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

Technical Information

Omnigrad S TAF11, TAF12x, TAF16

High temperature assemblies
With metal or ceramic thermowells
Adjustable process connection
Thermocouple sensor types J, K, N, R, S, B

Application

TAF11
- Applicable for steel treatment (annealing), concrete furnaces and primaries. It contains a single or double TC insert and a ceramic thermowell.

TAF12x
- The versions S/D/T are assemblies with **s**ingle/ **d**ouble/**t**riple ceramic thermowells, designed specifically for applications such as ceramic baking ovens, brickworks, porcelain production and glass industries. They contain a single or double TC insert in ceramic insulators.

TAF16
- Applicable for cement production, steel treatment, incinerators and fluidized bed furnaces. The TAF16 contains a single or double TC insert and a metal or ceramic thermowell.

Process temperatures:
- TAF11 up to +1600 °C (+2912 °F)
- TAF12 up to +1700 °C (+3092 °F)
- TAF16 up to +1700 °C (+3092 °F)

Your benefits

- Long lifetime by usage of innovative thermowell materials with increased wear and chemical resistance
- Long term stable measurement due to sensor protection with non-porous materials
- Flexible product selection by modular design
- Optimized life cycle costs by means of replaceable spare parts

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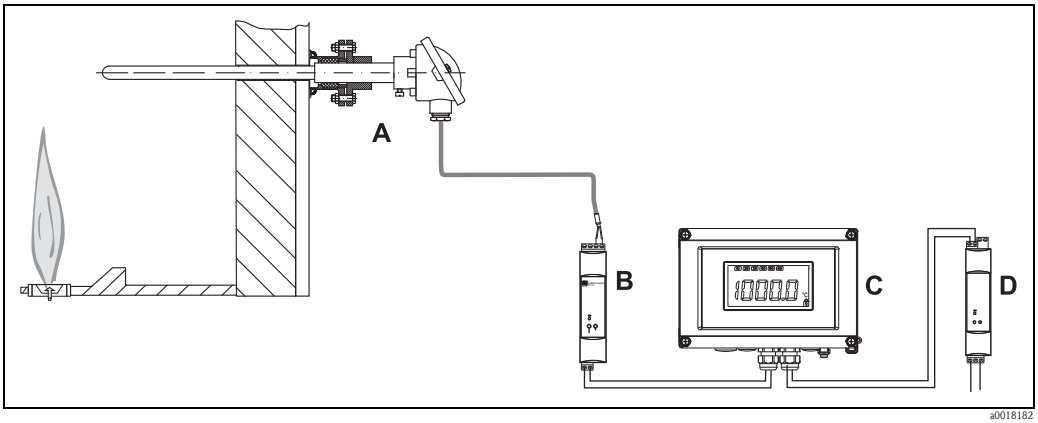
Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

Thermocouples are comparatively simple, robust temperature sensors which use the Seebeck effect for temperature measurement: if two electrical conductors made of different materials are connected at a point, a weak electrical voltage can be measured between the two open conductor ends if the conductors are subjected to a thermal gradient. This voltage is called thermoelectric voltage or electromotive force (emf.). Its magnitude depends on the type of conducting materials and the temperature difference between the "measuring point" (the junction of the two conductors) and the "cold junction" (the open conductor ends). Accordingly, thermocouples primarily only measure differences in temperature. The absolute temperature at the measuring point can be determined from these if the associated temperature at the cold junction is known or is measured separately and compensated for. The material combinations and associated thermoelectric voltage/ temperature characteristics of the most common types of thermocouple are standardized in the IEC 60584 and ASTM E230/ANSI MC96.1 standards.

Measuring system



Example of an application

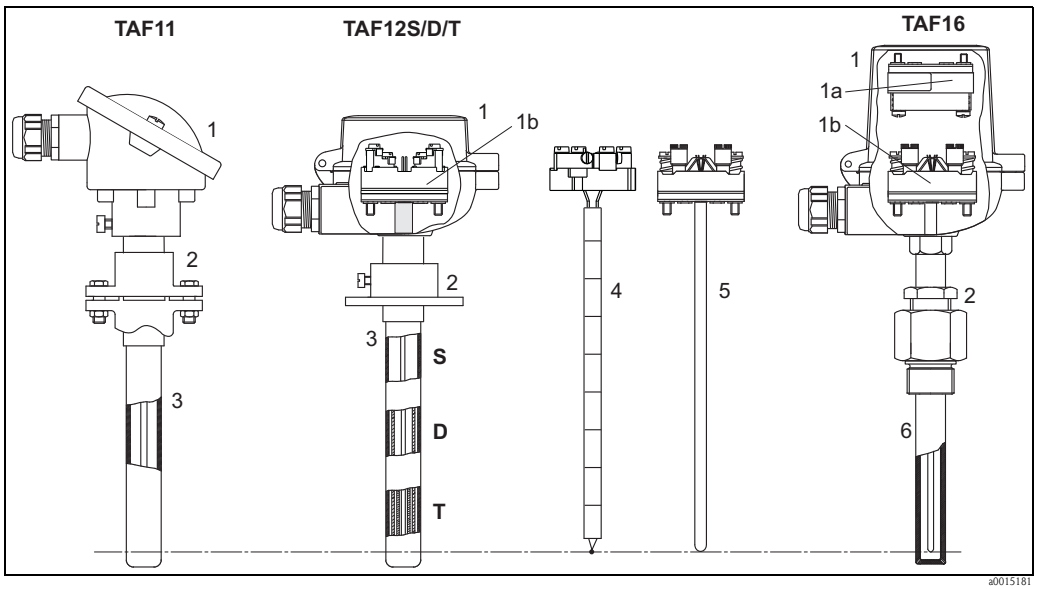
A Thermometer of the TAF series, installed in the reactor wall of a furnace

B Temperature transmitter iTEMP® DIN rail TMT12x. The two-wire transmitter detects the measurement signals of the thermocouple thermometer and converts them into an analog 4 to 20 mA measurement signal.

C RIA16 field display unit
- The display unit records the analog measuring signal from the head transmitter and shows this on the display. The LC display shows the current measured value in digital form and as a bar graph indicating a limit value violation. The display unit is looped into the 4 to 20 mA circuit and gets the required energy from there. More information on this can be found in the Technical Information (see "Documentation").

D Active barrier RN221N
- The RN221N active barrier (24 V DC, 30 mA) has an galvanically isolated output for supplying voltage to loop powered transmitters. The universal power supply works with an input supply voltage of 20 to 250 V DC/AC, 50/ 60 Hz, which means that it can be used in all international power grids. More information on this can be found in the Technical Information (see "Documentation").

Equipment architecture



High temperature assemblies design

1 Terminal head DIN A (see left side) or DIN B (e.g. see right side) with following available electrical connections:
1a – Terminal block DIN B with head transmitter (only in high cover terminal head)
1b – Terminal block (DIN B) or
– Flying leads, only with MgO insulated insert
2 Available process connections:
Stop flange according to DIN EN 50446, adjustable flange, or gas-tight compression fitting
3 Ceramic thermowell (external sheath for TAF11)
S (Single) ceramic thermowell external sheath for TAF12
D (Double) ceramic thermowell external and middle sheath for TAF12
T (Triple) ceramic thermowell external, middle and internal sheath for TAF12
4 Measuring insert TPC200 with ceramic isolation
5 Measuring insert TPC100 with MgO insulation and metallic sheath, selectable for TAF11 and TAF16
6 Metal or ceramic thermowell for TAF16

TAF series high temperature assemblies are manufactured according to international DIN EN 50446 standards. These products consist of a measuring insert, a thermowell, a metal sleeve (only TAF11/TAF12x) and a terminal head, which contains a transmitter or terminal block as electrical connection.

Measuring insert
The measuring point of the thermocouple is located close to the tip of the insert. The operating temperature ranges (→ 🖹 4) and permissible deviation limits of the thermoelectric voltages from the standard characteristic (→ 🖹 5) vary according to the type of thermocouple used. The thermocouple wires are inserted in appropriate high-temperature-resistant ceramic isolators or in a mineral insulated insert.

Thermowell

Two types are commonly used in this type of assembly:
- Metallic thermowell, usually machined from tubes or bars.
- Ceramic thermowell.

The selection of the thermowell materials majorly depends on the following material properties, which will directly influence the lifetime of the sensor:
- Hardness
- Chemical resistance
- Maximum operating temperature
- Wear/abrasion resistance
- Brittleness
- Porosity for process gases
- Creep resistance

Ceramic materials are commonly used for highest temperatures and, due to their hardness, for applications with high abrasion rates. Attention has to be paid regarding the brittleness of these materials when exposed to high mechanical loads inside the process. When using porous ceramics as external protection sheath, an additional, non-porous inner protection sheath has to be used in order to protect the noble sensor elements from contamination leading to temperature drift.

Metal alloys generally show higher mechanical resistance but lower maximum temperature limits and less abrasion resistance. All metal alloys are non-porous and usually there is no need for an additional inner protection sheath.

The TAF11 and TAF12 ceramic thermowells are mounted into a metal sleeve which connects them towards the terminal head. Also the process connection is fitted on the metal sleeve due to its higher mechanical strength. The dimensions and material type for the sleeve are related to the process temperatures and insertion length of the ceramic thermowells.
All high temperature assemblies are available with an adjustable flange, stop flanges or gas tight compression fittings.

