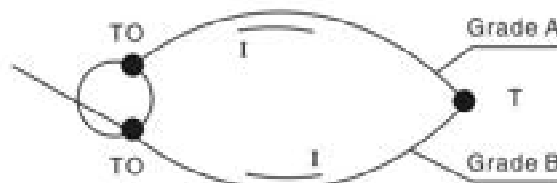


• 1. Principle of Thermocouple

Based upon Seeback Effect, i.e. if two different composition of homogeneous conductor A, B compose closed circuit, when two ends have temperature gradient (TEMPGRAD), an electric current passes through in the circuit and then two ends have Seeback electric potential, whereas this electric potential is called thermoelectrical potential.



• 2. Principle of RTD

RTD action principle: RTD measures temperature by utilizing the characteristics as follows: When the material has the temperature change, the resistance itself varies accordingly. When temperature gradient (TEMPGRAD) exists in the measured medium, it is the average temperature of the medium within the locating range of temperature-sensing element.

RTD element is mainly made of Pt or Cu. Filaments are evenly double-wrapped in insulating ceramic skeleton. It is called ceramic element. It has the advantage of fine high-temperature stability. But because of high manual manufacture cost, it always gets weak resistance value. In modern times, the production process of new RTD element is as follows: Firstly produce Pt paste, adopt sensitized lithographic printing technology, adhere Pt layer to ceramic substrate to form Pt film, within 2um film thickness, plus lead wire, go through laser engraving and trimming resistor, finally put protection glaze. Such production method is called film resistance element. It has the advantages of thin outline dimension, strong shock-resistance. The automation production results in fine resistance value persistency. It has weakness of small operating current (1mA) which is not good for use in old-style moving coil meter. It has weak stability when it is above 500°C of high temperature.

• 3. The characteristics of Mineral Insulated thermocouple and RTD

Put core wire and inorganic minerals insulating material in metal sleeve to produce a firm combination which is called MI Cable.

Mineral Insulated thermocouple cable which takes thermocouple wire as core wire goes through welding to form measuring side and assembly the related connect line device etc. to manufacture thermocouple. It is called Mineral Insulated thermocouple. Mineral Insulated thermocouple can be made into ungrounded type, ground type, end exposure type according to the clients' requirements.

MI cable which takes pure nickel as core wire is matched with resistance thermometer element, and then goes through welding to form measuring junction. It assemblies with the related connect line device etc. to manufacture RTD. It is called Mineral Insulated RTD. All Mineral Insulated RTD are of ungrounded type.

Because of the metal Mineral Insulated, Mineral Insulated thermocouple and RTD can directly contact the tested medium so as to measure the temperature. Or they can be put into the protection tube to be temperature measuring inner core elements. Mineral Insulated thermocouple, RTD are most widely applied in the industrial temperature testing equipments because of the steady measuring data, long life, easy exchange etc.

• 4. Thermocouple graduation selection and tolerance

4.1. Using temperature range of thermocouple & RTD, conductor color coding

Thin-film element Pt100	-200℃~100℃
Thin-film element Pt100	-50~400℃
Ceramic element Pt100	-200℃~600℃
T type	-40℃~350℃
J type	0℃~750℃
E type	0℃~800℃
K type	0℃~1000℃
N type	0℃~1100℃
S type	0℃~1600℃
R type	0℃~1600℃
B type	600℃~1700℃

4.2. Thermocouple tolerance (GB/T16839.2-1997 idt IEC584-2:1982 thermocouple tolerance)

Type	Class I tolerance		Class II tolerance		Class III tolerance	
	Temperature range	Tolerance value	Temperature range	Tolerance value	Temperature range	Tolerance value
T	-40℃~+125℃	±0.5℃	-40℃~+133℃	±1℃	-67℃~+40℃	±1℃
	125℃~350℃	±0.004 · t	133℃~350℃	±0.0075 · t	-200℃~ -67℃	±0.015 · t
J	-40℃~+375℃	±1.5℃	-40℃~+333℃	±2.5℃	---	
	375℃~750℃	±0.004 · t	333℃~750℃	±0.0075 · t		
E	-40℃~+375℃	±1.5℃	-40℃~+333℃	±2.5℃	-167℃~+40℃	±2.5℃
	375℃~800℃	±0.004 · t	333℃~900℃	±0.0075 · t	-200℃~ -167℃	±0.015 · t
K or N	-40℃~+375℃	±1.5℃	-40℃~+333℃	±2.5℃	-167℃~+40℃	±2.5℃
	375℃~1000℃	±0.004 · t	333℃~1200℃	±0.0075 · t	-200℃~ -167℃	±0.015 · t
R or S	0℃~1100℃	±1℃	0~600℃	±1.5℃	---	
	1100℃~1600℃	±[1+0.003(t-1100)]/℃	600℃~1600℃	±0.0025 · t		
B	---		---		600℃~800℃	±4℃
			600℃~1700℃	±0.0025 · t	800℃~1700℃	±0.005 · t

4.3. RTD tolerance (JB/T8622-1997 neq IEC751:1983 RTD technical requirement)

RTD	Tolerance classification	Tolerance Δ	a
Pt	A	± (0.15+0.002 t)	0.003851 ± 0.00006
	B	± (0.30+0.005 t)	0.003851 ± 0.00012
Cu	---	± (0.30+0.006 t)	0.004280 ± 0.00020

Note:

- 1) |t| in the table is absolute value, ℃
- 2) At 0℃, when nominal resistance value is 100.00Ω platinum resistance thermometer sensor, class A tolerance is not fit for t-850℃ temperature range. Class A tolerance is not fit for platinum resistance thermometer sensor which adopts two-wire system.
- 3) "Up-to-standard" is the only tolerance classification for copper resistance thermometer sensor.

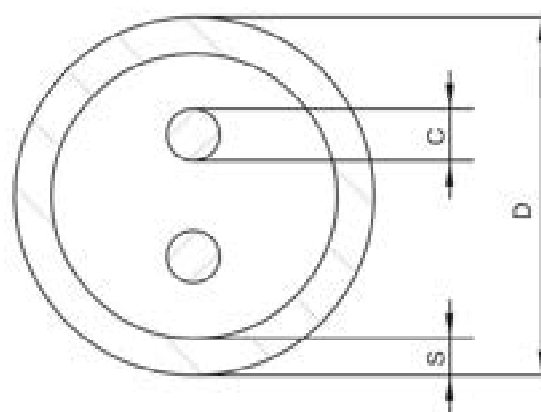
• **5. Mineral Insulated thermocouple standard specifications**
(GB/T18404-2001 idt IEC61515:1995 mineral insulated thermocouple cable or mineral insulated thermocouple)

Mineral Insulated outer diameter D	Sleeve wall thickness S	Thermocouple wire diameter C	Ungrounded MgO purity	Ungrounded resistance
0.5 ± 0.025	≥ 10% · D	≥ 15% · D	> 96% or * > 99.4%	20℃时, >100MQ/75VDC
1.0 ± 0.025				
1.5 ± 0.025				
1.6 ± 0.025				
2.0 ± 0.025				20℃时, >1000MQ/500VDC 500℃时, >5MQ/500VDC *680℃时, >5MQ/500VDC or Thermocouple T Graduation, 300℃时, >500MQ/500VDC
3.0 ± 0.030				
3.2 ± 0.030				
4.0 ± 0.045				
4.8 ± 0.045				
5.0 ± 0.045				
6.0 ± 0.060				
6.4 ± 0.060				
8.0 ± 0.080				

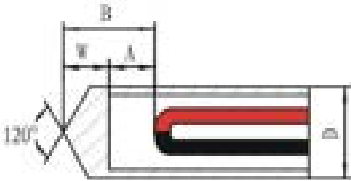
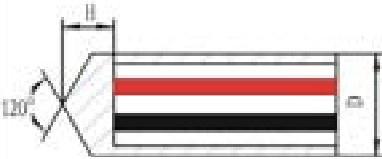
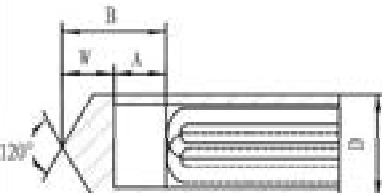
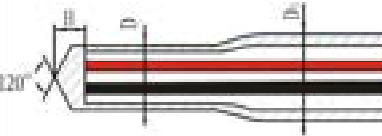
Note:

1) Ungrounded layer of Mineral Insulated thermocouple has limited electricity conductivity. The larger the Mineral Insulated thermocouple length, the lower un-grounded resistance is. Therefore shows electrical conductivity of Mineral Insulated thermocouple. (It equals to $\Omega^{-1} \cdot m^{-1}$). If length of Mineral Insulated thermocouple is larger than 1m, minimum ungrounded resistance is shown by $\Omega \cdot m$ or MQ · m. If it is less than 1m, it is shown by MQ.

2) * * * Optional to special requirements. Please clearly indicate in your order.



• **6. Mineral Insulated thermocouple measuring side form**
 (GB/T18404-2001 idt IEC61515:1995 mineral insulated thermocouple cable
 or mineral insulated thermocouple)

No	Type	Shape	Feature	Measuring junction size	Applicable Mineral Insulated outer diameter	
					Single	Double
1	Un-grounded type		1. If there is no special requirement, we usually choose the type with good anti-disturbance properties. 2. Its heat responsive speed is slower than that of body contact.	$A > 0.05D$ $0.8D > W > 0.1D$ $1.5D > B > 0.15D$	$\Phi 0.5 - \Phi 8.0$	---
2	Grounded type		1. Quick heat responsive speed 2. It is not fit for the occasions that have electro-magnetic disturbance.	$0.8D > H > 0.1D$	$\Phi 0.5 - \Phi 8.0$	$\Phi 3.0 - \Phi 8.0$
3	Un-grounded separate type		1. double have independent testing, they will not interfere with each other. 2. Others are the same as ungrounded type.	$A > 0.05D$ $0.8D > W > 0.1D$ $1.5D > B > 0.15D$	---	$\Phi 3.0 - \Phi 8.0$
4	Change track fleetness type		1. It has quick heat responsive speed, sound mechanical strength and long service life. 2. It can be made into grounded type or ungrounded type according to the clients' requirements.	$0.8D > H > 0.1D$	$\Phi 2.0 - \Phi 8.0$	$\Phi 3.0 - \Phi 8.0$

7. Heat responsive time table

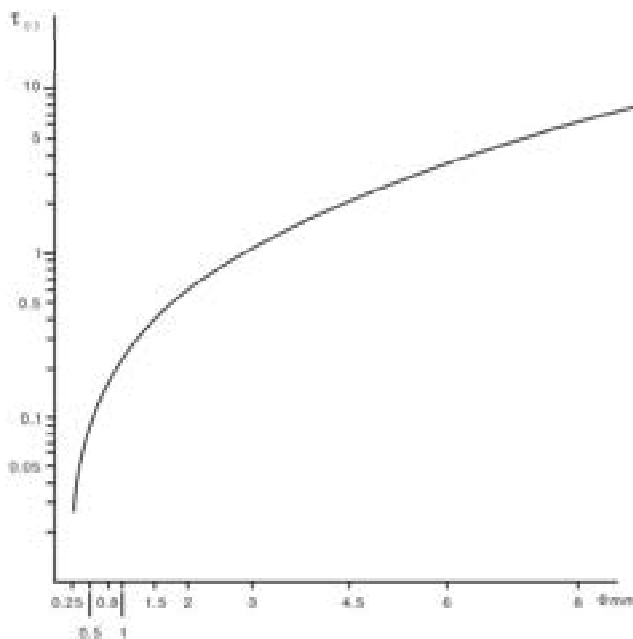
(IEC751-1983 Industrial platinum resistance thermometer sensors)

Time constant $\tau_{0.95}$: When the tested medium such as water, airflow etc. step changes from one temperature to another constant temperature, the required time for instantaneous value within 95% of the whole speed variation range.

7.1. Heat responsive time table of Mineral Insulated thermocouple

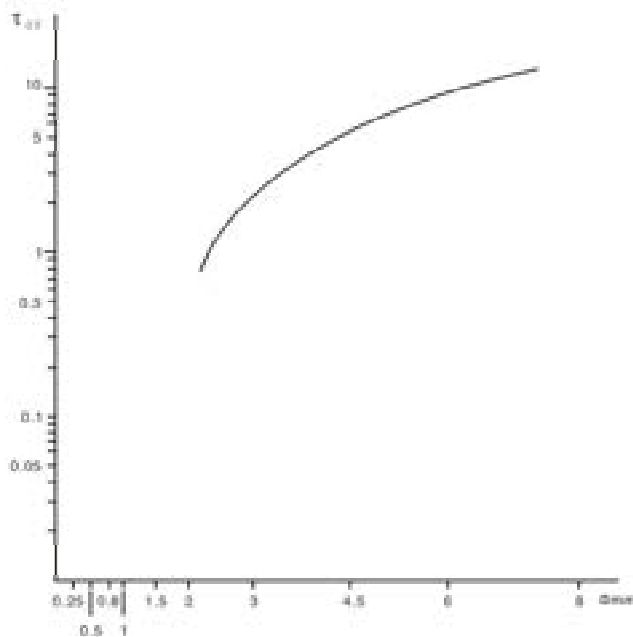
The chart shows heat responsive time of ungrounded type Mineral Insulated thermocouple, speed: 1m/s, test by water

Whereas grounded Mineral Insulated thermocouple reduces about 35% of heat responsive time.



7.2. Heat responsive time table of Mineral Insulated RTD

This chart shows heat responsive time at 1m/s testing speed in water.



8. Model mark

8.1. (It keeps in pace with international standard.)

New structure type Mineral Insulated thermocouple, RTD

Quick release (two-joint) type structure

Through the threaded connection between temperature measurer and outer protection sleeve, we can easily and quickly take out temperature measurer for the testing, repair and renewal. It need not stop the furnace and remove outer protection sleeve from the equipment, otherwise it will influence the normal production. Our standard sizes are convenient for the customers to accurately order the spares.



A Area

B Area

C Area

D Area

WR 1 KG - ②③④ / ⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬

Area	Mark	Description
A Area products category	W	Temperature instrument
	R	Thermocouple
	Z	RTD
	①	Thermocouple graduation
	B	B type, PtRh30 PtRh6
	R	R type, PtRh13 Pt
	S	S type, PtRh10 Pt
	N	N type, NiCrSi - NiSi
	K	K type, NiCr NiSi (或 NiCr NiAl)
	E	E type, NiCr - CuNi
	J	J type, Fe - CuNi
	T	T type, Cu - CuNi
	P	Pt100, RTD
	C	Cu50, RTD
	K	Mineral Insulated
	G	New structure type
	○	Temperature measurer single or double (double mark 2)

A Area B Area C Area D Area
WR ① KG◇ - ②③④ / ⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬

Area	Mark	Description
B Area temperature element device	②	Wire connection mode
	1	Wire connection ceramic plate
	2	Anti-splash terminal block
	3	Water-proof terminal block (grade of protection Ip65)
	4	Explosion-proof terminal block (anti-explosion grade Ex dIIBT4 or dIICT6)
	5	Water-proof spring pressing terminal block
	6	Handle type (or connector)
	7	Explosion-proof spring pressing terminal block
	8	Special small terminal block (not fit for double type thermocouple or RTD)
	9	With compensation conductor
	③	Measuring end pattern (for the detailed characteristics, please refer to P4)
	1	Ungrounded type
	2	Casing connection type
	3	Ungrounded separated type
	4	Armored core diameter change quick type
	④	Install fixed device
	WG	No fixed installation device
	GL	Fixed thread
	HK	Flexible cutting ferrule thread
	GK	Fixed cutting ferrule thread
	KM	Cutting ferrule pressure spring type
	GF	Fixed flange
	HF	Flexible cutting ferrule flange
	GF	Fixed cutting ferrule flange
	S	With reinforcing nozzle type
	G	With reinforcing nozzle movable bolt type
	N	With reinforcing nozzle fixed bolt type
	NH	With reinforcing nozzle sealing fixed bolt type (armored thermocouple and bolt sealed welding)
	U	Spring pressing reinforcing nozzle with flexible joint
	B	Leakage-blocking type
	NS	Reinforcing expansion type



A Area B Area C Area D Area
WR ① KG ◇ - ② ③ ④ / ⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

Area	Mark	Description
C Area Outer protection sleeve	⑤	Outer protection sleeve process connection
	1	No fixed process connection (or power station special-purpose code)
	2	Fixed threaded connection seamless stainless steel outer protection pipe
	3	Flexible flange connection seamless stainless steel outer protection pipe
	4	Fixed flange connection seamless stainless steel outer protection pipe
	5	Movable flange angle square shape
	6	Fixed threaded connection integrated drilling conical temperature sleeve
	7	Fixed flange connection integrated drilling conical temperature sleeve
	PD01	20x25 Temperature sensing sheet
	PD02	20x75 Temperature sensing sheet
	PD03	Fixing clip
	PD04	Arc heat absorber
	PD05	Arc bevel heat absorber
	PD06	Square heat absorber + base
	⑥	Outer protection sleeve diameter
	0	Φ16 outer protection pipe
	1	Φ20 outer protection pipe
	2	Diameter change outer protection sleeve
	3	Power station purpose special-purpose high temperature and high voltage welding type integrated drilling temperature sleeve
	4	Power station special-purpose medium temperature and medium voltage welding type integrated drilling temperature sleeve
	5	Power station special-purpose low temperature and low voltage conical fixed thread temperature sleeve
	6	Ultra-supercritical high temperature and high voltage welding type integrated drilling temperature sleeve
	7	Ultra-supercritical high temperature & high voltage welding type integrated drilling temperature sleeve (quick type)
	Outer diameter	Special outer diameter size temperature sleeve (in cone shape D ₁ D ₂)
	⑦	Outer protection sleeve material code (Please see attachment 2, P61 for commonly-used metal material Sino-foreign comparison table and use)
	A	1Cr18Ni9Ti (or 321)
	B	0Cr18Ni9 (or 304)
	C	0Cr18Ni12Mo2Ti (or 316, 316L)
	D	0Cr25Ni20 (or 310S)
	E	00Cr22Ni5Mo3N (double-phase stainless steel 2205)
	F	PTFE



