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Thermocouples Straight Design per DIN 43 733
Model Series TC51X, for Flue Gas Measurement

Applications

- Blast furnaces, regenerating air heaters
- Annealing / heat treatment processes
- Refuse / hazardous waste incineration
- Industrial heating installations, heat generation
- Glass / porcelain / ceramics industry
- Cement and brick production

Special Features

- Application ranges up to max. +1700 °C
- Thermowell made of heat resistant steel or ceramic
- Support tube of carbon steel
- Also with ceramic inner tube
- Gastight process connection

Thermocouples Straight Design, Model Series TC51X

Description

These flue gas thermocouples are in compliance with DIN 43 733. The thermoelectric wires of the thermocouple built into the thermowell are either carried in capillary holes of ceramic insulating tubes or in capillary holes of an insulating rod. A metal or ceramic thermowell with or without additional inner tube protects the thermocouple from the process medium.
An adjustable threaded bushing or a stop flange is used as standard process connection.

The electrical connection is located in a connection head. Optionally a transmitter can be mounted. One of the advantages of a built-in transmitter is the increased reliability of the signal transmission. Between transmitter and control room a standard copper cable can be used in lieu of special compensation cable. A cold junction is integrated in all WIKA transmitters.

Thermocouples straight design *Model TC501* *see data sheet TE 65.30*
Resistance thermometers straight design *Model TR501* *see data sheet TE 60.30*

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Sensor

Sensor types

Type	Thermocouple	Recommended max. operating temperature
K (NiCr-Ni)	non-precious	1200 °C
N (NiCrSi-NiSi)	non-precious	1200 °C
J (Fe-CuNi)	non-precious	800 °C
S (Pt10%Rh-Pt)	precious metal	1600 °C
R (Pt13%Rh-Pt)	precious metal	1600 °C
B (Pt30%Rh-Pt6%Rh)	precious metal	1700 °C

In the case of type K there is a risk of blue mould forming between 850 °C and 950 °C . We recommend the use of a type N sensor, if the working temperature is continuously within this range.

The application range of these thermometers is limited by the max. permissible temperature of the thermocouple as well as the max. permissible temperature of the thermowell material.

Listed sensor types are available both as simplex or duplex thermocouples.
The measuring point (hot junction) of the probe is supplied as ungrounded unless specified otherwise.

Sensor limiting error

A cold junction temperature of 0 °C is taken as the basis for the definition of the sensor limiting error of thermocouples.

Type K and N

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +1000 °C	± 0.0040 • | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +1200 °C	± 0.0075 • | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	0 °C ... +1250 °C	± 2.2 °C or [2] ± 0.75 %
Special	0 °C ... +1250 °C	± 1.1 °C or [2] ± 0.4 %

Limiting error with selected temperatures in °C for thermocouples type K and type N

Temperature (ITS 90) °C	Limiting error DIN EN 60 584 Class 1 °C	Class 2 °C
350	± 1.5	± 2.5
500	± 2	± 3.75
600	± 2.4	± 4.5
700	± 2.8	± 5.25
800	± 3.2	± 6
900	± 3.6	± 6.75
1000	± 4	± 7.5
1100	-	± 8.25
1200	-	± 9

Type J

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +750 °C	± 0.0040 • | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +750 °C	± 0.0075 • | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	0 °C ... +750 °C	± 2.2 °C or [2] ± 0.75 %
Special	0 °C ... +750 °C	± 1.1 °C or [2] ± 0.4 %

Limiting error with selected temperatures in °C for thermocouples type J

Temperature (ITS 90) °C	Limiting error DIN EN 60 584 Class 1 °C	Class 2 °C
350	± 1.5	± 2.5
500	± 2	± 3.75
600	± 2.4	± 4.5
700	± 2.8	± 5.25

Type S and R

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	0 °C ... +1100 °C	± 1.0 °C
1	+1100 °C ... +1600 °C	± (1+ 0.003 • (t - 1100)) [1]
2	0 °C ... +600 °C	± 1.5 °C
2	+600 °C ... +1600 °C	± 0.0025 • | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	0 °C ... +1450 °C	± 1.5 °C or [2] ± 0.25 %
Special	0 °C ... +1450 °C	± 0.6 °C or [2] ± 0.1 %

1) \| t \| is the value of the temperature in °C without consideration of the sign.
2) Whichever is larger.

Limiting error with selected temperatures in °C for thermocouples type S and type R

Temperature (ITS 90) °C	Limiting error DIN EN 60 584 Class 1 °C	Class 2 °C
350	± 1.0	± 1.5
500	± 1.0	± 1.5
600	± 1.0	± 1.5
700	± 1.0	± 1.8
800	± 1.0	± 2.0
900	± 1.0	± 2.3
1000	± 1.0	± 2.5
1100	± 1.0	± 2.8
1200	± 1.3	± 3.0
1300	± 1.6	± 3.3
1400	± 1.9	± 3.5
1500	± 2.2	± 3.8
1600	± 2.5	± 4.0

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Type B

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
2	+600 °C ... +1700 °C	± 0.0025 • | t | [1]
3	+600 °C ... +800 °C	± 4.0 °C
3	+800 °C ... +1700 °C	± 0.005 • | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	870 °C ... +1700 °C	± 0.5 %

1) | t | is the value of the temperature in °C without consideration of the sign.
2) Whichever is larger.

Limiting error with selected temperatures in °C
for thermocouples type B

Temperature (ITS 90) °C	Limiting error DIN EN 60 584 Class 2 °C	Class 3 °C
700	± 1.8	± 4.0
800	± 2.0	± 4.0
900	± 2.3	± 4.5
1000	± 2.5	± 5.0
1100	± 2.8	± 5.5
1200	± 3.0	± 6.0
1300	± 3.3	± 6.5
1400	± 3.5	± 7.0
1500	± 3.8	± 7.5
1600	± 4.0	± 8.0
1700	± 4.3	± 8.5

The long-term stability of the precious metal thermocouples rises with an increasing diameter of the thermoelectric wire. Therefore, the sensors type S, R and B are available with thermoelectric wire diameters of Ø 0.35 mm or Ø 0.5 mm.