Measuring range

Input	Designation	Measuring range limits[1]	Min. span
Thermocouples (TC) as per IEC 60584, part 1 - using an Endress+Hauser - iTEMP® temperature head transmitter	Type J (Fe-CuNi)	typ. -200… +1200 °C (-328… +2192 °F)	50 K
	Type K (NiCr-Ni)	typ. -200… +1372 °C (-328… +2502 °F)	50 K
	Type N (NiCrSi-NiSi)	typ. -270... +1300 °C (-454... +2372 °F)	50 K
	Type S (PtRh10-Pt)	typ. -50… +1768 °C (-58… +3214 °F)	500 K
	Type R (PtRh13-Pt)	typ. -50… +1768 °C (-58... +3214 °F)	500 K
	Type B (PtRh30-PtRh6)	typ. +40… +1820 °C (+104... + 3308 °F)	500 K
	■ Internal cold junction (Pt100) ■ Cold junction accuracy: ± 1 K ■ Max. sensor resistance 10 kΩ		
Thermocouples (TC)[2] - flying leads - as per IEC 60584	Type J (Fe-CuNi)	-210… +1200 °C (-346… +2192 °F), typical sensitivity ≈ 55 µV/K	
	Type K (NiCr-Ni)	-270… +1372 °C (-454… +2502 °F), typical sensitivity ≈ 40 µV/K	
	Type N (NiCrSi-NiSi)	-270… +1300 °C (-454… +2372 °F), typical sensitivity ≈ 40 µV/K	
	Type S (PtRh10-Pt)	-50… +1768 °C (-58… +3214 °F), typical sensitivity ≈ 11 µV/K	
	Type R (PtRh13-Pt)	-50… +1768 °C (-58… +3214 °F), typical sensitivity ≈ 13 µV/K	
	Type B (PtRh30-PtRh6)	0…1820 °C (+32... + 3308 °F), typical sensitivity ≈ 9 µV/K	

1) For definite ranges see respective Technical Information (→ 🖹 24) of the head transmitters.

2) Typical sensitivity above 0 °C (+32 °F)

Performance characteristics

Operating conditions

Ambient temperature

Terminal head	Temperature in °C (°F)
Without mounted head transmitter	Depends on the terminal head and cable gland used, see 'Terminal heads' section, → 🖹 9
With mounted head transmitter	-40 to +85 °C (-40 to +185 °F)

Process pressure

Depends on material.
High temperature assemblies are generally designed for use in pressureless processes. Available process connections can be gastight up to 1 bar, details → 🖹 12.

Permitted flow rate as a function of immersion length

Depends on material and application. For process pressures ≥ 1 bar and a flow rate ≥ 1 m/s it is recommended to order a thermowell stress calculation, please contact your nearest Endress+Hauser sales organisation.

Shock and vibration resistance

Valid for MgO insulated inserts: 4g / 2 to 150 Hz as per IEC 60068-2-6

Accuracy

Permissible deviation limits of thermoelectric voltages from standard characteristic for thermocouples as per IEC 60584:

Standard	Type	Standard tolerance		Special tolerance	
		Class	Deviation	Class	Deviation
IEC 60584	J (Fe-CuNi)	2	±2.5 °C (-40 to 333 °C) ±0.0075 |t|[1] (333 to 750 °C)	1	±1.5 °C (-40 to 375 °C) ±0.004 |t|[1] (375 to 750 °C)
	K (NiCr-Ni)	2	±2.5 °C (-40 to 333 °C) ±0.0075 |t|[1] (333 to 1200 °C)	1	±1.5 °C (-40 to 375 °C) ±0.004 |t|[1] (375 to 1000 °C)
	N (NiCrSi-NiSi)	2		1	
	R (PtRh13-Pt) and S (PtRh10-Pt)	2	±1.5 °C (0 to 600 °C) ±0.0025 |t|[1] (600 to 1600 °C)	1	±1 °C (0 to 1100 °C) ±[1 + 0.003(|t|[1] -1100)] (1100°C to 1600°C)
	S (PtRh13-Pt)	2		1	
	B (PtRh30-PtRh6)	2	±1.5 °C or ±0.0025 |t|[1] (600 to 1700 °C)	-	-

1) |t| = Absolute temperature value in °C

Note!
In order to obtain the maximum tolerances in °F, the results in °C must be multiplied by a factor of 1.8.

Response time

Assembly probe	Response time for fast temperature change from 1000 °C (1832 °F) to room temperature in stationary air	
TAF12T with Ø26/Ø14 mm double ceramic thermowell (material C530+C610)	t_{50} t_{90}	195 s 500 s

Note!
Response time for the assembly without transmitter.

Insulation resistance

Insulation resistance between each terminal and the sheath is measured with a voltage of 500 V DC[1].
Insulation resistance ≥ 1000 MΩ at ambient temperature 25 °C (77 °F).
Insulation resistance ≥ 5 MΩ at temperature 500 °C (932 °F).

Calibration specifications

Endress+Hauser provides comparison temperature calibration from -80 to +1400 °C (-110 °F to 2552 °F) based on the International Temperature Scale (ITS90). Calibrations are traceable to national and international standards. The calibration report is referenced to the serial number of the thermometer. Only the measurement insert is calibrated. In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.

	Minimum insertion length IL in mm (in)	
Temperature range	without head transmitter	with head transmitter
-80 °C to -40 °C (-110 °F to -40 °F)	200 (7.87)	
-40 °C to 0 °C (-40 °F to 32 °F)	160 (6.3)	
0 °C to 250 °C (32 °F to 480 °F)	120 (4.72)	150 (5.9)
250 °C to 550 °C (480 °F to 1020 °F)	300 (11.81)	
550 °C to 1400 °C (1020 °F to 2552 °F)	450 (17.75)	

1) For TAF16 with 6 mm (0.24 in) mineral insulated insert versions, standard DIN EN 61515 is applied.

Material

Sheath and thermowell.
The temperatures for continuous operation specified in the following table are only intended as reference values for use of the various materials in air and without any significant compressive load. The maximum operation temperatures are reduced considerably in some cases where abnormal conditions such as high mechanical load occur or in aggressive media.
Endress+Hauser supplies DIN/EN threaded process connections and flanges made of stainless steel according to AISI 316L (DIN/EN material number 1.4404 or 1.4435). With regard to their temperature stability properties, the materials 1.4404 and 1.4435 are grouped under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
AISI 316L/ 1.4404 1.4435	X2CrNiMo17-12-2 X2CrNiMo18-14-3	650 °C (1200 °F)[1)]	■ Austenitic, stainless steel ■ High corrosion resistance in general ■ Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) ■ Increased resistance to intergranular corrosion and pitting ■ Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
AISI 310/ 1.4841	X15CrNiSi25-20	1100 °C (2012 °F)	■ Austenitic, stainless steel ■ Good resistance to oxidizing and reducing atmospheres ■ Due to the higher chromium content well resistant to oxidizing aqueous solution and neutral salts melting at higher temperatures ■ Only weakly resistant to sulphurous gases
AISI 304/ 1.4301	X5CrNi18-10	850 °C (1562 °F)	■ Austenitic, stainless steel ■ Well usable in water and lowly pollute waste water ■ Only at relatively low temperatures resistant to organic acids, saline solutions, sulphates, alcaline solutions, etc.
AISI 446/ ~1.4762/ ~1.4749	X10CrAl24 / X18CrNi24	1100 °C (2012 °F)	■ A ferritic, heat resistant, high-chromium stainless steel ■ Very high resistance to reducing sulphurous gases and salts with low content of oxygen ■ Very good resistance to constant as well as cyclical thermal stress, to incineration ash-corrosion and to melts of copper, lead and tin ■ Poorly resistant to gases containing nitrogen
INCONEL®600 / 2.4816	NiCr15Fe	1100 °C (2012 °F)	■ A nickel/chromium alloy with very good resistance to aggressive, oxidizing and reducing atmospheres, even at high temperatures ■ Resistant to corrosion caused by chlorine gas and chlorinated media as well as many oxidizing mineral and organic acids, sea water etc. ■ Corrodible by ultrapure water ■ Not to be used in a sulfur-containing atmosphere
INCONEL®601 / 2.4851	NiCr23Fe	1200 °C (2192 °F)	■ High temperature corrosion resistance enhanced by aluminum content ■ Resistance to oxide spalling and carburization under thermal cycling ■ Good resistance against molten salt corrosion ■ Particularly susceptible to sulfidation
INCOLOY®800 HT / 1.4959	X8NiCrAlTi32-21	1100 °C (2012 °F)	■ A nickel/chromium/iron alloy that has the same basic composition as INCOLOY®800, but has significantly higher creep rupture strength, resultant from the close control of the carbon, aluminum and titatinium contents. ■ Good strength and excellent resistance to oxidation and carburization at high temperature environments. ■ Good resistance to stress corrosion cracking, attack by sulfur, internal oxidation, scaling and corrosion in a multitude of industrial environments. Suitable for sulfurous environments.
HASTELLOY® X / 2.4665	NiCr22Fe18Mo	1150 °C (2102 °F)	■ A nickel/chromium/iron/molybdenum alloy ■ Very resistant to oxidizing and reducing atmospheres ■ Good strength and ductility at high temperatures
Kanthal AF	FeCrAl	1400 °C (2552 °F)	■ A high-temperature ferritic iron/chrominum/aluminum alloy ■ High resistance to sulfurous, carburizing and oxidising environments ■ Good hardness and weldability ■ Good form stability at high temperature ■ Not to be used in a chloride-containing atmosphere and in nitrogenous gases (cracked ammonia)

