WR□K、WRG□K 系列铠装热电偶

WR □ K, WRG □ K series armoured thermocouple

安装使用说明书

Installation Manual

上海南浦仪表厂

Shanghai nanpu meter factory

一、 概述

铠装热电偶是新型的温度传感器，具有体形细长、热响应快、抗震动、耐高压、使用寿命长等优点。它们与显示仪表配套，可实现对气体、液体介质和固体表面温度的自动检测或自动调节，广泛应用于石油、化工、冶金、机械、电力、轻纺、食品、原子能、宇航等工业部门和科技领域，尤其适宜安装在管道狭窄弯曲和要求快速反应、微型化等特殊场合。

我厂于 **1985** 年引进日本冈崎制作所制造铠装热电偶全套先进技术和设备。由此制造的 **WR□K** 和 **WRG□K** 系列铠装热电偶均按国际电工委员会 **IEC** 标准生产，产品符合国家最新专业标准。

二、 作用原理

铠装热电偶的作用原理，是基于 **Seebeck**（塞贝克）效应，即：如果两种不同成分的均质导体（热电极）组成闭合回路，当两端存在温度梯度时，回路中就有电流通过，那么两端之间就存在 **Seebeck** 电势—热电势。

注：热电偶的热电动势随温度的升高而增大，其热电势的大小与热电偶的材料和热电偶两端的温度有关，而与热电极的长度、直径无关。

三、铠装热电偶的基本性能：

品 种	产 品 型 号		分度号	允 差 等 级		
				Ⅰ	Ⅱ	Ⅲ
	统 设	引 进		允 差 值（±）	允 差 值（±）	允 差 值（±）

镍 铬- 镍　　硅	WRNK	WRGKK	K	1.5℃或 0.4%t	2.5℃或 0.75%t	2.5℃或 1.5%t
镍铬硅- 镍　　硅	WRMK	WRGNK	N			
镍 铬- 康　　铜	WREK	WRGEK	E			
铁-康铜	WRFK	WRGJK	J			
铜-康铜	WRCK	WRGTK	T	0.5℃或 0.4%t	1℃或 0.75%t	1℃或 1.5%t

品　种	产　品　型　号		分度号	允　差　值 （±）
	统　　设	引　　进		
铂铑 10- 铂	WRPK	WRGSK	S	3℃或 0.5%t
铂铑 13- 铂	WRQK	WRGRK	R	
铂铑 13- 铑 铂 6	WRRK	WRGBK	B	4℃或 0.5%t

注：（1）t 为被测温度（℃），在同一栏给出的两种允差值中，取绝对值较大者。

（2）在-40℃以上的温度范围符合Ⅰ、Ⅱ级允差的 T、E、K 型热电偶，又要求在-40℃以下符合Ⅲ级允差时，由制造厂与用户商定。

四、 铠装热电偶套管材料，外径和测温范围

品　　种	套 管 材 料	外　　径 （mm）	最高使用温度 （℃）
镍铬-镍硅 （K）	不 锈 钢 1Cr18Ni9Ti	0.25	250
		0.5、1.0	400
		1.5、2.0	600
		3.0、4.0、4.5、5.0、 6.0、8.0	800
	高 温 合 金 钢 GH3030	0.25	300
		0.5、1.0	500
		1.5、2.0、3.0	800
		4.0、4.5、5.0	900
		6.0、8.0	1000

镍铬硅-镍硅（N）	不锈钢 1Cr18Ni9Ti	0.25	250
		0.5、1.0	400
		1.5、2.0	600
		3.0、4.0、4.5、5.0、6.0、8.0	800
	高温合金钢 GH3030	0.25	300
		0.5、1.0	500
		1.5、2.0	800
		3.0、4.0、4.5	900
		5.0、6.0、8.0	1000
镍铬-康铜(E)	不锈钢 1Cr18Ni9Ti	0.5、1.0	400
		1.5、2.0	500
		3.0、4.0、4.5、5.0 6.0、8.0	600
铁-康铜（J）	不锈钢 1Cr18Ni9Ti	0.5、1.0	300
		1.5、2.0	400
		3.0、4.0、4.5、5.0	500
		6.8、8.0	600
铜-康铜（T）	不锈钢 1Cr18Ni9Ti	0.5、1.0	200
		1.5、2.0、3.0、4.0、4.5、5.0	250
		6.0、8.0	300
铂铑$_{10}$-铂(S) 铂铑$_{13}$-铂（R）	高温合金钢 GH3039	2.0、3.0、4.0、4.5	1000
		5.0、6.0	1100
	铂铑 6	2.0、3.0、4.0、4.5 5.0、6.0	1100
铂铑$_{30}$-铂铑$_{6}$（B）	铂铑 6	2.0、3.0	1200
		4.0、4.5、5.0、6.0	1300