A Area B Area C Area D Area
 WR ① KG◇ - ②③④ / ⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬

Area	Mark	Description
C Area Outer protection sleeve	G	Nickel-based heat resistant and anti-corrosion alloy (or Inconel600)
	HB	Hastelloy Alloy B-2
	HC	Hastelloy Alloy C-276
	I	317L(or 00Cr19Ni13Mo3)
	J	3YC52(Ni45Cr17Al)
	M	Investment casting wear-resistant head
	MK	Monel K-500
	N	Wear-resistant painted
	S ₁	Recrystal SiC
	S ₂	Nitrogen combination SiC, 75%SiC 25%Si3N4
	T ₁	Containing 85% Al ₂ O ₃ protection pipe
	T ₂	Containing 99% Al ₂ O ₃ ceramic protection pipe
	TP91	ASTM A335P91
	TP92	ASTM A335P92
	TP11	A691Cr1-1/4CL22
	TP22	A691Cr2-1/4CL22
	TP347	TP347H
	V ₁	12Cr1MoV
	V ₂	15CrMo
	W	Wb36 (or 15NiGuMoNb5)
D Area specs parameter	⑧	Mineral Insulated thermocouple (RTD) diameter
	05	Φ0.5
	10	Φ1
	20	Φ2
	30	Φ3
	32	Φ3.2
	40	Φ4
	48	Φ4.8
	50	Φ5
	60	Φ6
	64	Φ6.4

A Area B Area C Area D Area
 WR ① KG◇ - ②③④ / ⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬

Area	Mark	Description
D Area specs parameter	80	Φ8
	95	Φ9.5
	127	Φ12.7
	⑨	Total length
	L	(mm)
	⑩	Accuracy class
	I	Accuracy class I (0.4%t)
	II	Accuracy class II (0.75%t)
	III	(Please note in the brackets for special accuracy requirements) Example 1: III (0.3%t), indicate: tolerance range 0.3%t Example 2: III (0.5℃/6000h), indicate: 6000 hours stability 0.5℃
	⑪	Insertion depth (if any)
	U	(mm)
	⑫	Procedure linkage (Please see attachment 1, P50 for various countries thread codes, old and new standards comparison table)
	M12	Screw thread M12x1.5
	M16	Screw thread M16x1.5
	M20	Screw thread M20x1.5
	M27	Screw thread M27x2
	M33	Screw thread M33x2
	G1/2	Screw thread G1/2-in (or 1/2-in.BSPF, PF)
	G3/4	Screw thread G3/4-in (or 3/4-in.BSPF, PF)
	G 1	Screw thread G 1-in (or 1-in.BSPF, PF)
	R1/2	Screw thread R1/2-in (or 1/2-in.BSPT, PT)
	R3/4	Screw thread R3/4-in (or 3/4-in.BSPT, PT)
	R 1	Screw thread R 1-in (or 1-in.BSPT, PT)
	NPT1/2	Screw thread 1/2-in.NPT (or Z1/2-in)
	NPT3/4	Screw thread 3/4-in.NPT (or Z3/4-in)
	NPT 1	Screw thread 1-in.NPT (or Z1-in)
	DN_PN_	Flange (HG20592-97- HG20635-97)
	13	Terminal block grade of protection
	ExB4	Cast aluminium alloy explosion-resistant terminal block Ex dIIBT4 (See standard allocation, P55)

A Area B Area C Area D Area
WR ① KG◇ - ②③④ / ⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬

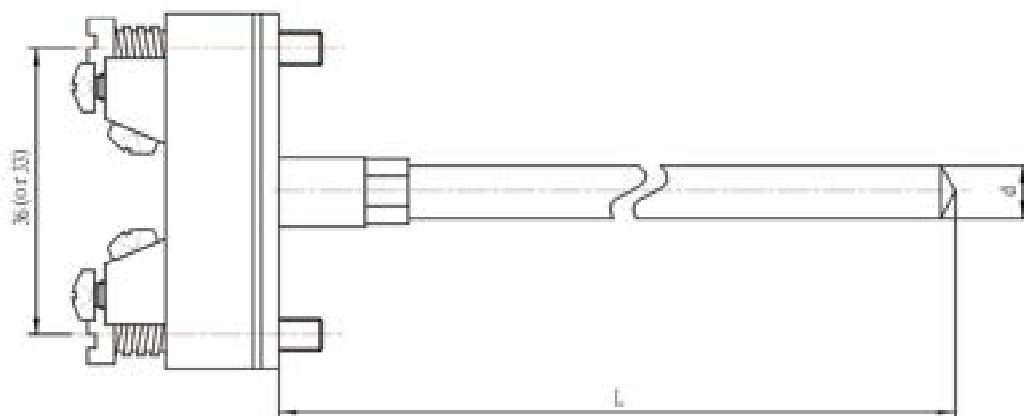
Area	Mark	Description
D Area specs parameter	ExC6	Cast aluminium alloy explosion-resistant terminal block Ex dIICT6 (See standard allocation, P55)
	p	304 stainless steel water-proof terminal block IP65 (See standard allocation, P55)
	PExB4	304 stainless steel explosion-proof terminal block Ex dIBT4 (See standard allocation, P55)
	PExC6	304 stainless steel explosion-proof terminal block Ex dIICT6 (See standard allocation, P55)
	PH01	Round hand shank (See standard allocation, P55)
	PH02	Tool shank (See standard allocation, P55)
	PP01	Uniform flat connector (See standard allocation, P55)
	PP02	Universal meter connector (See standard allocation, P55)
	PP03	Instrument and meter connector (See standard allocation, P55)
	PP04	Cable aligning arm type connector (See standard allocation, P55)
	PP05	Cable fast port type connector (See standard allocation, P55)

Wire connection ceramic plate Mineral Insulated thermocouple core

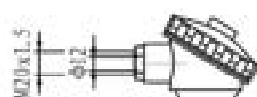
WR ① KG◇ - 11WG/⑦ - ⑧⑨⑩

Wire connection ceramic plate armored RTD core

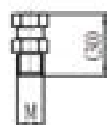
WZ ① KG◇ - 11WG/⑦ - ⑧⑨⑩



Terminal block type Mineral Insulated thermocouple	WR ① KG◇ - 31HK/⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬
Terminal block type armored RTD	WZ ① KG◇ - 31HK/⑤⑥⑦ - ⑧⑨⑩⑪⑫⑬



Cutting ferrule thread



(See standard allocation, P55)



It is applicable for >1m long armored core products.

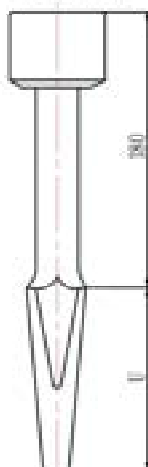
13 type Thermowells



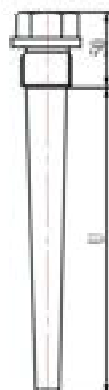
14 type Thermowells



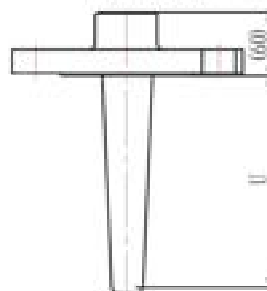
01 type Thermowells



15 type Thermowells



4□ type Thermowells



Draw-in attachment threaded installation conceptual diagram

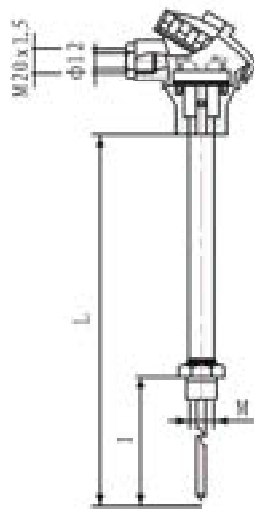


Spring pressing terminal block type armored thermocouple

Spring pressing terminal block RTD thermocouple

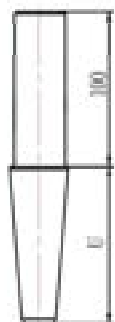
WR ① KG ② - 51N/ ⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

WZ ① KG ② - 51N/ ⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

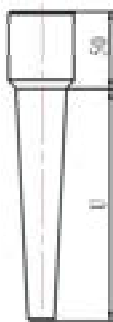


It is applicable for <1m spring pressing shock-resistant quick heat responsive products.

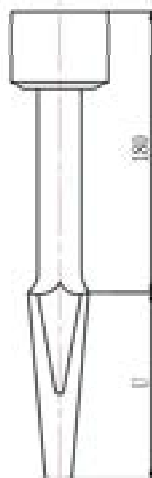
13 type Thermowells



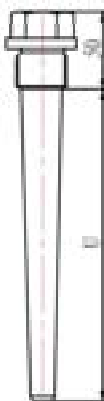
14 type Thermowells



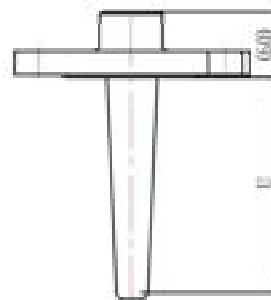
01 type Thermowells



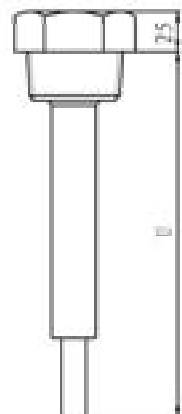
15 type Thermowells



4□ type Thermowells



22 type Thermowells

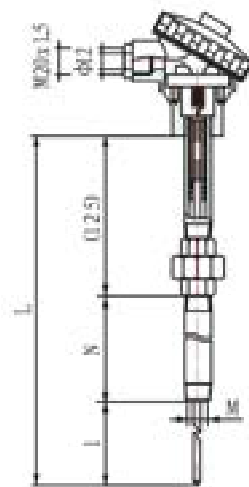


Spring pressing type reinforcing nozzle with flexible joint type armored thermocouple

Spring pressing type reinforcing nozzle with flexible joint type armored RTD

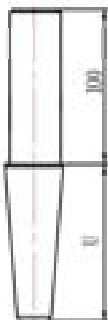
WR ① KG ○ - 51U/ ⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

WZ ① KG ○ - 51U/ ⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬



It is applicable for <1m spring pressing shock-resistant quick heat responsive products.

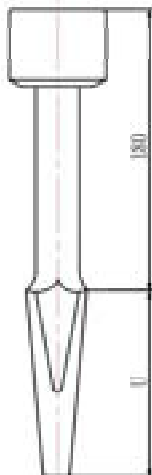
13 type Thermowells



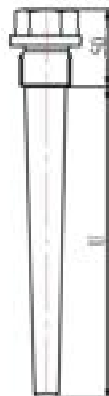
14 type Thermowells



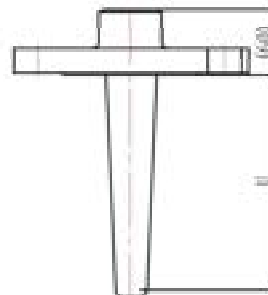
01 type Thermowells



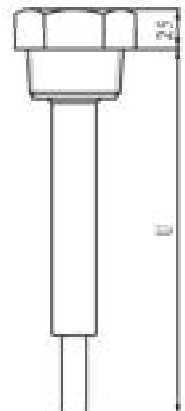
15 type Thermowells



4 □ type Thermowells



22 type Thermowells



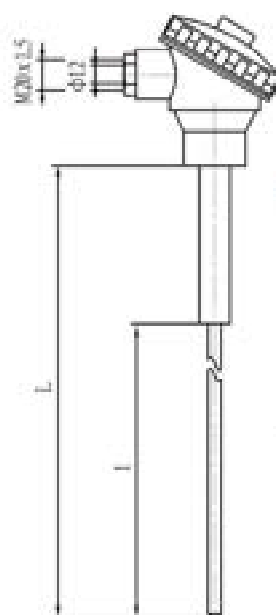
THERMOCOUPLE, RTD



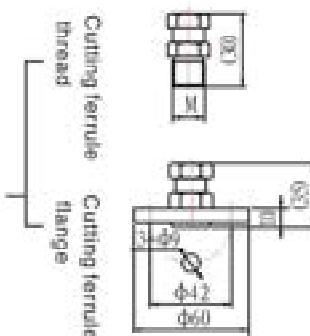
With reinforcing nozzle type Mineral Insulated thermocouple
With reinforcing nozzle armored RTD

WR ① KG◇ - 31S/⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

WZ ① KG◇ - 31S/⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬



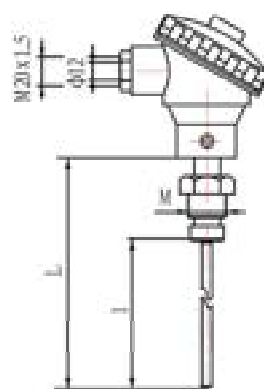
(See standard allocation, P55)



With reinforcing nozzle movable bolt type Mineral Insulated thermocouple
With reinforcing nozzle movable bolt type armored RTD

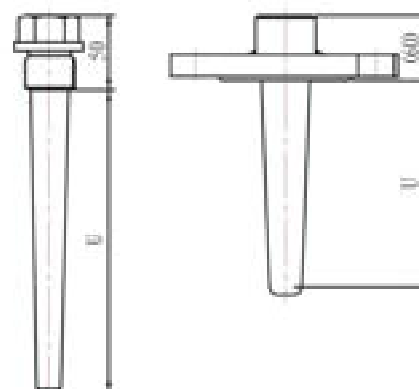
WR ① KG◇ - 31G/⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

WZ ① KG◇ - 31G/⑤ ⑥ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫ ⑬



15 type Thermowells

4□ type Thermowells

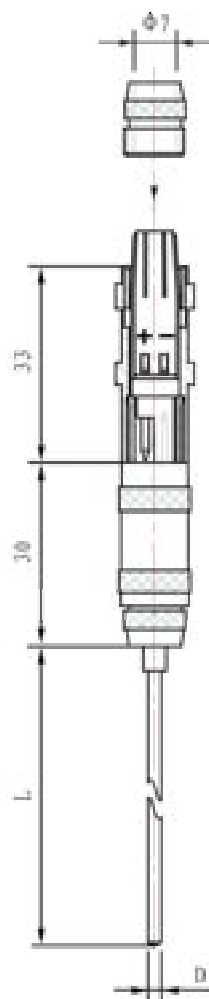


Connector type Mineral Insulated thermocouple

WR ① KG◇-61 ④ / ⑦-⑧ ⑨ ⑩ ⑪ ⑫ ⑬

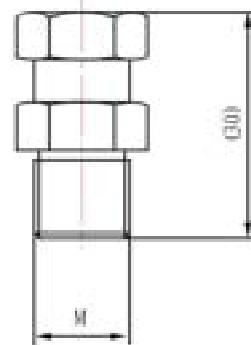
Connector type armored RTD

WZ ① KG◇-61 ④ / ⑦-⑧ ⑨ ⑩ ⑪ ⑫ ⑬

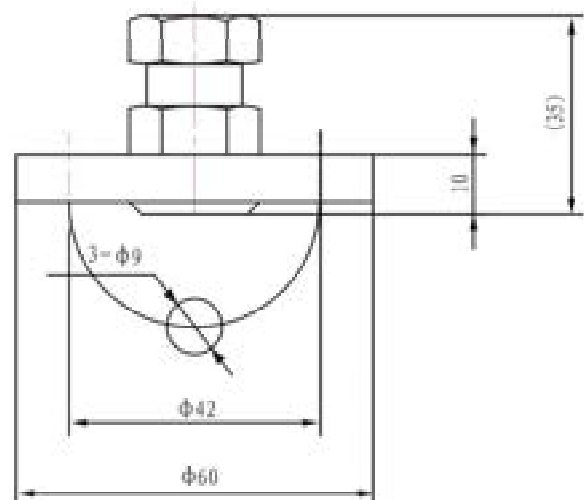


Cutting ferrule thread

(See standard allocation, P55)



Cutting ferrule flange



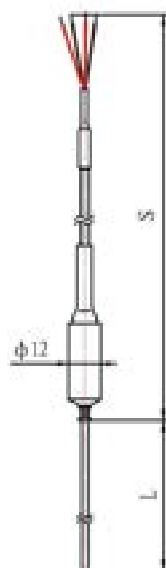
THERMOCOUPLE, RTD

With compensating conductor type
Mineral Insulated thermocouple

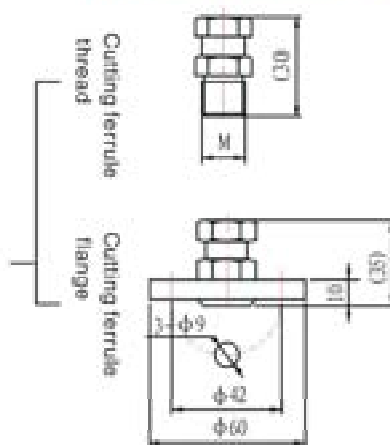
With compensating conductor type armored RTD