Material name	Short form	Recommended max. temperature for continuous use in air	Properties
Special nickel/ cobalt alloy	NiCo	1200 °C (2192 °F)	■ Very good resistance to sulfidation and chloride environment ■ Exceptionally good resistance to oxidation, hot corrosion, carburization, metal dusting, and nitridation ■ Good creep resistance ■ Average surface hardness ■ High wear resistance **Recommended applications** ■ Cement industry – gas standpipe: successfully tested with up to 20 times longer lifespan compared to AISI310 – clincker cooler: successfully tested with up to 5 times longer lifespan compared to AISI310 ■ Waste incinerators: successfully tested with up to 12 times longer lifespan than INCONEL®600 and C276 ■ Fluidized bed furnace (biogas reactor): successfully tested with up to 5 times longer lifespan than e.g. INCOLOY®800HT or INCONEL®600.
Ceramic material types according to DIN VDE0335			
C530		1400 °C (2552 °F)	■ Al_2O_3-content approx. 73-75 % ■ The cheapest porous ceramic material ■ Very resistant to temperature shocks, mainly used as external thermowell
C610		1500 °C (2732 °F)	■ Al_2O_3-content approx. 60 %, alkali-content 3 % ■ The most economic non porous ceramic material ■ Highly resistant to hydrogen fluoride, temperature shocks and mechanical influences, used for internal and external thermowells as well as insulators
C799		1800 °C (3272 °F)	■ Al_2O_3-content approx. 99.7 % ■ Can be used for both internal and external thermowells and insulators ■ Resistance to hydrogen fluoride gases and alkaline vapors, to oxydizing, reducing and neutral atmospheres as well as temperature changes ■ This material is very pure and has a very low porosity (gas tight) compared to all other types of ceramics
Sinterized silicon carbide	SiC	1650 °C (3000 °F)	■ High thermal shock resistance due to its porosity ■ Good thermal conductivity ■ Very hard and stable at high temperature **Recommended applications** ■ Glass industry: glass feeders, float glass production ■ Ceramic industry ■ Furnaces
Kanthal Super	$MoSi_2$ with a glass phase component	1700 °C (3092 °F)	■ High thermal shock resistance ■ Very low porosity (< 1%) and very high hardness ■ Not to be used in environments with chlorine and fluorine compounds ■ Not suitable for mechanical shock affected applications ■ Not to be used in applications with powder
Special silicon nitride ceramic	SiN	1400 °C (2552 °F)	■ Excellent wear and thermal shock resistance ■ No porosity ■ Good heat response ■ Not resistant to impacts (brittleness) **Recommended applications** ■ Cement industry – Cyclone preheater: successfully tested with up to 5 times longer lifespan compared to AISI310 – Secondary airpipe ■ Generally all applications with extreme abrasive conditions; mechanical shocks/impacts have to be avoided because of brittleness

1) Can be used to a limited extent up to 800 °C (1472 °F) for low compressive loads and in non-corrosive media. Please contact your Endress+Hauser sales team for further information.

Transmitter specifications

	iTEMP® TMT181 PCP	iTEMP® TMT182 HART®	iTEMP® TMT82[1] HART®	iTEMP® TMT84 PA iTEMP® TMT85 FF
Measurement accuracy	Type J, K: typ. 0.5 K (0.9 °F) or 0.08% Type N: typ. 1.0 K (1.8 °F) or 0.08% Type B, R, S: typ. 2.0 K (3.6 °F) or 0.08%	Type J, K: typ. 0.5 K (0.9 °F) or 0.08% Type N: typ. 1.0 K (1.8 °F) or 0.08% Type R, S: typ. 1.4 K (2.52 °F) or 0.08% Type B: typ. 2.0 K (3.6 °F) or 0.08%	Type J, K: ± typ. 0.25 K (0.45 °F) Type N: ± typ. 0.5 K (0.9 °F) Type S, B, R: ± typ. 1.0 K (1.8 °F)	
	% is related to the adjusted measurement range (the larger value applies)			
Galvanic Isolation (input/output)	U = 2 kV AC			

1) Entire accuracy = stated measurement accuracy + 0.03% (D/A-accuracy)

Components

Family of temperature transmitters

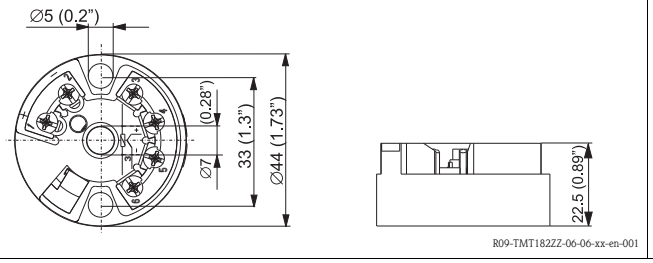
Thermometers fitted with iTEMP® transmitters are an installation ready complete solution to improve temperature measurement by increasing accuracy and reliability, when compared to direct wired sensors, as well as reducing both wiring and maintenance costs.

PC programmable head transmitter iTEMP® TMT181

They offer a high degree of flexibility, thereby supporting universal application with low inventory storage. The iTEMP® transmitters can be configured quickly and easily at a PC. Endress+Hauser offers the ReadWin® 2000 configuration software for this purpose. This software can be downloaded free of charge at **www.readwin2000.com**. More information can be found in the Technical Information (see chapter "Documentation").

HART® programmable head transmitter iTEMP® TMT182

HART® communication is all about easy, reliable data access and getting additional information about the measurement point more inexpensively. iTEMP® transmitters integrate seamlessly into your existing control system and provide painless access to numerous diagnostic information.
Configuration with a hand-held (Field Xpert SFX100 or DXR375) or a PC with configuration program (FieldCare, ReadWin® 2000) or configure with AMS or PDM. Details see Technical Information (see chapter 'Documentation').

Transmitter iTEMP® TMT18x	Specification
	■ Material: Housing (PC), Potting (PUR) ■ Terminals: Cable up to max. ≤ 2.5 mm² / 16 AWG (secure screws) or with wire end ferrules ■ Eyelets for easy connection of a HART®-handheld terminal with alligator clips ■ Degree of protection NEMA 4 (see also type of terminal head) Details see Technical Information (see chapter 'Documentation')

HART® programmable head transmitter iTEMP® TMT82

The iTEMP® TMT82 is a 2-wire device with two measurement inputs and one analog output. The device transmits both converted signals from resistance thermometers and thermocouples as well as resistance and voltage signals via the HART® communication. It can be installed as an intrinsically safe apparatus in Zone 1 hazardous areas and is used for instrumentation in the flat face terminal head to DIN EN 50446. Fast and easy operation, visualization and maintenance via PC using configuration software such as FieldCare, Simatic PDM or AMS.
Benefits are: Dual sensor input, maximum reliability, accuracy and long-term stability for critical processes, mathematical functions, monitoring of thermometer drift, backup function of the sensor, diagnostic functions

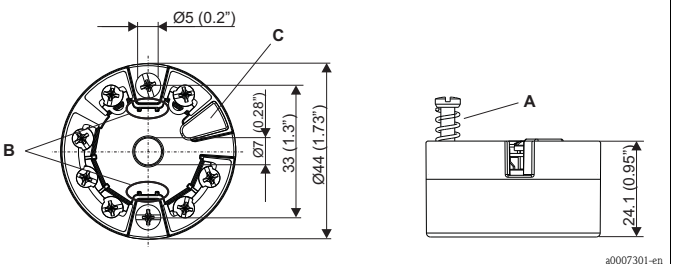
of the sensor and sensor-transmitter matching based on the Callendar/VanDusen coefficient. For more information, refer to the Technical Information (see chapter 'Documentation').

PROFIBUS® PA head transmitter iTEMP® TMT84

Universally programmable head transmitter with PROFIBUS® PA communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as FieldCare, Simatic PDM or AMS.
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar/Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').

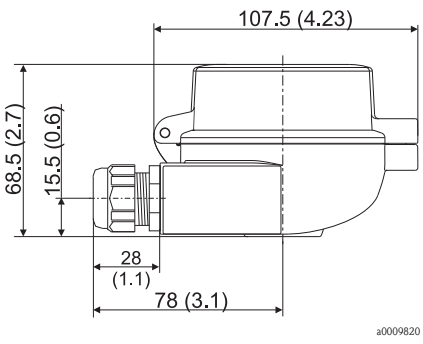
FOUNDATION Fieldbus™ head transmitter iTEMP® TMT85

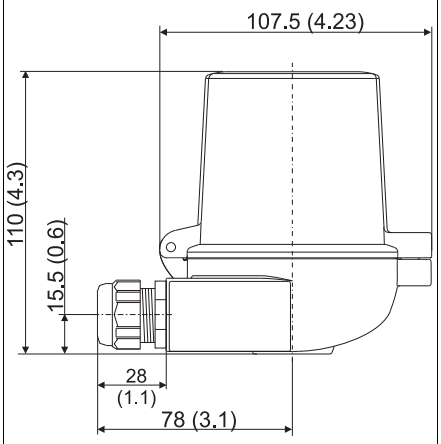
Universally programmable head transmitter with FOUNDATION Fieldbus™ communication. Converting various input signals into a digital output signal. High accuracy over the complete ambient temperature range. Swift and easy operation, visualization and maintenance using a PC directly from the control panel, e. g. using operating software such as ControlCare from Endress+Hauser or the NI Configurator from National Instruments.
Benefits are: dual sensor input, highest reliability in harsh industrial environments, mathematic functions, thermometer drift monitoring, sensor back-up functionality, sensor diagnosis functions and sensor-transmitter matching using Callendar/Van Dusen coefficients. Details see Technical Information (see chapter 'Documentation').