Designs

Based on the type of the connection head and the thermowell material, a variety of designs is subdivided into the following main models as per DIN 43 733:
AM, AMK, BM, BMK, AK, AKK, BK, BKK.
A Connection head form A
B Connection head form B
M Metal thermowell
K Ceramic thermowell
K (3rd character) with ceramic inner tube
no 3rd character = without inner tube
These main model designs as per DIN 43 733 are covered by the WIKA product family TC51X.

Designs with metal thermowell
Depending on the material used the upper operating temperature limit of metal thermowells can be up to 1200 °C. Generally a non-precious metal thermocouple is used as a sensor (Type K, J).

Designs with ceramic thermowell
Depending on the ceramics used the upper operating temperature limit of ceramic thermowells can be up to 1700 °C. Generally a precious metal thermocouple is used as a sensor (Type R, S, B).

For the measurement of temperatures above 1200 °C only a precious metal thermocouple can be used.
With precious metal thermocouples, however, there is a risk of "poisoning" by foreign substances. This risk rises with increasing temperatures. Therefore, at temperatures above 1400 °C gastight ceramics, preferably the high-purity C 799, should be used.

The process connection can be gastight up to 1 bar. It is recommended that with toxic or safety-critical process gases further constructive measures be taken in addition to the standard features in order to avoid any leakage of the medium via the connection head to the outside in the case of a thermowell fracture (pressure-sealed leadthrough in the connection head).

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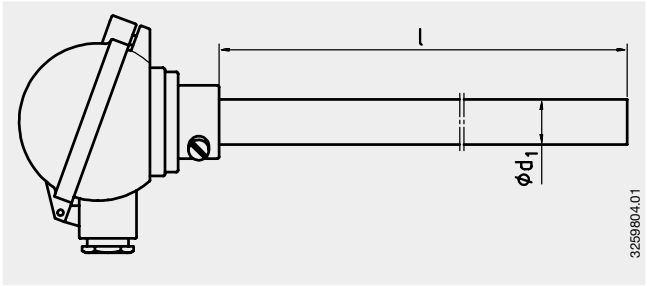
Model survey and dimensions

Model TC511 AM / AMK per DIN 43 733

- Connection head form A
- Metal thermowell
- Ceramic inner tube (optional)

Dimensions for standard versions in mm:

l	Nominal length	500, 710, 1000 or 1400
Ød$_1$	Thermowell outer Ø	22

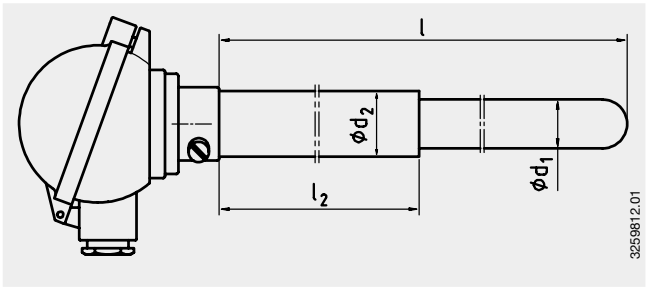


Model TC512 AK/ AKK per DIN 43 733

- Connection head form A
- Ceramic thermowell
- Metallic support tube
- Ceramic inner tube (optional)

Dimensions for standard versions in mm:

l	Nominal length	500, 710, 1000 or 1400
Ød$_1$	Thermowell outer Ø	24
l$_2$	Support tube length	200
Ød$_2$	Support tube Ø	32

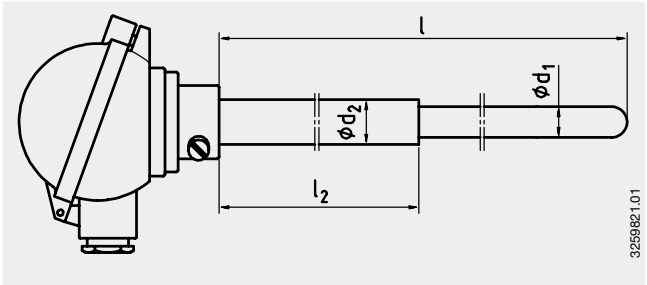


Model TC513 AK per DIN 43 733

- Connection head form A
- Ceramic thermowell
- Metallic support tube

Dimensions for standard versions in mm:

l	Nominal length	500, 710 or 1000
Ød$_1$	Thermowell outer Ø	15
l$_2$	Support tube length	150
Ød$_2$	Support tube Ø	22

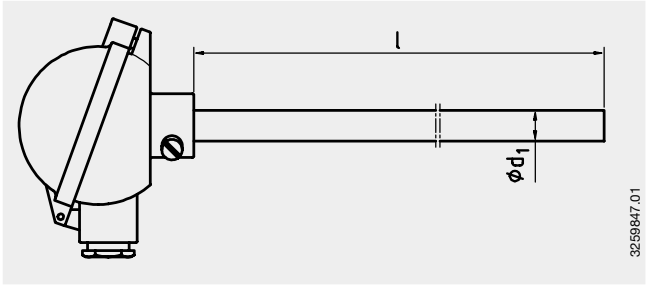


Model TC514 BM / BMK per DIN 43 733

- Connection head form B
- Metal thermowell
- Ceramic inner tube (optional)