WR ① KG◇-91 ④ / ⑤ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫

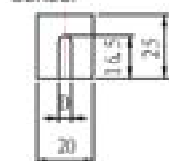
WZ ① KG◇-91 ④ / ⑤ ⑦ - ⑧ ⑨ ⑩ ⑪ ⑫



(See standard allocation, P55)



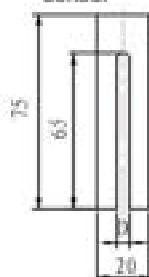
PD01 Temperature sensor



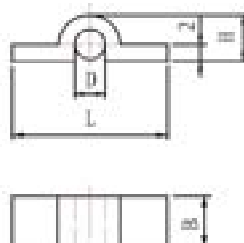
MI temperature



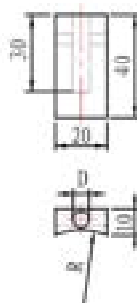
PD02 Temperature sensor



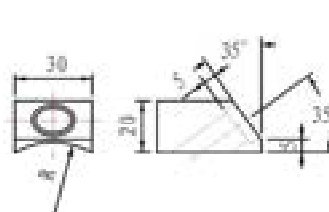
PD03 Fixing catch



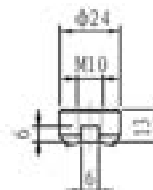
PD04 Heat collector



PD05 Heat collector



PD06 Base

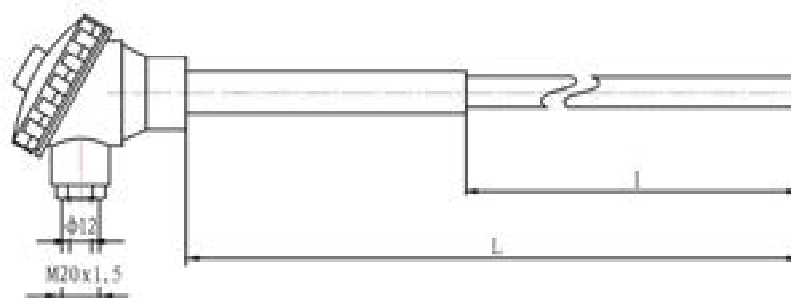


8.2. Assembled type thermocouple

8.2.1. High temperature purpose thermocouple

Model mark	Type	Outer protection sleeve		Applicable occasions	Operating temperature range	Heat responsive time $\tau_{0.5}$
		Material	Diameter			
WRB-130/T2	B (PtRh30 PtRh6)	Corundum (99% Al_2O_3)	$\Phi 16$	It is used in high temperature oxidizing atmospheres. It will be easily cracked in thermal cycling. It can not be used under the conditions of containing sulfureted hydrogen.	600~1600℃	<150s
WRB-131/T2			$\Phi 25$ double-layer sleeve			<360s
WRB-131/S1	B (PtRh30 PtRh6)	Recrystal SiC (SiC)	$\Phi 25$ double-layer sleeve	It has fine sulfur resistance. It can be used in high temperature combustion furnace. It has considerate strength of thermal shock resistance.	600~1700℃	<360s
WRR-130/T2	R (PtRh13 Pt)	Corundum (99% Al_2O_3)	$\Phi 16$	It is used in high temperature oxidizing atmospheres. It will be easily cracked in thermal cycling. It can not be used under the conditions of containing sulfureted hydrogen.	0~1600℃	<150s
WRS-130/T2	S (PtRh10 Pt)					
WRR-131/T2	R (PtRh13 Pt)		$\Phi 25$ double-layer sleeve			<360s
WRR-131/T2	S (PtRh10 Pt)					
WRR-131/S1	R (PtRh13 Pt)	Recrystal SiC (SiC)	$\Phi 25$ double-layer sleeve	It has fine sulfur resistance. It can be used in high temperature combustion furnace. It has considerate strength of thermal shock resistance.	0~1600℃	<360s
WRR-131/S1	S (PtRh10 Pt)					
WRR-130/T1	R (PtRh13 Pt)	High aluminum (85% Al_2O_3)	$\Phi 16$	It is used in high temperature oxidizing atmospheres. It will be easily cracked in thermal cycling. It can not be used under the conditions of containing sulfureted hydrogen.	0~1450℃	<150s
WRS-130/T1	S (PtRh10 Pt)					
WRR-131/T1	R (PtRh13 Pt)		$\Phi 25$ double-layer sleeve			<360s
WRR-131/T1	S (PtRh10 Pt)					
WRR-130/G	R (PtRh13 Pt)	*Gh3030	$\Phi 16$	Ni-based heat-resistant anti-corrosive alloy has anti-oxidization properties. It highly resists corrosion from various waste gas, alkali solution, most organic acid and compound.	0~1050℃	<150s
WRS-130/G	S (PtRh10 Pt)					
WRK-132/T1	K (NiCr - NiSi)	High aluminum (85% Al_2O_3)	$\Phi 16$	It is used in high temperature oxidizing atmospheres. It will be easily cracked in thermal cycling. It can not be used under the conditions of containing sulfureted hydrogen.	0~1200℃	<150s
WRK-130/G	K (NiCr - NiSi)	*Gh3030	$\Phi 16$	Ni-based heat-resistant anti-corrosive alloy has anti-oxidization properties. It highly resists corrosion from various waste gas, alkali solution, most organic acid and compound.	0~1050℃	<150s

Model mark	Type	Outer protection sleeve		Applicable occasions	Operating temperature range	Heat responsive time $\tau_{0.5}$
		Material	Diameter			
Note: 1) " * " is metal protection pipe. In order to protect noble metal thermocouple from being polluted by metal protection pipe and form low temperature eutectic, therefore inner core temperature measurer is Mineral Insulated noble metal thermocouple. 2) When noble metal thermocouple contains hydrogen, carbon, carbon monoxide, phosphorus etc. in use, it needs thickened protection pipe to reduce corrosion from HOAM.						

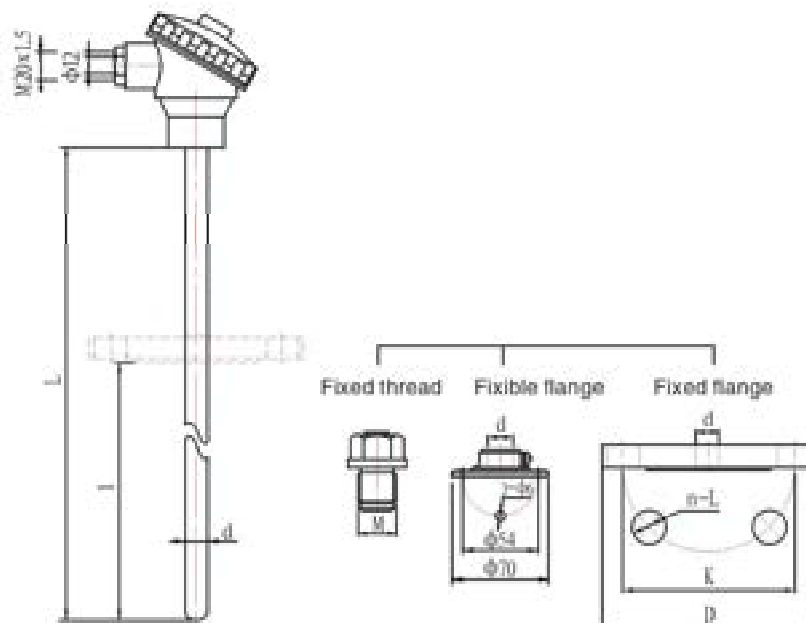


8.2.2. Nation-wide uniform design model general-purpose thermocouple, RTD

W (R) ① ◇ ② ③ ④

Mark	Description
W	Temperature instrument
R	Thermocouple
Z	RTD
①	Thermocouple graduation
B	Thermocouple B graduation, PtRh30 PtRh6
R	Thermocouple R graduation, PtRh13 Pt
S	Thermocouple S graduation, PtRh10 Pt
N	Thermocouple N graduation, NiCrSi - NiSi
K	Thermocouple K graduation, NiCr NiSi (或 NiCr NiAl) + (* Please note in your order)
E	Thermocouple E graduation, NiCr - CuNi
J	Thermocouple J graduation, Fe CuNi
T	Thermocouple T graduation, Cu - CuNi
P	RTD Pt100
C	RTD Cu50

标 记	说 明
◇	Single or double (double mark 2)
② Install fixed form	
1	No fixed installation device
2	Fixed thread
3	Loose flange
4	Fixed flange
5	Loose flange angle square shaped
6	Fixed thread conical protection pipe
③ Terminal block form	
2	Anti-splash type
3	Water-proof type
4	Explosion-proof type
④ pipe protection outer	
0	Φ16 outer protection pipe
1	Φ25 ceramic double-layer outer protection pipe (only be applicable for S, R, B thermocouple) or RTD Φ12 outer protection pipe
2	Φ16 high aluminum outer protection pipe (only be applicable for K, N thermocouple)
3	Ceramic outer protection pipe



9. Power station special-purpose thermocouple, RTD

9.1. Boiler metal wall temperature armored thermocouple

Armored thermocouple matches with heat absorber to be temperature measurer. It is used to measure metal pipe wall temperature such as PLATEN SH, outdo, Rehigier etc.

Technical parameter table

	Temperature measurer	Outer diameter size	Operating temperature	Sheath material	Armored length L	Outgoing conductor S	Insulating resistance value
K or E	Recommend double	Φ3 or Φ4	0~600℃	1Cr18Ni9Ti or 316	Maximum length <120m	Recommend 2m	20℃, >1000MΩ /500VDC
		Recommend Φ5 or Φ6	0~800℃				500℃, >5MΩ /500VDC *650℃, >5MΩ /500VDC

Note:

1) Insulating layer of armored thermocouple has limited power conductivity. The longer the length of armored thermocouple is, the lower the insulating resistance value will be. Therefore power conductivity of armored thermocouple uses $3m^{-1}$ (equal to $\Omega \cdot m^{-1}$). Therefore $\Omega \cdot m$ or $M\Omega \cdot m$ is shown to larger than 1m length of armored thermocouple and $M\Omega$ for less than 1m.

2) * * * optional for special requirements. Please clearly note in your order.

Name: Armored thermocouple with compensating conductor

Model mark: WR ☐ K◇-191/ ☐

Thermocouple graduation

K NiCr-NiSi

E NiCr-CuNi

Temperature measurer

1 Single (can be omitted)

2 Double

Installation form of heat absorber

PD01 Temperature sensing sheet 20x25

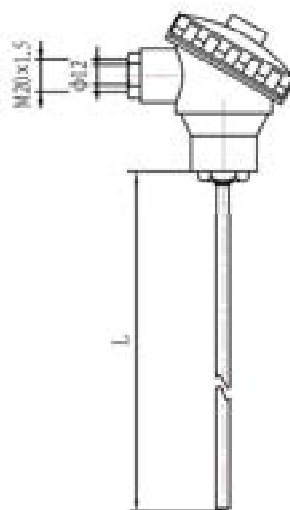
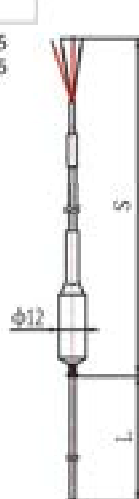
PD02 Temperature sensing sheet 20x75

PD03 Fixing clip

PD04 R arc heat absorber

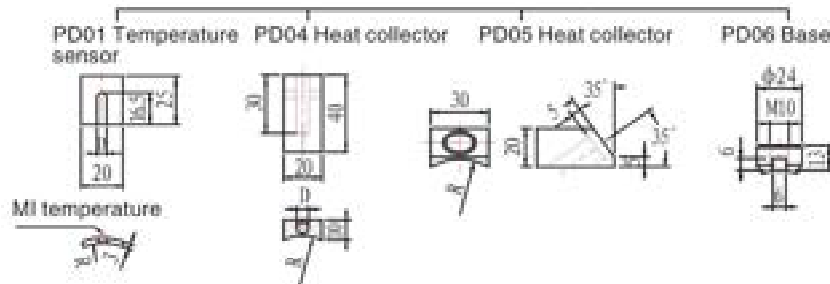
PD05 R arc bevel heat absorber

PD06 Square heat absorber + base



Name: Armored thermocouple with terminal block

Model mark: WR ☐ K◇-131/ ☐



9.2. High temperature wear-resistant and anti-corrosive thermocouple

Technical parameter table

Thermocouple graduation	Temperature measurer	Outer protection sleeve diameter	Operating temperature	Wear-resistant head length	Total length / insertion depth L/l	Procedure linage
K	Single	Φ16	0~1100℃	300mm	750/ 600	Flange
		Φ22		450mm	1000/ 850	
S		Φ25	0~1200℃	500mm	1150/ 1000	
		Φ32		500mm		

The uses and characteristics:

- It is especially fit for measuring the temperature of CFB (circulating fluidized bed) boilers and coal mills. It has sound wear resistance, anti-corrosion in high temperature environments.
- Measuring side outer protection pipe adopts wear-resistant head with 300mm to 500mm length out of investment casting. It welds with tail high temperature stainless steel pipe to extend the protection pipe.
- The investment casting wear-resistant head sleeve has unique batch feeder so that the material can be equipped with multi-functions such as heat-proof, wear-resistant, anti-corrosion etc. Major materials: Co≥8%, Ti≥2%, Ni≥38%.

Model mark: WR ☐ N ☐ - ☐ ☐ ☐ / M

Thermocouple graduation

- K NiCr- CuNi
- N NiCrSi - NiSi
- S PtRh10 Pt
- R PtRh13 Pt

Wear-resistant type code N

- Temperature measurer**
- 1 Single (can be omitted)
 - 2 Double

Investment casting wear-resistant head code M

Outer protection pipe

- 0 Φ16 outer protection pipe (wear-resistant head length 300mm)
- 1 Φ22 outer protection pipe (wear-resistant head length 450mm)
- 2 Φ25 outer protection pipe (Recommended) (wear-resistant head length 500mm)
- 3 Φ32 outer protection pipe (wear-resistant head length 500mm)

Cold junction form

- 2 Anti-splash terminal block type
- 3 Water-proof terminal block type
- 4 Explosion-proof terminal block type

Install fixing device

- 1 No fixed installation device
- 4 Fixed thread
- 3 Loose flange
- 4 Fixed flange



9.3. Flue & air duct thermocouple

Technical parameter table

Thermocouple graduation	Temperature measurer	Outer protection sleeve diameter	Operating temperature	Sheath material	Length / total length / insertion depth L/l	Procedure linkage	Remarks
K or E	Recommend double type	Φ28	0~800℃	1Cr18Ni9Ti or 316	480/ 230 680/ 430 880/ 630 1380/ 1130	R 2-in 2-in.NPT	• Fume temperature adopts painted wear-resistant protection sleeve. • Air temperature adopts stainless steel protection sleeve.

Model mark: WR ☐ KG◇-53N/ 12 ☐

Thermocouple mark

K NiCr- NiSi

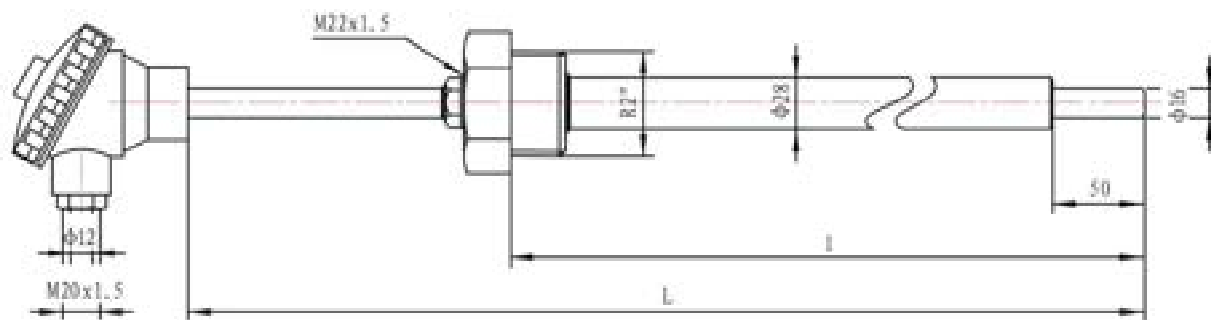
E NiCr- CuNi

Temperature measurer

1 Single (can be omitted)

2 Double

N painted wear-resistant protection bushing



9.4. Four pipelines thermometer well

Technical parameter table

Thermometer well model	Applicable unit type		
	600MW/ 1000MW USC (ultra-supercritical) unit	600MW SC (super-critical) unit	600MW以下 Subcritical unit
16 type	Applicable	Applicable	Applicable
01 type	Not applicable	Improved type	Applicable
13 type	Applicable	Applicable	Applicable

9.4.1. Supercritical (ultra-supercritical) high temperature & high voltage thermometer well type thermocouple

Technical parameter table

Thermo-couple graduation	Temperature measurer	Measuring point position	Major pipe material	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Procedure linkage U (mm)
600MW/1000MW ultra-supercritical high temperature & high voltage thermometer well type thermocouple									
K or E	Recommend double type	Main steam	A335P92	A335P92	P=30MPa T=610℃	≤ 100m/s	T ₉₀ < 90s	Welding	50 75 100 150
		Reheat (RH) hot section	A335P92	A335P92	P=8MPa T=610℃				
		Reheat (RH) cold section	A672B70CL32	1Cr18Ni9Ti	P=8MPa T=410℃				
		High pressure water feed	15NiCuMoNb5-6-4	WB36	P=40MPa T=300℃				
600MW supercritical high temperature & high voltage thermometer well type thermocouple									
K or E	Recommend double type	Main steam	A335P91	A335P91	P=30MPa T=580℃	≤ 100m/s	T ₉₀ < 90s	Welding	50 75 100 150
		Reheat (RH) hot section	A335P91	A335P91	P=8MPa T=580℃				
		Reheat (RH) cold section	A672B70CL32	1Cr18Ni9Ti	P=8MPa T=410℃				
		High pressure water feed	15NiCuMoNb5-6-4	Wb36	P=40MPa T=300℃				
The uses and characteristics: • High temperature, high voltage, high flow rate purposes armored thermocouple patent number ZL2006 2 0104489.8 • An optimized scheme of complete penetration and fusion in welding enhances the welding quality and results in the more safe running of thermometer bulb. • It provides temperature measuring points such as drain etc. with quick type ultra-supercritical high temperature & high voltage thermometer well type thermocouple, heat responsive time <15s, with temperature transmitter output 4-20mA.									