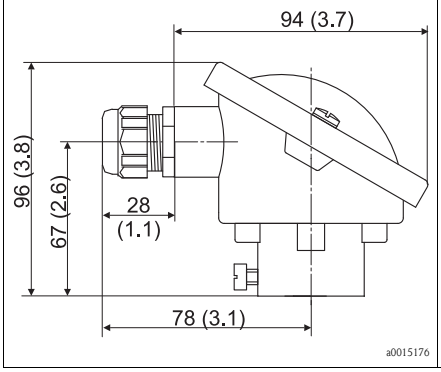
Transmitter iTEMP® TMT82, TMT84 and TMT85	Specification
	■ Spring range L ≥ 5 mm (0.2"), see Pos. A ■ Fixing elements for pluggable measured value display, see Pos. B ■ Interface for contacting measured value display, see Pos. C ■ Material (RoHS-compliant) Housing: PC Potting: PU ■ Terminals: Screw terminals (cable up to max. ≤ 2.5 mm² / 16 AWG) or spring terminals (e. g. from 0.25 mm² to 0.75 mm²/ 24 AWG to 18 AWG for flexible wires with wire-end ferrules with plastic ferrule) ■ Degree of protection NEMA 4 (see also type of terminal head) Details see Technical Information (see chapter 'Documentation')

Terminal heads

All terminal heads have an internal shape and size in accordance with DIN EN 50446, form B and a thermometer connection M24x1.5.
All dimensions in mm (in). The cable glands in the diagrams correspond to M20x1.5 connections. Specifications without head transmitter installed. For ambient temperatures with head transmitter installed, see 'Operating conditions' section.

TA30A	Specification
	■ Degree of protection: IP66/68 ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: silicone ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 330 g (11.64 oz)

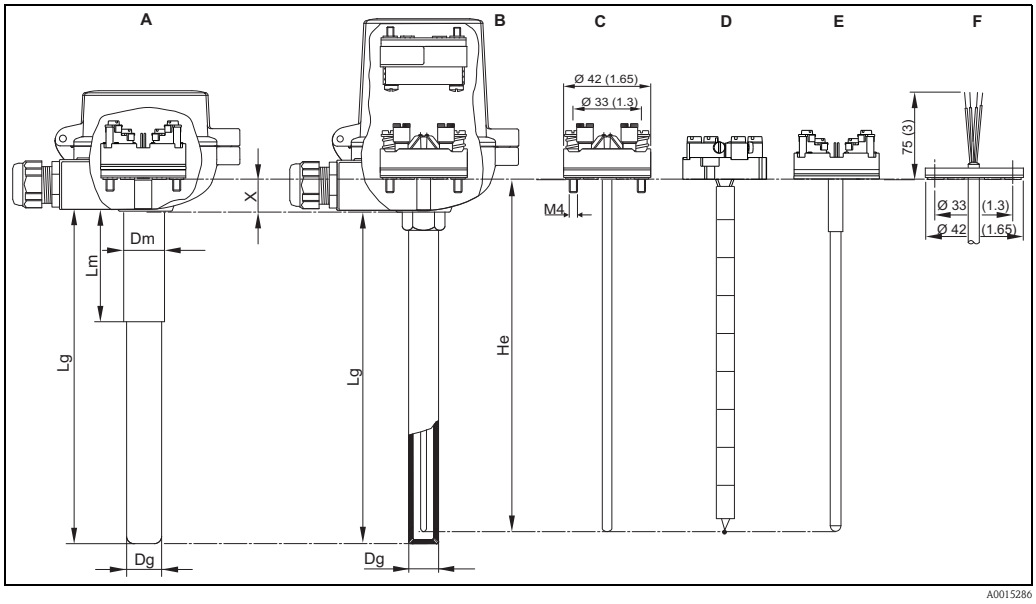
TA30D	Specification
	■ Degree of protection: IP66/68 ■ Max. temperature: 150 °C (300 °F) ■ Material: aluminum, polyester powder coated Seals: silicone ■ Cable entry incl. glands: ½" NPT and M20x1.5, only thread: G ½", plugs: M12x1 PA, 7/8" FF ■ A transmitter is mounted in the terminal head cover and an additional terminal block is installed directly on the insert. ■ Head color: blue RAL 5012 ■ Cap color: grey RAL 7035 ■ Weight: 390 g (13.75 oz)

DIN A	Specification
	■ Degree of protection: IP66 ■ Max. temperature: 130 °C (266 °F) ■ Material: aluminum, polyester powder coated Seals: CR (Neoprene® rubber) ■ Cable entry: G ½" ■ Head and cap color: white RAL 9006 ■ Weight: 270 g (9.52 oz)

Maximum ambient temperatures for cable glands	
Type	**Temperature range**
Cable gland ½" NPT, M20x1.5 (non Ex)	-40 ... +100 °C (-40 ... +212 °F)
Cable gland M20x1.5 (for dust ignition-proof area)	-20 ... +95 °C (-4 ... +203 °F)

Design, dimensions

All dimensions in mm (in).



A TAF11/TAF12
B TAF16
C TPC100 Insert with MgO insulation, metallic sheath and mounted terminal block (DIN B) for TC types J, K and N
D TPC200 Insert with segmented ceramic insulation and mounted terminal block (DIN B) for TC types J and K
E TPC200 Insert with ceramic insulation and mounted terminal block (DIN B) for TC types B, R and S
F TPC100 MgO-insulated insert with flying leads
Lg Immersion length
Dg Diameter thermowell
Lm Sleeve length
Dm Diameter of sleeve
He Insert length (He = Lg + X)
X Additional length, see table below

For replacement of the insert, it is necessary to refer to the following table. The length of the insert (He) is calculated adding the total length of the thermowell (Lg) and a defined length (X), which depends on the thermowell material used. Dimensions in mm (in).

Insert length He calculation rules (He = Lg + X)	**Insert TPC200, ceramic insulation**		**Insert TPC100, MgO insulation**	
Material	Terminal head DIN B	Terminal head DIN A	Terminal head DIN B	Terminal head DIN A
TAF11 thermowell:				
■ C610 + sleeve	He = Lg + 15 (0.6)	He = Lg + 30 (1.2)	He = Lg + 20 (0.8)	He = Lg + 35 (1.38)
■ Sinterized silicon carbide SIC + sleeve	He = Lg + 5 (0.2)	He = Lg + 20 (0.8)	He = Lg + 5 (0.2)	He = Lg + 20 (0.8)
■ Special silicon nitride ceramic SiN + sleeve	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)
TAF16 thermowell:				
■ NiCo special nickel/cobalt alloy (metal cap)	He = Lg + 5 (0.2)	He = Lg + 20 (0.8)	He = Lg + 20 (0.8)	He = Lg + 35 (1.38)
■ All metal thermowells, e. g. 310, 446, 316, etc.	He = Lg + 15 (0.6)	He = Lg + 30 (1.2)	He = Lg + 30 (1.2)	He = Lg + 45 (1.77)
■ Bar stock tip thermowells NiCo and INCOLOY800HT	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)	He = Lg + 25 (1.0)	He = Lg + 40 (1.57)
■ Kanthal Super	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)
■ SiN (special silicon nitride ceramic)	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)
■ Kanthal AF	He = Lg + 10 (0.4)	He = Lg + 25 (1.0)	He = Lg + 25 (1.0)	He = Lg + 40 (1.57)

Note!
When configuring the high temperature assemblies of the TAF family the thermocouple wire diameter also needs to be defined. The higher the temperature the larger the wire diameter needs to be selected, see chapter 'Product structure' → 🖹 17. A large wire diameter will increase the lifetime of the sensor.

Replaceable insert TPC200:

Type of insert	Wire diameter in mm (in)	Insert diameter in mm (in)
1x K, 2x K, 1x J, 2x J	1.63 (0.06)	8 (0.31)
1x K, 2x K, 1x J, 2x J	2.3 (0.09)	8 (0.31)
1x K, 1x J	3.26 (0.13)	12 (0.47), 14 (0.55)
2x K, 2x J	3.26 (0.13)	12 (0.47), 14 (0.55)
1x S, 2x S	0.35 (0.014)	6 (0.24)
1x S, 2x S, 1x R, 2x R, 1x B, 2x B	0.5 (0.02)	6 (0.24)

Replaceable insert TPC100:

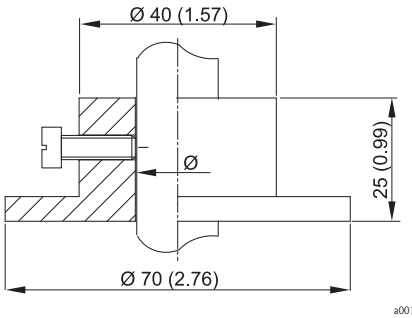
Type of insert (MgO insulated)	Insert diameter in mm (in)
1x N, 2x N	6 (0.24)
1x K, 2x K	
1x J, 2x J	

Weight

From 2 to 30 kg (4.4 to 66.1 lbs), depending on version. Some examples:

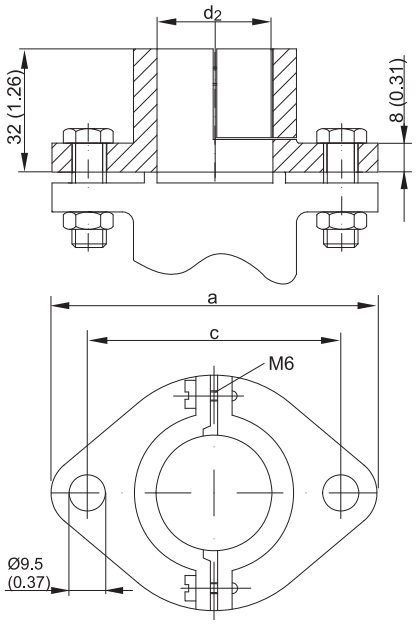
- TAF11, length 1000 mm, metallic sleeve 100 mm, terminal head DIN B: 2 kg (4.4 lbs)
- TAF12S, length 1000 mm, metallic sleeve 100 mm, terminal head DIN B: 2 kg (4.4 lbs)
- TAF12D, length 1000 mm, metallic sleeve 100 mm, terminal head DIN B: 2.5 kg (5.5 lbs)
- TAF12T, length 1000 mm, metallic sleeve 100 mm, terminal head DIN B: 3 kg (6.6 lbs)
- TAF16, length 1000 mm, tube A106 , D=22 mm, terminal head DIN B: 3 kg (6.6 lbs)

