

The selection is detailed on page 9



DS08

Industrial Thermocouple Thermometer

Working principle

Thermocouple is the use of thermoelectric effect for temperature measurement, thermoelectric effect refers to two different components of the conductor at both ends of the synthetic circuit, when the temperature of the two joint points is not the same, it will produce electromotive force in the circuit phenomenon, the generated electromotive force is called thermoelectric potential. The end that is directly used to measure the temperature of the medium is called the working end or the measuring end, and the end that is not directly used to measure the temperature of the medium is called the cold end or the compensation end. The cold end is connected with the display instrument or other supporting instruments, and the thermoelectric potential generated by the thermocouple will be displayed on the instrument.

Product description

Thermocouple sensors can be connected directly to the process through threads or flanges and are mainly used in container and pipe connections.

The replacement of the measuring rod can be achieved without removing the entire thermometer from the process medium.

This makes it possible to detect and replace equipment during operation and operation, or during maintenance. The choice of standard length measuring rod delivery time is short, more conducive to customers for parts purchase and inventory.

Insertion depth, process connection, sheath design, connection head, type and number of sensors, accuracy, connection form, etc. can be selected according to the respective application. In addition, an analog or digital temperature transmitter can be installed inside the junction box.

Product application

Machinery, equipment and container manufacturing

Energy technology and power plants

Chemical, food and beverage industries

Sanitation, heating and air conditioning systems

Functional characteristics

Application range: -196... + 1260 °C

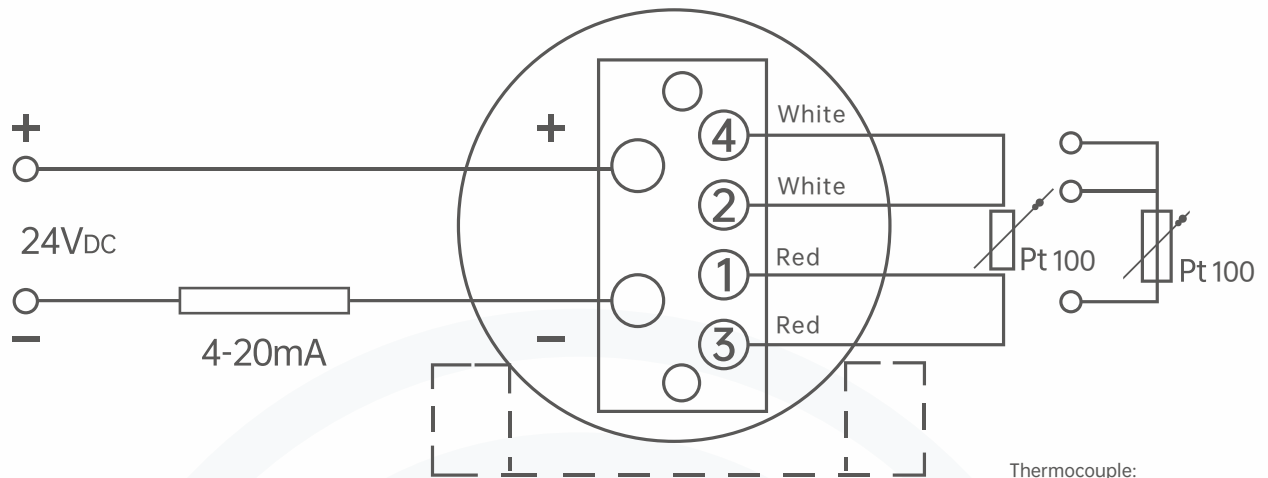
Includes prefabricated jacket

Measuring rod with spring (replaceable)

Explosion proof type



Working principle Analytic table



Thermocouple:
three or four wire system

Sensor

The thermocouple complies with IEC 60584-1 Standard or ASTM E230 standard

Types K, J, E, N and T (single or double measuring elements)

The table shows the temperature ranges listed in each standard, including the effective tolerance values (accuracy classes).

The actual operating temperature range of the thermometer is limited by the maximum allowable operating temperature range, the diameter of the thermocouple, the maximum allowable operating temperature range of the MI cable and the thermocouple material.

The models listed can be used as single/double thermocouples. Unless specifically specified, the thermocouple will be delivered with an insulation measuring point.