Dimensions for standard versions in mm:

l	Nominal length	250, 355, 500, 710 or 1000
Ød$_1$	Thermowell outer Ø	15

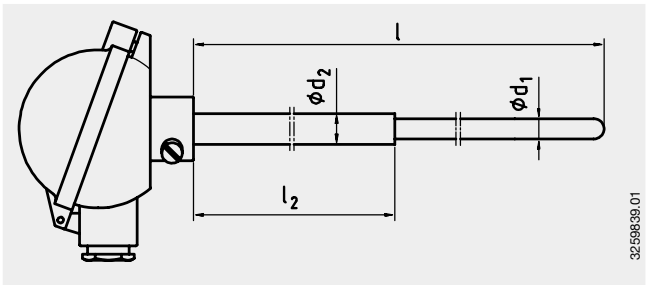


Model TC515 BK per DIN 43 733

- Connection head form B
- Ceramic thermowell
- Metallic support tube

Dimensions for standard versions in mm:

l	Nominal length	250, 355, 500 or 710
Ød$_1$	Thermowell outer Ø	10
l$_2$	Support tube length	80
Ød$_2$	Support tube Ø	15



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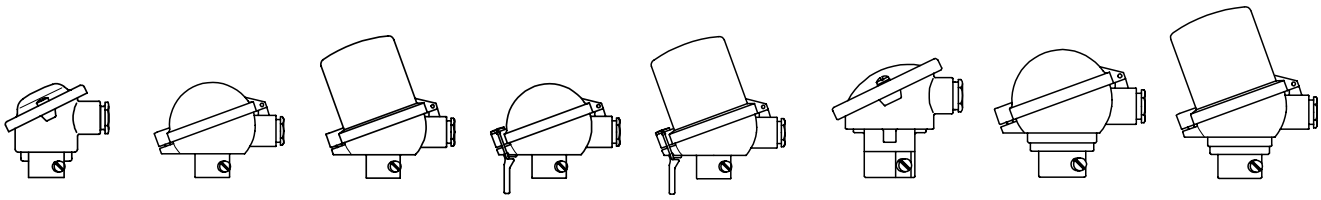
Connection head



BS BSZ BSZ-H BSS BSS-H AS ASZ ASZ-H

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
BS	aluminium	M20 x 1.5	IP53	cap with 2 screws	silver bronze, painted
BSZ	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted
BSZ-H	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted
BSS	aluminium	M20 x 1.5	IP53	flap cap with clip	silver bronze, painted
BSS-H	aluminium	M20 x 1.5	IP53	flap cap with clip	silver bronze, painted
AS	aluminium	M20 x 1.5	IP53	cap with 2 screws	silver bronze, painted
ASZ	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted
ASZ-H	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted

Transmitter (option)

The transmitter can be directly mounted into the thermometer (head mount). The permissible ambient temperature of the trans-mitter as specified in the pertinent data sheet is to be observed.
In the case of a direct connection of the thermocouple to the transmitter the risk of an inadmissibly high heating of the transmitter terminals rises due to the thermal conduction of the thermoelectric wires. Therefore the thermocouple is indirectly connected to the transmitter via a short piece of a thin compensating cable between terminal block and transmitter.

As the transmitter consequently has to be mounted within the cap of the connection head, this cap has to be relatively high: Head ASZ-H for thermometers TC511, TC512 and TC513 and head BSZ-H or BSS-H for thermometers TC514 and TC515.

Connection head	Transmitter				
	T12	T19	T32	T42	T5350
BS	–	–	–	–	–
BSZ	–	–	–	–	–
BSZ-H	●	●	●	●	●
BSS	–	–	–	–	–
BSS-H	●	●	●	●	●
AS	–	–	–	–	–
ASZ	–	–	–	–	–
ASZ-H	●	●	●	●	●

● mounted within the cap of the connection head
– mounting not possible

Model	Description	Data sheet
T19	Analogue transmitter, configurable	TE 19.01
T12	Digital transmitter, PC configurable	TE 12.01
T32	Digital transmitter, HART protocol	TE 32.01
T42	Digital transmitter, PROFIBUS PA	TE 42.01
T5350	Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA	TE 53.01

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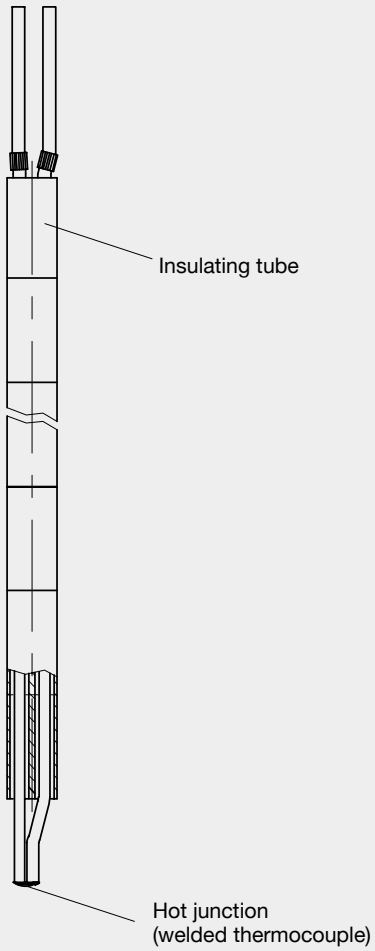
Assembly of the thermocouples

