SIC
重庆川仪

一体化温度变送器

使用说明书

Integrated Temperature Transmitter

Operation Instructions

重庆川仪十七厂有限公司
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特 别 提 示
Particular Notes

本说明书仅限于下列产品使用：

The Instructions is restricted to be applied in the following products:

SBWR 带热电偶一体化温度变送器

SBWR series integrated temperature transmitter with thermocouple

SBWZ 带热电阻一体化温度变送器

SBWZ series integrated temperature transmitter with thermal resistance

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警告！

Warning!

1. 安装使用前，请认真阅读本使用说明书；
1. Please read the Operation Instructions carefully before installation and use.
2. 隔爆产品严禁带电条件下开盖；
2. Strictly prohibit uncovering any energized explosion insulation product;
3. 本产品技术规范可能发生改变，恕不另行通知。
3. Changes may happen on the Product Technical Specification, so there is no further notice.

1. 概述

1. Overview

一体化温度变送器主要是由温度传感器（热电偶或热电阻）与二线制温变模块构成，安装于热电偶或热电阻温度传感器的接线盒内或分体安装在现场管道上，将传感器信号转换成 4～20mADC，从而使温度的传感、变送、显示一体化。

Mainly made up of temperature sensor (thermocouple or thermal resistance) and two-wire system temperature module, integrated temperature transmitter is installed in the junction box of thermocouple or thermal resistance temperature sensor or installed on the site pipeline separately, and transform sensor signal into 4～20mADC so as to make sense, transmission and display of temperature integrated.

2. 执行标准

2. Executive standard

Q/CY165-2015 热电偶（阻）一体化温度变送器

Q/CY165-2015 *Thermocouple (Thermal Resistance) Integrated Temperature Transmitter*

3. 产品特点

3. Product features

- 采用二线制传输、大信号 4～20mADC 输出；
- Adopt two-wire system transmission and 4～20mADC strong signal output;
- 直接安装在防水或防爆接线盒上，或安装在接线箱轨道上；
- Be directly installed on the water or explosion proof junction box or on the track of the junction cabinet;
- 带通信功能（TS300 为 HART 协议 rev.5.0， TS200 为 mini-USB 接口专用协议），可编程，即传感器连接、测量范围和其他一些变量可编程；
- Be equipped with communication function (TS300 refers to HART Protocol rev.5.0; TS200 refers to mini-USB Interface Special Agreement) and can be programmed, namely, the connection, measurement range and other variables of the sensor can be programmed.
- 电气隔离，高达 2KV；
- Electric isolation with 2KV at the maximum.
- 可用在危险区域的本质安全型 ；
- Belong to intrinsic safety type which can be applied in the dangerous area;
- 操作状态信息（绿色 LED）。
- Operation status information (green LED)

4. 主要技术参数

4. Main technical parameters

表 1 技术参数表

Table 1 Technical parameter table

显示表	环境温度	-20～60℃（LCD 显示表）	-40～60℃（LED 显示表）
	输入信号	4～20mA.dc 模拟信号	
	供电电源	小于 4 V.dc	
温度变送器	输入信号	热电偶、热电阻信号	
	输出信号	4～20mA.dc 模拟信号（TS300 温度变送器叠加输出 HART 协议数字通讯信号）	
	输 入 / 输出关系	非隔离（适用于 TS100 温度变送器）	
		隔离（适用于 TS200、TS300 温度变送器）	
	量程	详见测量误差表	
	供电电源	普通型：12～42V d.c	本安型：12～28V d.c
	负载电阻	（V_{aux}-12）/0.022A(单位：Ω)	
	防爆等级	Exia Ⅱ CT6 Ga	
	环境温度	普通型：-40～80℃	本安型：-20～50℃
	安装尺寸	外径：Φ44×20	安装孔中心距：Φ33