Sensor type

Type	Effective range of accuracy level			
	IEC 60584-1		ASTM E230	
	Level 2	Level 1	Standard configuration	Special
K	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	0 ... 1,260 °C
J	-40 ... +750 °C	-40 ... +750 °C	0 ... 760 °C	0 ... 760 °C
E	-40 ... +900 °C	-40 ... +800 °C	0 ... 870 °C	0 ... 870 °C
N	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	0 ... 1,260 °C
T	-40 ... +350 °C		0 ... 370 °C	0 ... 370 °C

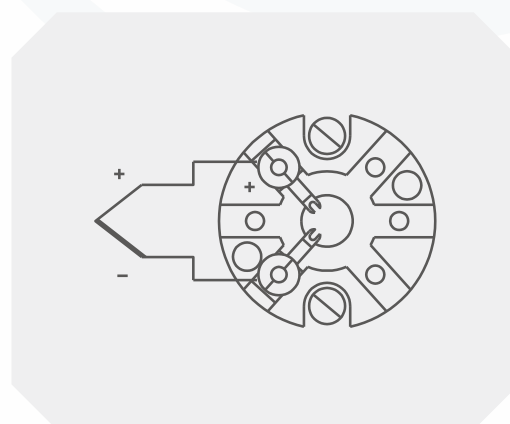
Measuring point

- Ungrounded (standard)
- Ground connection

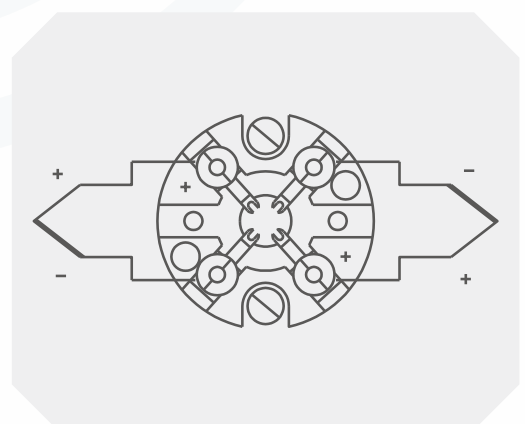
Allowance

The tolerance of the thermocouple is based on the 0 °C cold end compensation temperature.

A single thermocouple



Two thermocouples



Electrical connection

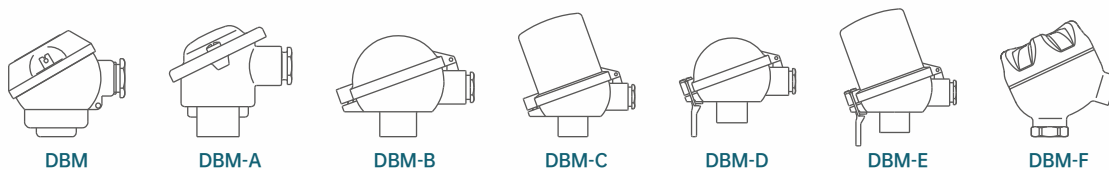
The color coding on the positive terminal of the meter determines the relationship between the polarity and the terminal

For electrical connections for built-in temperature transmitters, see the corresponding data or instructions.



Connector

Connector material and specification



Material	Cable inlet thread specification	Protection level (maximum) ¹⁾	Protective cap	Surface	The connection to the neck tube
Aluminum	M16×1.5 ³⁾	IP65	Cover (with 2 screws)	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	M20×1.5 or 1/2NPT ³⁾	IP65, IP68	Flat cover (with 2 screws)	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	M20×1.5 or 1/2NPT ³⁾	IP65, IP68	Spherical hinge cover with cylinder head screws	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	M20×1.5 or 1/2NPT ³⁾	IP65, IP68	Raised hinge cover with cylinder head screws	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	2×M20×1.5 or 2×1/2NPT ³⁾	IP65, IP68	Raised hinge cover with cylinder head screws	Blue finish	M24 x 1.5
Aluminium ²⁾	M20×1.5 or 1/2NPT ³⁾	IP65	Raised hinge cover with cylinder head screws	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	M20×1.5 or 1/2NPT ³⁾	IP65	Spherical hinged cover with tightening handle	Blue finish	M24 x 1.5, 1/2 NPT
Aluminum	M20×1.5 or 1/2NPT ³⁾	IP65	Raised hinged cover with tightening handle	Blue finish	M24 x 1.5, 1/2 NPT
Stainless steel	M20×1.5 ³⁾	IP65	Precision cast tight cap	Uncoated, electropolished	M24 x 1.5
Plastic	M20×1.5 or 1/2NPT ³⁾	IP65	Spherical hinge cover with cylinder head screws	black	M24 x 1.5
Plastic	M20×1.5 or 1/2NPT ³⁾	IP65	Raised hinge cover with cylinder head screws	black	M24 x 1.5