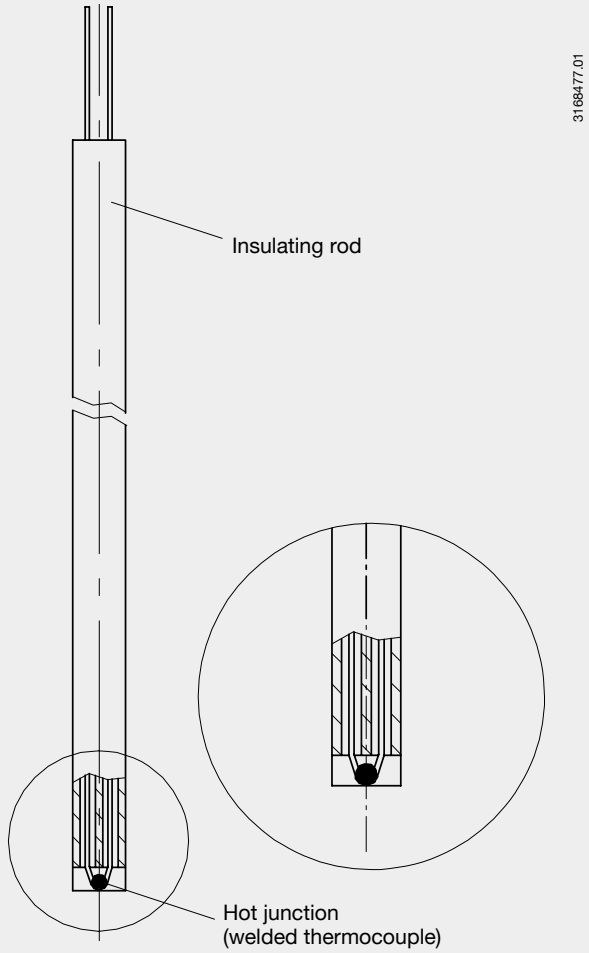
Non-precious metal thermocouple
Type K, N, J

Thermoelectric wire: Ø 1 mm or Ø 3 mm
Insulation: insulating tube, ceramic C 610



Precious metal thermocouple
Type S, R, B

Thermoelectric wire: Ø 0.35 mm or Ø 0.5 mm
Insulation: insulating rod, ceramic C 799



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Model TC511 (AM/AMK)
Model TC514 (BM/BMK)

Metal thermowell
The thermowell is made of tube. The bottom of the thermowell is either flat or dished, in the case of enamelled thermowells it is always dished. The thermowell is plugged into the connection head and compression fitted.
The adjustable process connection is compression fitted on the thermowell, thus allowing a variable insertion length. Preference is to be given to standard nominal lengths to DIN 43 733.

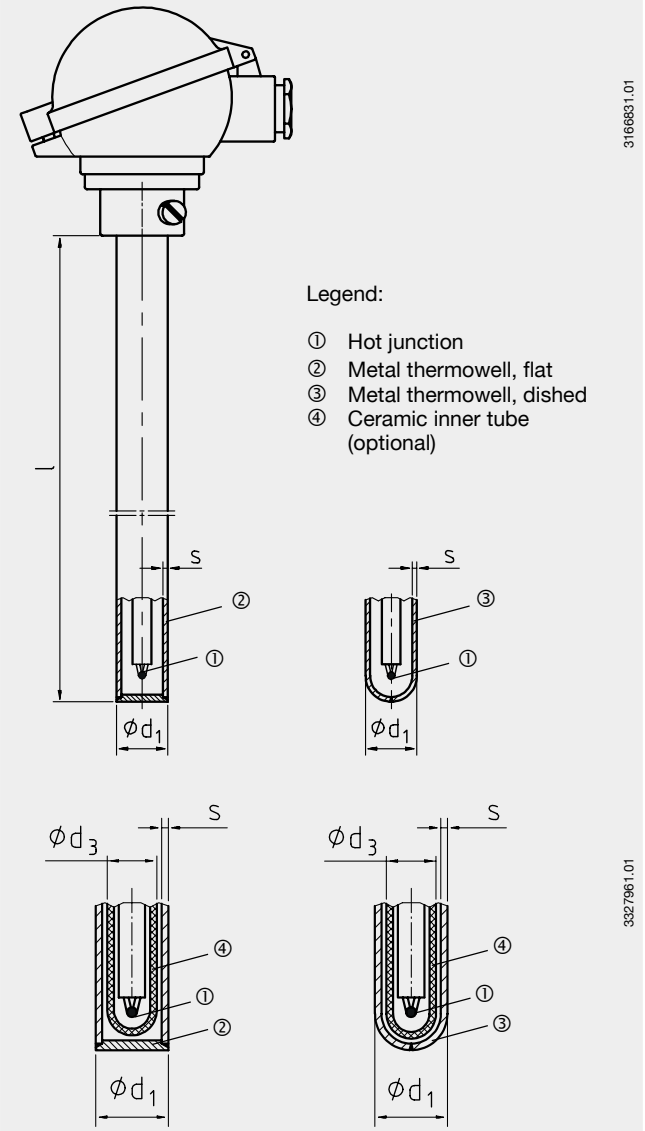
Standard nominal length
l = 500, 710, 1000, 1400 mm
other on request

Materials for metal thermowells
See "Remarks on the selection and operation of metal thermowells" on page 11

Inner tube (optional)
At high temperatures metal thermowells might get porous. An inner tube of gastight ceramics protects the thermocouple from aggressive gases. As a result changes of the thermoelectric properties of the thermocouple are avoided, and in addition the service life of the thermometer is generally prolonged.

Materials for inner tube
- Ceramic C 610 gastight
  usable up to 1500 °C, not resistant to alkali vapours
- Ceramic C 799 gastight, high-purity
  usable up to 1700 °C, however only partially resistant to changes in temperature, not resistant to alkali vapours

Thermowell design



Dimensions in mm for thermowell and inner tube

Model	Metal thermowell outer Ø Ød1	tube thickness s	Ceramic inner tube outer Ø Ød3
TC511	22	2	15
TC514	15	2	10

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Model TC512 (AK/AKK)
Model TC513 (AK)
Model TC515 (BK)

Ceramic thermowell

Ceramic thermowells consist of fired aluminium oxide ceramics, the tip is spherical. Due to the low mechanical stability a metal support tube is used to fix the process connection to the thermometer.
The ceramic thermowell is cemented into the support tube by means of a fireproof ceramic compound. The support tube is inserted into the connection head and compression fitted. Preference is to be given to standard nominal lengths to DIN 43 733.

