1000	Pt100/500/1000 Ni100/500/1000	Pt50/100/200/500/1000 Ni100/120/500/1000 Cu10/50/100	Pt50/100/200/500/1000 Ni100/120/500/1000 Cu50/100
TC input	B, E, J, K, N, R, S, T, C, D, L, U	B, C, D, E, J, K, L, N, R, S, T, U	B, C, D, R, S, E, J, K, L, N, T, U	B, E, J, K, N, R, S, T, C, D, L, U
Ω input	10 to 400 Ω, 10 to 2000 Ω	10 to 400 Ω, 10 to 2000 Ω	10 to 2000 Ω	10 to 400 Ω, 10 to 2000 Ω
mV input	-10 to 100 mV	-10 to 75 mV	-20 to 100 mV	-20 to 100 mV
Accuracy (Pt100, -58 to +392°F/-50 to 200°C)	≤0.2 K	≤0.2 K	≤0.15 K	≤0.2 K (≤0.2 K)
Output	4 to 20 mA 20 to 4 mA	0/4 to 20 mA 20 to 0/4 mA	4 to 20 mA 20 to 4 mA FOUNDATION® Fieldbus	4 to 20 mA 20 to 4 mA
Power supply (DC)	12 to 35 V	12.5 to 35 V (loop powered)	11 to 40 V (8.5 V without display)	11 to 40 V (8 V without display)
Galvanic isolation 2 kV	Yes	Yes	Yes	Yes
Approvals	FM, CSA, UL	FM, CSA	FM, CSA, UL	

Calibration of sensor probes

Temperature is the most frequently measured parameter in process automation. Temperature measurement technology is applied world wide in industry. In order to be able to uniformly define and check the accuracy of the measurement, it was necessary to establish worldwide calibrating standards.

Endress+Hauser fulfills these standards and calibrates industrial resistance sensors and thermocouples according to the ISO/IEC 17025, DKD- and SIT-guidelines. The high calibrating competence at Endress+Hauser becomes evident through the accredited laboratories and calibration documentation using internationally recognized calibration certificates from the European co-operation for Accreditation (EA).

Over and above this, Endress+Hauser offers further services such as Sensor-Transmitter-Matching or the calibration of complete measurement chains including loop powered displays. This makes Endress+Hauser the right partner in all aspects of thermometer calibration.

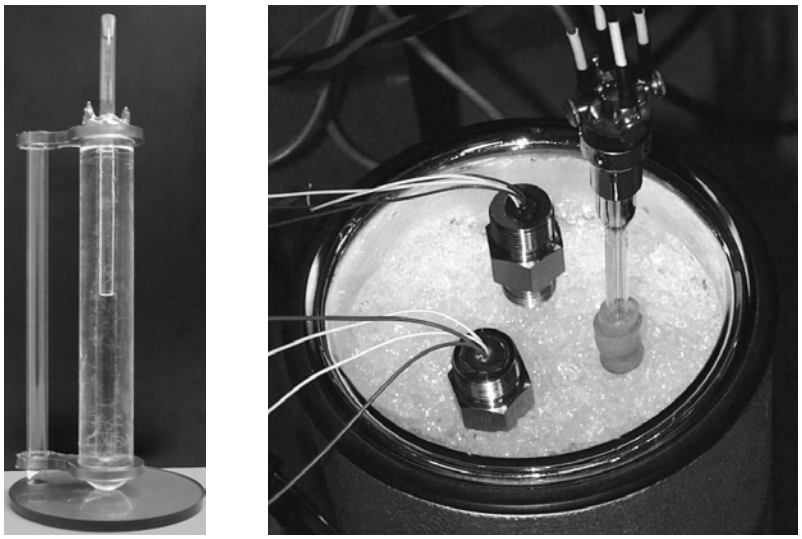
Basics

Calibrating sensor probes
Here the phrase calibration generally means the comparison of the measurements from a test piece with the corresponding measurements from a very accurate referencing a defined and reproducible measurement procedure. The aim is to define the measurement deviations of the test piece to the so-called true value of the measurand.