Connector explosion-proof protection type

There is no	Ex i Explosive gas environment Zones 0, 1 and 2	Ex i Explosive dust environment Zones 20, 21 and 22	Ex nA Explosive gas environment Zone 2	Ex tc Explosive dust environment Zone 22
X	X	X	-	-
X	X	-	-	-
X	X	X	X	X
X	X	X	X	X
X	X	X	X	X
X	X	-	-	-
X	X	-	-	-
X	X	-	-	-
X	X	-	-	-
X	X	-	-	-
X	X	-	-	-

1) Protection grade refers to the connection head;
 2) LED display;
 3) Standard (other can be provided according to customer requirements)

Cable inlet

Junction box product illustration



Standard

Plastic

Plastic (Ex)

Nickel-plated brass

Cable inlet thread specification and temperature

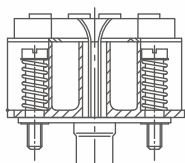
Cable inlet	Cable inlet thread specification
Standard cable inlet	M20×1.5 or 1/2NPT
Plastic Gran head (Cable Ø6... 10 mm)	M20×1.5 or 1/2NPT
Nickel plated brass Gran head (Cable Ø6... 12 mm)	M20×1.5 or 1/2NPT

Type of explosion-proof protection for cable inlet

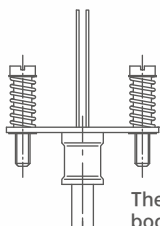
Cable inlet	colour	Class of protection 'highest'	Minimum/maximum ambient temperature	Explosion protection				
				There is no	Ex i explosive Gas environment 0, 1 Zone 2 and	Ex i explosive Dust environment 20 Districts 21 and 22	Ex nA Explosive gas environment Zone 2	Ex tc Explosive dust environment Zone 22
Standard cable inlet	uncoated	IP65	-40...+80°C	x	x	-	-	-
Plastic head	Black or grey	IP65, IP68	-40...+80°C	x	-	-	-	-
Plastic granulated head, Ex e	Baby blue	IP65, IP68	-20...+80°C (standard)	x	x	x	-	-
			- 40... +70°C (optional)					
Plastic granulated head, Ex e	black	IP65, IP68	- 20... +80°C (standard)	x	-	-	x	x
			- 40... +70°C (optional)					
Nickel plated brass gran head	uncoated	IP65, IP68	-60 ¹⁾ /-40...+80°C	x	-	-	-	-
Nickel plated brass Gran head, Ex e	uncoated	IP65, IP68	-60 ¹⁾ /-40...+80°C	x	x	x	x	x

1) Special models are available on request (only specified certifications are available), other temperatures are available on request

Transmitter



Install the transmitter terminal board



The terminal board of the transmitter will be installed

Mount to measuring rod

When the transmitter is installed on the measuring rod, the transmitter replaces the terminal and is directly fixed on the terminal board of the measuring rod.



Install it in the protective cap of the connection head

Compared with installing the transmitter on the measuring rod, it is recommended to install it in the protective cap of the connection head to ensure better thermal insulation and simplify the replacement and installation operations required for maintenance.