Indicator gauge	Environment temperature	-20～60℃ (LCD indicator gauge)	-40 ～ 60 ℃ (LCD indicator gauge)
	Input signal	4～20mA.dc analog signal	
	Power supply	lower than 4 V.dc	
temperature transmitter	Input signal	Thermocouple and thermal resistance signal	
	Output signal	4 ～ 20mA.dc analog signal (TS300 temperature transmitter overlapping outputting HART Protocol digital communication signal)	
	Input/output relationship	Non-isolation (suitable for TS100 temperature transmitter)	
		Isolation (suitable for TS200 and TS300 temperature transmitter)	
	Measurement range	See Measuring Error Table for further details.	
	Power supply	Ordinary type: 12～42V d.c	Intrinsic safety type: 12 ～ 28V d.c
	Load resistance	（V_{aux}-12）/0.022A(Unit：Ω)	
	Explosion proof grade	Exia Ⅱ CT6 Ga	
	Environment temperature	Ordinary type: -40～80℃	Intrinsic safety type: -20～50℃
	Installation size	External diameter: Φ44×20	Center distance of mounting hole: Φ33

5. 温度变送器测量误差

5. Measuring Error of Temperature Transmitter

表 2 温度变送器测量误差

Table 2 Temperature transmitter measuring error

输入信号	测量范围 ℃	最小可测量量程 ℃	测量精度（取较大值） ℃
Pt100	-200～850	10	±0.1%量程或±0.1
Pt1000	-200～350	10	±0.1%量程或±0.15
K	-230～1370	50	±0.1%量程或±0.5
N	-200～1300	50	±0.1%量程或±0.5
E	-200～1000	50	±0.1%量程或±0.5
J	-210～1200	50	±0.1%量程或±0.5
T	-200～400	50	±0.1%量程或±0.5
R	-50～1760	100	±0.1%量程或±1
S	-50～1760	100	±0.1%量程或±1
B	0～1820	100	±0.1%量程或±1

Input signal	Measurement range ℃	Measurable range at the minimum ℃	Measurement accuracy (select larger value) ℃
Pt100	-200～850	10	±0.1% or ±0.1 measurement range
Pt1000	-200～350	10	±0.1% or ±0.15 measurement range
K	-230～1370	50	±0.1% or ±0.5 measurement range
N	-200～1300	50	±0.1% or ±0.5 measurement range
E	-200～1000	50	±0.1% or ±0.5 measurement range
J	-210～1200	50	±0.1% or ±0.5 measurement range
T	-200～400	50	±0.1% or ±0.5 measurement range

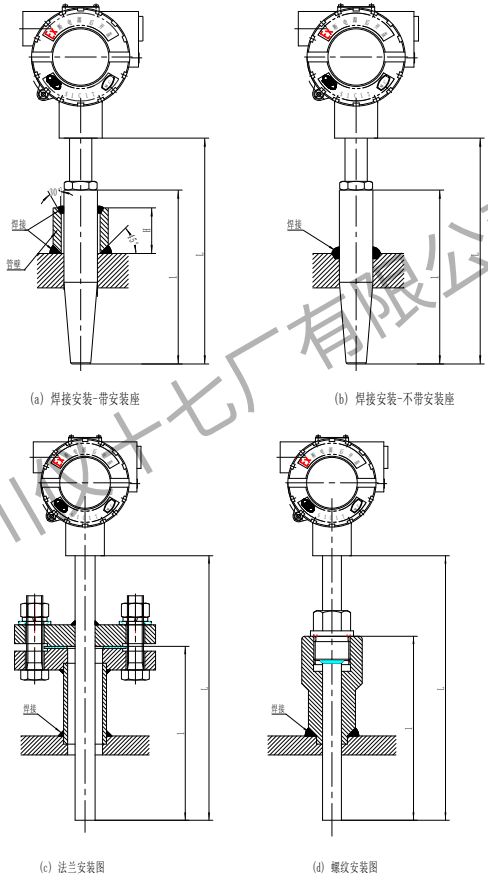
R	-50～1760	100	±0.1% or ±1 measurement range
S	-50～1760	100	±0.1% or ±1 measurement range
B	0～1820	100	±0.1% or ±1 measurement range

6. 安装

6. Installation

6.1 一体化安装

6.1 Integrated installation



(a) 焊接安装-带安装座　(b) 焊接安装-不带安装座

(c) 法兰安装图　(d) 螺纹安装图

图 1 一体化产品典型安装图

Fig. 1 Typical installation diagram of integrated products

焊接	weld
管壁	pipe wall
(a) 焊接安装-带安装座	(a) welding installation with mounting base
(b) 焊接安装-不带安装座	(b) welding installation without mounting base
(c)法兰安装图	(c) flange installation diagram
(d) 螺纹安装图	(d) thread installation diagram

注：若安装方式为特殊结构，可来电商榷。

Note: In case of installation of any special structures, users can consult with us on relevant questions.