Process connection

Type	
Adjustable flange 	■ Max. temperature: +350 °C (+662 °F) ■ Material: Aluminum ■ Ø depends on sleeve (TAF11 and TAF12) or thermowell pipe (TAF16) diameter ■ No gas tight connection

Type

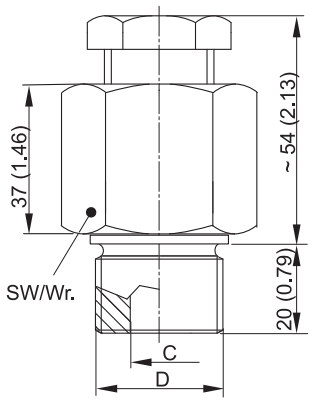
Stop flange according to DIN EN 50446



- Max. temperature: +400 °C (+752 °F)
- Material: Cast iron
- No gas tight connection
- Counter flange and gasket is not provided

d2 in mm (in)	a in mm (in)	c in mm (in)	clampable sleeve diameter in mm (in):	Order numbers for order as accessories:
23 (0.91)	90 (3.54)	70 (2.76)	21...22 (0.83...0.87)	60000516
33 (1.3)	90 (3.54)	70 (2.76)	31...33 (1.22...1.3)	60000517
16 (0.63)	75 (2.95)	55 (2.16)	14...15 (0.55...0.59)	60008385
29 (1.14)	90 (3.54)	70 (2.76)	27...28 (1.06...1.1)	71039792

Gas tight GCP assembly



- Max. temperature: +350 °C (+662 °F)
- Material: AISI 316Ti
- Maximum process pressure ≤ 1 bar (14.5 psi)

D	C in mm (in)	Clampable sleeve diameter in mm (in)	SW/Wr.	Order numbers for order as accessories:
G½"	15.5 (0.61) 17.5 (0.69)	13.7...14 (0.54...0.55) 17...17.2 (0.67)	36 36	60019126 60019129
G¾"	15.5 (0.61) 18 (0.71) 19 (0.75) 22.5 (0.89)	13.7...14 (0.54...0.55) 17...17.2 (~0.67) 17.5...18 (0.69...0.71) 21.3...22 (0.84...0.86)	36 36 36 41	71031438 60019130 71125362 60020836
G1"	15.5 (0.61) 18 (0.71) 19 (0.75) 22.5 (0.89) 28 (1.1)	13.7...14 (0.54...0.55) 17...17.2 (~0.67) 17.5...18 (0.69...0.71) 21.3...22 (0.84...0.86) 26.7...27 (1.05...1.06)	41 41 41 41 46	60022699 60021758 71125364 60021757 71001827
G1¼"	29 (1.14)	27.5...28 (~1.1)	55	71125353
G1½"	22.5 (0.89) 29 (1.14) 35 (1.38)	21.3...22 (0.84...0.86) 27.5...28 (~1.1) 33.4...34 (1.32...1.34)	55 55 55	60021425 71125354 60022497

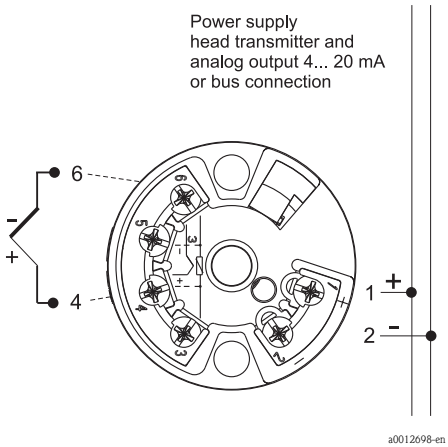
Wiring

Wiring diagrams

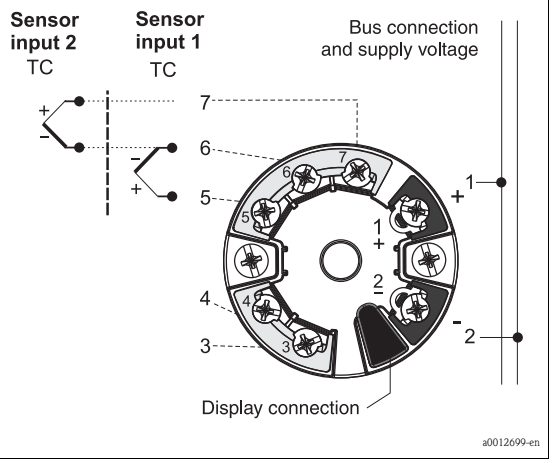
Thermocouple wire colors

As per IEC 60584	
■ Type J: black (+), white (-) ■ Type K: green (+), white (-) ■ Type N: pink (+), white (-)	■ Type B: grey (+), white (-) ■ Type R: orange (+), white (-) ■ Type S: orange (+), white (-)

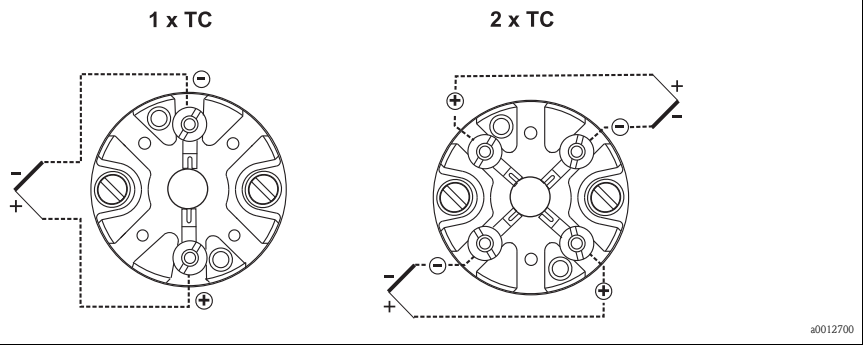
Head mounted transmitter TMT18x (single input)



Head mounted transmitter TMT8x (dual input)



Terminal block mounted

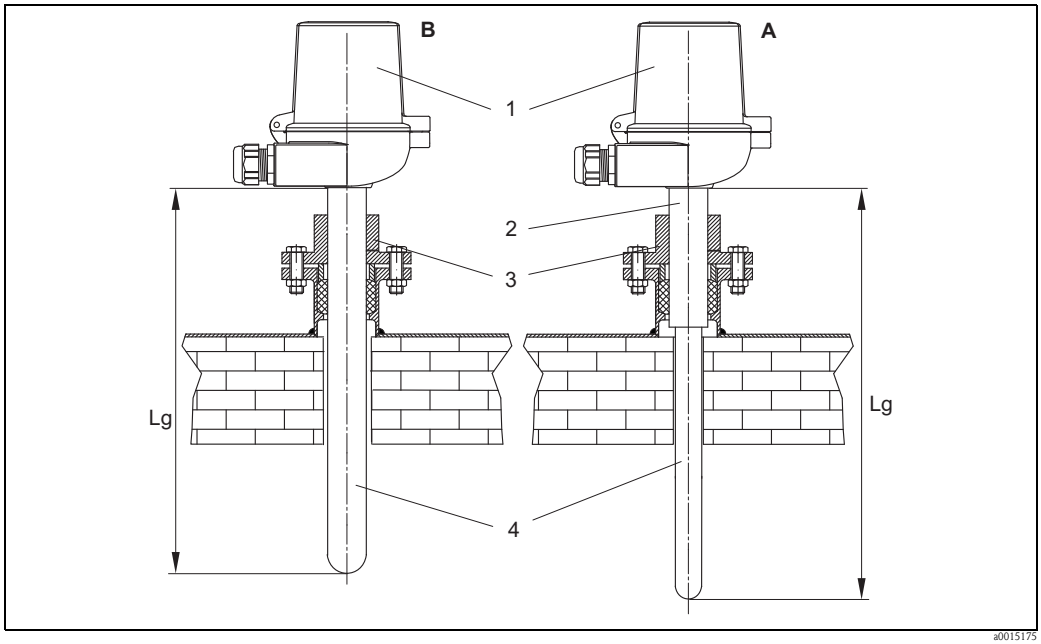


Installation conditions

Orientation

Vertical and horizontal installation. A vertical installation should be preferred due to possible irreversible bending of metal tubes and the brittleness of the ceramic materials, which could be hit by falling parts.

Installation instructions



Examples of vertical thermometer installation

A = TAF11 and TAF12x with ceramic thermowell
B = TAF16 with metal or ceramic thermowell

1 Terminal head
2 Metal sleeve
3 Stop flange according to DIN EN 50446
4 Thermowell
Lg Immersion length

Recommended maximum immersion length Lg for horizontal mounting:
- 1500 mm (59 in) for diameter > 20 mm (0.8 in)
- 1200 mm (47.3 in) for diameter < 20 mm (0.8 in)

Note!
When installing longer lengths than the recommended maximum in horizontal position, the thermowell might be bend irreversibly under its own weight in the hot environment.