Transmitter model number

Output signal 4... 20 mA HART® protocol
FOUNDATION™ Fieldbus and PROFIBUS® PA standard cable entry

Transmitter	S10 type	S20 type	S30 type
Exportation			
4 ... 20 mA	x	x	-
HART Agreement	-	x	-
Connection mode			
1x2 wire, 3 wire or 4 wire system			x
Measuring current	<0.2mA	<0.3mA	<0.2mA
Explosion protection	Selectable	Selectable	Selectable

Potential transmitter installation location

Connector	S10 type	S10 type	S10 type
DBM	○	-	○
DBM-A	○	○	○
DBM-B	●	●	●
DBM-C	○	○	○
DBM-D	●	●	●
DBM-E	○	○	○

For all connectors listed here, the transmitter can be mounted on the measuring rod;

2 transmitters can be installed as required;

In order to determine the total measurement error correctly, the measurement error of sensor and transmitter must be increased.

● Install the wiring terminal instead ○ Install the connector in the protective cap — Cannot install

**Process connection
No process connection**

The DS08 armoured thermocouple can optionally be installed with the following process connections. Insert length A (U1 or U2) can be customized. The neck length N (MH) depends on the type of process connection selected.

In order to minimize the heat loss error of the threaded connection, the insertion length A should be ≥25mm. The position of the threaded connection is indicated by the size N (MH) and is not affected by the connection type.

Please note:

- For cylindrical threads (e.g. G1/2), size refers to the threaded joint seal closest to the process.
- For taper threads (such as NPT), the measuring plane is located near the center of the thread.

Gran Head (optional)-Ex n type is mandatory

No process connection

This type is mainly used for mounting into movable bushing and is compatible with all measuring heads from B to KN sizes.

In this case, the neck length N (MH) refers only to the height of the hexagonal portion of the sheathed head. N (MH) is always 10 mm.

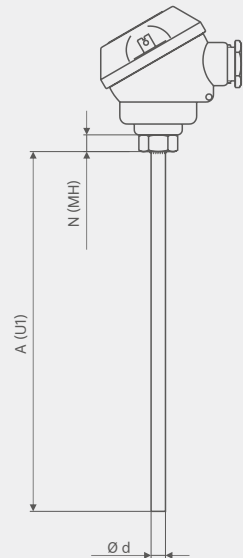
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INSTRUMENT**

Process connection No process connection (micro)

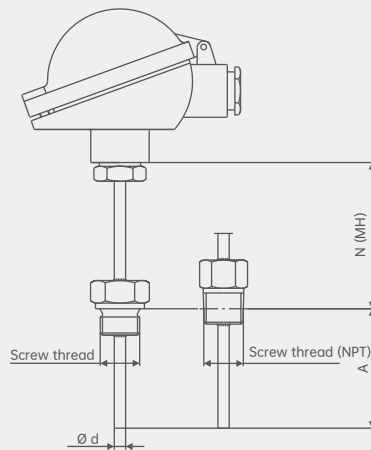
No process connection

This type is mainly designed to be mounted using a movable sleeve and is only compatible with measuring heads of the JS design.

In this case, the neck length N(MH) refers only to the height of the hexagonal portion of the sheathed head. N(MH) is always 7 mm.



Process connection Extension fixed thread



Extension fixed thread

This type is mainly used for mounting thermometers into threaded joints via internal threads.

Insert length A: refer to the specifications
Material: stainless steel (other available on request)

The sensor must be turned to screw it into the process connection. Therefore, this design must first complete the mechanical installation and then the electrical connection.

Process connection Movable sleeve

Movable sleeve

This type can be easily adjusted to the desired insertion length at the mounting position.

Since the movable sleeve can be moved on the probe, the A and N(MH) dimensions refer to the values under the most primitive conditions. The length of the movable sleeve determines the minimum neck length N(MH) to be about 40 mm.

Material: Stainless steel

Seal ring material: stainless steel or PTFE

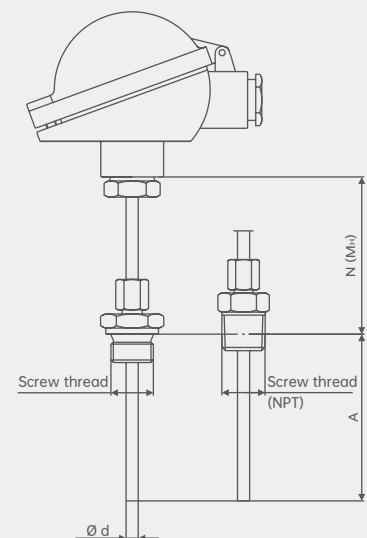
Stainless steel sealing ring can only be adjusted once; Once unscrewed, it can no longer slide along the casing.