POWER STATION SPECIAL-PURPOSE THERMOCOUPLE, RTD

Model mark: WR ☐ KG◇-53U/16

Thermocouple graduation

K NiCr- NiSi

E NiCr- CuNi

Temperature measurer

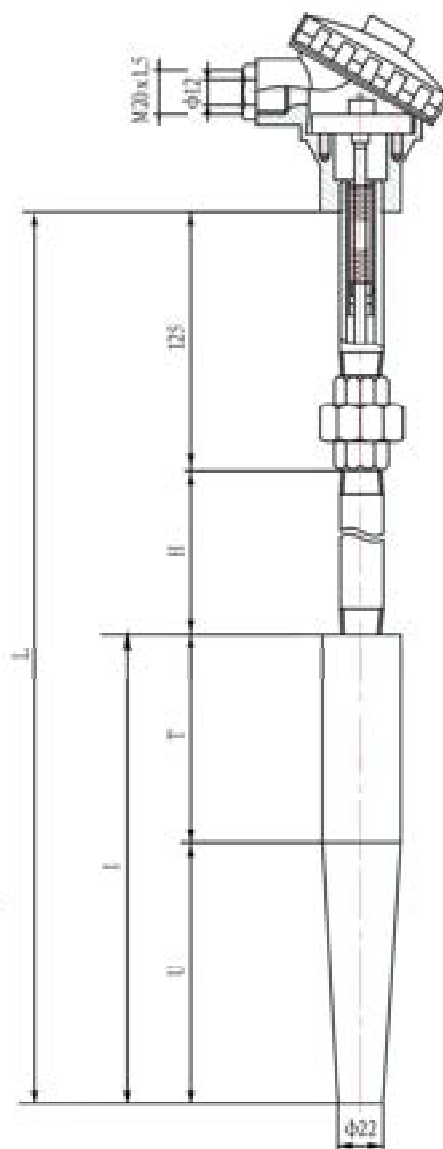
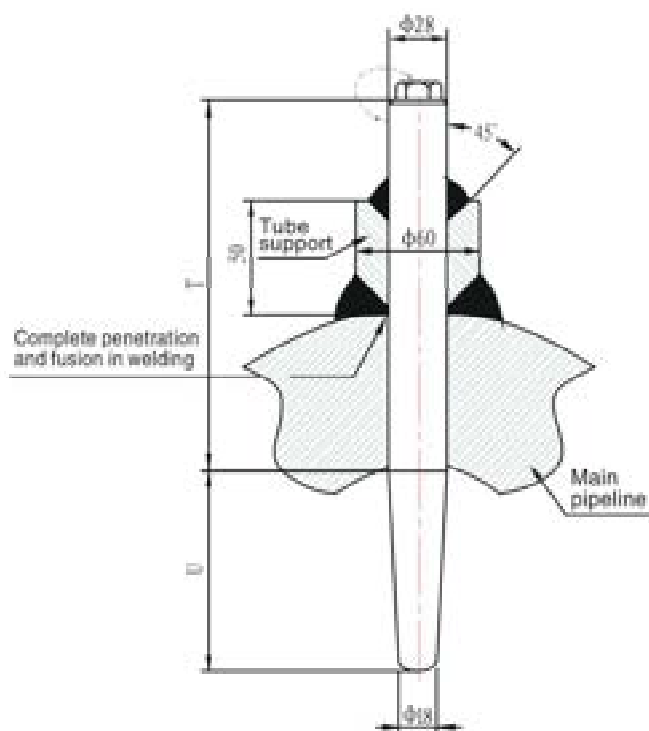
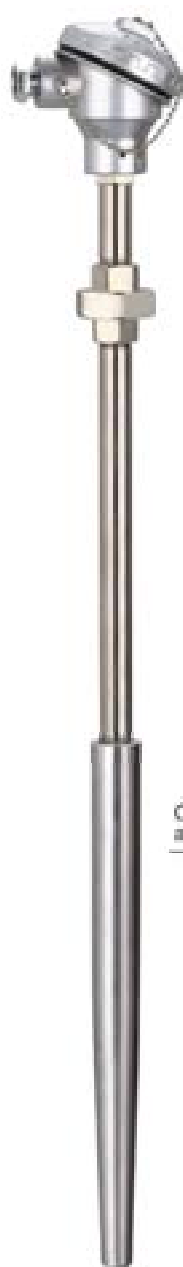
1 Single (can be omitted)

2 Double

16 type ultra-supercritical
high temperature & high
voltage welding type integrated
drilling thermometer well
17 (quick) type ultra-supercritical high
temperature & high voltage welding type
integrated drilling thermometer well



Our patent is protected by Chinese Law.



9.4.2. Sleeve-on thermocouple

Technical parameter table

Thermocouple graduation	Temperature measurer	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Thermometer well insertion thickness U (mm)
K or E	Recommend double	1Cr18Ni9Ti 0Cr18Ni12Mo2Ti	P=30MPa T=580℃	≤100m/s	$t_{0.5} < 60s$	Welding	120

The uses and characteristics:

- It is applicable for measuring various main pipelines of subcritical units. It needs slight improvement if thermowell will be used in subcritical unit.
- The steam enters into pipe support cavity, being cyclized and flows out. It enhances thermocouple measuring accuracy and heat responsive time.

Model mark: WR ☐ KG ☐ -53U/ 01

Thermocouple graduation

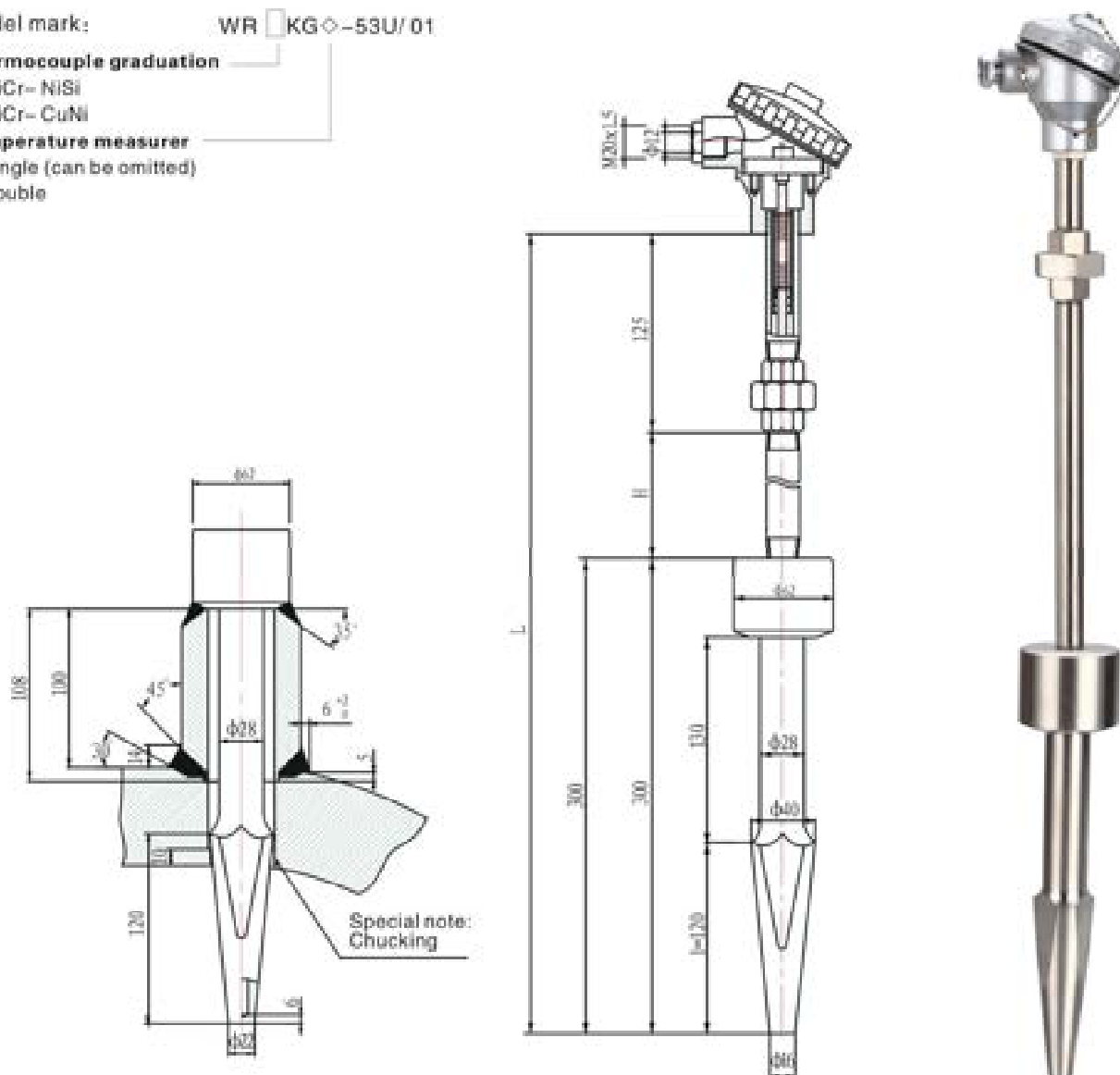
K NiCr-NiSi

E NiCr-CuN

Temperature measurer

1. Single (can be omitted)

2 Double



9.4.3. High temperature & high voltage thermometer well type thermocouple

Technical parameter table

Thermo- couple graduation	Temper- ature measurer	Measuring point position	Major pipe material	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Procedure linkage U (mm)
600MW/1000MW ultra-supercritical high temperature & high voltage thermometer well type thermocouple									
K or E	Reco- mend double type	Main steam	A335P92	A335P92	P=30MPa T=610℃	≤ 100m/s	$\tau_{90} < 90s$	Welding	50 75 100 150
		Reheat (RH) hot section	A335P92	A335P92	P=8MPa T=610℃				
		Reheat (RH) cold section	A672B70CL32	1Cr18Ni9Ti	P=8MPa T=410℃				
		High pressure water feed	15NiCuMoNb5-6-4	WB36	P=40MPa T=300℃				
600MW supercritical high temperature & high voltage thermometer well type thermocouple									
K or E	Reco- mend double type	Main steam	A335P91	A335P91	P=30MPa T=580℃	≤ 100m/s	$\tau_{90} < 90s$	Welding	50 75 100 150
		Reheat (RH) hot section	A335P91	A335P91	P=8MPa T=580℃				
		Reheat (RH) cold section	A672B70CL32	1Cr18Ni9Ti	P=8MPa T=410℃				
		High pressure water feed	15NiCuMoNb5-6-4	WB36	P=40MPa T=300℃				
600MW below high temperature & high voltage thermometer well type thermocouple									
K or E	Reco- mend double type	Each measuring point	---	1Cr18Ni9Ti 0Cr18Ni12Mo2Ti	P=30MPa T=580℃	≤ 100m/s	$\tau_{90} < 90s$	Welding	50 75 100 150
The uses and characteristics: • The most widely applied welding thermometer well forms									

Model mark: WR ☐ KG ○ -53U/ 13

Thermocouple graduation

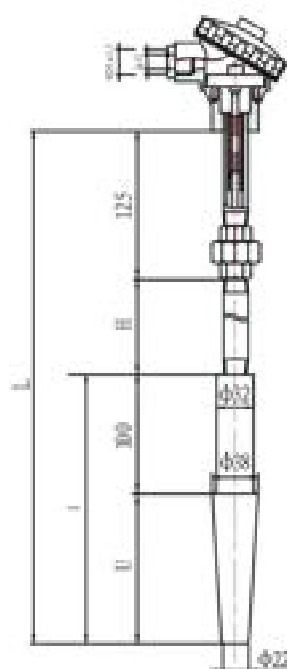
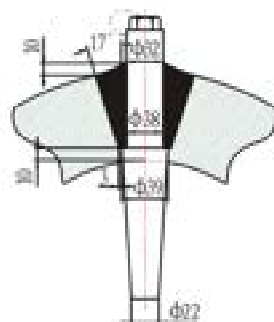
K NiCr- NiSi

E NiCr- CuNi

Temperature measurer

1 Single (can be omitted)

2 Double



9.4.4. Medium temperature & medium voltage thermometer well type thermocouple

Technical parameter table

Thermocouple graduation	Temperature measurer	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Thermometer well insertion depth U (mm)
K or E	Recommend double	1Cr18Ni9Ti 0Cr18Ni12Mo2Ti	P=14.7MPa T=580℃	≤60m/s	$t_{0.5} < 60s$	Welding	50 75 100 150 200 250
			P=14.7MPa T=350℃	≤30m/s			300 400 500

Model mark: WR ☐ KG◇-53N/14

Thermocouple graduation

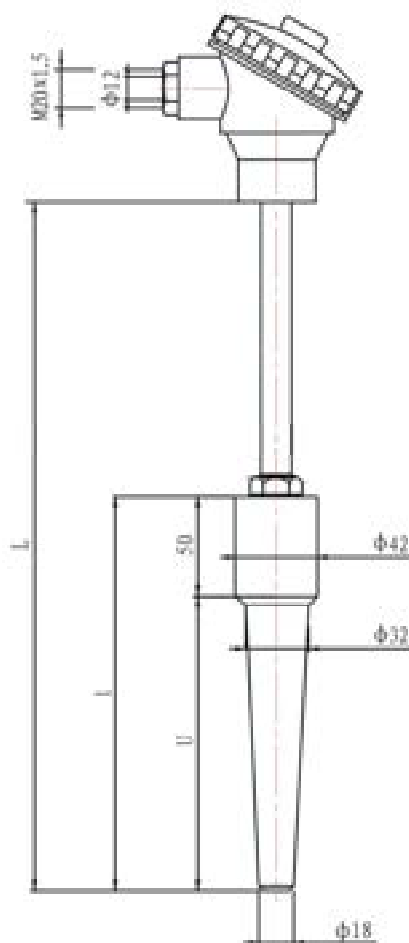
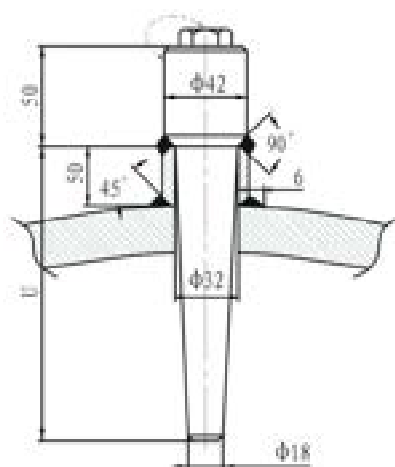
K NiCr- NiSi

E NiCr- CuNi

Temperature measurer

1 Single (can be omitted)

2 Double



9.4.5. Low temperature & low voltage thermometer well type thermocouple, RTD

Technical parameter table

Thermocouple graduation	Temperature measurer	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Thermometer well insertion depth U (mm)
K or E	Recommend double	1Cr18Ni9Ti 0Cr18Ni12Mo2Ti	P=9.8MPa T=580℃	≤9m/s	τ _{0.95} < 60s	M33x2	50 75 100 150 200 250
			P=9.8MPa T=350℃				300 400 500

Model mark: WR ☐ KG ○ -53N/ 15

Thermocouple graduation

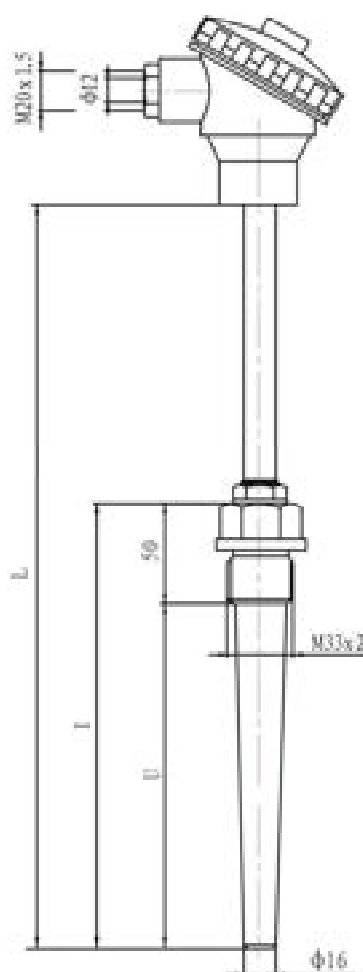
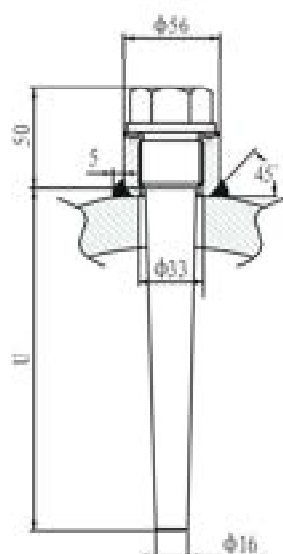
K NiCr- NiSi

E NiCr- CuNi

Temperature measurer

1 Single (can be omitted)

2 Double



9.5. Fixed thread conical protection sleeve type thermocouple , RTD

Technical parameter table

Thermocouple graduation	Temperature measurer	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time	Procedure linkage	Thermometer well insertion depth U (mm)
K or E or Pt100	Recommend double	1Cr18Ni9Ti 316	P=9.8MPa T=580℃	≤9m/s	$\tau_{0.5} < 60s$	M27x2	50 75 100 150 200 250
			P=9.8MPa T=350℃				300 400 500
The uses and characteristics: It is applicable for use in the strong scour occasions such as circulating water etc. Because of applying the integrated drill thermo-well, the strength is much higher than that of steel pipe type protection tube. It can increase the security and service life in the important and dangerous occasions.							

