WR□□-□4□、WZP□□-□4□

系列隔爆型

工业热电偶、热电阻

WR □ □ - □ 4 □, WZP □ □ - □ 4 □
Series of explosion-proof
Industrial thermocouple, RTD

安
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书

Installation Manual

上海南浦仪表厂

Shanghai nanpu meter factory

一、概述

在石油、化工等生产现场常伴有各种易燃、易爆气体、蒸气，使用普通的热电偶、热电阻容易引起环境气体爆炸。因此，必须使用隔爆热电偶、热电阻作温度传感器。隔爆型热电偶、热电阻产品适用在 dIIBT4 和 dIICT5 温度组别区间内具有爆炸性气体的场所内使用。符合 IEC60079 标准，GB3836 标准。

二、主要技术指标

热电偶、热电阻类别、测量范围与允差

类型	代号	测量范围℃	精度等级	允许偏差Δt℃
K 镍铬，热电偶	WRN	0-800	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
E 镍铬-铜镍	WRE	0-600	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
J 铁-铜镍	WRJ	0-500	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
T 铜-铜镍	WRT	-40- +350	I	*±0.5℃or±0.4%t
			II	*±1℃or±0.75%t
S	WRP	0-1600	II	±1.5℃ or ±0.25%t
铂电阻 Pt10 或装 Pt100	WZP	-200- +850	A	-200- +650 ±(0.15+0.002 ltl)
			B	-200- +850 ±(0.30+0.005 ltl)

注：（1）式中“ltl”为感温元件的实测温度。

（2）“*”表示允许偏差两者中取其大者。

三、防爆类型和级组

防爆级组：dIIBT4、ExiallCT5(本安)、DIP DTTll(粉尘)。

外壳防护等级:IP54、IP65（GB4280 标准）.

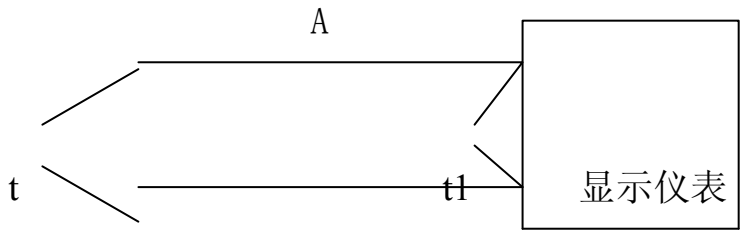
温度组别

隔爆热电偶、热电阻的温度组别按其外露部分最高表面温度分为 T1-T6 六组。

温度等级	允许最高表面温度℃
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

四、热电偶测温原理

如下图，选用两种不同的金属或合金丝 A、B，称为热电极，焊接的一端称为测量端，连接显示仪表的两头称为参比端，当测量端和参比端温度不同时，就会产生热电势 E_{AB}（t,、t_1)。当 t_1=0℃时则有：E_{AB}（t,0）= E_{AB}（t）=f(t)



五、热电阻测温原理

受热后的金属丝电阻随着温度的变化而变化，其热电阻值

R（t）与其所处温度 t 的关系可表示为:

$$R(t)=R0(1+At+Bt^2+\ldots\ldots)$$

按测得的电阻值查相应分度表即可得出被测温度值 t。或由显示仪表直接读出。

热电阻最小置入深度

一般不小于 100mm（特殊产品除外）

六、热电偶、热电阻推荐测量范围

温度传感器类型	分度号	推荐测量范围（℃）
热电偶	B	600-1600 800-1600 900-1800 1000-1600 1000-1800
	S	0-1300 0-1600 400-1600 600-1600 800-1400 800-1600 900-1400 1000-1400
	K	0-300 0-600 0-800 0-1000 0-1300 400-800 400-1300 600-1300
	E	0-200 0-400 0-800 0-600 200-600 300-500 400-600
	J	0-200 0-400 0-600 300-600
	T	-200-0 –200-300 0-200 0-300
铂热电阻	Pt100	-200-+50 –100-50 –50-+50 –50-+100 0-50 0-100 0-150 0-200 0-300 0-400 0-500 200-400 200-500
	Pt10	0-150 0-200 0-300 0-500 0-700 0-850 50-100 200-400 –50-+50
铜热电阻	Cu50	-50-+50 –50-+100 –50-+150 0-50 0-100 0-150