- The maximum temperature at the process connection is 500 °C
- The maximum pressure load is 4 MPa

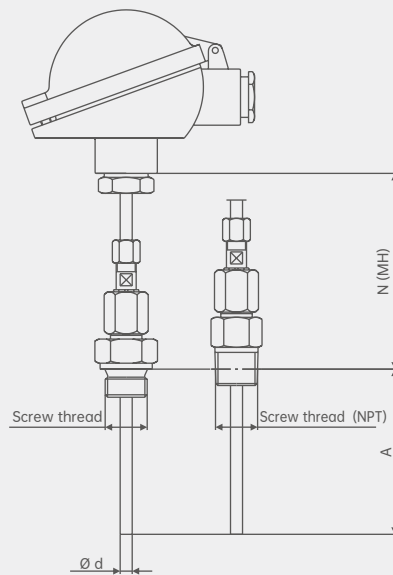
The PTFE seal ring can be adjusted multiple times and can slide repeatedly on the casing after being unscrewed.

- The maximum temperature at the process connection is 150 °C
- Maximum pressure load is 2.5MPa

For thermocouple thermometers with a diameter of Ø2 mm (with casing), only PTFE sleeve rings can be used.



Process connection Spring loaded movable sleeve



Spring loaded movable sleeve

This type can be easily adjusted to the desired mounting length at the mounting point, while maintaining a certain spring preload. Since the movable sleeve can be moved on the probe, the A and N (MH) dimensions refer to the original values at the time of delivery. The length of the movable sleeve determines the minimum neck length N (MH) to be about 80 mm.

Material: Stainless steel

Sealing ring material: stainless steel

Stainless steel sealing ring can only be adjusted once; Once unscrewed, it can no longer slide along the casing.

- The maximum temperature at the process connection is 500 °C
- No applicable pressure load values are provided

Process connection Spring driven active sleeve, maximum working pressure up to 0.8MPa

Spring driven active sleeve, maximum working pressure up to 0.8MPa

This type can be easily adjusted to the desired insertion length at the mounting point, while still maintaining a certain spring preload (mainly used in hydraulic oil applications).

Since the movable sleeve can be moved on the sensor, the A and N (MH) dimensions refer to the original values at the time of delivery. The length of the movable sleeve determines the minimum neck length N (MH) to be about 80 mm

Material: Stainless steel

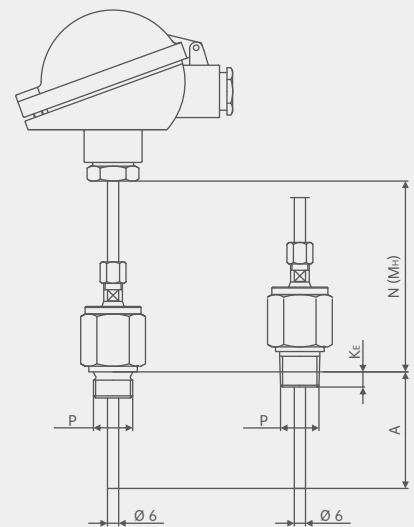
Ring material: stainless steel

Stainless steel collar can only be adjusted once; Once unscrewed, it can no longer slide along the casing.

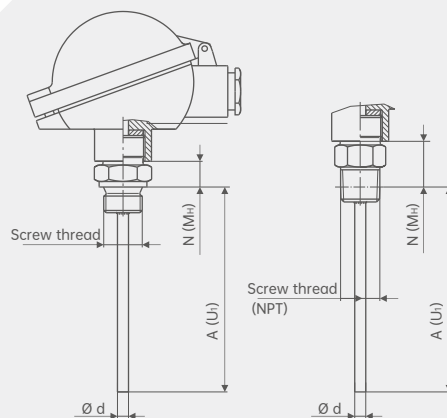
- Permissible temperature at process joints -30... +100 °C

The allowable pressure load on the spring driven movable sleeve can reach 0.8MPa.

For thermocouple thermometers with a diameter of Ø2 mm (with casing), only PTFE sleeve rings can be used.



Process connection Hexagonal bushing with double thread



Hexagonal bushing with double thread

Use a double-sided threaded casing to screw the thermometer directly into the process connection. The specified permissible temperature requirements must be observed.