Model mark: WR ☐ KG $\diamond$ -53N/ 63

Thermocouple graduation

K NiCr- NiSi

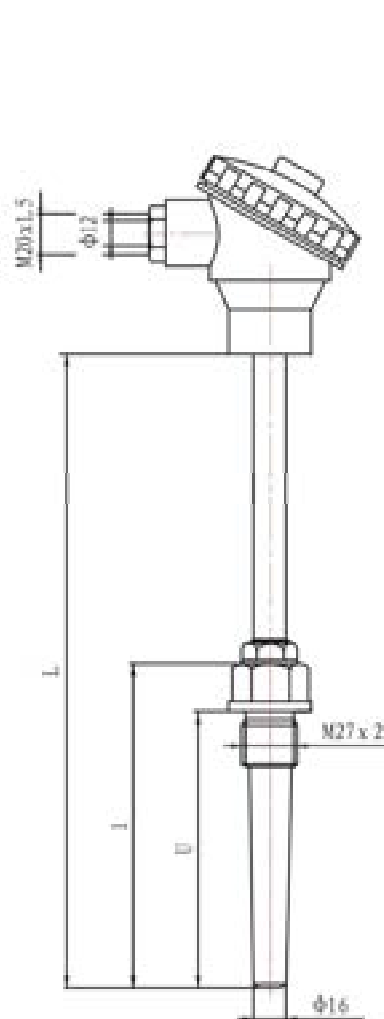
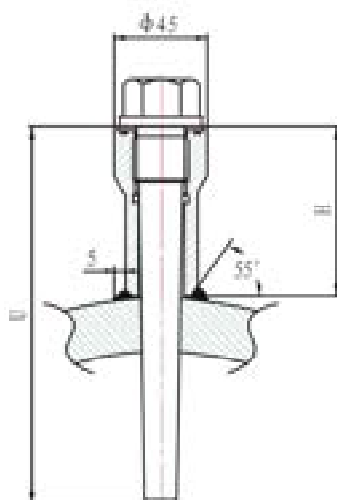
E NiCr- CuNi

WZP RTD Pt100

Temperature measurer

1 Single (can be omitted)

2 Double

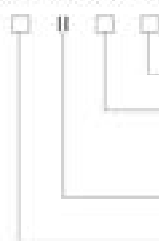


9.6. Oil tank purpose reducing sleeve type explosion-proof Thermocouple,RTD

Technical parameter table

RTD	Temperature measurer	Outer protection sleeve Diameter	Maotianbo	Sheath material	Insertion depth l (mm)	Operating pressure	Procedure linkage	Explosion-Proof
Pt100	Recommend double	Φ16/Φ10 or Φ12/Φ8	0~400℃	1Cr18Ni9Ti or 316	≤300mm ≥300mm	≤3MPa Pressure	M27x2	dIIBT4

Note: Explosion-proof marks



Temperature class: T1/450℃, T2/300℃, T3/200℃, T4/135℃, T5/100℃, T6/85℃

Explosive-proof grade: B, C

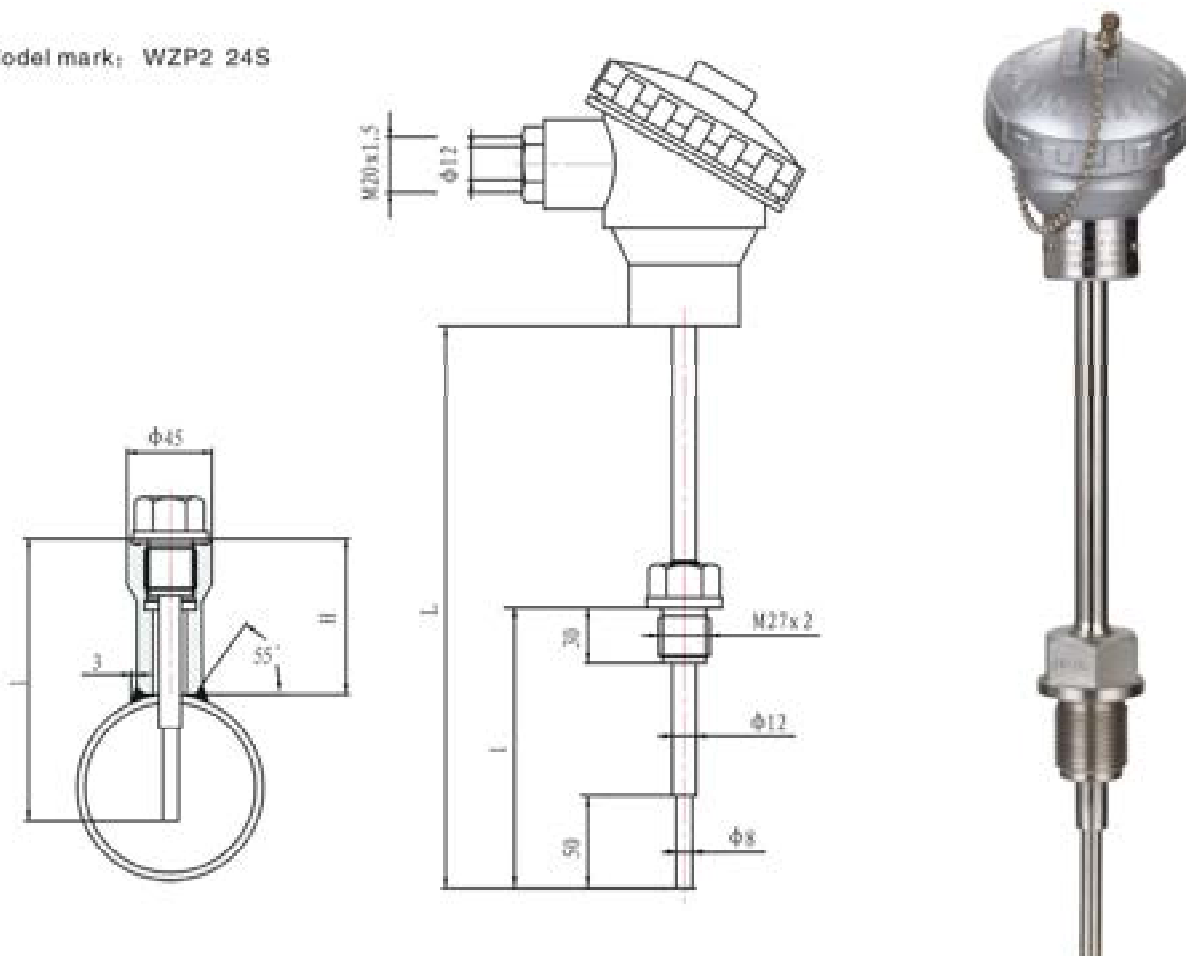
(Explosive-proof grade is divided into A, B, C class according to maximum safety gap or MICR of explosive gas mixture.)

Type (factory purpose electrical equipments) II

Flame-proof type: d

Intrinsic safety type: ia

Model mark: WZP2 24S

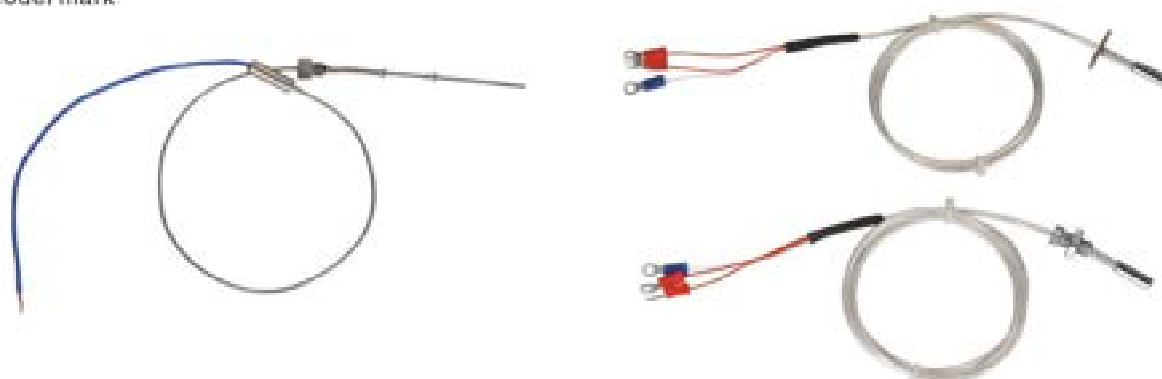


9.7. Bush face RTD

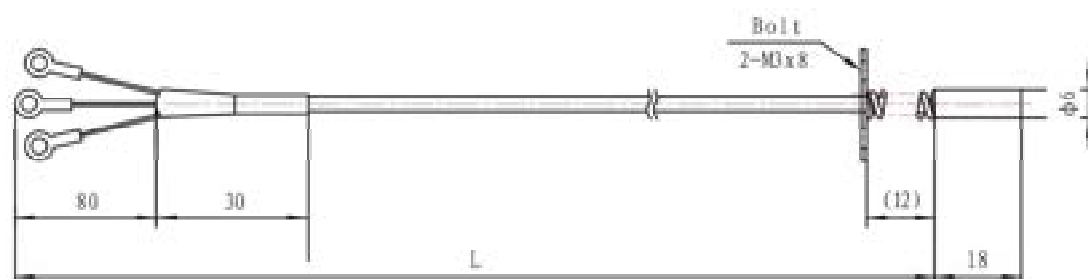
Technical parameter table

RTD	Temperature measurer	Mark	Install fixing device	Operating temperature	Temperature probe specification
Pt100	Single or double	201	M8x0.75	0-150℃	Φ6x18
		201B	M10x1		Φ8.7x18
		001	Metal retaining web		Φ6x18
The uses and characteristics : • It is applicable for embedded bush face temperature measurement. It is oil and heat resistant.					

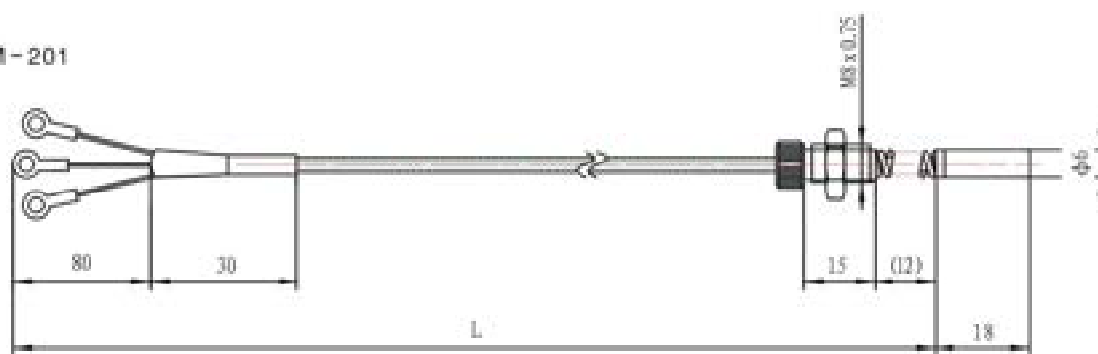
Model mark



WZPM-001



WZPM-201



NUCLEAR POWER STATION SPECIAL-PURPOSE THERMOCOUPLE, RTD

10. Nuclear power station special-purpose thermocouple and RTD

10.1. Inertia RTD thermometer

Technical parameter table

RTD	Temperature measurer	Nuclear safety class	Thermometer well material	Designed Pressure Temperature	Flow rate	Heat responsive time 0.4m/s flow rate / hour	Thermometer well insertion depth U (mm)
Pt100	Recommend double	1E	1Cr18Ni9Ti 0Cr18Ni12Mo2Ti	P=20MPa T=500℃	≤20m/s	$t_{0.412} < 2.0s$	120
						$t_{0.412} < 2.5s$	277

The uses and characteristics:

- Inertia 1E class platinum RTD thermometer patent number ZL2006 2 0106678.9
- It provides nuclear reactor power control system, nuclear reactor protection system and thermal control system with corresponding temperature signal of main coolant.

Model mark:

WZPKG 2-X 100 / 3

Armored RTD Pt100
Double temperature measurer

Test third generation
Insertion depth length 100mm
Inertia 1E class



Our patent is protected by Chinese Law.

Experiment proof:

Heat responsive time test report, LOCA / MSLB environment simulation test report, r irradiation test report, shock-resistant appraisal test report, severe accident environment simulation test report



10.2. 1E class thermocouple thermometer and temperature transmitter

Technical parameter table

Thermocouple	Temperature measurer	Nuclear safety class	Thermometer well material	Safety class	Sleeve cleanliness	Shock-resistant type	Thermometer well insertion depth U (mm)
K	Recommend double type	1E	00Cr19Ni10	1E	A23	1	According to actual need

The uses and characteristics:

- Test temperature of the equipments or technological pipelines in nuclear island factory houses

Model mark:

WRKKG 2- 1E 100 / E

MI thermocouple K graduation

Double type temperature measurer

Thermometer well type

A type sleeve: 10MPa

C type sleeve: 2MPa

E type sleeve: 20MPa

F type sleeve: 10MPa

G type sleeve: 1MPa

H type sleeve: 1MPa

E (T2) type sleeve: 20MPa

E (T2) A type sleeve: 2MPa

Insertion depth length 100mm

Safety class: 1E class

Test proof:

LOCA / MSLB environment simulation test report, irradiation test report, shock-resistant appraisal test report, severe accident environment simulation test report



• 11. Petrochemical industry special-purpose thermocouple, RTD

11.1. Integrated temperature transmitter

Technical parameter table

Mark	Name	Functions	Operating environment temperature	Accuracy		Break alarm
				Standard error	Cold junction compensating errors	
SB	Simulation temperature transmitter	- Fixed input signal and range - Low end economy type	-40~+85℃	± 0.5%t	0.5℃	No
U	Intellectual PC temperature transmitter	- Intellectual PC configuration, custom input signal and range; - Output signal 4~20mA DC 2-wire - Electrical isolation strength 1500VAC / 1 minute	-40~+85℃	± 0.05%t	0.5℃	Yes
HU	Intellectual HART temperature transmitter	- Intellectual HART communication agreement, site setting - Output signal 4~20mA DC 2-wire - Electrical isolating strength 1500VAC / 1 minute	-40~+85℃	± 0.05%t	0.5℃	Yes
L	LCD site display	It matches with U type or HU type intellectual temperature transmitter with two-way output site display.	-40~+85℃	—	—	—

Note:

1) Operating temperature range: T4/ -40~+80℃, T5/ -40~+60℃, T6/ -40~+45℃ are available with explosion-Proof certification.

2) Accuracy = standard error + cold junction compensating error

*t*maximum range temperature

Model mark:

HUL WR 1 KG- 2 3 4 / 5 6 7 - 8 9 10 11 12 13

HART Agreement

Intellectual temperature transmitter

LCD site display

Temperature measurer



11.2. Blade type Mineral Insulated thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side type		Outer diameter size	Operating temperature	Sheath material
		Mark	Name			
K	Single type	01	Blade type furnace tube surface grounded type	Φ12.7 Φ12 Φ10	0-800℃	321 316
		02	Shielded blade type furnace pipe surface type	Φ9.5 Φ8 Φ6	0-1050℃	Inconel600 GH3030
The uses and characteristics: ▪ It is fit for measuring the temperature in heating furnace pipe and furnace pipe surface high-temperature occasions.						