注：使用温度与被测介质状况和环境条件等因素有关，故仅供用户参考，测量端为露端型时，使用温度应相应降低。

五、 常温绝缘电阻

绝缘型铠装偶在环境温度为 20±15℃，相对湿度不大于 80%时，热电极与外套管之间的绝缘电阻应符合下列规定。

铠装偶直径（mm）	试验电压（直流 V）	绝缘电阻 MΩ·m
0.25	50±5	≥100
0.5~1.5	50±5	≥1000
>1.5	500±50	≥1000

注：1.绝缘电阻用 MΩ·m 表示，即为常温绝缘电阻与铠装偶长

度的乘积，例如：**1000MΩ・m** 表示

1m 长试样的绝缘电阻为 **1000MΩ**

10m 长试样的绝缘电阻为 **100MΩ**

对于长度小于 **1m** 的铠装偶按 **1m** 计算

2.带补偿导线的铠装偶其常温绝缘电阻按 **GB4989** 规定

3.带金属接插件的铠装偶其常温绝缘电阻与铠装偶长度的乘积≥**100MΩ・m**

六、铠装热电偶的最大热响应时间 **τ 0.5** 见下表（秒）

铠装偶直径（m） 测量端型式 热响应时间 $\tau_{0.5}$	**0.25**	**0.5**	**1.0**	**1.5**	**2.0**	**3.0**	**4.0**	**4.5**	**5.0**	**6.0**	**8.0**
露端型	**-**	**-**	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**1.0**
接壳型	**0.1**	**0.2**	**0.2**	**0.3**	**0.4**	**0.6**	**0.8**	**1.0**	**1.2**	**2.0**	**4.0**
绝缘型	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**	**2.0**	**2.5**	**3.0**	**4.0**	**6.0**	**8.0**

注：热响应时间系铠装热电偶测量端自室温空气中迅速移入沸水中起，直至其温度达到整个温度变化范围的 **50%**瞬时止所需要的时间。

七、 铠装热电偶的安装

1、 铠装热电偶的安装，应避免在炉门旁边或距加热物体过近，以及具有强磁场之处，接线盒不应碰到被测介质的容器壁。铠装热电偶参比端的温度一般不应超过 **100**℃，如果参比端套有聚乙烯塑料管时，一般不应超过 **80**℃。

2、 铠装热电偶的插入深度可按实际需要和具体情况决定，一般不

小于铠装热电偶外径的 6 倍。

3、 铠装热电偶的外露长度，用户应依据其环境温度高低和空间位置的大小予以确定。并加装合适的套管、压板或支架给予支撑，压紧和固定。以防参比端（接线盒）摇晃而损坏。在被测介质具有较大流速或按水平位置安装时，最好能在其插入部分加以支撑保护，防止弯折断裂或测量端偏离。

4、 铠装热电偶测量表面温度时，必须尽量使测量贴紧被测物体表面，以保持良好的热接触，减少测量误差。

5、 接线盒的出线孔最好朝下放置，以防水汽、灰尘和脏物等落入接线盒内。

6、 卡套装置有结构简单、使用方便等特点，对于承受压力的固定卡套式铠装热电偶，务必在调整好所需的插入深度后，立即加以拼紧，注意用力适度，以确保达到耐压密封而又不损坏的要求。

固定卡套装置再首次使用时，插入深度是可调的，一旦拧紧，插深则不再可调。

可动卡套装置，插深是可调的，但不能承受压力，如果加入适当的辅助密封调料（如石棉绳等），则亦可达到一定程度的密封要求。

7、 铠装热点偶接线

热电偶接线前，先检查补偿导线是否与热电偶分度号一致，确认一致后方可接线。热电偶接线时。先打开接线盒，按下图线路接线。接线必须牢靠。补偿导线的出线孔空隙，用橡皮垫圈塞紧后再拧紧空心螺栓，然后盖好接线盒盖子，接线时应注意补偿