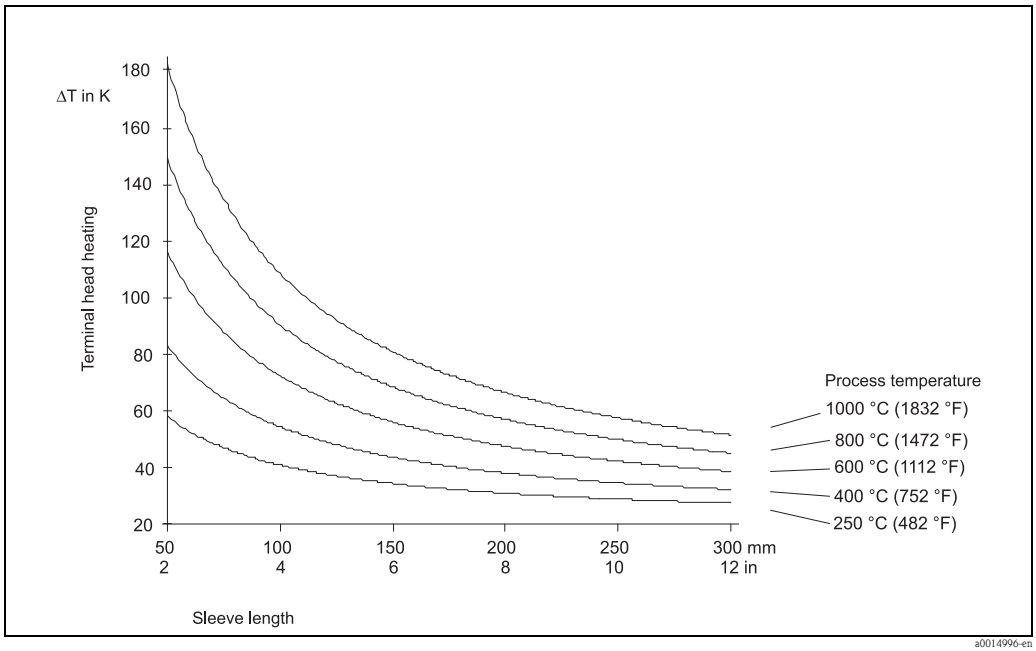
Installation of ceramic sheaths

Gas tight ceramic thermowells and inserts are sensitive to fast temperature changes: In order to reduce the risk of thermal shock and prevent the sheaths from failure, gas tight ceramic sheaths must be heated before installation. Two possibilities are applicable:

- Installation with pre-heating
  At process temperatures ≥ 1000 °C (1832 °F) the ceramic part of the thermowell must be pre-heated from room temperature to 400 °C (752 °F). It is suggested to use a horizontal, cylindrical cross-section oven or cover the ceramic part with electric heating elements. Do not use direct flames.
  It is suggested to pre-heat the ceramic sheath in situ and then proceed immediately with the insertion. The thermowell and inserts shall be installed carefully with an insertion rate of 100 mm/min, avoiding any mechanical shock. If it is not possible to run the pre-heating phase near the plant, the insertion rate must be lowered to 30 mm/min because of the cooling of the system during the transportation.
- Installation without pre-heating
  The insert shall be installed at process working temperature inserting the ceramic sheath in the plant for a length equal to the wall thickness, including the insulation material, and left in that position for 2 hours. After this time, the device shall be installed at a rate of 30 mm/min avoiding any mechanical shock.
  At process temperatures < 80 °C (176 °F) it is not necessary to consider any insertion rate. It is recommended to avoid any impact or collision among the ceramic sheath and the components of the plant.

Sleeve length

The sleeve is the part between the process connection and the terminal head.
As illustrated in the following figure, the sleeve length may influence the temperature in the terminal head. It is necessary that this temperature is kept within the limit values defined in the chapter "Operating conditions".



Heating of the terminal head consequent to the process temperature
Temperature in terminal head = ambient temperature 20 °C (68 °F) + ΔT

Sleeve-Ø = ¾" schedule 40

Certificates and approvals

CE Mark

The device meets the legal requirements of the EC directives if applicable. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Other standards and guidelines

- IEC 60529:
  Degrees of protection by housing (IP-Code).
- IEC 61010-1:
  Safety requirements for electrical measurement, control and laboratory instrumentation.
- IEC 60584:
  Thermocouples
- DIN EN 50446:
  Straight thermocouple assembly with metal or ceramic protection tube and accessories, including terminal heads
- IEC 61326-1:
  Electromagnetic compatibility (EMC requirements)

PED approval

The thermometer complies with paragraph 3.3 of the Pressure Equipment Directive (97/23/CE) and is not marked separately.

Test report and calibration

The "Factory calibration" is carried out according to an internal procedure in a laboratory of Endress+Hauser accredited by the European Accreditation Organization (EA) to ISO/IEC 17025. A calibration which is performed according to EA guidelines (SIT or DKD calibration) may be requested separately. The calibration is performed on the replaceable insert of the thermometer. In the case of thermometers without a replaceable insert, the entire thermometer - from the process connection to the tip of the thermometer - is calibrated.

Ordering information

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

Product structure TAF11

Thermocouple TAF11 – High temperature, max. 1700 °C; TC inserted in ceramic insulators and a ceramic process protection sheath; TC standard according to IEC 60584

	TC Type; Accuracy; Wire diameter; Max. temperature:
12	1x K; class 2; 2.3 mm; 1150 °C
13	1x K; class 2; 3.26 mm; 1150 °C
15	2x K; class 2; 2.3 mm; 1150 °C
16	2x K; class 2; 3.26 mm; 1260 °C
21	1x J; class 2; 2.3 mm; 650 °C
22	1x J; class 2; 3.26 mm; 760 °C
24	2x J; class 2; 2.3 mm; 650 °C
25	2x J; class 2; 3.26 mm; 760 °C
31	1x N; class 2; MgO Pyrosil; 6 mm; 1150 °C
32	2x N; class 2; MgO Pyrosil; 6 mm; 1150 °C
41	1x S; class 2; 0.35 mm; 1300 °C
42	2x S; class 2; 0.35 mm; 1300 °C
43	1x S; class 2; 0.50 mm; 1480 °C
44	2x S; class 2; 0.50 mm; 1480 °C
51	1x R; class 2; 0.50 mm; 1480 °C
52	2x R; class 2; 0.50 mm; 1480 °C
61	1x B; class 2; 0.50 mm; 1700 °C
62	2x B; class 2; 0.50 mm; 1700 °C
99	Special version, TSP-no. to be specified

		Sheath material; Diameter; Max. length:
AA	C610; 14 mm; 600 mm; max. Temp. 1500 °C
AB	C610; 14 mm; 1000 mm; max. Temp. 1500 °C
AC	C610; 14 mm; 1500 mm; max. Temp. 1500 °C
AD	C610, 17 mm; 600 mm; max. Temp. 1500 °C
AE	C610; 17 mm; 1000 mm; max. Temp. 1500 °C
AF	C610; 17 mm; 1500 mm; max. Temp. 1500 °C
AG	C610; 24 mm; 600 mm; max. Temp. 1500 °C internal sheath C610 diameter 17 mm
AH	C610; 24 mm; 1000 mm; max. Temp. 1500 °C internal sheath C610 diameter 17 mm
AJ	C610; 24 mm; 1500 mm; max. Temp. 1500 °C internal sheath C610 diameter 17 mm
BA	SiC; 17 mm; 550 mm; max. Temp. 1600 °C
BB	SiC; 17 mm; 850 mm; max. Temp. 1600 °C
BC	SiC; 17 mm; 1150 mm; max. Temp. 1600 °C
BD	SiC; 26.6 mm; 600 mm; max. Temp. 1600 °C
BE	SiC; 26.6 mm; 800 mm; max. Temp. 1600 °C
BF	SiC; 26.6 mm; 1000 mm; max. Temp. 1600 °C
BG	SiC; 26.6 mm; 1200 mm; max. Temp. 1600 °C
BH	SiC; 26.6 mm; 1400 mm; max. Temp. 1600 °C
BI	SiC; 26.6 mm; 1700 mm; max. Temp. 1600 °C
CA	SiN; 16 mm; 600 mm; max. Temp. 1400 °C
CB	SiN; 16 mm; 900 mm; max. Temp. 1400 °C
CC	SiN; 16 mm; 1200 mm; max. Temp. 1400 °C
CD	SiN; 22 mm; 900 mm; max. Temp. 1400 °C
CE	SiN; 22 mm; 1100 mm; max. Temp. 1400 °C
CF	SiN; 22 mm; 1300 mm; max. Temp. 1400 °C
CG	SiN; 22 mm; 1500 mm; max. Temp. 1400 °C
YY	Special version, TSP-no. to be specified

			Immersion length Lg:
A	250 mm
B	300 mm
C	400 mm
D	450 mm
E	500 mm
F	550 mm
G	600 mm
H	700 mm
I	750 mm
J	800 mm
K	850 mm

Immersion length Lg:	
L	900 mm
M	1000 mm
N	1050 mm
P	1100 mm
Q	1150 mm
R	1200 mm
S	1300 mm
T	1400 mm
U	1500 mm
V	1600 mm
W	1700 mm
X	..... mm
Y	..... mm, as specified

Terminal type:	
3	Terminal block DIN B
4	Terminal block DIN A

Sleeve length Lm; Diameter; Material:	
B	65 mm; 21.34 mm; AISI304
F	100 mm; 21.34 mm; AISI304
G	150 mm; 21.34 mm; AISI304
H	200 mm; 21.34 mm; AISI304
J	185 mm; 33 mm, AISI 304
K	300 mm; 33.70 mm; AISI 446
L	300 mm; 22 mm; AISI 446
M	400 mm; 33.40 mm; AISI 310
N	400 mm; 22 mm; AISI 310
Y	..... mm, as specified

Process connection:	
B	GCP assembly, D=G ¾", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
C	GCP assembly, D=G 1", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
D	GCP assembly, D=G 1½", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=55
R	GCP assembly, D=G 1½", C=35 mm, gas tight, clampable 33.4...34 mm, Wr=55
Z	Process connection: see additional specification
0	Not needed
1	Adjustable flange, D=70 mm
2	Stop flange DIN EN 50446, 21...22 mm, clampable, d2=23 mm, a=90 mm, c=70 mm
3	Stop flange DIN EN 50446, 31...33 mm, clampable, d2=33 mm, a=90 mm, c=70 mm
9	Special version, TSP-no. to be specified

Head; Cable entry:	
E	TA30A Alu, IP66/68; M20
F	TA30D Alu, high cover, IP66/68; M20
G	TA30A Alu; G ½" w/o gland
H	TA30D Alu, high cover; G ½" w/o gland
R	DIN A, Alu, G ½"
Y	Special version, TSP-no. to be specified