七、可能发生故障及修理

故障现象	可能原因	修理方法
显示仪表指示值比实际值低或指示值不稳定。	保护管或接线盒内有水，金属屑、灰尘或热电阻短路。	1、倒出水或消除灰尘，并将潮湿部分加以干燥处理，（不得用火烤），提高绝缘性。 2、用万用表检查短路或接地线部分，并消除之。如系感温元件短路，应进行修复或更换。
显示仪表指示值无限大	热电阻断路	1、用万用表检查断路部分，确定是连接导线还是感温元件断路。 2、如系连接导线断路，可以更换或修复。 3、如系感温元件断路，应进行更换。
显示仪表指针反向标尺下限值	1、热电阻短路。 2、与显示仪表接线接错	1、用万用表确定短路部位，并消除之，如系感温元件短路，应进行修复或更换。 2、重新连接导线

八、 贮存

隔爆型热电偶应贮存在周围环境温度 10~35℃，相对湿度不高于 80%，且空气中不含可能使零部件腐蚀的介质中。

爆炸型气体的分类、分级、分组举例表

类和级	引燃温度与组别					
	T1	T2	T3	T4	T5	T6
	T＞450	450≥T＞300	300≥T＞200	200≥T＞135	135≥T＞100	100≥T＞85
IIA	乙烷、丙烷、丙酮、苯乙烯、氯乙烯、氨笨、甲苯、苯氨、甲醇、一氧化碳、乙酸乙酯、乙酸、丙烯腈	丁烷、乙醇丙烯、丁醇、乙酸丁酯、乙酸戊酯、乙酸酐	戊烷、己烷、庚烷、癸烷、辛烷、汽油、硫化氢、环已烷	乙醚、乙醛		亚硝酸、乙酯
IIB	二甲苯、民用煤气、环丙烷	环氧乙烷、环氧丙烷、丁二烯、乙烯	异戊二烯			
IIC	水、煤气、氢、焦炉煤气	乙炔			二硫化碳	硝酸乙酯

注：表中未列中的爆炸性气体见 GB3836.1

九、 补充说明

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。

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

In the oil and chemical production sites often have a variety of flammable and explosive gases, steam, the use of common thermocouple, RTD vulnerable to the environment caused by gas explosion. It is therefore necessary to use proof thermocouple, the temperature sensors for heat resistance. Explosion-proof thermocouple, RTD products in the application of dIIBT4 and dIICT5 temperature range with a group of explosive gas used in the place. With the IEC60079 standard, GB3836 standards.

II、the major technical indicators

Thermocouple, RTD category, range and Tolerance

Type	Code	Measuring Range℃	Accuracy Class	ToleranceΔt℃
K NiCr-NiSi	WRN	0-800	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
E NiCr-CuNi	WRE	0-600	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
J Fe-CuNi	WRJ	0-500	I	*±1.5℃or±0.4%t
			II	*±2.5℃or±0.75%t
T Cu-CuNi	WRT	-40- +350	I	*±0.5℃or±0.4%t
			II	*±1℃or±0.75%t
S	WRP	0-1600	II	±1.5℃ or ±0.25%t
Pt-RTD Pt10 or pt100	WZP	-200- +850	A	-200- +650 ±(0.15+0.002 ltl)
			B	-200- +850 ±(0.30+0.005 ltl)

Note: (1)“ltl”:actually measured temperature of the sensor.

(2)“*”means to choose whichever is more.

III、explosion-proof type and level group

Explosion-proof Classes:dIIBT4、ExiallCT5、ExiallCT5.

(Intrinsic safety).DIPTTll(powder).

Protection Class of Head：IP54、IP65（GB4280 Standard）

Class Of Temperature

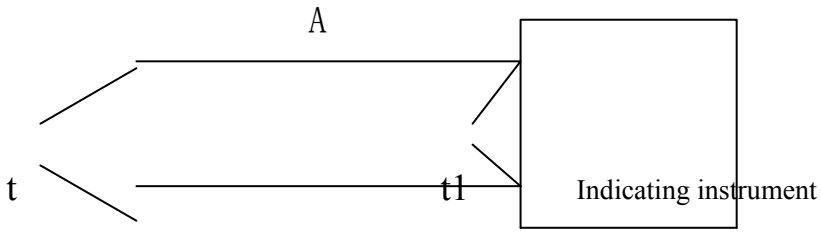
Temperature of EPTC and EPRTD can be categorized into 6 classes according to the highest surface temperature of the exposed parts.