Standard nominal length

l = 250, 355, 500, 710, 1000, 1400 mm
other on request

Materials for ceramic thermowells

- Ceramic C 530 not gastight, fine pored
  highly resistant to changes in temperature, usable up to 1600 °C, not attacked by gases
  Used as outer thermowell in combination with gastight inner thermowell
- Ceramic C 610 gastight
  usable up to 1500 °C, not resistant to alkali vapours
- Ceramic C 799 gastight, high-purity
  usable up to 1700 °C, however only partially resistant to changes in temperature, not resistant to alkali vapours

other materials on request

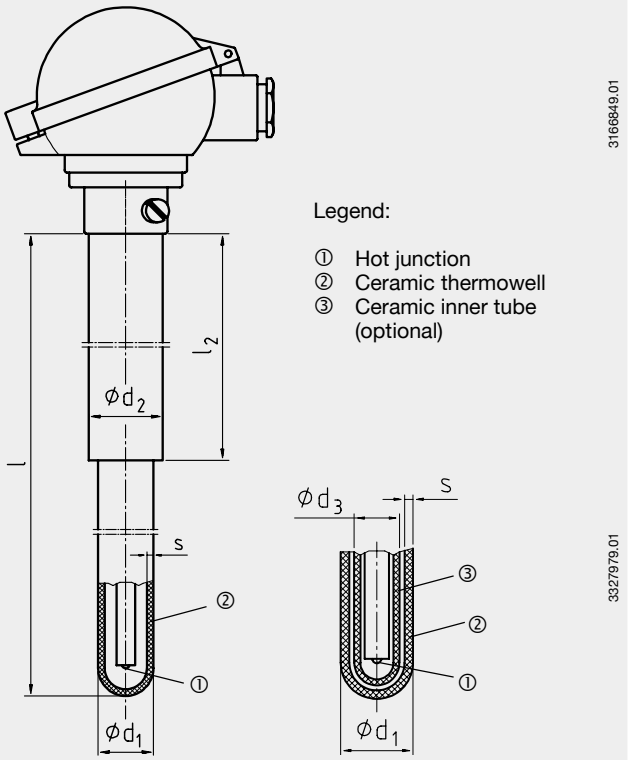
Inner tube (optional, only with Model TC 512)

If the outer thermowell selected for model TC 512 is of the non-gastight ceramics C 530, it has to be combined with a gastight inner tube to protect the thermocouple from aggressive gases.
As a result changes of the thermoelectric properties of the thermocouple are avoided, and in addition the service life of the thermometer is generally prolonged.

Materials for inner tube

- Ceramic C 610 gastight
  usable up to 1500 °C, not resistant to alkali vapours
- Ceramic C 799 gastight, high-purity
  usable up to 1700 °C, however only partially resistant to changes in temperature, not resistant to alkali vapours

Thermowell design



Dimensions in mm for thermowell and inner tube

Model	Ceramic thermowell outer Ø Ød1	tube thickness s	Ceramic inner tube outer Ø Ød3
TC512	22	2	15
TC513	22	2	15
TC515	15	2	10

Support tube

Material: carbon steel
other materials on request

Dimensions in mm for support tube

Model	Outer Ø Ød2	Length l2
TC512	32	200
TC513	22	150
TC515	15	150

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Model TC511 (AM/AMK)
Model TC514 (BM/BMK)

Enamelled thermowell
For enamelled thermowells a threaded bushing is to be used to prevent the enamel layer from being damaged.

Not gastight
A stop flange is sufficient, a mating flange is not necessary. The stop flange slides on the thermowell and is assembled by means of a clamp. Therefore, the insertion length of the thermometer is variable and can be easily adjusted at the mounting location.

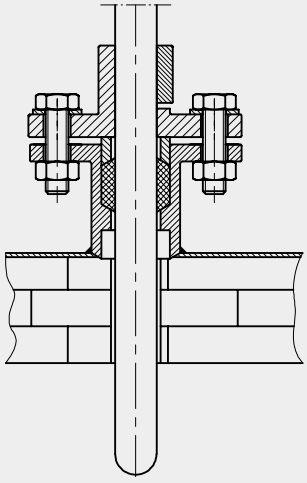
Gastight up to 1 bar
A threaded bushing or a combination stop flange / mating flange is needed.
Threaded bushing: This is assembled on the metal thermowell by means of a clamp. After loosening the clamp the threaded bushing slides on the thermowell. Therefore, the insertion length of the thermometer is variable and can be easily adjusted at the mounting location.
Stop flange / mating flange: Sealing is done by a stuffing-box packing between mating flange and thermowell. Assembly is done by means of clamping between stop flange and thermowell.
The insertion length of the thermometer is variable.

Model TC512 (AK/AKK)
Model TC513 (AK)
Model TC515 (BK)

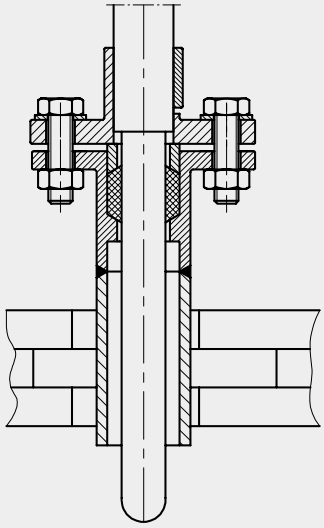
Not gastight
A stop flange is sufficient, a mating flange is not necessary. The stop flange slides on the support tube and is assembled by means of a clamp. Therefore, the insertion length is variable within the limits of the length of the support tube and can be easily adjusted at the mounting location.