6.3 分体安装

6.3 Split installation

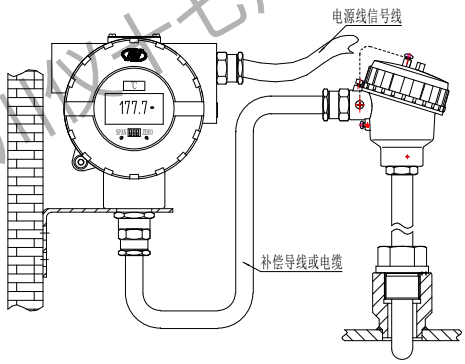


图 2 一体化（带显示）产品墙壁式分体安装

Fig. 2 wall type split installation of integrated product (with display device)

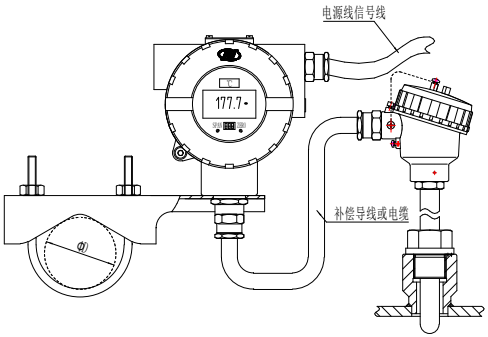


图 3 一体化热电偶、热电阻抱箍式分体安装

Fig. 3 anchor ear type split installation of integrated thermocouple and thermal resistance

电源线	power line
信号线	signal line
补偿导线或电缆	compensating lead wire or cable

注：1.传感器与变送器连接电缆应选择与传感器匹配的补偿导线或电缆；

Note: 1. Connecting cables of sensor and transmitter shall select compensating lead wire or cable matched with sensor.

2.隔爆产品的连接电缆及电缆密封接头需满足隔爆要求。

2. Connecting cables and cable sealing joint of explosion insulation products shall meet explosion insulation requirements.

3. 若安装方式为特殊结构，可来电商榷。

3. In case of installation of any special structures, users can consult with us on relevant questions.

7. 电气连接图

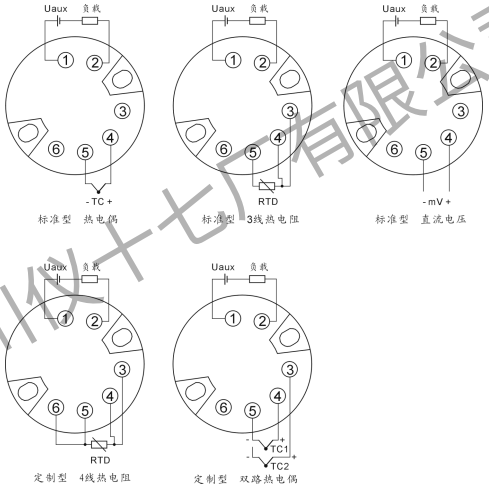
7. Connection diagram of electric devices

7.1 一体化温变（适用于 TS 系列温变）

7.1 Integrated temperature transmitter (suitable for TS series temperature transmitter)

回路供电接线：接线为 1(+)和 2(-)，需确保极性正确（有反接保护），最高不超过 45VDC。接线图见图 4。

Circuit power supply wiring: wiring includes 1(+) and 2(-), accurate polarity shall be ensured, which shall not exceed 45VDC at the maximum. The wiring diagram is presented in Fig. 4.