Basis for a practical temperature measurement and the traceability of thermometer calibration is the International Temperature Scale ITS-90. This defines a number of special temperatures, so-called fixed point temperatures, as well as procedures and measurement instruments with which every temperature can be interpolated between fixed points.

Fixed point calibration
Thermometers can be calibrated directly using these fixed point temperatures. Basically, these are temperature values which have certain thermodynamic equilibrium states of pure substances, such as melting/ freezing or the triple point (simultaneous appearance of solid, liquid and gaseous phase of a substance). Because such fixed point calibration procedures are very long winded, they are only used when very high requirements on the uncertainty of measurement are required.

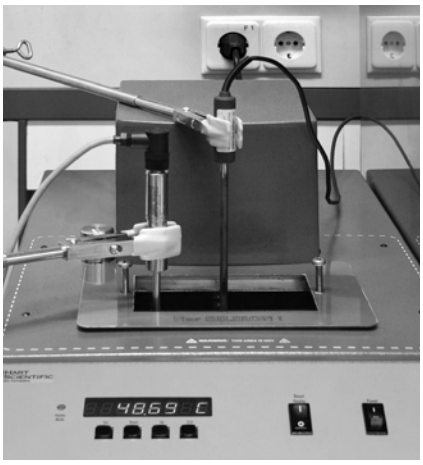
In comparison, calibration using the so-called freezing point, the solidification point of water at 0 °C, is relatively easy to do. A water ice mixture is easier to produce and has become the standard calibration procedure for industrial resistance thermometers.



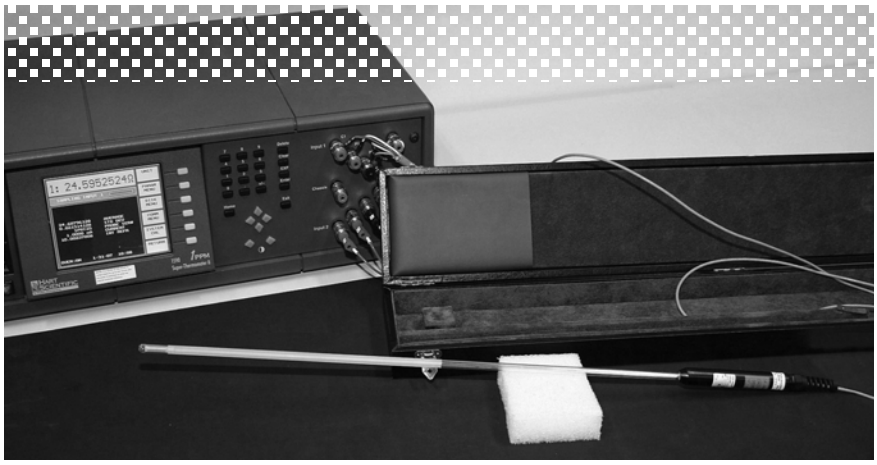
Fixed point calibration using a triple point cell and ice bath

Comparison calibration
In everyday use thermometers are more frequently calibrated applying the comparison procedure against reference or standard thermometers which were directly or indirectly calibrated to the fixed point temperature of the ITS-90 scale using further comparison thermometers. An essential prerequisite for the comparison procedure is that the thermometer to be calibrated and the comparison thermometer have exactly or as near as possible the same temperature. What has been proven and widely accepted is the use of calibration baths filled with liquids, salts or powders as measurement media. Both thermometers are dipped sufficiently deep and very close to each other into the bath. Stirrers or compressed air keep the liquid or the powder in the baths permanently in motion so that a homogeneous temperature distribution is reached within the measurement medium.