Gastight up to 1 bar
A threaded bushing or a combination stop flange / mating flange is needed.
Threaded bushing: This is assembled on the support tube by means of a clamp. After loosening the clamp the threaded bushing slides on the thermowell. Therefore, the insertion length of the thermometer is variable within the limits of the length of the support tube and can be easily adjusted at the mounting location.
Stop flange / mating flange: Sealing is done by a stuffing-box packing between mating flange and ceramic thermowell. Assembly is done by means of clamping between stop flange and metallic support tube.
Therefore, the insertion length is variable a few mm only.

Mounting example: thermocouple with metal thermowell



Mounting example: thermocouple with ceramic thermowell



Installation notes for ceramic thermowells

The ceramic material C799 is only partially resistant to changes in temperature. A temperature shock can therefore easily result in stress cracks and consequently in a damage to the ceramic thermowell. For this reason thermometers with thermowells of ceramics C799 have to be pre-heated before installation, and subsequently they are to be slowly immersed into the process.
Depending on the ambient and process temperatures this procedure is also recommendable for the other ceramic materials.

Besides the protection from thermal stress the ceramic thermowells also have to be protected from mechanical stress. Such negative stress conditions are caused by bending forces acting in a horizontal installation position. Therefore, a vertical installation of the thermometer is to be preferred. Where this is not possible, the thermowell should be supported.

The note regarding the problems caused by bending forces also applies to metal thermowells.

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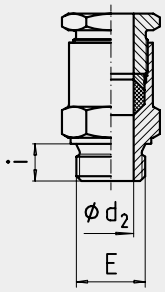
Process connection

Threaded bushing
adjustable, gastight up to 1 bar
Seal: asbestos free, up to max. 300 °C, for higher temperatures on request



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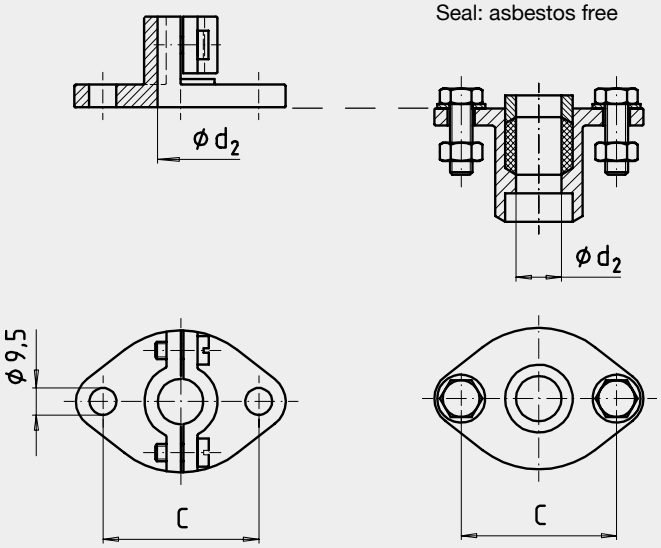
Material:
carbon steel or
stainless steel 1.4571

Stop flange DIN 43 734,
adjustable

Stop flange with mating flange
adjustable, gastight up to 1 bar
Seal: asbestos free



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Material:
carbon steel or malleable cast iron,
other on request

Selectable threaded bushings

Model	Thermowell outer Ø	Dimensions 1) Ød2	i min.	Process connection E
TC511	22	22.5	20	G 1, 1 NPT
TC514	15	15.5	20	G ½, G ¾, G 1

other threads on request

1) Dimensions in mm

Selectable threaded bushings

Model	Thermowell outer Ø	Dimensions 1) Ød2	i min.	Process connection E
TC512	32	32.5	30	G 1¼
TC513	22	22.5	20	G 1, 1 NPT
TC515	15	15.5	20	G ½, G ¾, G 1

other threads on request

1) Dimensions in mm

Selectable stop flanges

Model	Thermowell outer Ø	Dimensions in mm Ød2	C (hole spacing)
TC511	22	22.5	70
TC514	15	15.5	55

Selectable stop flanges

Model	Thermowell outer Ø	Dimensions in mm Ød2	C (hole spacing)
TC512	32	32.5	70
TC513	22	22.5	70
TC515	15	15.5	55

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Remarks on the selection and operation of metal thermowells

Resistance when in contact with gases

Material No.	AISI No.	Usable in air up to °C	Resistance against Sulfurous gases oxidising	reducing	Nitrogenous, low-oxygen gases	Carburisation
1.0305		550	low	low	medium	low
1.4571	**316Ti**	800	low	low	medium	medium
1.4762		1200	very high	high	low	medium
1.4749	**446**	1150	very high	high	low	medium
1.4841	**310 / 314**	1150	very low	very low	high	low

Operation in gases

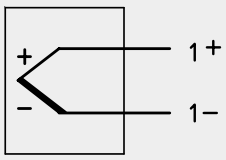
Material No.	Application
1.0305 (St35.8)	Temperature furnaces for heat treatment processes, galvanisation and tinning plants, carbon-dust-air mixture pipelines in steam power stations
1.0305 enamelled (St35.8 enamelled)	Flue-gas desulphurisation plants, bearing metal, lead and tin melts
1.4762 **X 10 CrAlSi 24**	Combustion exhausts, cement and ceramic furnaces, heat treatment processes, annealing furnaces
1.4749 **X 18 CrNi 28**	Flue ducts, cooling furnaces
Kanthal Super (Molybdändisilizid)	Glass and ceramics industry, carbon pressure-gasification, refuse incinerators
1.4841 **X 15 CrNiSi 25.20**	Combustion chambers, industrial furnaces, petrochemical industry, regenerating air heaters , cyanide baths