负载	load
标准型 热电偶	standard type thermocouple
标准型 3 线热电阻	Standard type three-wire thermal resistance
标准型 直流电压	standard type direct voltage
定制型 4 线热电阻	customized type four-wire thermal resistance
定制型 双路热电偶	customized type dual thermocouple

图 4 一体化温变接线图

Fig. 4 wiring diagram of integrated temperature transmitter

注:其它温变见其相应的说明书中的接线图。

Note: Wiring diagram of other temperature transmitters are presented on corresponding Instructions.

7.2 带显示一体化温变

7.2 Integrated temperature transmitter with indicator gauge

传感器与温变之间的接线方法可参见 7.1，温变和显示表之间已串联在电气回路中，现场施工接线只需要接电源线即可，如图所示：

Wiring methods of sensor and temperature transmitter can be seen in Section 7.1 for reference. The temperature transmitter and indicator gauge has been connected to Circuit of electric device in series and on-site operation wiring only needs to connect to power line, which is presented in the figure below:

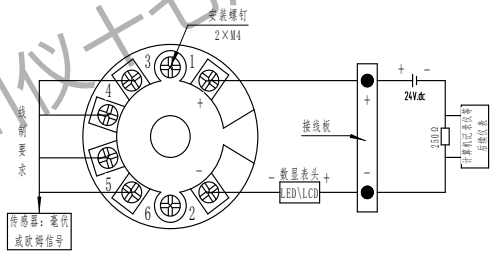


图 5　SBW 带热电阻、热电偶的一体化温度变送器显示式接线法

Fig. 5 wiring methods of SBW series displaying integrated temperature transmitter with thermocouple and thermal resistance

线制要求	wire system requirement
传感器：毫伏或欧姆信号	sensor:　millivolt or ohm signal
安装螺钉	mounting screw

接线板	wiring board
数显表头	digital display gauge outfit
计算机记录仪等后续仪表	subsequent instrument of computer recorder

8. 防爆产品要求

8. Requirements on explosion proof products

8.1 安装场所中气体、蒸汽、薄雾状易燃物质的级别不得高于产品铭牌中所规定的级别，运行时接线盒、保护管和固定装置等任何暴露于爆炸性混合物部分的表面温度不得超过产品铭牌中所规定的温度级别。

8.1 Levels of gas, steam, mist shape inflammable materials on installation spot shall not exceed that stipulated in product nameplate. The surface temperature of any part exposed to explosive mixture during operation, including junction box, protective tube, fixed device and so on, shall not exceed temperature levels stipulated in the product nameplate.

- 隔爆型热电偶(阻)在可氧化性或中性气氛中使用，但不适用于强烈氧化气氛。
- Explosion insulation thermocouple (thermal resistance) can be used under oxidizable or neutral atmosphere but not to be suitable for strong oxidizing atmosphere.
- 使用隔爆型热电偶时必须选用相匹配的补偿导线，并注意补偿导线与热电偶极性相一致。
- During operation of explosion insulation thermocouple, matched compensating lead wire must be selected, which shall conform to the

polarity of thermocouple.

8.2 隔爆型热电偶(阻)（**防爆标志“Ex d ⅡC T6 Gb”**）只能用于爆炸性气体环境，且限于 1 区、2 区危险场所，不能在 0 区使用。

8.2 Explosion insulation thermocouple (thermal resistance) (**explosion sign “Ex d ⅡC T6 Gb”)** shall be only used for explosive gas environment. Moreover, it is limited to be used in hazardous locations of Area 1 and Area 2 and cannot be used in Area 0.

粉尘防爆型热电偶(阻)（**防爆标志“Ex t ⅢC Db”**）只能用于可燃性粉尘环境，且限于 21 区、22 区危险场所，不能在 20 区使用。

Dust explosion isulation thermocouple (thermal resistance) **“explosion sign Ex t ⅢC Db”** shall be only used for combustible dust environment. Moreover, it is limited to be used in hazardous locations of Region 21 and Region 22 and cannot be used in Region 20.

防爆产品使用时，应符合相应防爆等级的有关规定。

Any explosion proof products shall comply with relevant regulations on explosion proof grades when using.