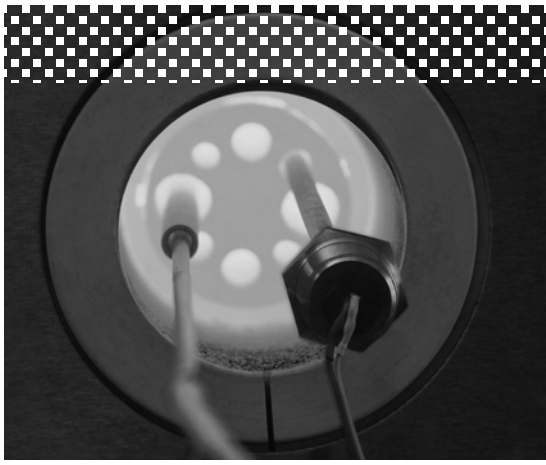
Special calibrating furnaces are particularly used for higher calibrating temperatures. These demand complex control mechanisms and contain heat pipes or solid equalizing blocks with high heat conductivity. The required zones with a largely constant and homogeneous temperature distribution for the comparison measurement can be realized in these furnaces.



Comparison procedure in a calibration bath



ITS-90 calibrated reference thermometer



Comparison procedure in a calibration furnace

What is calibrated?

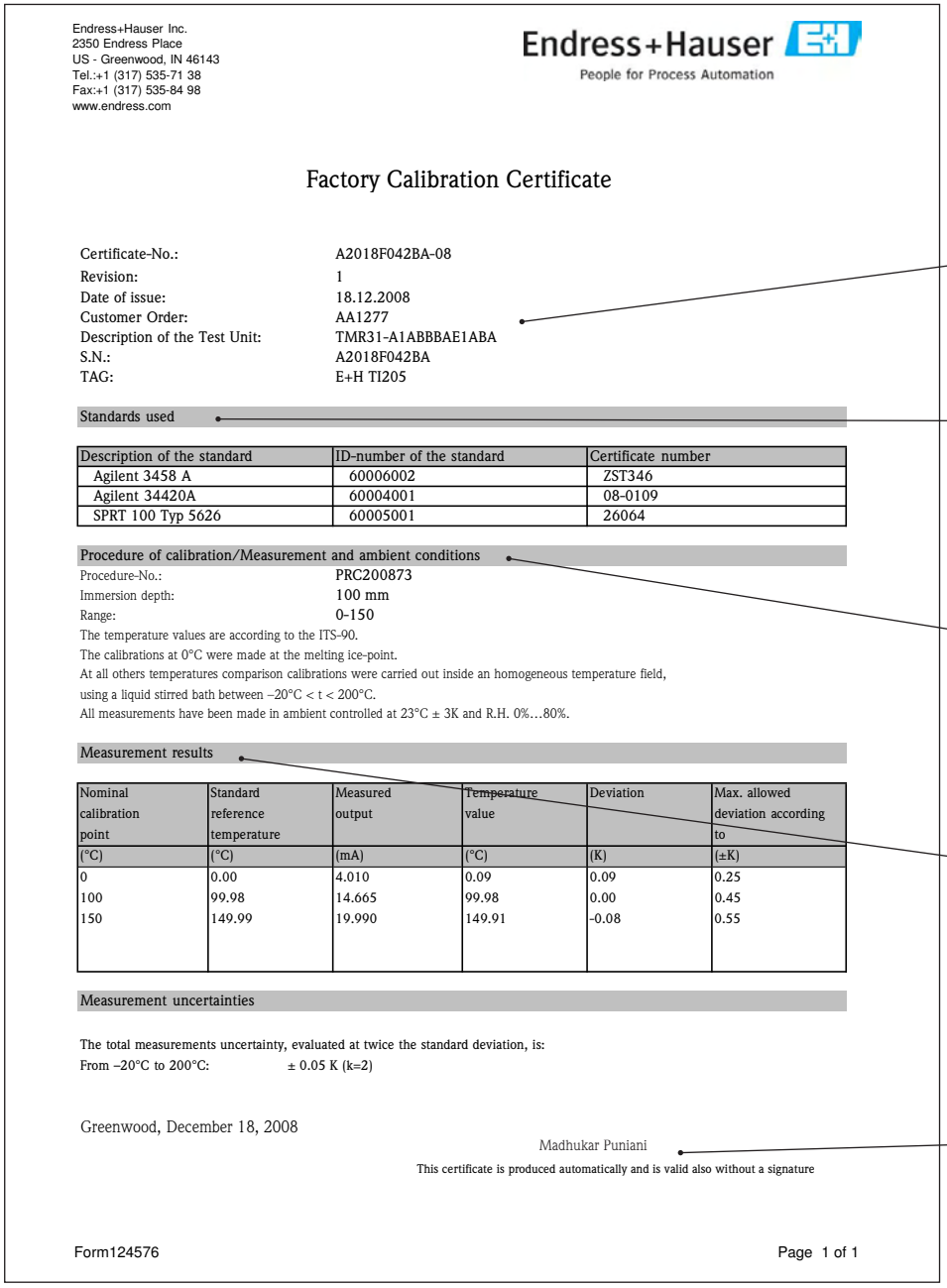
Resistance thermometers (RTD)	Measurement of the Ohmic resistance at various calibration temperatures.
Thermocouples (TC)	Measurement of the electromotive force (thermovoltage emf) at the calibration temperature related to cold junction temperature of 0 °C.
Analog transmitters with connected temperature sensor	Measurement of the analog output signal (4-20 mA current circuit) with a connected sensor element at the calibration temperature.
Digital transmitters with connected temperature sensor	Readout of the digital measured value – normally the temperature value – using standard field bus protocols (HART®, PROFIBUS®, FOUNDATION Fieldbus™) with a connected sensor element at the calibration temperature.