Model mark:

WRKKT-01 DB

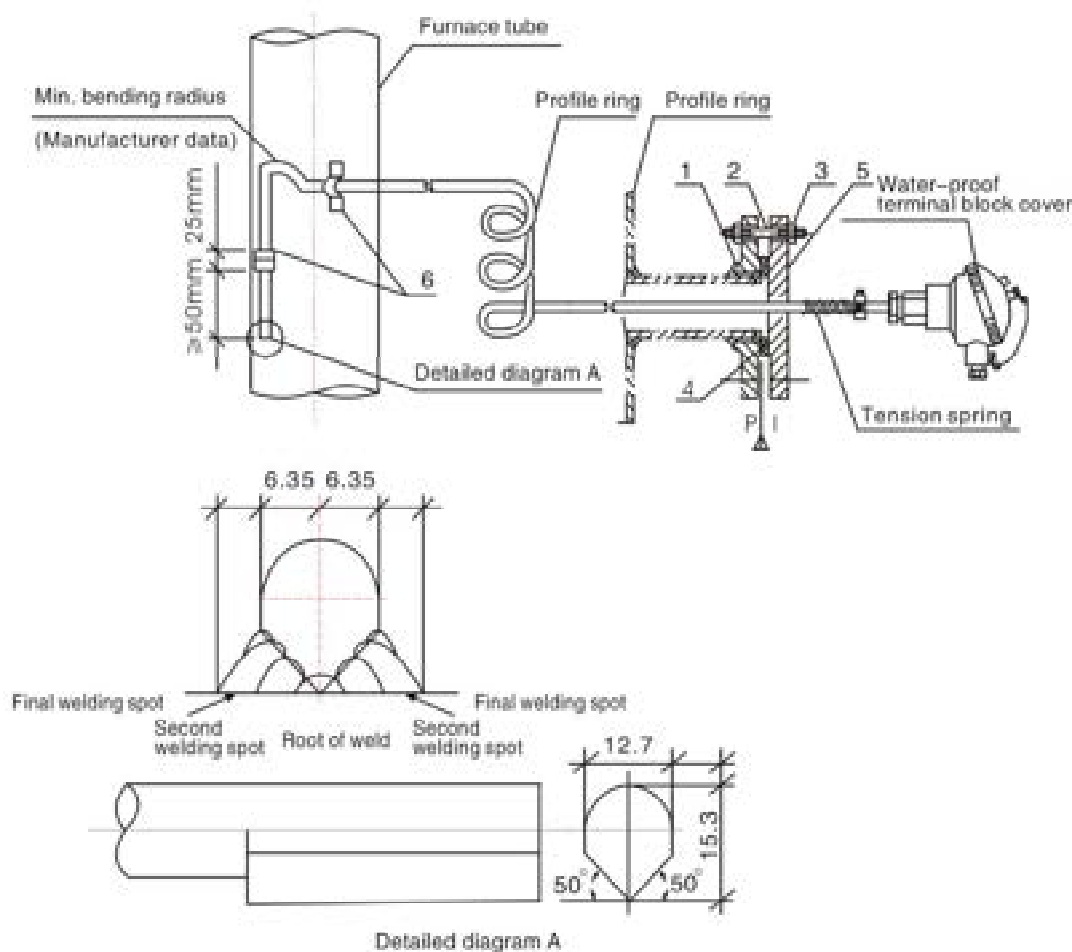
MI thermocouple K type

Special purpose

Blade type

01 Blade type furnace tube surface grounded type

02 Shielded blade type furnace tube surface type



11.3. Multi-point Mineral Insulated thermocouple, RTD

Technical parameter table

Thermocouple RTD	Temperature measurer	Designed pressure		Mineral insulated outer diameter size	Operating temperature	Sheath material
		Normal pressure	< 5MPa			
K or Pt100	Multi-point, 2 to 6 points	The equipment has its own protection sleeve.	Please specially clearly it in your oder.	Φ2 Φ3 Φ4 Φ5 Φ6 Φ8	0~800℃	321 316
					0~1050℃	Inconel600 GH3030
The uses and characteristics: • It is applicable for measuring the temperature in various height positions in chemical reaction kettle.						

Model mark: WRKK $\diamond/\diamond$ ☐ ☐ ☐ DD

WRKK

MI thermocouple K type

WZPK

Armored RTD Pt100

Thermocouple (RTD) pairs

1 Single

2 Double

Temperature measuring

point number

2 2-point

3 3-point

...

6 6-point

Multi-point type

Measuring side form

2 Grounded

3 Ungrounded type

Terminal block

3 Water-proof terminal block

4 Explosion-isolating

terminal block

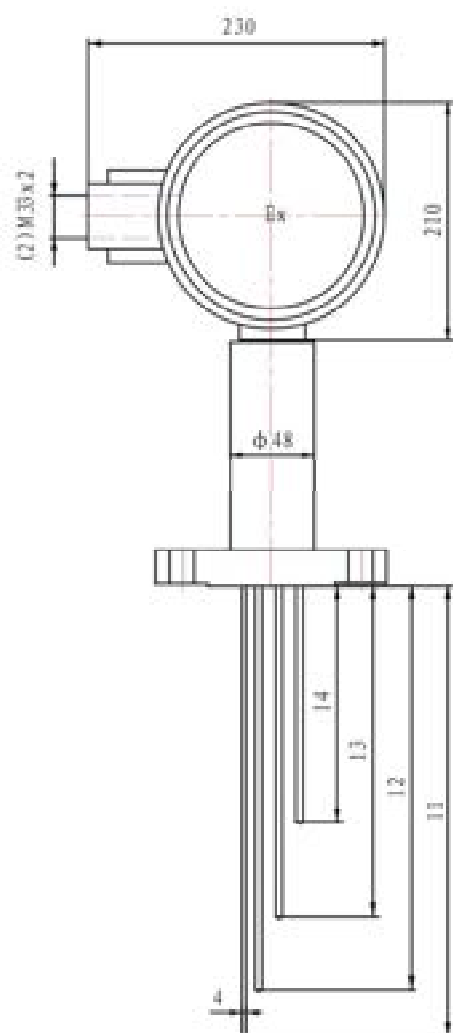
Install fixing device

1 No fixed installation device

2 Fixing thread

3 Cutting ferrule thread

4 Fixed flange



11.4 Mineral Insulated integral multi-point thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Designed pressure	Mineral insulated outer diameter size	Operating temperature	Sheath material
K	Mineral insulated integral multi-point, 2 to 24 points	< 5MPa	Φ3 Φ4 Φ5 Φ6 Φ8 Φ10	0~600℃	321 316
				0~800℃	Inconel600 GH3030

The uses and characteristics:

- It is applicable for measuring the temperature in various height positions of chemical reaction kettle.

Model mark:

WRKK ○/○ □ □ DDD

WRKK

MI thermocouple K type

WZPK

Armored RTD Pt100

Thermocouple (RTD) pairs

1 Single

2 Double

Temperature

measuring point number

2 2-point

3 3-point

6 6-point

Armored integral multi-point type

Measuring side form

2 Grounded

3 Ungrounded

Terminal block

3 Water-proof terminal block

4 Explosion-isolating terminal block

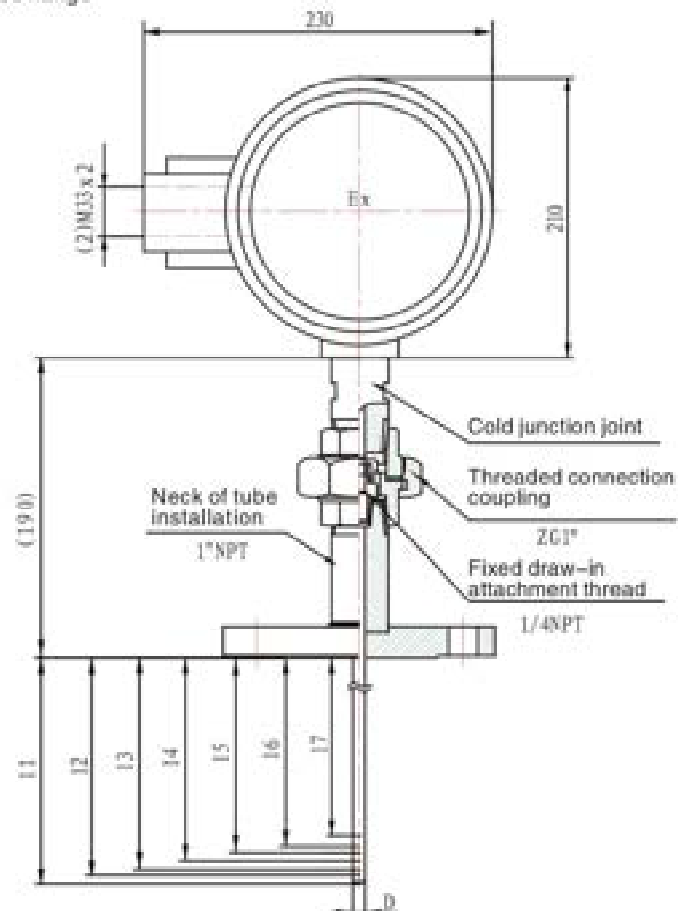
Install fixing device

1 No fixed installation device

2 Fixing thread

3 Cutting ferrule thread

4 Fixed flange



11.5.3 螺纹锥形温度套管式热电偶、热电阻

Technical parameter table

Thermo-couple RTD	Thermometer well	E	D	Designed parameter			Operating temperature	Sheath material
				Pressure	Flow rate	Resonance frequency		
K or Pt100	≤375mm	NPT3/4	Φ19	< 6.4MPa	10m/s	≠ 1 ± 0.2	0~580℃	321 316
		NPT 1	Φ22					

Model mark: WR KG - / 60

WRKKG

MI thermocouple K type

WZPKG

Armored RTD Pt100

Temperature measurer

1 Single

2 Double

Install fixed device

G With reinforcing nozzle

movable bolt type

N With reinforcing nozzle

fixed bolt type

NH With reinforcing nozzle

sealing fixed bolt type

U Spring pressing type reinforcing

nozzle with flexible joint

B Leakage blocking type

Measuring side pattern

1 Ungrounded

2 Grounded

3 Ungrounded separation type

(be applicable for double-type)

Wire connection mode

3 Water-proof terminal block

(protection grade IP65)

4 Explosion-proof terminal block

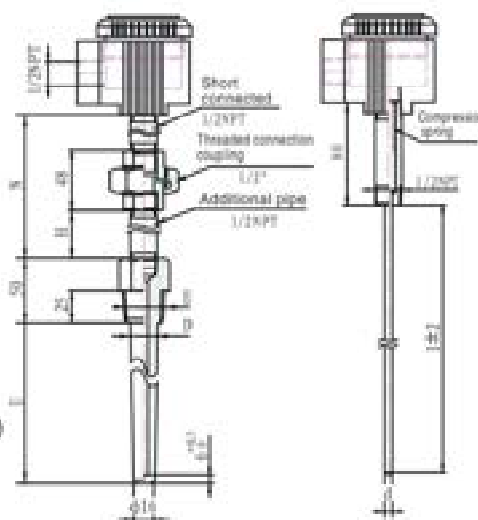
(explosion-proof grade Ex dIIBT4 or dIICT6)

5 Water-proof spring pressing

terminal block

7 Explosion-isolating type spring

pressing terminal block



11.6. Internal leakage resistant sleeve type thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Outer protection pipe	Operating temperature	Operating pressure
K S R	Single	Wear-resistant sleeve	0~1100℃	< 2.5MPa
The uses and characteristics : - It is applicable for measuring fume temperature. It can still prevent toxic or harmful gases from leaking after it wears and punches through the protection pipe.				

Model mark: WR KG - B

MI thermocouple

graduation

K type

S type

R type

Temperature measurer

1 Single

2 Double

Outer protection pipe diameter

0 Φ16 outer protection pipe

1 Φ20 outer protection pipe

(Outer diameter) special outer

diameter size thermometer well

Outer protection sleeve procedure linkage

1 No fixed procedure linkage

2 Fixed threaded connection

3 Flexible flange connection

4 Fixed flange connection

6 Overall drilling conical thermometer well

Anti-leaking type

Measuring side pattern

1 Ungrounded type

2 Body contact type

3 Ungrounded separation type (be

applicable for double)

Wire connection mode

3 Water-proof terminal block

(protection grade IP65)

4 Anti-explosion terminal block

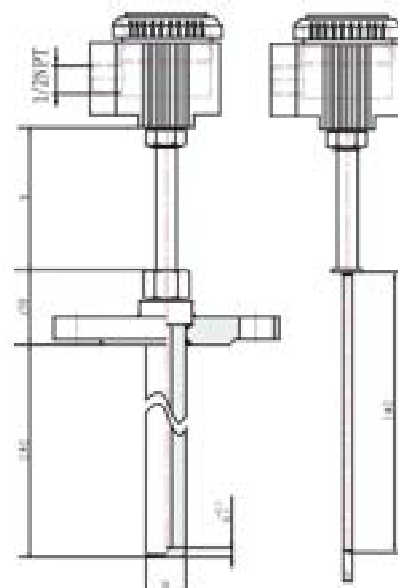
(Explosion-proof grade Ex dIIBT4 or

dIICT6)

5 Water-proof spring pressing terminal block

7 Explosion-isolating spring pressing

terminal block



PETROCHEMICAL INDUSTRY SPECIAL-PURPOSE THERMOCOUPLE, RTD

11.7 Anti-corrosion protection pipe type RTD

Technical parameter table

RTD	Temperature measurer	Outer protection pipe	Anti-corrosion protection layer	Operating temperature	Operating pressure
Pt100	Single or double	316L+F46	PTEE wall thickness 1.2mm	0~300℃	Normal pressure

The uses and characteristics :

- It is applicable for measuring the temperature in strongly corrosive acid substance in the chemical industry.

Model mark: WZPF◇ - □□□

RTD Pt100

Anti-corrosive code F

Temperature measurer

1 Single (can be omitted)

2 Double

Outer protection pipe

0 Φ18.5 outer protection pipe

(steel tube Φ16+F46)

1 Φ14.5 outer protection pipe

(steel tube Φ12+F46)

Cold junction form

2 Anti-splash terminal block type

3 Water-proof terminal block type

4 Explosion-proof terminal block type

Install fixed device

1 No fixed installation device

2 Fixed thread (material: F46)

4 Fixed flange (304 stainless steel flange + F46 gasket)



12. Metallurgy industry special-purpose thermocouple

12.1. High temperature purpose thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Mark	Outer protection pipe		Operating temperature	Operating pressure
			Material	Diameter		
S R B	Single or double	T1	85% Al_2O_3	$\Phi 16$ 或 $\Phi 25$ (Double-layer sleeve)	0~1450℃	Normal pressure
		T2	99% Al_2O_3		1600℃	
		T2+	99.7% Al_2O_3			

The uses and characteristics ;

• It is applicable for use in high temperature oxidizing atmospheres. It easily gets cracked in thermal cycling conditions. It can not be used in the atmosphere which contains sulfur or hydrogen.

Model mark:

WR /

Thermocouple graduation

S type

R type

B type

Temperature measurer

1 Single (can be omitted)

2 Double

Outer protection pipe material

T1 85% Al_2O_3

T2 99% Al_2O_3

T2+ 99.7% Al_2O_3

Protection pipe outer diameter

0 $\Phi 16$ ceramic outer protection pipe

1 $\Phi 25$ ceramic double-layer outer protection pipe

3 $\Phi 20$ ceramic outer protection pipe

Terminal block form

3 Water-proof type

4 Explosion-isolating type

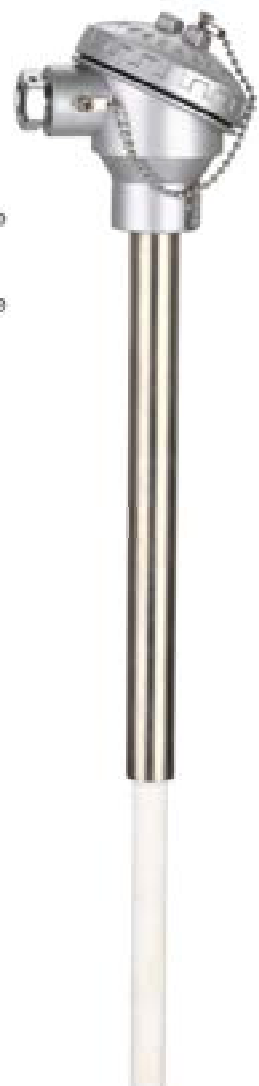
Install fixed form

1 Not install fixed device

2 Fixed thread

3 Loose flange

4 Fixed flange



12.2. Recrystal silicon carbide protection pipe thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Mark	Outer protection pipe			Operating temperature	Operating pressure
			Material	Density	Diameter		
S R B	Single	S ₁	SiC ≥ 99.3%	≥ 2.7g/cm ³	Φ25 (Double-layer sleeve)	0~1600℃	Normal pressure

The uses and characteristics :
 • It has sound sulfur resistance. It can be used in high temperature combustion furnace. It has strong strength of thermal shock resistance.

Model mark: WR C / S₁

Thermocouple graduation
 S type
 R type
 B type

SiC protection pipe
 Recrystal silicon carbide protection pipe
 Protection pipe outer diameter
 1 Φ25 ceramic double-layer outer protection pipe
 Terminal block form
 3 Water-proof type
 4 Explosion-isolating type
 Install fixed form
 1 Not install fixed device
 2 Fixed thread
 3 Loose flange
 4 Fixed flange

12.3 Nitrogen combination silicon carbide protection pipe thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Mark	Outer protection pipe			Operating temperature	Operating pressure
			Material	Density	Diameter		
S R B	Single	S ₂	75%SiC 25%Si3N4	≥ 2.62g/cm ³	Φ30 (Double-layer sleeve)	0~1600℃	Normal pressure

The uses and characteristics :
 • It can resist corrosion from aluminum solution in high temperature. It can be used as temperature protectionsleeve to aluminum solution.