Operation in melting plants

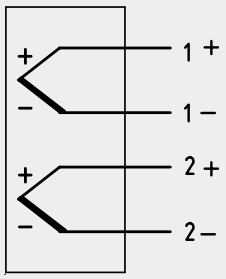
Material No.	Application	
1.4841	Aluminium	up to 700 °C
1.1003	Magnesium (magnesium-containing aluminium)	
1.0305	Babbitt metal	up to 600 °C
1.0305	Lead	up to 700 °C
1.4841	Lead	up to 700 °C
2.4867	Lead	up to 700 °C
1.0305	Zinc	up to 480 °C
1.4749	Zinc	up to 480 °C
1.4762	Zinc	up to 480 °C
1.1003	Zinc	up to 600 °C
1.0305	Tin	up to 650 °C
1.4762	Copper	up to 1250 °C
1.4841	Copper-zinc alloy	up to 900 °C

Electrical connection

Simplex thermocouple

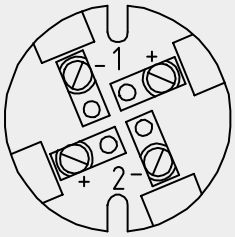


Duplex thermocouple



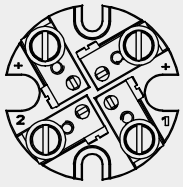
3171966.01

TC511, TC512 and TC513 non-precious metal thermocouple



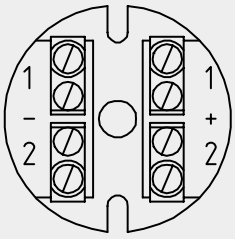
3168451.01

TC 514 and TC515 non-precious metal thermocouple



3188397.01

precious metal thermocouple



3168442.01

precious metal thermocouple

3274071.01

The number of connection terminals depends on the number of thermocouples mounted.

Colour code at the terminal block

Sensor Type	DIN EN 60 584 Positive terminal	Negative terminal	ISA (ANSI) MC96.1-1982 Positive terminal	Negative terminal
K	green	white	yellow	red
N	pink	white	orange	red
J	black	white	white	red
S	orange	white	black	red
R	orange	white	black	red
B	grey	white	grey	red

OBSOLETE

Ordering information for straight thermocouple Model TC511 (AM/AMK)

Field No.		Code	Features	
			Type and number of sensors	
		A	1 x type K (NiCr-Ni)	
		B	2 x type K (NiCr-Ni)	
		C	1 x type J (Fe-CuNi)	
		D	2 x type J (Fe-CuNi)	
1		?	other	*please state as additional text*
			Sensor limiting error	
		2	class 2 per DIN EN 60 584	
		1	class 1 per DIN EN 60 584	
2		?	other	*please state as additional text*
			Measuring point	
		1	insulated	
3		2	not insulated	
			Process connection	
		ZZ	without	
		P3	threaded bushing G 1, carbon steel	*adjustable*
		P5	threaded bushing 1 NPT, carbon steel	*adjustable*
		A1	stop flange DIN 43734, malleable cast iron	*adjustable*
		A5	stop flange with mating flange DIN 43734, malleable cast iron	*adjustable*
4		??	other	*please state as additional text*
			Thermowell outer diameter	
		9	22 mm	*metal*
5		?	other	*please state as additional text*
			Thermowell material	
		B	carbon steel 1.0305	
		C	carbon steel 1.0305, enamelled	
		5	steel 1.4762	
		3	steel 1.4841	
6		?	other	*please state as additional text*
			Inner tube	
		Z	without	
		L	ceramic C 610	
7		?	other	*please state as additional text*
			Nominal length	
		0500	500 mm	
		0710	710 mm	
		1000	1000 mm	
		1400	1400 mm	
8			length in mm, e.g. 0850 for 850 mm	
			Connection head	
		D	AS (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		E	ASZ (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		F	ASZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
9		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
10		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
11		TB	mounted in the cap of the connection head	

		Additional order info			
		YES	NO		
12		T	Z	quality certificates	*see price list*
13		T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2	3		4		5	6	7		8		9	10	11		12	13
TC511 - Z -				**-**		**-**										**ZZ -**		

Additional text: _____

OBSOLETE

Ordering information for straight thermocouple Model TC512 (AK/AKK)

Field No.		Code	Features	
			Type and number of sensors	
		G	1 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		H	2 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		K	1 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
		L	2 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
1		?	other	*please state as additional text*
			Sensor limiting error	
		2	class 2 per DIN EN 60 584	
		1	class 1 per DIN EN 60 584	
2		?	other	*please state as additional text*
			Process connection	
		ZZ	without	
		P4	threaded bushing G 1 1/4, carbon steel	*adjustable*
		A1	stop flange DIN 43734, malleable cast iron	*adjustable*
		A5	stop flange with mating flange DIN 43734, malleable cast iron	*adjustable*
3		??	other	*please state as additional text*
			Support tube	
		3	carbon steel, diameter 32 mm, length 200 mm	
4		?	other	*please state as additional text*
			Thermowell outer diameter	
		A	24 mm	*ceramic*
5		?	other	*please state as additional text*
			Thermowell material	
		K	ceramic C 530	
		L	ceramic C 610	
		M	ceramic C 799	
6		?	other	*please state as additional text*
			Inner tube	
		Z	without	
		L	ceramic C 610	
		M	ceramic C 799	
7		?	other	*please state as additional text*
			Nominal length	
		0500	500 mm	
		0710	710 mm	
		1000	1000 mm	
		1400	1400 mm	
8			length in mm, e.g. 0850 for 850 mm	
			Connection head	
		D	AS (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		E	ASZ (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		F	ASZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
9		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
10		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
11		TB	mounted in the cap of the connection head	

		Additional order info			
		YES	NO		
12		T	Z	quality certificates	*see price list*
13		T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2		3		4	5	6	7		8		9	10	11		12	13
TC512 - Z -			**-**		**-**											**ZZ -**		

Additional text: _____

OBSOLETE

Ordering information for straight thermocouple Model TC513 (AK)