Interpretation of a calibration certificate

Contents

A calibration certificate documents the measurement qualities of the test piece at the time of the calibration. It describes type, extent and result of the calibrated measurements carried out and makes statements on the traceability of the measurements to national standards and to the uncertainty of measurement.

Each calibration certificate issued contains at least:



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People for Process Automation

Factory Calibration Certificate

Certificate-No.:	A2018F042BA-08
Revision:	1
Date of issue:	18.12.2008
Customer Order:	AA1277
Description of the Test Unit:	TMR31-A1ABBBAE1ABA
S.N.:	A2018F042BA
TAG:	E+H TI205

Standards used

Description of the standard	ID-number of the standard	Certificate number
Agilent 3458 A	60006002	ZST346
Agilent 34420A	60004001	08-0109
SPRT 100 Typ 5626	60005001	26064

Procedure of calibration/Measurement and ambient conditions

Procedure-No.:	PRC200873
Immersion depth:	100 mm
Range:	0-150

The temperature values are according to the ITS-90.
The calibrations at 0°C were made at the melting ice-point.
At all others temperatures comparison calibrations were carried out inside an homogeneous temperature field, using a liquid stirred bath between –20°C < t < 200°C.
All measurements have been made in ambient controlled at 23°C ± 3K and R.H. 0%...80%.

Measurement results

Nominal calibration point	Standard reference temperature	Measured output	Temperature value	Deviation	Max. allowed deviation according to
(°C)	(°C)	(mA)	(°C)	(K)	(±K)
0	0.00	4.010	0.09	0.09	0.25
100	99.98	14.665	99.98	0.00	0.45
150	149.99	19.990	149.91	-0.08	0.55

Measurement uncertainties

The total measurements uncertainty, evaluated at twice the standard deviation, is:
From –20°C to 200°C: ± 0.05 K (k=2)

Greenwood, December 18, 2008

Madhukar Puniani

This certificate is produced automatically and is valid also without a signature

Form124576

Page 1 of 1

Description of the measurement device to be calibrated and possibly its' serial number

Indication of the standards and equipment used

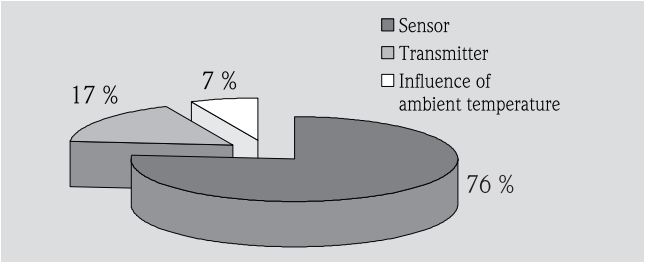
Identification of all procedures and specifications used. The conditions (e.g. ambient conditions) under which the calibration or measurement has been carried out