Model mark: WR C / S₂

Thermocouple graduation
 S type
 R type
 B type

SiC protection pipe
 Nitrogen combination silicon carbide protection pipe
 Protection pipe outer diameter
 30 Φ30ceramic double-layer outer protection pipe
 Terminal block form
 3 Water-proof type
 4 Explosion-isolating type
 Install fixed form
 1 Not install fixed device
 2 Fixed thread
 3 Loose flange
 4 Fixed flange



13. Mould plastic machine special-purpose thermocouple

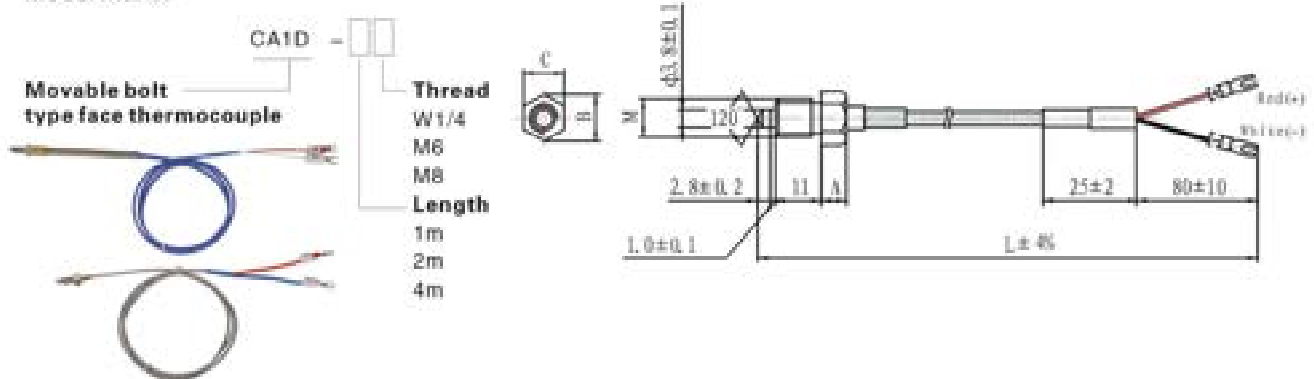
13.1. Movable bolt type face thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side pattern	Thermocouple conductor wire gauge
K	Single	Grounded type	AWG 22 2x0.62
Size Threaded M	W 1/4	M6	M8
A (mm)	4.3	4	5.3
B (mm)	12.5	11.5	15
C (mm)	11	10	10

Note: All the parts accord with European Union ROHS Certification.
The manufactory passes ISO14001 Environmental Supervision System Certification.

Model mark :



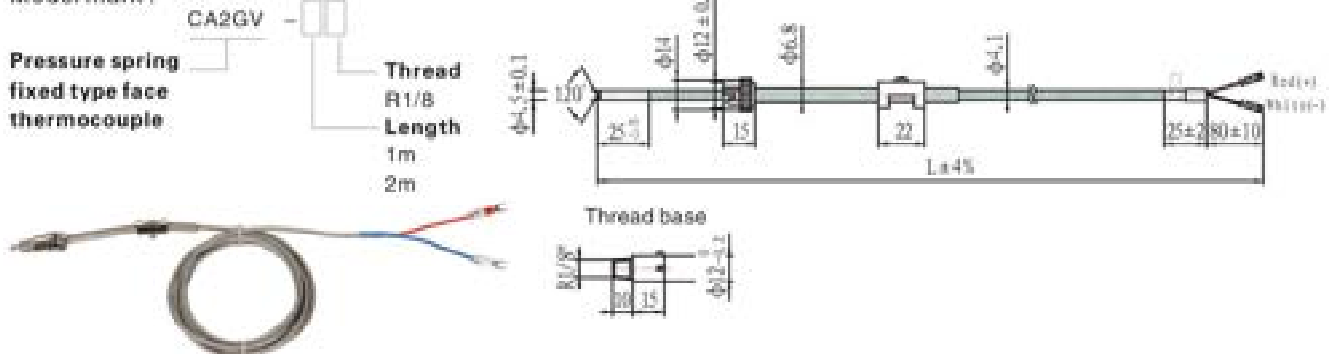
13.2. Pressure spring fixed face thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side pattern	Thread base	Thermocouple conductor wire gauge
K	Single	Grounded type	R 1/8	AWG 22 2x0.62

Note: All the parts accord with European Union ROHS Certification.
The manufactory passes ISO14001 Environmental Supervision System Certification.

Model mark :



MOULD PLASTIC MACHINE SPECIAL-PURPOSE THERMOCOUPLE, RTD

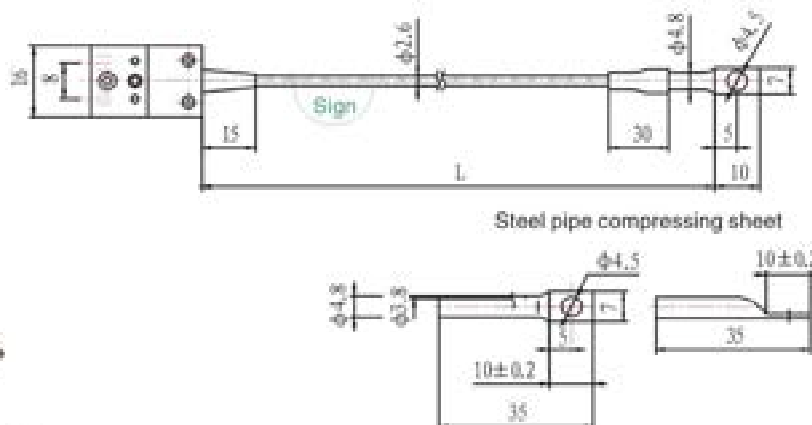
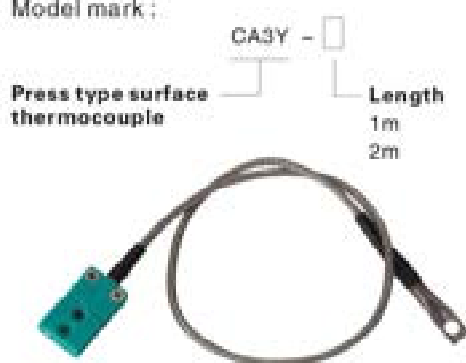
13.3. Press type surface thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Temperature measurer	Tap hole	Thermocouple conductor wire gauge
K	Single	Grounded type	Φ4.5	AWG 24 2x0.2/7

Note: All the parts accord with European Union ROHS Certification.
The manufactory passes ISO14001 Environmental Supervision System Certification.

Model mark :



13.4. Pin type armored thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side pattern	Thermocouple outer diameter MI	Operating temperature	Conductor heat resistance	Thermocouple conductor wire gauge
K or J	Single	Ungrounded type	Φ1 Φ1.5 Φ1.6	0~600℃	<400℃	AWG 24 2x0.2/7

The uses and characteristics:
 • All the parts accord with European Union ROHS Certification. The manufactory passes ISO14001 Environmental Supervision System Certification.
 • Pin type armored thermocouple is fit for measuring spray nozzle temperature matching with electric heating ring in hot runner mould. It can be embedded into the mould wiring duct. Conductor heat resistance <400℃

Model mark : WR K - 103T / x +

MI thermocouple

K graduation

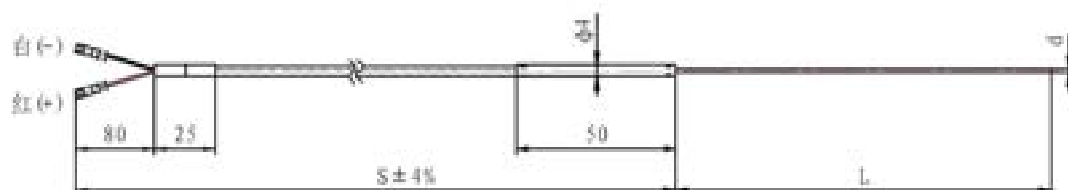
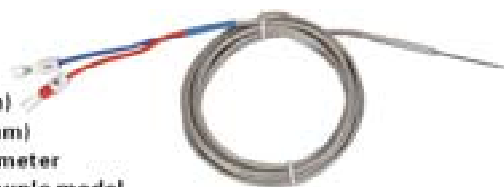
J graduation

Sector conductor length (m)

MI thermocouple length (mm)

MI thermocouple outer diameter

Pin type armored thermocouple model



14. Special thermocouple, RTD

14.1. Fine armored thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side pattern	MI Thermocouple outer diameter	Operating temperature	Conductor heat resistance	Thermocouple conductor wire gauge
K	Single	Ungrounded or grounded	Φ0.5 Φ0.8 Φ1.0	0~400℃	<100℃	AWG 24 2x0.2/7

The uses and characteristics:

- All the parts accord with European Union ROHS Certification.

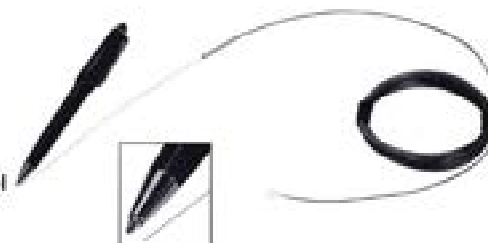
The manufactory passes ISO14001 Environmental Supervision System Certification.

- Fine armored thermocouple is applicable for quickly measuring the temperature variation of the tested substance.

Model mark : WR K -103 / x +

MI thermocouple
K graduation

Sector conductor length (m)
MI thermocouple length (mm)
MI thermocouple outer diameter
Fine armored thermocouple model



14.2. Quick reducing type Mineral Insulated thermocouple

Technical parameter table

Thermocouple	Temperature measurer	Measuring side pattern	MI Thermocouple outer diameter	Operating temperature	Operating Pressure	Heat responsive time
K	Single	Grounded or ungrounded	Φ6.4縮徑到Φ4.8 Φ4.8縮徑到Φ3.20~800℃	0~800℃	2.5MPa	<1.7s

The uses and characteristics:

- All the parts accord with European Union ROHS Certification.

The manufactory passes ISO14001 Environmental Supervision System Certification.

- Fine armored thermocouple is applicable for quickly measuring the temperature variation of the tested substance.

Model mark : WR KG ◊ - 4

MI thermocouple
K graduation

Install fixed device
WG No fixed installation device
GL Fixed thread
HK Flexible cutting ferrule thread
GK Fixed cutting ferrule thread
Wire connection mode
3 Water-proof terminal block (grade of protection IP65)
4 Explosion-proof terminal block
(anti-explosion grade Ex dIIBT4 or dIICT6)



14.3. "Buried type" shock resistant type sheath RTD

Summary

It is a new generation structure type sheath RTD elaborately designed and manufactured by this company with a combination of years' productive experience and the internationally fashionable mounted structures. This serial products conform with the international electricians' Committee IEC standard. It is widely applied in the modernized equipments in the fields such as petroleum, chemicals, chemical fibre, electric force, machinery, atomic energy, aviation etc.

The structural features:

Unique "Auqi inner buried type" sheath platinum RTD structure

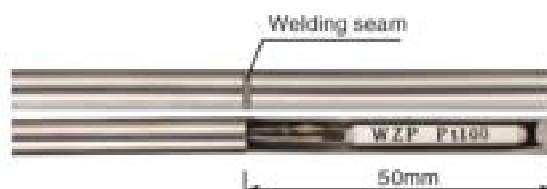
More firm mechanical strength of the measuring end

"Auqi inner buried type" sheath platinum RTD may reduce the breaking possibilities caused during transportation or usage.

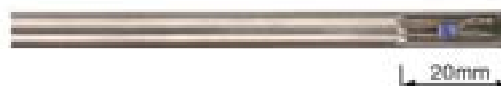


Our patent is protected by Chinese Law.

Butt welded tube sheath Pt RTD



"Auqi inner buried type" sheath Pt RTD



It has no butt seam.

Better shock resistant performance:

The damage of the platinum RTD, i.e. The wire breaking of the platinum RTD elements is mostly due to vibrations.

"Auqi inner buried type" sheath platinum RTD may greatly increase the sensor anti-vibration performance, therefore prolongs its use life.



It has solid magnesia powder filler and shock-resistant platinum resistance thermometer sensor elements.

More bendable length and radius:

In some special occasions, it is very near and crooked towards the measuring ends.

"Auqi inner buried type" sheath platinum RTD is much better than the butt joint sheath platinum RTD.

The bendable length: non-bending within 50mm of the measuring end tip. The bending radius: 2.5 times of the sheath platinum RTD exterior diam.



Only 20mm is available for measuring terminal element.

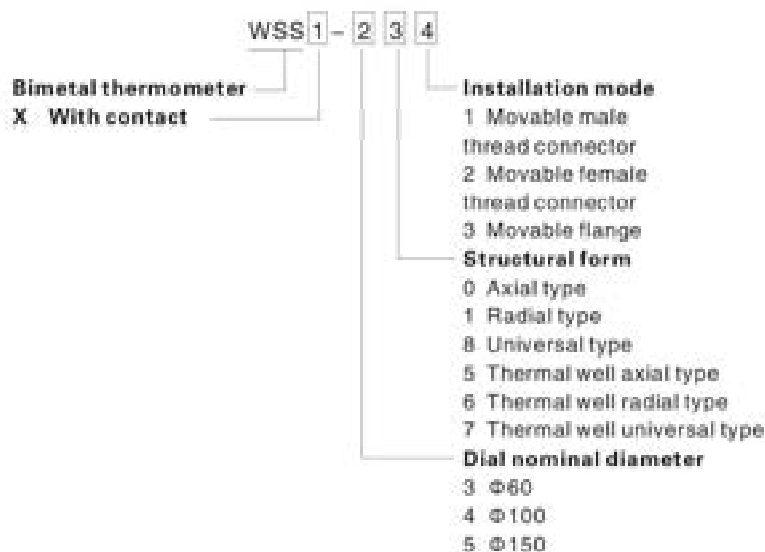
1. Principle of bimetal thermometer

Principle of bimetal thermometer: Weld and fix one end of bimetal sheet which has been wound into spiral tube. Another end connects with indicator needle shaft. When the temperature changes, it also varies bimetallic element curvature. Indicator needle shaft spurs on pointer for deflexion, therefore it indicates the temperature variation in dial scale.

Technical parameter table

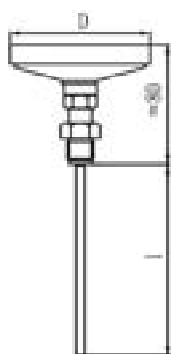
Temperature range		Accuracy class	Protection pipe diameter	Insertion length l (mm)	Designed pressure	Protection grade	Electric contact	
Scale	Scale division value						Rated power of the contact	Operating voltage
-60~+40℃	2℃	Class 1.5 (1.5% of the range)	Φ6 Φ8 Φ10 Φ12	100~2000	≤6.4MPa	IP65	≤ 10W	≤380V
-40~60℃	2℃							
-20~+80℃	2℃							
0~50℃	1℃							
0~100℃	2℃							
0~150℃	2℃							
0~200℃	5℃							
0~300℃	5℃							
0~400℃	10℃		* Thermal well type	100~250	≤40MPa			
0~500℃	10℃							
0~600℃	10℃							
The uses and characteristics:								
• ISite temperature display								
• Thermometer well can draw reference from "9.3 four-pipeline thermometer well" technical parameter coordination.								