8.3 现场使用时，接线盒的盖子须在切断电源后方可开盖

8.3During on-site operation, any junction boxes cannot be uncovered unless being cut off in advance.

8.4 必须防止热流引爆。

8.4 Thermal flow detonation must be prevented.

8.5 对隔爆外壳材质有明显腐蚀的地方不能使用。

8.5 Any places that are obviously capable of corrosive effects on explosion insulation shell materials are not allowed to use.

8.6 补偿导线应为隔爆阻燃型电缆。

8.6 Compensating lead wires shall adopt explosion and flame insulation cables.

8.7 各连接件应保护连接可靠。

8.7 Reliable connections of various fastenings must be protected.

8.8 外接地端子必须可靠接地。

8.8 External grounding terminals are required of reliable earthing.

8.9 安装场所存在可燃性气体的温度组别与产品使用中外露部分最高表面温度均应符合下表参数：

8.9 Temperature grading groups of combustible gases on installation site and the maximum surface temperature of exposed parts during use shall be consistent with the parameters stated in the table below:

表 3 产品外露部分最高表面温度

Table 3 minimum surface temperature of exposed parts

温度组别	T1	T2	T3	T4	T5	T6
允许最高表面温度	440℃	290℃	195℃	130℃	95℃	80℃

Temperature groups	T1	T2	T3	T4	T5	T6
Maximum surface temperature allowable	440℃	290℃	195℃	130℃	95℃	80℃

8.10 隔爆铭牌应保持清晰、完好、不得丢失。

8.10 Explosion insulation nameplate shall be kept clear and intact and shall not be lost.

8.11 使用过程中严禁拆卸热电偶中的任何部件。

8.11 Any parts of thermocouple are strictly forbidden during operation.

8.12 现场安装必须符合“中华人民共和国爆炸危险场所电气安全规程（试行）”和 GB 3836.15-2000 爆炸性环境用防爆电气设备 第 15

部分-危险场所电气安装（煤矿除外）中有关规定。

8.12 On-site installation must comply with relevant regulations of *Safety Rules of Electric Devices in Explosion Hazardous Areas of the People's Republic of China (Trial) and* GB 3836.15-2000 *Electrical apparatus for explosive gas atmospheres-Part 15: Electrical Installations in Hazardous Areas (Other than Mines).*

9. 使用

9. Operation

9.1 在防爆场合的连接

9.1 Connection on explosion proof conditions

- 需要与安全栅配套使用，最大允许输入电压是 Ui=DC35V。
- Need to be used with the coordination with guard grating and the maximum output voltage permissible is Ui=DC35V.
- 只有本安型 HART 手操器或其他本安型通讯器才能在本安区域操作。
- Only intrinsic safety type HART manual manipulator and other intrinsic safety type communicator can be operated on the intrinsic safety region.

9.2 LED 指示

9.2 LED indicating

- 不亮：无供电
- Failure of lightening: no power supply
- 持续点亮：一切正常，正常的无误差操作状态
- Continuous lightening: All operate well and the equipment is in the status of normal error-free operation.
- 灯闪： 断偶、输入引线故障

- Flash of lamp: disconnection of thermocouple and lead input malfunction

9.3 通信

9.3 Communication

- TS200 使用 mini-USB 接口与电脑通讯，应用调试软件可以设定参数。
- TS200 adopts mini-USB interface and computer communication and parameters of the application debugging software can be set.
- TS300 有 HART 通讯功能，符合 HART 协议要求，支持 HART 协议，支持长、短地址帧。
- TS300 is equipped with HART communication function, meets requirement of HART Protocol, supports HART Protocol and long and short address frame.