Measurement results and the measurement deviations connected with them and if necessary a statement concerning conformity with a regulated measurement specification

Name(s) and signature(s) of the authorized person(s)

Sensor-Transmitter-Matching

Matching the transmitter to the sensor
In addition to the calibration the measurement accuracy can be optimized by using the Sensor-Transmitter-Matching possibility. To carry out such an optimization, the possible error sources must first be found. The complete uncertainty of measurement arises from the measurement error of the temperature transmitter and the sensor element. At a more exact consideration it can be seen that the largest part of the measurement inaccuracy results from the sensor, especially at high temperatures.



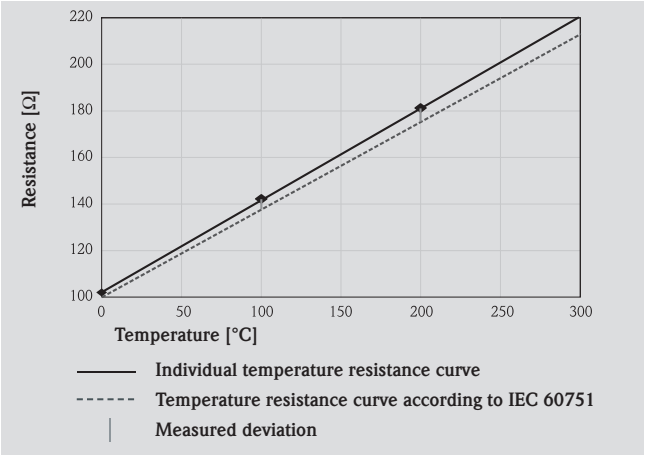
Composition of the complete measurement uncertainty - Analysis for a Class A Pt100 at a process temperature of 150 °C

Resistance thermometers show high linearity. Nevertheless every sensor has an individual temperature resistance characteristic. This characteristic must be described as exact as possible to achieve high precision on the transmitter measurement linearization.

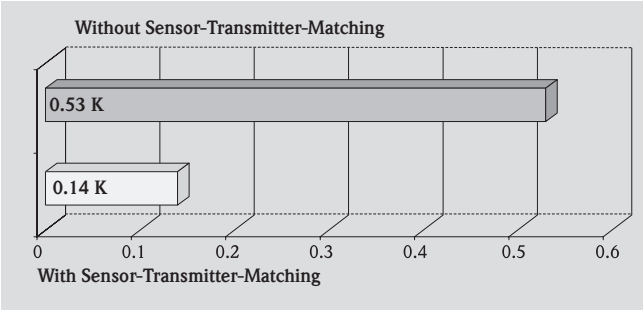
This description is made, for example, for platinum resistors (Pt/RTD) by the Callendar/Van Dusen equation which can also be found in IEC 60751 standard applications:

$$R_T = R_0[1+AT+BT^2+CT^3(T-100\ °C)]$$

R_T: Resistance value at a measured temperature T
R_0: Resistance value at 0 °C
A, B: Sensor specific constants
C: Sensor specific constants at T < 0 °C (for T ≥ 0 °C, C = 0)



If, instead of the normalized standard coefficients from the IEC 60751, the sensor specific constants from the thermometer calibration are programmed into the transmitter this will then calculate the specific temperature resistance characteristic for the connected sensor.
This results in a significant accuracy improvement.