导线和热电偶以及显示仪表的接线柱的极性，不可接反。对于插座式结构，应注意接线标志：“+”表示正极“－”表示负极。

为保护补偿导线不受外来的机械损坏和由于磁场而造成对电子式显示仪表的干扰，补偿导线应加以屏蔽，最好把补偿导线等装入接地的钢管内，补偿导线不得有曲折迂回等现象。

除双支式铠装偶外，单支式铠装偶在不使用切换开关的情况下，不可同时连接 2 台毫伏计，也不宜同时连接一台毫伏计和一台电位差计，否则，将会引起指示偏低或指针跳动等现象。

八、 铠装热电偶使用：

铠装热电偶插入温场后，经过一定时间，一般可以把实测温度视作被测对象的实际温度。实际上，铠装热电偶与环境间的传热在一定程度上造成了测量端与被测对象之间的温差，因此实测温度低于实际温度，反之则偏差高。

为了尽量消除上述的传热误差，一般采用以下措施：

（1）减小热电偶的辐射系数。

（2）增加被测介质的循环，在工作压力许可条件下，尽量使热电偶与被测介质间的对流传热增加。

（3）应尽可能地减小热电偶的外径。

（4）增加热电偶的插入深度，尽可能使热电偶受热部分增加。

（5）尽可能采用热传系数小的材料作铠装套管。如要热响应时间快，减少动态误差，应采用热传导系数大的材料。

两者之间是有矛盾，应根据实际需要加以舍取。

除此以外，热电偶在某些场合使用时，应注意热电极和大地之间应保持良好的绝缘，不然，将会有热电势的损耗，直接影响测量结果的准确性，严重时，甚至会影响仪表的正常运行。当热电偶用来测量变化的温场时，常有动态误差的存在。因此，还必须注意选择具有适当热响应的热电偶。热响应时间大小，是决定动态误差大小的主要因素，并与之成比例的，同时，它对温度的自动调节和控制以及温度的快速测定等起着相当重要的作用。

总之，在应用铠装热电偶测温时，首先必须正确地选型，合理地安装和使用，同时还必须力避污染，并尽可能地设法消除各种外界影响，减小附加误差，以达到测量准确、简便和耐用等目的。

铠装热点偶应经常或定期进行检查和计量，以确保它的使用可靠性。检查的项目有：铠装偶表面的侵蚀，零件缺损，绝缘电阻，往复电阻以及电特性等。

九、 可能发生的故障及其修理

序号	故障现象	可能原因	修理办法
1	没有热电势输出	1. 热电极断路 2. 测量端或参比端焊接点断路 3. 热电极为同名极	1. 更换 2. 重新焊接 3. 更换
2	热电势比应有的数值小（测量仪表示值偏低）	1. 热电偶内部电极漏电（短路） 2. 热电偶内部吸潮 3. 接线盒内接线柱短路 4. 补偿导线短路	1. 检验热电势，检查测量端焊接情况。若不合格，应予更换或重焊 2. 用兆欧表检查绝缘电阻，不合格的应予更换或切断、烘干、重新焊接

		5. 热点极变质或测量端损坏 6. 补偿导线极性接反 7. 补偿导线品种配置错误 8. 热电偶安装位置或插入深度不当 9. 热电偶参比端温度过高 10. 热电偶品种与仪表刻度不一致	3. 清洁接线板，消除短路因素 4. 短路处重新绝缘或更换补偿导线。 5. 把变质部分剪去，重新焊接测量端。 6. 重新改接 7. 换成与热电偶相对应的补偿导线 8. 改变安装位置或方法，改变插入深度 9. 正确进行参比端温度补偿 10. 更换热电偶和补偿导线，或者更换显示仪表，使之相适应。
3	热电势以应有的数值大（测量仪表示值偏高）	1. 热电偶品种与显示仪表不符。 2. 补偿导线与热电偶品种不符	1.更换热电偶和补偿导线，或者更换仪表，使之相适应 2.换成与热电偶相对应的补偿导线
4	测量仪表的示值不稳定（在测量仪表没有故障的情况下）	1. 热电偶接线柱与热点极接触不良 2. 热电偶有断续短路或断续接地现象 3. 热点极已断，或将断未断而有断续连接现象 4. 热电偶安装不牢固发生摆动 5. 补偿导线有接地、断续短路或断路现象	1. 清洁接线盒和热电极端部，重新连接好 2. 用万用表检查偶线电阻值，不合格的应予更换 3. 用万用表检查偶线电阻值，不合格的更应予更换 4. 将热电偶安装牢固 5. 找出故障处并加以修理，或者更换补偿导线
5	热电偶热电势变化	1. 热电极变质 2. 热电偶的安装位置或方法不当	1. 更换 2. 改变安装位置或方法