9.4 其它

9.4 Others

- 智能温度变送器的电源与总线信号共用一对电缆，称为总线电缆。智能温度变送器的接线端子位于后盖侧，拧开后盖可见。
- Power source and bus signals of intelligent temperature transmitter shares a pair of cable named bus cable. Wiring terminal of intelligent temperature transmitter is located on the side of the rear cover, which can be seen after unscrewing the rear cover.
- 一体化温度变送器投入运行前，应先核对线路连接是否正确、负载电阻是否满足要求、后续仪表与一体化温度变送器的分度号是否一致、配电器或安全栅是否符合相关标准规

定、电源的正负极性是否正确等。确认正确无误后，一体化温度变送器便可投入运行。

- Before the operation of integrated temperature transmitter, one shall check whether line connection is correct or not, whether load resistance meets requirements or not, whether graduation of subsequent instrument conforms to that of integrated temperature transmitter, whether distributor or safety barrier meets requirements of relevant standards, whether the positive and negative pole of power source is correct or not and so on. After confirmed but no error found, the integrated temperature transmitter can be put into operation.
- 一体化温度变送器出厂，已通过精确调校，如无特殊情况，勿须调校。特殊情况下，可由熟悉本仪表的专业人士按有关要求进行微调校正。
- Accurate adjustment and proofreading of integrated temperature transmitter has been conducted before delivery. In case of no exceptional situations, adjustment and proofreading shall not be conducted. Under special conditions, subtle adjustment and proofreading can be conducted by specialized person familiar with the instrument according to relevant requirements.
- 使用中，如需要接线、拆线或开启接线盒盖，必须在断电情况下进行。**严禁变送器接线柱间短接**。
- During operation, wiring, clearing and opening the cover of the junction box must be carried out in case of outage. Short connection among transmitter binding posts is strictly forbidden.

- 一体化(HART 协议）温度变送器可通过 HART 调制调解器与上

  位机通讯或与手持器和 PC 机对变送器的型号、分度号、量程进行远程信息管理、组态、变量监测、校准和维护。
- Integrated temperature transmitter (HART Protocol) can conduct remote information management, configuration, variables monitoring, calibration and maintenance to types, graduation and measurement rangeof the transmitter through HART modem to communicate with upper computer communicator or through manual manipulator and PC.
- 避免污染，并尽可能地设法消除各种外界影响，减小附加误差，以达到温度检测，控制的准确、方便、可靠和稳定。
- Avoid pollution and manage to eliminate various external influences as much as possible to reduce additional error so as to reach temperature measurement and conduct accurate, convenient, reliable and stable control.

10. 维护与修理

10. Maintenance and repair

10.1 维护

10.1 Maintenance

- 经常接线盒清除外露部分的杂物和易燃物，保持其清洁；
- Frequently clean away sundries and inflammable materials exposed on the exterior of the junction box and keep it clean.
- 定期检查接线盒盖，引入装置密封塞是否良好；安装是否牢固；隔爆型一体化温度变送器还应检查防松装置是否有效，接地是否牢靠；

- The performance of the cover of the junction box and sealing plug of lead-in device, the fastness of the installation shall be inspected at fixed period. For explosion insulation integrated temperature transmitter, the effectiveness of locking device and the fastness of ground connection also shall be inspected.
- 经常检查防爆型一体化温度变送器与危险气体相接触部分其最高表面温度，该温度不得超过相关温度组别的规定。
- Frequently inspect the surface temperature at the maximum of contact part between explosion proof type integrated temperature transmitter and hazardous gas, which shall not exceed temperature stipulated in related temperature groups.

10.2 故障判断

10.2 Fault determination

使用过程中，若后续仪表显示异常，请按表 3 进行检查。

In case the subsequent instrument displays abnormally during operation, please conduct inspection based on Table 3.

表 3 一体化温度变送器可能故障判断

Table 3 Possible fault determination of integrated temperature transmitter

故障现象	故障排查
变送器无输出	检测电源电压是否正常 电源正负级是否接反 带显示表头的，检查表头是否损坏
变送器输出≥20mA	检测热电偶（阻）是否断路 检测热电偶（阻）是否超量程 接线是否松动
变送器输出≤4mA	检测电源电压是否正常 检测热电偶（阻）是否短路

	接线是否松动
变送器输出不正确	检测电源电压是否正常 变送器量程与控制室是否一致 变送器负载阻抗是否满足要求 传感器型号是否与变送器匹配 传感器是否正常 接线是否松动