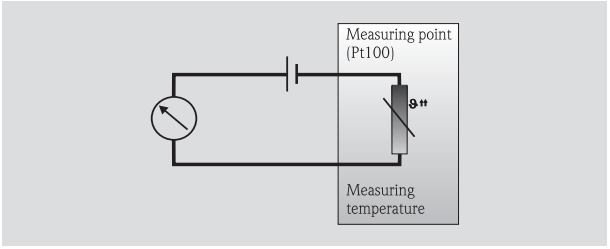
Uncertainty of measurement of the total measurement point in Kelvin for a class A Pt100 at a temperature of 150 °C

Applying Sensor-Transmitter-Matching
- High accuracy over a large measurement range.
- Economic alternative to paired sensors, especially at temperatures over 100 °C.
- In addition to platinum sensors (Pt), this can also be used for copper- (Cu) and nickel sensors (Ni).

Basic principles of temperature measurement

Temperature is the most frequently measured parameter in the process industry.
In electrical contact sensors, two measurement principles have asserted themselves as a standard:

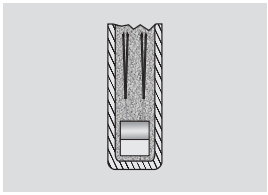
RTD – Resistance sensors



In RTD resistance sensors the electrical resistance changes with a change in temperature. They are suitable for the measurement of temperatures between -200 °C and approx. 800 °C and stand out due to high measurement accuracy and long-term stability.
The resistance sensor element most frequently used is a Pt100 which has a nominal value of 100 Ω at 0 °C. Pt100 sensors are manufactured in different formats:

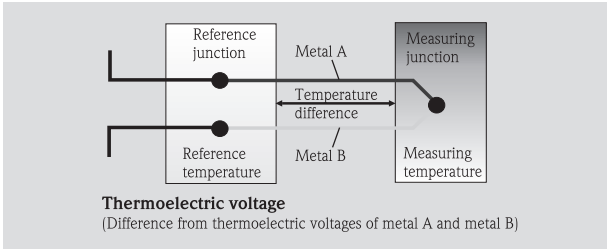
- Wire wound ceramic sensors: A spiral of platinum wire is wound and embedded in ceramic powder within a capillary and is fed to the outside by platinum wires.
- Thin film sensors: A platinum layer is vaporized on a ceramic plate (sputtered). A glass layer is melted on in order to protect the connection wires and the platinum layer.

As a standard, Endress+Hauser RTD resistance sensors fulfill the IEC 60751 accuracy class F 0.15.



RTD TF-sensor, 4-wire with MgO insulation

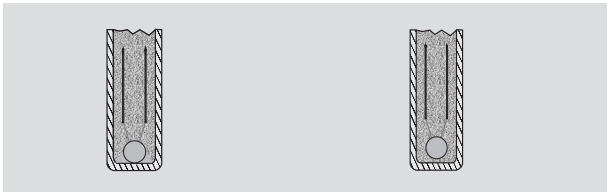
TC – Thermocouples



Thermoelectric voltage
(Difference from thermoelectric voltages of metal A and metal B)

A thermocouple is a component made of two different metals connected with each other at one end. An electrical potential (thermoelectric force) is caused due to the Seebeck effect at the open end if the connection and the free ends are exposed to different temperatures. With the help of the so-called thermocouple reference tables (see IEC 584), the temperature at the connection (measuring junction) can be concluded.

Thermocouples are suitable for temperature measurement in the range of 0 °C to +1800 °C. They stand out due to fast response time and high vibration resistance.



TC sensor, grounded and ungrounded, with MgO insulation

Features of a quality sensing probe:

- Made from Magnesium oxide powder crushed to form a very tight packing.
- High voltage insulation – tested as per standards.
- High purity metals or sensor chip and good quality end termination.
- Properly welded and end capped to avoid rupture due to vibration.
- Open end sealed and potted against moisture ingress.
- Calibrated and tested to standards.

Good measurement practice

How to design a sensor assembly for an application

The important information you need is:

In a pipe
- Line size
- Process connection
- Pipe standoff
- Design pressure and temperature
- Flow rates
- Medium
- Area classification
- Preferred signal output
- Preferred accuracy
- Any other legal requirement

In a vessel or reactor
- Maximum insertion possible/required
- Sensor placement
- Number of measurements – single or multipoint
- Process connection
- Design pressure and temperature
- Medium
- Preferred accuracy
- Area classification
- Preferred signal output
- Any other legal requirement

Selecting an Endress+Hauser sensor assembly replacement for an existing instrument, see flow charts.