Head transmitter; Range:	
B	TMT84 PA
D	TMT85 FF
K	TMT82 (HART); temp. range to be specified
P	TMT181-A PCP; 4...20 mA, temp. range to be specified, 2-wire, isolated
R	TMT182-A HART; temp.range to be specified, 2-wire, isolated
0	Not needed
9	Special version, TSP-no. to be specified

TAF11-	← **Order code (complete)**

Product structure TAF12S

Thermocouple TAF12S - High temperature, max. 1700 °C; Manufactured with external ceramic sheath; Metallic mounting sleeve; TC standard according to IEC 60584

TC Type; Accuracy; Wire diameter; Max. temperature:	
31	1x S; class 2; 0.35 mm; 1300 °C
32	2x S; class 2; 0.35 mm; 1300 °C
33	1x S; class 2; 0.5 mm; 1480 °C
34	2x S; class 2; 0.5 mm; 1480 °C
41	1x R; class 2; 0.5 mm; 1480 °C
42	2x R; class 2; 0.5 mm; 1480 °C

	TC Type; Accuracy; Wire diameter; Max. temperature:
	51 1x B; class 2; 0.5 mm; 1700 °C
	52 2x B; class 2; 0.5 mm; 1700 °C
	99 Special version, TSP-no. to be specified

		Sheath material; Diameter; Max. length:
		SA C610, 9 mm; 600 mm; max. Temp. 1500 °C
		SB C610, 9 mm; 1000 mm; max. Temp. 1500 °C
		SC C610, 9 mm; 1500 mm; max. Temp. 1500 °C
		SD C799, 9 mm; 600 mm; max. Temp. 1800 °C
		SE C799, 9 mm; 1000 mm; max. Temp. 1800 °C
		SF C799, 9 mm; 1500 mm; max. Temp. 1800 °C
		YY Special version, TSP-no. to be specified

			Immersion length Lg:
			X ..... mm
			Y ..... mm, as specified

				Terminal type:
				3 Terminal block
				9 Special version, TSP-no. to be specified

					Sleeve length Lm; Diameter; Material:
					A 100 mm; 14 mm; 304
					Y ..... mm, as specified

						Process connection:
						A Stop flange DIN EN 50446, 14...15 mm, clampable, d2=16 mm, a=75 mm, c=55 mm
						G GCP assembly, D=G ½", C=15.5 mm, gas tight, clampable 13.7...14 mm, Wr=36
						J GCP assembly, D=G ¾", C=15.5 mm, gas tight, clampable 13.7...14 mm, Wr=36
						M GCP assembly, D=G 1", C=15.5 mm, gas tight, clampable 13.7...14 mm, Wr=41
						Z Process connection: see additional specification
						0 Not needed
						1 Adjustable flange, D=70 mm
						9 Special version, TSP-no. to be specified

							Head; Cable entry:
							E TA30A Alu, IP66/68; M20
							F TA30D Alu, high cover, IP66/68; M20
							G TA30A Alu; G ½" w/o gland
							H TA30D Alu, high cover; G ½" w/o gland
							Y Special version, TSP-no. to be specified

								Head transmitter; Range:
								B TMT84 PA
								D TMT85 FF
								K TMT82 (HART); temp. range to be specified
								P TMT181-A PCP; 4...20 mA, temp. range to be specified, 2-wire, isolated
								R TMT182-A HART; temp.range to be specified, 2-wire, isolated
								0 Not needed
								9 Special version, TSP-no. to be specified

TAF12S-										← **Order code (complete)**

Product structure TAF12D

Thermocouple TAF12D – High temperature, max. 1700 °C; Manufactured with double ceramic sheath external and internal; Metallic mounting sleeve; TC standard according to IEC 60584

	TC Type; Accuracy; Wire diameter; Max. temperature:
	31 1x S; class 2; 0.35 mm; 1300 °C
	32 2x S; class 2; 0.35 mm; 1300 °C
	33 1x S; class 2; 0.5 mm; 1480 °C
	34 2x S; class 2; 0.5 mm; 1480 °C
	41 1x R; class 2; 0.5 mm; 1480 °C
	42 2x R; class 2; 0.5 mm; 1480 °C
	51 1x B; class 2; 0.5 mm; 1700 °C
	52 2x B; class 2; 0.5 mm; 1700 °C
	99 Special version, TSP-no. to be specified

		Sheath material; Diameter; Max. length:
		DA C610; 14 mm; C610, 9 mm; 600 mm; max. Temp. 1500 °C
		DB C610; 14 mm; C610, 9 mm; 1000 mm; max. Temp. 1500 °C
		DC C610; 14 mm; C610, 9 mm; 1500 mm; max. Temp. 1500 °C
		DD C799, 15 mm; C799, 9 mm; 600 mm; max. Temp. 1800 °C

Sheath material; Diameter; Max. length:	
DE	C799; 15 mm; C799, 9 mm; 1000 mm; max. Temp. 1800 °C
DF	C799; 15 mm; C799, 9 mm; 1500 mm; max. Temp. 1800 °C
YY	Special version, TSP-no. to be specified

Immersion length Lg:	
X	..... mm
Y	..... mm, as specified

Terminal type:	
3	Terminal block
9	Special version, TSP-no. to be specified

Sleeve length Lm; Diameter; Material:	
B	65 mm; 21.34 mm; ASTM106
C	200 mm; 21.34 mm; ASTM106
F	100 mm; 21.34 mm; 304
G	150 mm; 21.34 mm; 304
H	200 mm; 21.34 mm; 304
Y	..... mm, as specified

Process connection:	
A	Stop flange DIN EN 50446, 21...22 mm, clampable, d2=23 mm, a=90 mm, c=70 mm
B	GCP assembly, D=G ¾", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
C	GCP assembly, D=G 1", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
D	GCP assembly, D=G 1½", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=55
Z	Process connection: see additional specification
0	Not needed
1	Adjustable flange, D=70 mm
9	Special version, TSP-no. to be specified

Head; Cable entry:	
E	TA30A Alu, IP66/68; M20
F	TA30D Alu, high cover, IP66/68; M20
G	TA30A Alu; G ½" w/o gland
H	TA30D Alu, high cover; G ½" w/o gland
Y	Special version, TSP-no. to be specified

Head transmitter; Range:	
B	TMT84 PA
D	TMT85 FF
K	TMT82 (HART); temp. range to be specified
P	TMT181-A PCP; 4...20 mA, temp. range to be specified, 2-wire, isolated
R	TMT182-A HART; temp.range to be specified, 2-wire, isolated
0	Not needed
9	Special version, TSP-no. to be specified

TAF12D-	**← Order code (complete)**

Product structure TAF12T

Thermocouple TAF12T - High temperature, max. 1700 °C; Manufactured with external and two internal ceramic sheaths; Metallic mounting sleeve; TC standard according to IEC 60584

	TC Type; Accuracy; Wire diameter; Max. temperature:
31	1x S; class 2; 0.35 mm; 1300 °C
32	2x S; class 2; 0.35 mm; 1300 °C
33	1x S; class 2; 0.5 mm; 1480 °C
34	2x S; class 2; 0.5 mm; 1480 °C
41	1x R; class 2; 0.5 mm; 1480 °C
42	2x R; class 2; 0.5 mm; 1480 °C
51	1x B; class 2; 0.5 mm; 1700 °C
52	2x B; class 2; 0.5 mm; 1700 °C
99	Special version, TSP-no. to be specified

		Sheath material; Diameter; Max. length:
TA	C530+C610, 26 mm; 600 mm; max. Temp. 1400 °C
TB	C530+C610, 26 mm; 1000 mm; max. Temp. 1400 °C
TC	C530+C610, 26 mm; 1500 mm; max. Temp. 1400 °C
TD	C530+C799, 26 mm; 600 mm; max. Temp. 1500 °C
TE	C530+C799, 26 mm; 1000 mm; max. Temp. 1500 °C
TF	C530+C799, 26 mm; 1500 mm; max. Temp. 1500 °C
TG	C799+C799, 24 mm; 600 mm; max. Temp. 1800 °C
TH	C799+C799, 24 mm; 1000 mm; max. Temp. 1800 °C
TJ	C799+C799, 24 mm; 1500 mm; max. Temp. 1800 °C
YY	Special version, TSP-no. to be specified

			Immersion length Lg:
X	..... mm
Y	..... mm, as specified

				Terminal type:
4	Terminal block
9	Special version, TSP-no. to be specified

					Sleeve length Lm; Diameter; Material:
A	185 mm; 33.40 mm; AISI106
Y	..... mm, as specified

						Process connection:
R	GCP assembly, D=G 1½", C=35 mm, gas tight, clampable 33.4...34 mm, Wr=55
Z	Process connection: see additional specification
0	Not needed
1	Adjustable flange, D=70 mm
9	Special version, TSP-no. to be specified

							Head; Cable entry:
E	TA30A Alu, IP66/68; M20
F	TA30D Alu, high cover, IP66/68; M20
G	TA30A Alu; G ½" w/o gland
H	TA30D Alu, high cover; G ½" w/o gland
P	DIN A, Alu, for terminal block DIN A, G ½"
Y	Special version, TSP-no. to be specified

								Head transmitter; Range:
B	TMT84 PA
D	TMT85 FF
K	TMT82 (HART); temp. range to be specified
P	TMT181-A PCP; 4...20 mA, temp. range to be specified, 2-wire, isolated
R	TMT182-A HART; temp.range to be specified, 2-wire, isolated
0	Not needed
9	Special version, TSP-no. to be specified

TAF12T-									← **Order code (complete)**

Product structure TAF16

Thermocouple TAF16 - High temperature, max. 1700 °C; Manufactured with metallic sheath; TC standard according to IEC 60584

	TC Type; Accuracy; Wire diameter; Max. temperature:
11	1x K; class 2; 1.63 mm; 1100 °C
12	1x K; class 2; 2.3 mm; 1100 °C
13	1x K; class 2; 3.26 mm; 1100 °C
14	2x K; class 2; 1.63 mm; 1100 °C
15	2x K; class 2; 2.3 mm; 1100 °C
16	2x K; class 2; 3.26 mm; 1100 °C
17	1x K; class 1; MgO INCONEL600; 6 mm; 1100 °C
18	2x K; class 1; MgO INCONEL600; 6 mm; 1100 °C
20	1x J; class 2; 1.63 mm; 700 °C
21	1x J; class 2; 2.3 mm; 700 °C
22	1x J; class 2; 3.26 mm; 700 °C
23	2x J; class 2; 1.63 mm; 700 °C
24	2x J; class 2; 2.3 mm; 700 °C
25	2x J; class 2; 3.26 mm; 700 °C
26	1x J; class 2; MgO INCONEL600; 6 mm; 700 °C
27	2x J; class 2; MgO INCONEL600; 6 mm; 700 °C
31	1x N; class 2, MgO Pyrosil; 6 mm; 1150 °C
32	2x N; class 2, MgO Pyrosil; 6 mm; 1150 °C
41	1x S; class 2; 0.35 mm; 1300 °C
42	2x S; class 2; 0.35 mm; 1300 °C
43	1x S; class 2; 0.50 mm; 1480 °C
44	2x S; class 2; 0.50 mm; 1480 °C
99	Special version, TSP-no. to be spec.