Field No.		Code	Features	
			Type and number of sensors	
		G	1 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		H	2 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		K	1 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
		L	2 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
1		?	other	*please state as additional text*
			Sensor limiting error	
		2	class 2 per DIN EN 60 584	
		1	class 1 per DIN EN 60 584	
2		?	other	*please state as additional text*
			Process connection	
		ZZ	without	
		P3	threaded bushing G 1, carbon steel	*adjustable*
		P5	threaded bushing 1 NPT, carbon steel	*adjustable*
		A1	stop flange DIN 43734, malleable cast iron	*adjustable*
		A5	stop flange with mating flange DIN 43734, malleable cast iron	*adjustable*
3		??	other	*please state as additional text*
			Support tube	
		2	carbon steel, diameter 22 mm, length 150 mm	
4		?	other	*please state as additional text*
			Thermowell outer diameter	
		8	15 mm	*ceramic*
5		?	other	*please state as additional text*
			Thermowell material	
		L	ceramic C 610	
		M	ceramic C 799	
6		?	other	*please state as additional text*
			Nominal length	
		0500	500 mm	
		0710	710 mm	
		1000	1000 mm	
7			length in mm, e.g. 0850 for 850 mm	
			Connection head	
		D	AS (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		E	ASZ (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		F	ASZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
8		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
9		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
10		TB	mounted in the cap of the connection head	

		Additional order info			
		YES	NO		
11		T	Z	quality certificates	*see price list*
12		T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2		3		4	5	6		7		8	9		10		11	12
TC513 - Z -			**-**		**-**											**ZZ -**		

Additional text: _____

OBSOLETE

Ordering information for straight thermocouple Model TC514 (BM/BMK)

Field No.		Code	Features	
			Type and number of sensors	
		A	1 x type K (NiCr-Ni)	
		B	2 x type K (NiCr-Ni)	
		C	1 x type J (Fe-CuNi)	
		D	2 x type J (Fe-CuNi)	
1		?	other	*please state as additional text*
			Sensor limiting error	
		2	class 2 per DIN EN 60 584	
		1	class 1 per DIN EN 60 584	
2		?	other	*please state as additional text*
			Measuring point	
		1	insulated	
3		2	not insulated	
			Process connection	
		ZZ	without	
		P1	threaded bushing G 1/2, carbon steel	*adjustable*
		P2	threaded bushing G 3/4, carbon steel	*adjustable*
		P3	threaded bushing G 1, carbon steel	*adjustable*
		A1	stop flange DIN 43734, malleable cast iron	*adjustable*
		A5	stop flange with mating flange DIN 43734, malleable cast iron	*adjustable*
4		??	other	*please state as additional text*
			Thermowell outer diameter	
		8	15 mm	*metal*
5		?	other	*please state as additional text*
			Thermowell material	
		B	carbon steel 1.0305	
		C	carbon steel 1.0305, enamelled	
		5	steel 1.4762	
		3	steel 1.4841	
6		?	other	*please state as additional text*
			Inner tube	
		Z	without	
		L	ceramic C 610	
7		?	other	*please state as additional text*
			Nominal length	
		0250	250 mm	
		0355	355 mm	
		0500	500 mm	
		0710	710 mm	
		1000	1000 mm	
8			length in mm, e.g. 0850 for 850 mm	
			Connection head	
		1	BS (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		2	BSZ (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		3	BSZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
9		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
10		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
11		TB	mounted in the cap of the connection head	

Additional order info				
	YES	NO		
12	T	Z	quality certificates	*see price list*
13	T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2	3		4		5	6	7		8		9	10	11		12	13
TC514 - Z -				**-**		**-**										**ZZ -**		

Additional text: _____

OBSOLETE

Ordering information for straight thermocouple Model TC515 (BK)

Field No.		Code	Features	
			Type and number of sensors	
		G	1 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		H	2 x type S (Pt10%Rh-Pt), wire diameter 0.35 mm	
		K	1 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
		L	2 x type S (Pt10%Rh-Pt), wire diameter 0.5 mm	
1		?	other	*please state as additional text*
			Sensor limiting error	
		2	class 2 per DIN EN 60 584	
		1	class 1 per DIN EN 60 584	
2		?	other	*please state as additional text*
			Process connection	
		ZZ	without	
		P1	threaded bushing G 1/2, carbon steel	*adjustable*
		P2	threaded bushing G 3/4, carbon steel	*adjustable*
		P3	threaded bushing G 1, carbon steel	*adjustable*
		A1	stop flange DIN 43734, malleable cast iron	*adjustable*
		A5	stop flange with mating flange DIN 43734, malleable cast iron	*adjustable*
3		??	other	*please state as additional text*
			Support tube	
		1	carbon steel, diameter 15 mm, length 80 mm	
4		?	other	*please state as additional text*
			Thermowell outer diameter	
		5	10 mm	*ceramic*
5		?	other	*please state as additional text*
			Thermowell material	
		L	ceramic C 610	
		M	ceramic C 799	
6		?	other	*please state as additional text*
			Nominal length	
		0250	250 mm	
		0355	355 mm	
		0500	500 mm	
		0710	710 mm	
7			length in mm, e.g. 0850 for 850 mm	
			Connection head	
		1	BS (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		2	BSZ (aluminium)	*mounting of a transmitter not possible (thermal reasons)*
		3	BSZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
8		?	other	*please state as additional text*
			Cable entry to connection head	
		4	M20 x 1.5	
9		?	other	*please state as additional text*
			Transmitter	
		ZZ	without	
10		TB	mounted in the cap of the connection head	

		Additional order info			
		YES	NO		
11		T	Z	quality certificates	*see price list*
12		T	Z	additional text	*Please state as clearly understandable text!*

Order code:

	1	2		3		4	5	6		7		8	9	10		11	12
TC515 - Z -			-		-										ZZ -		

Additional text: _____

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

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