注：当发现以上故障情况时，应将补偿导线和接线盒分开，然后分别检查热电偶与补偿导线，待确定故障所在后，再进行处理。

十、 运输与保存

铠装热电偶及其附件在安装前，必须保存在不受震动和碰撞的地方，最合适的存放场所条件为：环境温度 **20±15**℃，相对温度不大

于 **80%**，周围空气不应含有可能使仪表另件腐蚀的介质。

铠装热电偶在长距离运输过程中应仔细地包装好

十一、 补充说明

1、 产品验收。收到本产品后，请及时按产品国家标准或我厂标准规定的出厂检验项目验收。若有质量问题，请于收货之日起一个月内（以用户来函邮戳日期为准）函告我厂，我厂将及时受理。逾期则视为已验收合格。

2、 关于热电势测试问题。热电势是微电压测试，加上外界影响，温度偏差控制诸多因素，**uV** 级测试准确十分困难，加之耐磨偶固有热电势受温度、机械振动等多种条件影响很难做到固定不变。请各位用户在验收时注意几个问题：（**1**）采用相应等级标准监测温度（**2**）标准偶与被测偶的测量端必须在同一等温区（**3**）保证足够的浸入深度（**4**）避免因绝缘体或保护管污染和漏电造成测试误差（**5**）测试时必须温度稳定（**6**）标准偶与被测偶参比端置于同一冰点（**7**）连接相同等级的补偿导线。

I. Overview

Armored TC is the new temperature sensor, a slender build, heat fast response, anti-vibration, high pressure resistance, such as a long life. And show their support instrument can be realized on the gas, liquids and solid surface temperature of the automatic detection or automatic adjustment, widely used in petroleum, chemical industry, metallurgy, machinery, electricity, textile, food, atomic energy, aerospace and other industrial sectors, and science and technology Areas, especially suitable for installation in the pipeline narrow bend and requirements of rapid reaction, special occasions, such as miniature.

I plant in 1985, Okazaki, Japan introduced by the manufacturer produced a full set of armor thermocouple advanced technology and equipment. This created by WR □ K and WRG □ K series armoured thermocouple according to the International Electrotechnical Commission IEC standards of production, the latest products in line with the state professional standards.

II. the role of principle

Armored thermocouple the role of principle, is based on the Seebeck (Seebeck) effect, that is: If two different components of heterogeneous conductor (hot electrode) of closed-loop, when the

temperature gradient exists at both ends, out of loop Current through, then there is between the two ends of Seebeck potential - thermoelectric potential.

Note: the thermocouple hot EMF-year-old rising temperature increases, its size and potential of thermoelectric materials and TC thermocouple ends of the temperature, and the hot electrode and the length, diameter has nothing to do.

III. Armored thermocouple the basic properties:

Variety	Model		Indexing	Tolerance levels		
				Ⅰ	Ⅱ	Ⅲ
	Commission set up	Introduction		Tolerance value (±)	Tolerance value (±)	Tolerance value (±)
Ni-Cr --Nickel Silicon	WRNK	WRGKK	K	1.5℃or 0.4%t	2.5℃or 0.75%t	2.5℃or 1.5%t
Ni-Cr silicon -Silicon Nickel	WRMK	WRGNK	N			
Ni-Cr - Kangtong	WREK	WRGEK	E			
Rail - Kangtong	WRFK	WRGJK	J			
Copper - Kangtong	WRCK	WRGTK	T	0.5℃or 0.4%t	1℃or 0.75%t	1℃or 1.5%t

Variety	Model		Indexing	Tolerance value (±)
	Commission set up	Introduction		
Platinum and rhodium 10 - Platinum	WRPK	WRGSK	S	3℃ or0.5%t
Platinum and rhodium 13 - Platinum	WRQK	WRGRK	R	

Platinum and rhodium 13 - platinum and rhodium 6	WRRK	WRGBK	B	4℃or0.5%t

Note: (1) t is measured temperature (℃), in the same field are the two values of tolerance, for the greater absolute value.