		Insertion length He:
	A	676 mm (for SiN with head DIN B)
	B	826 mm (for SiN with head DIN B)
	C	976 mm (for SiN with head DIN B)
	D	1076 mm (for SiN with head DIN B)
	E	1176 mm (for SiN with head DIN B)
	F	1276 mm (for SiN with head DIN B)
	G	1576 mm (for SiN with head DIN B)
	M	880 mm
	N	691 mm (for SiN with head DIN A)
	O	841 mm (for SiN with head DIN A)
	P	991 mm (for SiN with head DIN A)
	Q	1091 mm (for SiN with head DIN A)
	R	1191 mm (for SiN with head DIN A)
	S	1291 mm (for SiN with head DIN A)
	T	1591 mm (for SiN with head DIN A)
	X	..... mm
	Y	..... mm, as specified

			Pipe diameter; Material; Max. temperature:
		A	14 x 11 mm; 310; 1100 °C
		B	17.2x 14.2 mm; 310; 1100 °C
		C	21.3 x 16.3 mm; 310; 1100 °C
		D	26.7 x 23.7 mm; 310; 1100 °C
		E	21.3 x 15.76 mm (½" schedule 40s); 316; 800 °C
		F	26.7 x 20.96 mm (¾" schedule 40s); 316; 800 °C
		G	21.3 x 15.76 mm (½" schedule 40s); 446; 1100 °C
		H	26.7 x 20.96 mm (¾" schedule 40s); 446; 1100 °C
		J	15.0 x 12 mm; INCONEL600; 1100 °C
		K	17.2x 13.2 mm; INCONEL600; 1100 °C
		L	21.3 x 15.76 mm (½" schedule 40s); INCONEL600; 1100 °C
		M	26.7 x 20.96 mm (¾" schedule 40s); INCONEL600; 1100 °C
		N	22.0 x 18.0 mm; 310; 1100 °C
		O	22 x 13 mm; Kanthal Super; 1700 °C; Lgmax = 2000 mm
		P	22.0 x 18.0 mm; INCONEL600; 1100 °C
		Q	22.0 x 18.0 mm; INCONEL601; 1200 °C
		R	26.7 x 18.85 mm (bar stock tip 300 mm, ¾", sch.80); INCOLOY800HT; 1100 °C
		S	26.7 x 18.85 mm (bar stock tip 400 mm, ¾", sch.80); INCOLOY800HT; 1100 °C
		U	18 x 10 mm; Kanthal Super; 1700 °C; Lgmax = 2000 mm
		V	21.3 x 15.76 mm (½" schedule 40s); INCONEL601; 1200 °C
		Y	Special version, TSP-no. to be specified
		1	26.7 x 20.96 mm (¾" schedule 40); Hastelloy X; bar stock tip 400 mm (schedule 80) NiCo; 1200 °C
		2	21.3 x 15.76 mm (½" schedule 40); Hastelloy X; bar stock tip 400 mm (schedule 80) NiCo; 1200 °C

Pipe diameter; Material; Max. temperature:	
3	21.3 x 15.76 mm (½" schedule 40s); NiCo; 1200 °C
4	26.7 x 20.96 mm (¾" schedule 40s); NiCo; 1200 °C
5	22 x 19.40 mm Kanthal AF; 1300 °C, Lgmax = 1000 mm
6	22 x 12 mm; SiN; 1400 °C, Lgmax = 1550 mm
7	28 x 16 mm; SiN; 1400 °C, Lgmax = 1550 mm

Immersion length Lg:	
A	650 mm (SiN)
B	800 mm (SiN)
C	950 mm (SiN)
D	1050 mm (SiN)
E	1150 mm (SiN)
F	1250 mm (SiN)
G	1550 mm (SiN)
M	800 mm
X	..... mm (200...2000)
Y	..... mm, as specified
8	..... mm (400...2200)

Internal protective sheat; Diameter:	
M	Ceramic sheat C610; 14 x 10 mm
N	Ceramic sheath C799; 9 x 6 mm
0	Not needed
9	Special version, TSP-no. to be specified

Terminal type:	
2	Flying leads
3	Terminal block DIN B
4	Terminal block DIN A

Process connection:	
A	Stop flange DIN EN 50446, 14...15 mm, clampable, d2=16 mm, a=75 mm, c=55 mm
D	GCP assembly, D=G ¾", C=19 mm, gas tight, clampable 17.5...18 mm, Wr=36
E	GCP assembly, D=G 1", C=19 mm, gas tight, clampable 17.5...18 mm, Wr=41
F	GCP assembly, D=G 1 ¼", C=29 mm, gas tight, clampable 27.5...28 mm, Wr=55
I	GCP assembly, D=G 1 ½", C=29 mm, gas tight, clampable 27.5...28 mm, Wr=55
G	GCP assembly, D=G ½", C=15.5 mm, gas tight, clampable 13,7...14 mm, Wr=36
H	GCP assembly, D=G ½", C=17.5 mm, gas tight, clampable 17 mm...17.2, Wr=36
J	GCP assembly, D=G ¾", C=15.5 mm, gas tight, clampable 13,7...14 mm, Wr=36
K	GCP assembly, D=G ¾", C=18 mm, gas tight, clampable 17...17.2 mm, Wr=36
L	GCP assembly, D=G ¾", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
M	GCP assembly, D=G 1", C=15.5 mm, gas tight, clampable 13.7...14 mm, Wr=41
N	GCP assembly, D=G 1", C=18 mm, gas tight, clampable 17...17.2 mm, Wr=41
P	GCP assembly, D=G 1", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=41
Q	Stop flange DIN EN 50446, 27...28 mm, clampable, d2=29 mm, a=90 mm, c=70 mm
S	GCP assembly, D=G 1", C=28 mm, gas tight, clampable 26.7...27 mm, Wr=46
Z	Process connection: see additional specification
0	Not needed
1	Adjustable flange diameter 70 mm
2	Stop flange DIN EN 50446, 21...22 mm, clampable, d2=23 mm, a=90 mm, c=70 mm
3	GCP assembly, D=G 1½", C=22.5 mm, gas tight, clampable 21.3...22 mm, Wr=55
9	Special version, TSP-no. to be specified

Head; Cable entry:	
E	TA30A Alu, IP66/68; M20
F	TA30D Alu, high cover, IP66/68; M20
G	TA30A Alu; G ½" w/o gland
H	TA30D Alu, high cover; G ½" w/o gland
R	DIN A, Alu, for terminal block DIN A, G ½"
Y	Special version, TSP-no. to be specified

Head transmitter; Range:	
B	TMT84 PA
D	TMT85 FF
K	TMT82 (HART); temp. range to be specified
P	TMT181-A PCP; 4...20 mA, temp. range to be specified, 2-wire, isolated
R	TMT182-A HART; temp. range to be specified, 2-wire, isolated
0	Not needed
9	Special version, TSP-no. to be specified

TAF16-	**← Order code (complete)**

Accessories

- Thermowells:
  TWF11, accessory for high temperature assembly TAF11
  TWF16, accessory for high temperature assembly TAF16
  (Details in Technical Information, see chapter 'Documentation').
- Inserts:
  TPC100, accessory for high temperature assembly TAF11 and TAF16
  TPC200, accessory for high temperature assembly TAF11, TAF12D, TAF12T and TAF16
  (Details in Technical Informations, see chapter 'Documentation').
- Process connections:
  All types are available as accessories, order numbers see chapter 'Process connection'.

Documentation

Technical Information:
- Temperature head transmitter:
  – iTEMP® TMT181, PC programmable, single input, RTD, TC, Ω, mV (TI070R/09/en)
  – iTEMP® TMT182 HART®, single input, RTD, TC, Ω, mV (TI078R/09/en)
  – iTEMP® TMT82 HART®, dual input, RTD, TC, Ω, mV (TI01010T/09/en)
  – iTEMP® TMT84 PROFIBUS® PA, dual input, RTD, TC, Ω, mV (TI138R/09/en)
  – iTEMP® TMT85 FOUNDATION Fieldbus™, dual input, RTD, TC, Ω, mV (TI134R/09/en)
- Thermowells:
  TWF11, TWF16 (TI01015T/09/en)
- Inserts:
  TPC100 (TI278T/02/en)
  TPC200 (TI01016T/09/en)

Application example

Technical Information:
- Field display RIA16 (TI144R/09/en)
- Active barrier with power supply RN221N (TI073R/09/en)

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