Class of temperature	Allowable highest surface temperature
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

IV、thermocouple temperature measurement principle

PRINCIPLE OF THERMOCOUPLE

As shown in the left Figure ,A and B thermocouple wires are made with different metal or alloy .The welded end is the measuring junction .The Reference ends t1 are connected to the indicator ,A thermal-electromotive force EAB(t,t1)will result when the temperature of the two ends differs ,when t1=0℃。



B

V、thermal resistance measurement principle

After the heat resistance of the wire as the temperature changes, the thermal resistance

Electrical resistance of metal wire changes with temperture,The relationship of RTD value R(t) and temperature can be expressed:

$$R(t)=R0(1+At+Bt^2+\ldots\ldots)$$

The temperature to be measured can either be obtained from the R(t) table or directly from the indicator.

Minimum Insertion Depth Of RTD

Generally no less than 100mm(except special products)

VI、thermocouple, RTD recommended range

Type of Temperature Detector	Grad Symb	Recommended Measuring Range（℃）
TC	B	600-1600 800-1600 900-1800 1000-1600 1000-1800
	S	0-1300 0-1600 400-1600 600-1600 800-1400 800-1600 900-1400 1000-1400
	K	0-300 0-600 0-800 0-1000 0-1300 400-800 400-1300 600-1300
	E	0-200 0-400 0-800 0-600 200-600 300-500 400-600
	J	0-200 0-400 0-600 300-600
	T	-200-0 –200-300 0-200 0-300
Pt-RTD	Pt100	-200-+50 –100-50 –50-+50 –50-+100 0-50 0-100 0-150 0-200 0-300 0-400 0-500 200-400 200-500
	Pt10	0-150 0-200 0-300 0-500 0-700 0-850 50-100 200-400 –50-+50
Cu-RTD	Cu50	-50-+50 –50-+100 –50-+150 0-50 0-100 0-150

VII、may malfunction and repair

Symptom	Probable Cause	Remedies
Displayed value appears to be less than the actual value ,or unstable indication	There is water inside the protective tube ,or short in the element ,metallic particles and dust inside the terminal box.	1.Remove water and dust and dry the dampness .Increase insulation(no baking) 2.Check for the location of short and grounding with a multimeter and eliminate the cause .If sensing element found short ,repair or replace.
Display instrument shows an infinity	Open circuit in the element	1.Check the open circuit with a multimeter to determine whether it is in the lead connection or the

		elem nt. 2．If the open occurs in the lead connection ,repair or replace. 3.If the sensing element is open ,replace.
The pointer of display instrument swings to low extreme	1.There is a short in RTD 2.Wrong connection on the display instrument	1.Locate the short ,repair or replace the element . 2.Rewire the connection leads.

VIII、Storage

Flameproof thermocouple should be stored in a temperature around 10～35 ℃, relative humidity of not more than 80 percent, and in the air may make non-corrosive parts of the media.

Gas explosion of the classification, grading, for example division table

Category and class	Ignition temperature and constituencies					
	T1	T2	T3	T4	T5	T6
	T＞450	450≥T＞300	300≥T＞200	200≥T＞135	135≥T＞100	100≥T＞85
IIA	Ethane, propane, acetone, styrene, vinyl chloride, ammonia stupid, toluene, benzene ammonia, methanol, carbon monoxide, ethyl acetate, acetic acid, acrylonitrile	Butane, ethanol propylene, alcohol, butyl acetate, isoamyl acetate, acetic anhydride	Pentane, hexane, heptane, decane, octane, gasoline, hydrogen sulfide, cyclohexane	Ether, acetaldehyde		Nitrite, ethyl
IIB	Xylene, civilian gas, propane, Central	Ethylene oxide, propylene oxide, butadiene, ethylene	Isoprene			
IIC	Water, gas, hydrogen, coke oven gas	Acetylene			CS2	Nitric acid ethyl

Note: not listed in the table in the explosive gas, see GB3836.1

IX、Added

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 considered 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.