(2) -40 ℃ over the temperature range in line with Ⅰ, Ⅱ level of tolerance T, E, K thermocouples, also requested in -40 ℃ with the following grade Ⅲ Tolerance, from factories and users agreed.

IV. Armoured thermocouple casing material, diameter and temperature range

Variety	Casing materials	Diameter (mm)	The maximum temperature (℃)
Ni-Cr - nickel-silicon(K)	Stainless steel 1Cr18Ni9Ti	0.25	250
		0.5、1.0	400
		1.5、2.0	600
		3.0、4.0、4.5、5.0、6.0、8.0	800
	High-temperature alloy steel GH3030	0.25	300
		0.5、1.0	500
		1.5、2.0、3.0	800
		4.0、4.5、5.0	900
		6.0、8.0	1000
Ni-Cr silicon - Silicon nickel (N)	Stainless steel 1Cr18Ni9Ti	0.25	250
		0.5、1.0	400
		1.5、2.0	600
		3.0、4.0、4.5、5.0、6.0、8.0	800
	High-temperature alloy steel GH3030	0.25	300
		0.5、1.0	500
		1.5、2.0	800
		3.0、4.0、4.5	900
		5.0、6.0、8.0	1000
Ni-Cr - Kang Tong	Stainless steel	0.5、1.0	400

(E)	1Cr18Ni9Ti	1.5、2.0	500
		3.0、4.0、4.5、5.0 6.0、8.0	600
Rail - Kang Tong (J)	Stainless steel 1Cr18Ni9Ti	0.5、1.0	300
		1.5、2.0	400
		3.0、4.0、4.5、5.0	500
		6.8、8.0	600
Copper - Kang Tong (T)	Stainless steel 1Cr18Ni9Ti	0.5、1.0	200
		1.5、2.0、3.0、4.0、 4.5、5.0	250
		6.0、8.0	300
Platinum and rhodium 10 - Platinum (S) Platinum and rhodium 13 - Platinum (R)	High-temperature alloy steel GH3039	2.0、3.0、4.0、4.5	1000
		5.0、6.0	1100
	Platinum and rhodium 6	2.0、3.0、4.0、4.5 5.0、6.0	1100
Platinum and rhodium 30 -- Platinum and rhodium 6 (B)	Platinum and rhodium 6	2.0、3.0	1200
		4.0、4.5、5.0、6.0	1300

Note: The use of temperature and tested medium conditions and environmental conditions and other factors, the only reference to the user, measuring end-to-open, the temperature should be reduced accordingly.

V. insulation resistance at room temperature

Dual-sheathed insulation in the ambient temperature of 20 ± 15 ℃, relative humidity of not more than 80 percent, the heat between the electrode and the coat of insulation resistance shall meet the following requirements.

Armored dual diameter (mm)	Test voltage (DC V)	Insulation resistance M Ω • m
0.25	50±5	≥100
0.5~1.5	50±5	≥1000
>1.5	500±50	≥1000

Notes: 1. Insulation resistance with M Ω • m, which is normal temperature insulation resistance and the length of the armoured dual product, for example: 1000 M Ω • m said

1m long sample of the insulation resistance of 1000 M Ω

10m long sample of the insulation resistance of 100 M Ω

The length of less than 1 m of armoured dual calculated by 1 m

2. Conductor with the compensation of its armoured even at room temperature insulation resistance provided by GB4989

3. With metal connectors armoured even its normal temperature insulation resistance and armoured even the product of the length of ≥ 100 M Ω • m

VI. Armored thermocouple the largest thermal response time τ0.5 the following table (in seconds)

Armored dual diameter (mm) / Heat response time τ0.5 / Measurement-type	0.25	0.5	1.0	1.5	2.0	3.0	4.0	4.5	5.0	6.0	8.0
Lu--	-	-	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	1.0
Next Shell	0.1	0.2	0.2	0.3	0.4	0.6	0.8	1.0	1.2	2.0	4.0
Insulation -	0.2	0.4	0.6	0.8	1.0	2.0	2.5	3.0	4.0	6.0	8.0

Note: thermal response time of armoured thermocouple measurement since the end in the air at room temperature in the

rapidly into the boiling water, until the temperature reaches the entire temperature range of 50 percent instantaneous only the time required.

VII. the installation of armoured thermocouple

1, armoured thermocouple installation, should be avoided in the Furnace Door next to or from heating too close to objects, and has a strong magnetic field, the junction box should not be measured met the vessel wall media. Armored thermocouple reference-the temperature should not generally exceed 100 ℃, if the Senate than the end of the sets of polythene plastics, generally should not exceed 80 ℃.