Fault phenomenon	Fault elimination
No output of transmitter	Check whether supply voltage operates normally or not Whether the positive pole and the negative pole of power source are inversely connected. For transmitter with display gauge outfit, inspect whether gauge outfit breaks down or not.
Transmitter output ≥20mA	Check whether thermocouple (thermal resistance) exists open circuit Check whether thermocouple (thermal resistance) exceeds measurement rangeor not. Inspect whether wiring becomes loose or not.
Transmitter output ≥4mA	Check whether supply voltage operates normally or not Check whether thermocouple (thermal resistance) exists open circuit Inspect whether wiring becomes loose or not.
Incorrect output of transmitter	Check whether supply voltage operates normally or not

	Check whether measurement rangeof the transmitter is consistent with that in the control room. Check whether load impedance of the transmitter meets requirements or not Check whether the type of sensor matches with the transmitter Check whether sensor operates normally or not Inspect whether wiring becomes loose or not.

11. 贮存

11. Storage

一体化温度变送器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。

Integrated temperature transmitter shall be stored in 10~35 ℃ surrounding environment temperature with relative humidity less than 80%. Moreover, any mediums that may corrode components shall not be contained in the air.

12. 补充说明

12. Supplementary instructions

12.1产品验收

12.1 Product acceptance

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。逾期则被视为已验收合格。

After receiving the product, please timely conduct inspection and acceptance in accordance with product national standard or factory inspection items stipulated by our factory. In case of any quality problems, please inform us by letters within one month after the date of receiving (subject to the postmark date of letters from users), and we will approach any issues proposed without delay. Expiry will be regarded as accepted and qualified.

12.2 我公司提供的包装物有可能对贵方的环境造成影响，请妥善处理。

12.2 Please properly dispose the packaging materials supplied by our company that may influence the environment.

13. 附表

13. Annexed Table

爆炸性气体分级、分组举例表：

Example table of Grading and Grouping of Explosive Gases

类和级			ⅡA	ⅡB	ⅡC
引燃温度（℃）与组别	T1	T＞450	乙烷、丙烷、丙酮、苯乙烯、氯乙烯、氨苯、甲苯、苯胺、甲醇、一氧化碳、乙酸乙脂、乙酸、丙烯酸	二甲苯、民用煤气、环戊烷	煤气、氢气、焦炉煤气
	T2	450≥T＞300	丁烷、乙酸、丙烯、丁醇、乙酸丁脂、乙酸戊脂、乙酸酐	环氧乙烷、环氧戊烷、丁二烯、乙烯	乙炔
	T3	300≥T＞200	戊烷、己烷、庚烷、葵烷、辛烷、汽油、硫化氢、环乙烷	异戊二烯	-
	T4	200≥T＞135	乙醚、乙醛	-	-
	T5	135≥T＞100	-	-	二硫化碳
	T6	100≥T＞85	亚硝酸乙脂	-	硝酸乙烯
注：表中未列入的爆炸性气体见 GB3836.1-2010					

Classification & Grade			ⅡA	ⅡB	ⅡC
Ignition on temperature (℃) and groups	T1	T＞450	Ethane, propane, acetone, styrene, vinyl chloride, phenalgin, methyl benzene, phenyl-sulfamic acid, Toluene, aniline, methyl alcohol, carbon monoxide, ethyl acetate, acetic acid, acrylic acid	Dimethyl benzene domestic gas, cyclopentane	Coal gas, hydrogen, coke oven gas
	T2	450≥T＞300	Butane, acetic acid, propylene, butanol, butyl acetate, amyl acetate, acetic anhydride	Oxirane, epoxy pentane, butadiene, ethylene	acetylene

	T3	300≥T＞200	Pentane, hexane, heptane, decane, octane, gasoline, hydrogen sulfide, cyclohexane	isoprene	-
	T4	200≥T＞135	Ether, acetic aldehyde	-	-
	T5	135≥T＞100	-	-	Carbon disulfide
	T6	100≥T＞85	Nitrous ether	-	Nitric acid ethylene
Note: See GB3836.1-2010 for explosive gases not listed in the table.					

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