Best installation practices

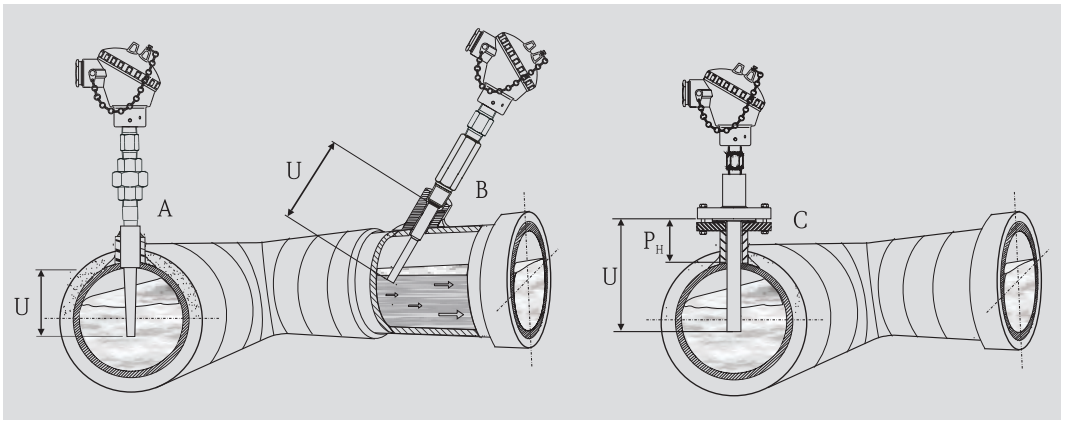
In an oven, the aim of the application or design engineer should be to install a thermocouple in a furnace, such that the sensing tip is always in equilibrium with the temperature of the zone of interest and, therefore, accurate measurements are made. Ideally, there should be no flow of heat from inside the zone of interest to outside or ambient. However, this cannot be achieved in real world conditions as most probes are made of metallic sheaths and or metals

Conductance errors
Temperature gradients cause conduction and thus induce errors in temperature measurement. This is a simple physics phenomenon– heat flows from a hotter body/ area to a colder one. Since the temperature sensor is installed through the insulation, it automatically creates a conductive path along which heat flows from the inside of the hotter zone to the exterior, thus creating an error.
Other sources of gradients can be bad placement of heaters, causing uneven heating – and uneven distribution of product being treated.

A good sensing instrument
is classified by the following characteristics:
- High accuracy
- Long term stability
- Reproducibility
- Adequate response time
- Easy to maintain
- Reliable signal
- Noise immunity
- Must not disturb the temperature to be measured

To ensure all this we suggest:
- Have at least 20 times the O.D of the sensor as an isothermal area. So for ¼" diameter – use at least 5"
- Class 1 accuracy for TC, Class A for RTD
- Test the finished probe for insulation at high potential
- Use best quality MgO materials and stable sensor like RTD platinum 100 Ohm (Pt100) and Type N thermocouples
- Use transmitters wherever possible – ensure proper ambient through remote mounting in very hot applications
- Use lowest possible O.D. for speed of response and low conduction interference

Follow the installation examples in pipes for best results



Examples for pipe installation - In pipes with a small cross section the sensor tip should reach or extend slightly past the center line of the pipe (=U).