2. Model mark

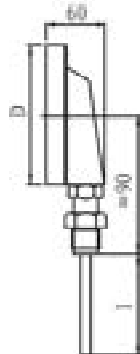




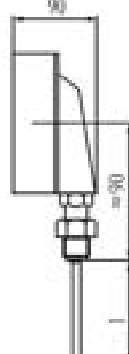
Axial type



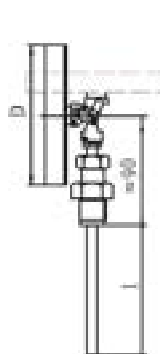
Radial type



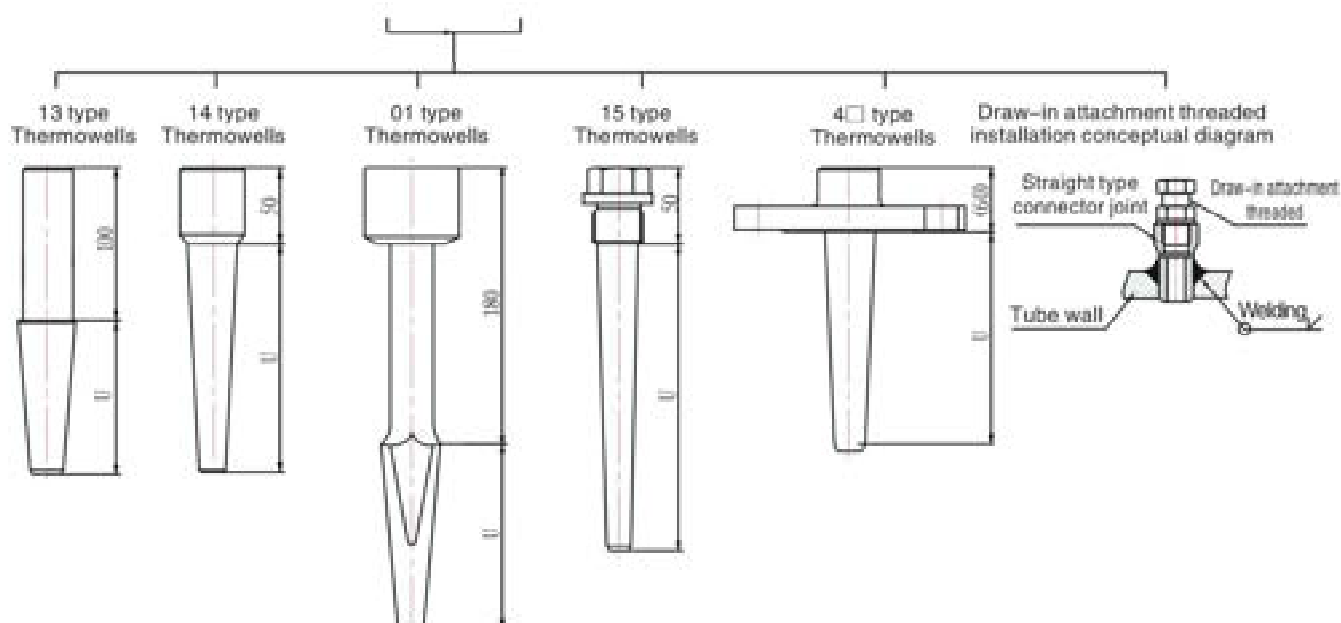
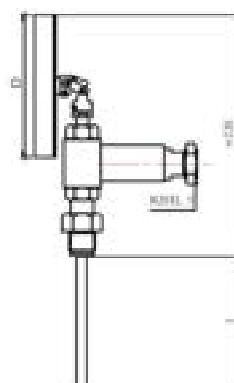
With contact



Universal type



With RTD or thermocouple



Attachment 1

VARIOUS COUNTRIES THREAD CODES,
OLD AND NEW STANDARDS COMPARISON TABLE

Standards	British system pipe thread (55°)				NPTF (60°)	
	Non sealing BSPP GB/T 7307-2001 ISO 228-1:2000		Sealed BSPT GB/T 7306.1/2-2000 ISO 7-1:1994		Ordinary sealing BSPT GB/T12716-2002 ASME B1.20.1-1983	
	Male thread	Female thread	Male thread	Female thread	Male thread	Female thread
Pipe Thread standards	G		R (Used from 1987 to 1999)	Rc	NPT	
			R ₁ or R ₂ (use after 2000)			
(Old) Mechanical Drafting Standard	G		2G		Z	
(Old)	BSP		BST		---	
(Old) Japan & Korea	PF		PT		---	

• Attachment 2

COMMONLY-USED METAL MATERIALS
SINO-FOREIGN COMPARISON TABLE AND USES

Mark	Chinese materials trademarks	Overseas materials trademarks	Highest operating temperature	Material use
A	1Cr18Ni9Ti 0Cr18Ni10Ti	ASTM 321	930℃	It has sound anti-corrosion in phosphoric acid and dilute nitric acid.
B	0Cr18Ni9 00Cr19Ni10	ASTM 304 ASTM 304L	930℃	Acid-resistant stainless steel is applicable for food and pharmaceutical industries.
C	0Cr17Ni12Mo2 00Cr17Ni14Mo2 0Cr18Ni12Mo2Ti	ASTM 316 ASTM 316L ASTM 316Ti	980℃	It is especially fit for anti-corrosion in marine atmosphere, inorganic acid, organic acid & alkali, uric acid, dilute sulphuric acid and acetic acid.
D	0Cr25Ni20	ASTM 310S	1100℃	It belongs to iron series high chrome stainless steel. It has good high temperature oxidation resistance. It can usually be used in heat treatment furnace of oxidizing atmosphere.
E	00Cr22Ni5Mo3N (double-phase stainless steel 2205)	S31803	800℃	The outstanding properties shows in high yield strength. It resists stress corrosion cracking and is anti-corrosive in acid medium with high chloridion concentration.
F	PTFE cladding (F46)	PTFE	180℃	It resists various acids and alkalis.
G	GH3030	* Inconel600	1100℃	Nickel-based heat-resistant and anti-corrosive alloy resists oxidizability and highly resists corrosion in various waste gas, alkali solution and most organic acid and compounds.
HB	00Ni70Mo28V	(Hastelloy Alloy B-2)	870℃	Nickel molybdenum base anti-corrosive alloy is famous for resisting hydrochloric acid. It has been reputed as the best alloy among HCl and H2SO4 corrosive media. But it can not be used in oxidants.
HC	00Cr15 Ni60Mo16W4	(Hastelloy Alloy C-276)	900℃	Anti-corrosive heat-resistant alloy superiorly resists corrosion in oxidation-reduction medium, for example, it nicely resists corrosion in wet / dry chlorine gas, nitric acid (<50℃), hydrochloric acid, sulphuric acid, phosphoric acid, acetic acid, hypochlorite, iron chloride, cupric chloride, caustic soda, sea water.
I	00Cr19Ni13Mo3	ASTM 317L	800℃	It belongs to ultra-low carbon stainless steel containing molybdenum. It superiorly resists corrosion, especially in urea & chemical fiber industries.
J	HR1300, HR3214 (3YC52, Alloy214)	---	1250℃	It has the more superior antioxidizability than Gh3030 and Inconel600.
M	Investment casting wear-resistant head	---	1300℃	Investment casting heat-proof, wear-resistant and anti-corrosive alloy is applicable for Fluid Bed Dryers boiler high temperature coal powder granules, coal mill and industrial cement furnace.
MK	Ni70Cu30Al	(Monel K-500)	500℃	Magnet-free anti-corrosive Ni-Cu alloy is famous for resisting hydrofluoric acid and alkali. It is strictly forbidden to use fuel heating which contains S, Pb etc. in hot-working the alloy. It will deteriorate the mechanical properties of alloy and results in hot brittleness.
N	Wear-resistant (anti-corrosion) painted	---	600℃	Electric arc spraying is applicable for fume wear-resistant painting or sulfur corrosion in sulfur firing furnace.

• Attachment 2

COMMONLY-USED METAL MATERIALS
SINO-FOREIGN COMPARISON TABLE AND USES

Mark	Chinese materials trademarks	Overseas materials trademarks	Highest operating temperature	Material use
S ₁	Recrystal SiC	SiC	1700℃	It is fit for high furnace top.
S ₂	Nitrogen combination SiC (Si3N4)	NBSC	1600℃	It is fit for aluminum solution.
T ₁	High aluminum	85% Al ₂ O ₃	1450℃	It contains 85% Al ₂ O ₃ . It can be used in high temperature oxidizing atmosphere. It will be easily cracked in thermal cycling. It can not be used in the atmosphere which contains sulfureted hydrogen.
T ₂	Corundum	99% Al ₂ O ₃	1600℃	It contains 99% Al ₂ O ₃ . It can be used in high temperature oxidizing atmosphere. It will be easily cracked in thermal cycling. It can not be used in the atmosphere which contains sulfureted hydrogen.
TP91	----	ASTM A335P91	600℃	Power plant creep resisting CrMo steel is applicable for supercritical unit main steam and reheat (RH) hot section pipeline thermometer well.
TP92	----	ASTM A335P92	650	Power plant creep resisting CrMo steel is applicable for ultra-supercritical unit main steam and reheat (RH) hot section pipeline thermometer well.
TP11	----	ASTM A335P11 (A691Cr1-1/4CL22)	500℃	Power plant creep resisting CrMo steel is applicable for four-pipeline reheat (RH) system, upper side system thermometer well.
TP22	----	ASTM A335P22 (A691Cr2-1/4CL22)	535℃	
TP347	0Cr18Ni11Nb	ASTM 347	600℃	Austenite creep resisting stainless steel containing Nb is applicable for power plant steam conduit thermometer well.
V ₁	12Cr1MoV	Cr.65	500℃	Power plant creep resisting CrMo steel is applicable for steam conduit thermometer well.
V ₂	15CrMo	----	500℃	Power plant creep resisting CrMo steel is applicable for steam conduit thermometer well.
W	----	WB36 (15NiGuMoNb5)	500℃	Power plant creep resisting Mo steel is applicable for feed water piping thermometer well.

Note: " * " chemical composition are not completely the same.

• Attachment 3

CHEMICAL COMPOSITION TABLE OF STAINLESS
STEEL PROTECTION PIPE

Mark	Materials	Chemical composition (%)							
		C	Si	Mn	P	S	Ni	Cr	Others
A	1Cr18Ni9Ti	≤0.12	≤1.00	≤2.00	≤0.035	≤0.03	8~11	17~19	Ti : [5x(C-0.02)] - 0.80
	0Cr18Ni10Ti ASTM 321	≤0.08	≤1.00	≤2.00	≤0.035	≤0.03	9~12	17~19	Ti ≥ 5xC
B	0Cr18Ni9 ASTM 304	≤0.07	≤1.00	≤2.00	≤0.035	≤0.03	8~11	17~19	---
	00Cr19Ni10 ASTM 304L	≤0.03	≤1.00	≤2.00	≤0.035	≤0.03	8~12	18~20	---
C	0Cr17Ni12Mo2 ASTM316	≤0.08	≤1.00	≤2.00	≤0.035	≤0.03	10~14	6~18	Mo: 2~3
	0Cr17Ni14Mo2 ASTM316L	≤0.03	≤1.00	≤2.00	≤0.035	≤0.03	12~15	6~18	Mo: 2~3
	0Cr18Ni12Mo2Ti ASTM 316Ti	≤0.08	≤1.00	≤2.00	≤0.045	≤0.03	11~14	6~18	Mo: 2~3 Ti : (5xC)- 0.70
D	0Cr25Ni20 ASTM 310S	≤0.08	≤1.00	≤2.00	≤0.045	≤0.03	19~22	24~26	---
E	00Cr22Ni5Mo3N (Biphase stainless steel2205) S31803	≤0.03	---	---	---	---	5	22	Mo: 2.8 N: 0.15
G	GH3030	≤0.12	≤0.80	≤0.70	≤0.03	≤0.12	余 (>75)	19~22	Fe: ≤1.5
	Inconel600	≤0.15	≤0.50	≤1.00	≤0.03	≤0.15	>72	14~17	Fe: 6~10 Cu: < 0
I	00Cr19Ni13Mo3 ASTM 317L	≤0.03	≤1.00	≤2.00	≤0.035	≤0.03	11~15	18~20	Mo: 3~4
TP347	0Cr18Ni11Nb ASTM 347	≤0.08	≤1.00	≤2.00	≤0.035	≤0.08	9~13	17~19	Nb≥10xC%

Attachment 3

CHEMICAL COMPOSITION TABLE OF ALLOY
MATERIAL PROTECTION PIPES

Mark	Materials	Chemical composition (%)													
		C	Si	Mn	Al	Cu	Cr	Ni	Mo	W	V	Nb	B	N	Others
HB	00Ni70Mo28V (Hastelloy Alloy B-2)	< 0.05	< 1.00	< 1.00	----	----	----	Beyond (>65)	26-30	----	1.4- 1.7	----	----	----	Fe: < 1.00
HC	00Cr15Ni60 Mo16W4 (Hastelloy Alloy C-276)	< 0.02	< 0.05	< 1.00	----	----	14.5- 16.5	Beyond (>51)	15-17	3-4.5	< 0.35	----	----	----	Fe: 4-7 Co: < 2.5
J	3YG52 (Ni45Cr17Al)														
MK	Ni70Cu30Al (Monel K-500)	< 0.25	≤ 1.0	< 1.5	2.0 -4.0	Beyond (>21)	----	63-70	----	----	----	----	----	----	Fe: < 2.00
TP91	ASTM A335P91	0.08- 0.12	0.20- 0.50	0.30- 0.60	< 0.040	----	8.00- 9.50	< 0.40	0.85- 1.05	----	0.18- 0.25	0.06- 0.10	----	0.03- 0.07	----
TP92	ASTM A335P92	0.07- 0.13	< 0.50	0.30- 0.60	< 0.04	----	8.00- 9.50	< 0.40	0.30- 0.60	1.50- 2.00	0.15- 0.25	0.04- 0.09	----	0.001- 0.006	0.03- 0.07
TP11	ASTM A335P11 (A691Cr1- 1/4CL22)	0.10- 0.17	0.10- 0.35	0.40- 0.70	< 0.04	----	0.70- 1.10	----	0.45- 0.65	----	----	----	----	----	----
TP22	ASTM A335P22 (A691Cr2- 1/4CL22)	0.08- 0.15	0.15- 0.40	0.30- 0.70	< 0.04	----	2.00- 2.50	----	0.90- 1.20	----	----	----	----	----	----
V ₁	12Cr1MoV Cr.65														
V ₂	15CrMo														
W	WB36 (15NiGuMoNb5)	< 0.17	0.25- 0.50	0.80- 1.20	< 0.05	0.50- 0.80	< 0.30	1.00- 1.30	0.25- 0.50	----	----	0.015- 0.045	----	----	----

Standard allocation

Thermocouple,RTD common purpose terminal block category

Assembly type water-proof terminal block(2-6poles)
recommend for use
Material: aluminium cast



Product order code S-0201



Germany water-proof terminal block(2-6 poles)
Material:aluminium cast



Product order code S-0202



Sheath type water-resistant terminal block(2-6poles)
recommend for use
Material: aluminium cast

Product order code S-0203



Small water-proof terminal block(2-4poles)fit for limited
mounted occasions
Material: aluminium cast

Product order code S-0204



Standard allocation

Straight type explosion-proof terminal block(2-6poles)
recommend for use
Explosion isolation grade: dIIBT4
Material: aluminium cast

直式防爆接线盒 (接线座2-6个) 推荐使用
隔爆等级: dIIBT4
材料: 铸铝

Product order code S-0205



圆式防爆接线盒 (接线座2-6个)
隔爆等级: dIIBT4 dIICT6
材料: 铸铝 材料: 304

Circular explosion resistant terminal block(2-6 poles)
Explosion isolation grade: dIIBT4 dIICT6
Material: aluminium cast Material: 304

Product order code S-0206



stainless steel water-proof terminal block(2-6 poles)
fit for limited erection occasions
Material: 304

Product order code S-0207



Hanging type water-proof terminal block(2-6 poles)
Material: aluminium cast

Product order code S-0208



Standard allocation

The thermocouple, RTD common uses handles

Code	Product order code S-0308	
Model	/PH-01	/PH-02
Connecting thread	M16x1	Φ12
Product picture		

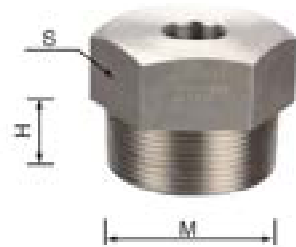
The thermocouple, RTD common uses connectors

Product order code S-0309	
Uniform set flat connector Model: /PP-01	
Universal meter connector Model: /PP-02	
Instrument connector Model: /PP-03	
Cable type connector (positioning clamp type) Model: /PP-04	
Cable type connector (quick inter face type) Model: /PP-05	

The common use threads of the thermocouple, RTD

Fixed welding thread

Material: 321 or 316L (321 or 316L)

Product order code S-0301					Product order code S-0302			
Model	M	H	S	D	型号	M	H	S
/PS-01	M27x2	32mm	32mm	Φ39	/PS-06	1/8NPT	10mm	16mm
/PS-02	M33x2	32mm	36mm	Φ44	/PS-07	1/4NPT	14mm	19mm
/PS-03	G1/2"	20mm	27mm	Φ34	/PS-08	1/2NPT	20mm	27mm
/PS-04	G3/4"	25mm	32mm	Φ39	/PS-09	3/4NPT	25mm	32mm
/PS-05	G1"	30mm	36mm	Φ44	/PS-10	1NPT	30mm	38mm
								
10MPa (Nominal pressure)								

Standard allocation

Cutting sleeve thread

Product order code S-0303							Product order code S-0304						
Model	/PS-11	/PS-12	/PS-13	/PS-14	/PS-15	/PS-16	/PS-17	/PS-18	/PS-20	/PS-21	/PS-22	/PS-23	/PS-24
Param- size d	Φ2.0	Φ3.0	Φ4.0	Φ5.0	Φ6.0	Φ8.0	Φ1.6	Φ3.2	Φ4.8	Φ6.4	Φ8.0	Φ9.5	Φ12.7
M	M12x1.5			M16x1.5			1/8NPT			1/4NPT		1/2NPT	
H	15			15			10			14		20	
S	19			22			16			19		27	
The conceptual diagram													
	Nominal pressure												
Fixed cutting sleeve thread=2.5MPa Movable cutting sleeve thread=Normal pressure													

The thermocouple, RTD common purposes flanges

Flexible flange

Material: Cast iron

Cutting sleeve flange

Material: 321, 316L

Product order code S-0305			
D	K	The conceptual diagram	Normal pressure
Flange external diameter	Quadrupuntal center to center spacing		Normal pressure

Product order code S-0305							
Model	/PF-04	/PF-05	/PF-06	/PF-07	/PF-08	/PF-09	/PF-10
Param size d	Φ2.0	Φ3.0	Φ4.0	Φ5.0	Φ6.0	Φ8.0	Φ12.0
D	Φ50			Φ60		Φ75	
D ₀	Φ36			Φ42		Φ50	
d ₀	Φ7			Φ9		Φ11	
S	19			22		27	
The conceptual diagram							
	Fixed cutting sleeve thread=2.5MPa Movable cutting sleeve thread=Normal pressure						