2, armoured thermocouple depth can be inserted into the actual needs and circumstances decision, the general sheathed thermocouple not less than six times the diameter.

3, armoured thermocouple length of the exposed, the user should be based on the level of their environmental temperature and the size of the position be identified. And to install a suitable casing, or support to platen support, pinched and fixed. To prevent the Senate than the end (junction box) shaking and damage. In the medium measured by a higher level position or velocity at the time of installation, preferably in its support to insert some protection against fracture or bending from side measurement.

4, sheathed thermocouple measuring surface temperature, it should be possible to measure the surface Tiejin detected objects to maintain good contact with heat, reduce measurement error.

5, junction box down the Chuxian the best-placed to prevent water vapor, dust and Zangwu, such as falling into the cable box.

6, card sets of devices are simple, user-friendly features, under pressure of the fixed-armoured card sets Thermocouple, be sure to adjust the depth inserted immediately after the fight to be tight, the attention of appropriate force to ensure that Pressure to seal without damage to the request.

Fixed-card sets of devices used for the first time again, the insertion depth is adjustable, once tightened, is no longer deep into adjustable.

Moving card sets of devices, into the deep is adjustable, but not under pressure, if appropriate to join the auxiliary sealed seasoning (such as asbestos rope, etc.), can also be sealed up to a certain degree of demand.

7, armoured dual hot wiring

Thermocouple connection, to check whether the compensation wire, thermocouple points of agreement, unanimously confirmed only after the wiring. Thermocouple connection when. You open the junction box, click on map-circuit blocks. Wiring must be solid.

Compensation for the Chuxian wire-gap, with rubber gaskets, Saijin hollow after tightening bolts, and then cover lid of wiring, cables and wires attention should be paid compensation thermocouple Instruments Posts and show that the polarity, non-access. The socket structure, attention should be paid wiring signs: "+" positive "-" negative.

Compensation for the protection of wire without external mechanical damage and the magnetic field caused by the electronic display instruments of interference, compensation should be shielded wires, wires and other compensation to the best grounding into the pipe, wire without compensation, and other twists and turns to return Phenomenon.

In addition to dual-dual-armoured, single-armoured dual switch in the non-use of the circumstances, can not be connected at the same time for two millivolts, at the same time we should not connect one millivolts and a Taipower potentiometer, Otherwise, the low will cause instructions or guidelines, such as beating phenomenon.

VIII. Armored thermocouple:

Armored Thermocouple Temperature inserted after a certain period of time, the general temperature can be measured as the actual temperature measured object. In fact, armoured thermocouple and the environment between the heat to a certain extent, with the end

result of the survey measured the temperature difference between objects, measured the temperature lower than the actual temperature, otherwise high deviation.

In order to maximize the heat and the elimination of error, the general use of the following measures:

(1) reduce the radiation factor thermocouple.

(2) increase the cycle of measured media, the pressure in the permit conditions, as far as possible, thermocouple and tested medium to spread the heat increased.

(3) should do everything possible to reduce the diameter of the thermocouple.

(4) increase the thermocouple insertion depth, as far as possible, so that some increase in heating thermocouple.

(5) as far as possible, using small heat transfer coefficient of the material for armoured casing. To heat faster response time, reduce the dynamic error, should be used thermal conductivity of the material. There are contradictions between the two should be based on actual need to be care for.

In addition, the thermocouple when used on certain occasions, should pay attention to heat between the earth electrode and should maintain good insulation, otherwise there will be a thermoelectric potential loss directly affects the accuracy of the measurement results,

serious, even Instruments will affect the normal operation. When thermocouples used to measure changes in temperature field, often the existence of dynamic error. Therefore, attention must also choose a proper response to the thermocouple hot. The size of the response time is to determine the size of a dynamic error factors, and in proportion with the same time, it's automatic temperature control and temperature regulation and the rapid determination, and so plays an important role.

In short, in the use of armoured thermocouple temperature, we must first correct selection and reasonable to install and use, also of the need to avoid contamination, and where possible, to try to eliminate all outside influence, reducing the additional errors, so as to achieve Measuring accurate, simple and durable, and other purposes.

Armored hot spots should be kept or even conduct regular inspections and measures to ensure the reliability of its use.