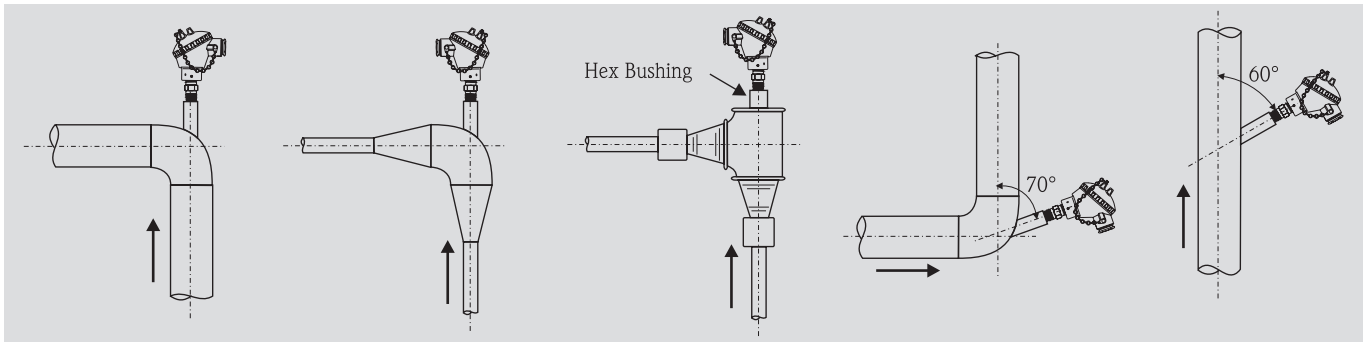
NOTE:
Calculate and factor in the pipe stand-off for computing the best fit U length.

A Socket weld installation
B Threaded, tilted installation
C Flange installation
P_H Pipe stand off

Immersion depth

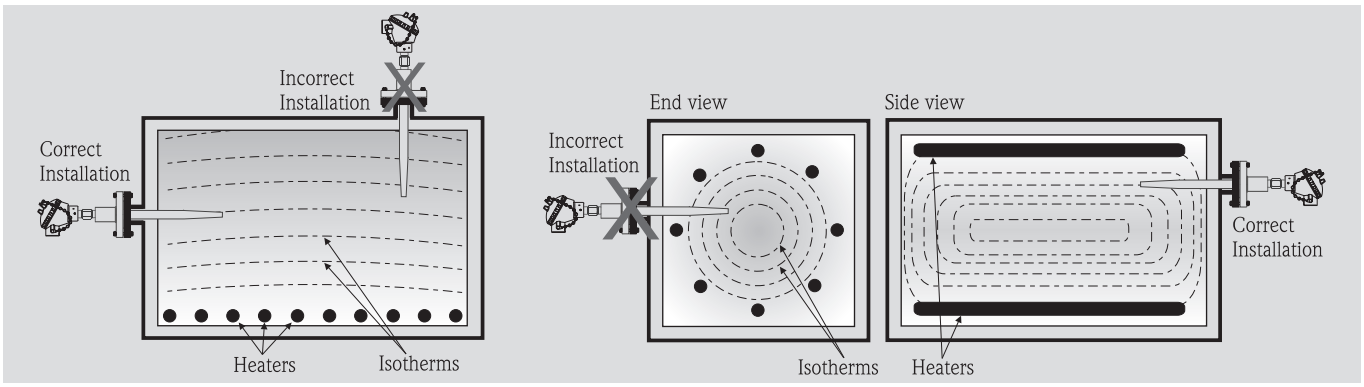
The thermowell immersion depth (U) should be sufficient to eliminate conduction error. A general rule is to use an insertion length equaling a minimum of 10 times the diameter of the protection tube or well. Another rule of thumb is to have the sensitive portion of the sensor immersed to a depth of a minimum of 3“ (75 mm) plus the length of the sensitive portion.

In the case of expansion bulbs, the immersion depth may be specified by the supplier or can be indicated on a calibration report, if furnished.
For pipe installations, such as steam or hot water lines, insertion in an elbow on the axis of the pipe can permit an appropriate immersion depth should the diameter of the pipe be inadequate, see figure below.



Alternate ways of installing thermowells in pipes that are 3” (75 mm) or smaller in diameter (source Bela G Liptak – Handbook of instrumentation)

Examples of installations in furnaces



Furnace with bottom heaters

Furnace with heaters on all sides

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TriNova, Inc.
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251-378-7837

TriNova, Inc.
Bessemer, AL
205-426-0494

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Anchorage, AK
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Chandler, AZ
480-413-0899

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