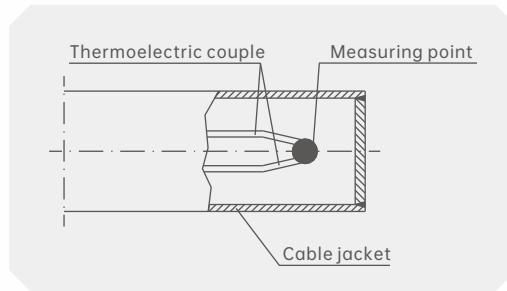
The neck length N (MH) of the cylindrical thread depends on the height of the hexagonal part. Here it is 13 mm.

The neck length N (MH) of the NPT thread includes not only the height of the hexagonal part, but also half the height of the thread. As a result, the neck length N (MH) is about 25 mm.

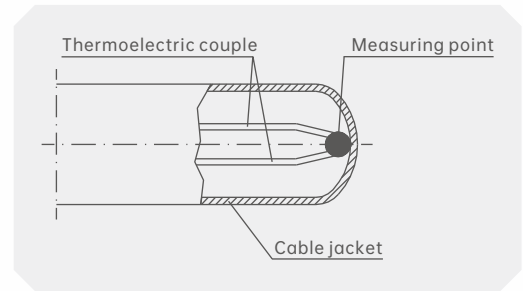


Process connection Probe tip design

The measuring point is not grounded



The measuring point is grounded



Sheath material

- Nickel alloy: Alloy 600
 - Maximum temperature up to 1,200 °C (air)
 - Standard material for applications that require special corrosion resistance at high temperatures, as well as stress corrosion cracking and erosion resistance in chloride media
 - Corrosion resistance to ammonia at any temperature and concentration
 - High tolerance to halogens, chlorine and hydrogen chloride
 - Stainless steel
 - Maximum temperature up to 850 °C (air)
 - Good corrosion resistance to corrosive media and steam and exhaust gas in chemical media
- Other materials can be provided on request

Please note:

The flexibility of armoured thermocouples must be taken into account, especially in applications with relatively large flow rates. If the process connector is not directly attached to the cable transition joint, it must be considered a critical factor in applications where vibration or oscillating stress may occur.

Sheath diameter

- 3.0 mm
 - 4.5 mm
 - 6.0 mm
 - 8.0 mm
- Other sizes are available on request

Sheath diameter

Ambient temperature and storage temperature

- 40 ... +80 °C
- Other ambient and storage temperatures are provided upon request

DS08-Selection composition

Selection example Threaded type **DS08** **B** **S** **G** **K** **V** **X** **A** **D** **E** **0-400** **D** **Z** **M**

1 2 3 4 5 6 7 8 9 10 11 12 13

1.Selection description	A	All-in-one transmitter
	B	Threaded casing
	C	Intrinsically safe explosion-proof type
	D	Flameproof type
	T()	Other types
2.Threaded connection	S	Sliding thread
	F	Fixed thread
3.Insert probe design	G	Fixed installation
	H	Spring-fixed terminal block (replaceable ferrule)
4.Junction box	J	Aluminum
	K	Stainless steel
	L	Digital temperature display
	T()	Other types of junction boxes
5.Electrical interface	U	1/2NPT
	V	M20×1.5
6.Wiring block/sensor	W	Crastin Terminal block
	X	Ceramic connection block
	Y	S10 (4-20mA transmitter)
	Z	S20 (HART transmitter)
	S	S30 (Fieldbus transmitter)
7.Wire system	A	Single 3-wire system
	B	Double branch 6-wire system
	T()	Other wire system
8.Dimension of thread connection	C	1/2NPT
	D	G1/2
	E	M20×1.5
9.Thermocouple element	K	K (NiCr-Ni)
	E	E (NiCr-CuNi)
	N	N (NiCrSi-NiSi)
	F	J (Fe-CuNi)
	T	J (T-CuNi)
	T()	Other measuring elements
10.Temperature range(°C)	S	-200...+1260
	T()	Other measured temperatures
11.Rod diameter (mm)	A	3mm
	B	4mm
	C	5mm
	D	6mm
	E	8mm
	F	10mm