Inspection of the project are: Armored dual surface erosion, parts defects, insulation resistance, reciprocating and electrical characteristics such as resistance.

IX. the fault may occur and repairs

NO.	Occurrence	Possible reasons for	Repair methods
1	Potential output without thermoelectric	1. Electrode opening heat 2. Measurement or reference-point opening-welding	1. Replacement 2. Re-welding 3. Replacement

		3. Thermoelectric very very same name	
2	**Thermoelectric potential than the value should be small (measuring instrument that the low value)**	**1. Thermocouple internal electrode leakage (short circuit) 2. Thermocouple internal moisture absorption 3. Short-circuit wiring box Posts 4. Compensation wires short-circuit 5. Metamorphic extremely hot or damage measurement - 6. Compensation to the anti-polarity wire 7. Compensation wire varieties configuration errors 8. Thermocouple installation location or improper insertion depth 9. Thermocouple reference high-temperature 10. Thermocouple varieties inconsistent with the instrument calibration**	**1. Thermoelectric potential test, measurement check-welding conditions. If the unqualified and should be replaced or re-welding 2. Zhaoou table with check insulation resistance, the failure should be replaced or cut, dried and re-welding 3. Clean wiring boards, to eliminate short-circuit factors 4. Short-circuit the re-wire insulation or replacement of compensation. 5. Metamorphic part of the cut, re-measurement of welding. 6. Diverted to re - 7. Thermocouple replaced with the corresponding compensation wire 8. Change the location or method of installation, insert the depth of change 9. Reference to the right-temperature compensation 10. Thermocouple and compensation for the replacement of wire, or the replacement of display instruments, make it compatible.**

3	**Thermoelectric potential to be the largest numerical (measuring instrument that high value)**	**1. Thermocouple species and display instruments do not match. 2. Compensation wire inconsistent with the thermocouple varieties**	**1. Thermocouple and compensation for the replacement of wire, or the replacement of instruments, make it compatible 2. Thermocouple replaced with the corresponding compensation wire**
4	**Measuring instruments showed the value of instability (in the instrument did not fault the circumstances)**	**1. Thermocouple Posts connection is bad and very hot 2. Thermocouple have intermittent short circuit or grounding of intermittent 3. Hotspots have been very broken, or breaking off and did not connect with intermittent phenomenon 4. Thermocouple does not install a solid swing 5. Grounding wire compensation, the phenomenon of intermittent short circuit or open circuit**	**1. Thermoelectric clean junction box and the Department of extremism, re-link good 2. Multimeter check with dual line resistance values, the failure should be replaced 3. Multimeter check with dual line resistance values, the more unqualified to be replaced 4. Thermocouple will be firmly installed 5. To find fault and the repair, replacement or compensation wire**
5	**Thermocouple changes THERMOELECTRIC POWER**	**1. Metamorphic hot electrode 2. Thermocouple improper installation location or method**	**1. Replacement 2. Change the location or method of installation**

Note: When found more fault conditions, compensation should be separated from wires and junction box, and then check each

thermocouple wire and compensation, to be determined fault lies, and then for treatment.

X. transport and preservation

Armored thermocouple and its annex in the installation, must be kept in shock from the collision and where the most suitable conditions for the storage places: the ambient temperature 20 ± 15 ℃, the relative temperature of not more than 80 percent of ambient air should not be Another instrument may contain pieces of corrosion of the medium.

Armored thermocouple in the process of long-distance transport should be carefully packaged

XI. added

1、product acceptance. After receiving this product, please promptly by national standards or products in our factory standards for factory acceptance test items. If it has quality problems, from the date of the receipt within one month (postmark date of the communication users), I set out plants, I plant will promptly accepted. Late acceptance is deemed to have qualified.

2、thermoelectric potential test on the issue. Potential is a thermoelectric-voltage test, coupled with outside influence, control the temperature deviations many factors, uV level test accuracy is very difficult, plus the wear-resistant thermoelectric potential

inherent in the dual temperature, vibration, and other conditions affecting difficult to achieve fixed. Members user acceptance attention when several questions: (1) used to monitor temperature corresponding grades (2) with the dual standards of measurement-even measured in the same, and so must the temperature (3) ensure sufficient depth immersion (4) avoid Insulator, or the protection of the pollution caused by leakage test and error (5) tests the temperature must be stable (6) and measured dual standard dual-placed in the Senate than the same freezing point (7) the same level of compensation for connecting wires.