DS08-Selection composition

Selection example Threaded type **DS08** 1 B 2 S 3 G 4 K 5 V 6 X 7 A 8 D 9 E 10 0-400 11 D 12 Z 13 M

12.Rod length (mm)	Z	50
	Y	100
	W	150
	X	200
	V	250
	U	300
	T	350
	S	400
	Q	450
	R	500
T()	Other lengths	
13.Probe rod material	M	304SS
	L	316L
	T()	Other materials
14.Safety certification	A	Intrinsic safety
	B	Flameproof
	N	There is no
15.Additional order information	X	Additional information
	N	There is no

Instructions:

Indicates that DS08 industrial thermocouple is a thermometer with threaded sleeve, threaded connection mode is sliding thread, probe rod design is fixed installation, connection box material is stainless steel, electrical interface M20*1.5, sensor is ceramic connection block, single three-wire system, thread specification G1/2, thermocouple element is E (NiCr-CuNi), Temperature range 0... 400°C, probe diameter 6mm, insert depth length 50mm, probe material 304SS, item 14/15 in the table is not required.

DS08-Selection composition

Selection example Flange connection type **DS08** **B** **S** **G** **K** **V** **X** **A** **C** **E** **A** **Z** **D** **0-400**

1 2 3 4 5 6 7 8 9 10 11 12 13

1.Selection description	A	All-in-one transmitter
	B	Flange casing
	C	Intrinsically safe explosion-proof type EEx-i
	D	Flameproof Ex-d
	T()	Other types
2.Flange connection	S	20592 Standard flange
	F	ANSI Standard flange
3.Insert probe design	G	Fixed installation
	H	Spring-fixed terminal block (replaceable ferrule)
4.Junction box	J	Aluminum
	K	Stainless steel
	L	With digital temperature display
	T()	Other types of junction boxes
5.Electrical interface	U	1/2NPT
	V	M20×1.5
6.Wiring block/sensor	W	Crastin Terminal block
	X	Ceramic connection block
	Y	S10 (4-20mA transmitter)
	Z	S20 (HART transmitter)
	S	S30 (Fieldbus transmitter)
7.Wire system	A	Single 3-wire system
	B	Double branch 6-wire system
	T()	Other wire system
8.Flange connection size	C	DN25
	D	DN50
	E	DN80
	F	DN100
	G	ANSI 1"
	H	ANSI 2"
	I	ANSI 3"
	J	ANSI 4"
	T()	Other flange types
	9.Thermocouple element	K
E		E (NiCr-CuNi)
N		N (NiCrSi-NiSi)
F		J (Fe-CuNi)
T		J (T-CuNi)
T()		Other measuring elements
10.Probe rod material	A	304SS
	B	316/316L (1.4401/1.4435)
	C	Other materials

DS08-Selection composition

Selection example
Flange connection type **DS08** / B / S / G / K / V / X / A / C / E / A / Z / D / 0-400

1 2 3 4 5 6 7 8 9 10 11 12 13

11.Rod length (mm)	Z	50
	Y	100
	W	150
	X	200
	V	250
	U	300
	T	350
	S	400
	Q	450
	R	500
	T()	Other lengths
12.Rod diameter	A	3mm
	B	4mm
	C	5mm
	D	6mm
	E	8mm
	F	10mm
13.Temperature range(°C)	T	-200...+1260
	T()	Other measured temperatures
14.Safety certification	E	Intrinsic safety
	F	Flameproof
	N	There is no
15.Additional order information	A	Additional information
	N	There is no

Instructions:

The DS08 industrial thermocouple is a thermometer with flanged sleeve, the connection mode is 20592 standard flange, the probe rod design is fixed installation, the connection box is stainless steel, the electrical interface is M20*1.5, the sensor is ceramic connection block, the single three-wire system, the flange specification is DN25, the thermocouple element is E (NiCr-CuNi). The probe rod material is 304SS, the length of the probe rod is 50mm, the diameter of the probe rod is 6mm, and the temperature range is 0... 400 °C: Item 14/15 in the table is optional.

Product certification

Compliance and approval; Rodwig thermometers meet key standards and certifications for process measurement technology; This guarantees the highest reliability in such Settings;