

ZR22S

Separate type Explosion-proof Zirconia Oxygen Analyzer, Detector

Start-up and Safety Precautions

IM 11M13A01-02E

This Start-up Manual explains mainly the installation and wiring of the ZR22S.
For detailed information and other information, the User's Manual of the ZR22S should be referred to.

◆ Introduction

Thank you for purchasing the ZR22S, Separate type Explosion-proof Zirconia Oxygen Analyzer, Detector.

Please read the following respective documents before installing and using the ZR22S.

The ZR22S detector is used in combination with the ZR802S converter.

The related documents are as follows.

General Specifications

Contents	Document number	Note
ZR22S, ZR802S, and ZR202S Explosion-proof Zirconia Oxygen Analyzers	GS 11M13G01-01EN	Online manual

* the "EN" in the document number is the language code.

User's Manual

Contents	Document number	Note
ZR22S Separate type Explosion-proof Zirconia Oxygen Analyzer, Detector Start-up and Safety Precautions	IM 11M13A01-02E	Printed manual (This manual)
ZR22S and ZR802S Explosion-proof Zirconia Oxygen Analyzer	IM 11M13G01-02EN	Online manual

* the "E" or "EN" in the document number is the language code.

An exclusive User's Manual might be attached to the products whose suffix codes or option codes contain the code "Z" (made to customers' specifications). Please read it along with this manual.

You can download the latest documents from our website.

<http://www.yokogawa.com/an/zr802/download/>



For details on converter and other related products, please read the individual instruction manuals.

■ Notes on Handling User's Manuals

- Please hand over the user's manuals to your end users so that they can keep the user's manuals on hand for convenient reference.
- Please read the information thoroughly before using the product.
- The purpose of these user's manuals is not to warrant that the product is well suited to any particular purpose but rather to describe the functional details of the product.
- No part of the user's manuals may be transferred or reproduced without prior written consent from YOKOGAWA.
- YOKOGAWA reserves the right to make improvements in the user's manuals and product at any time, without notice or obligation.
- If you have any questions, or you find mistakes or omissions in the user's manuals, please contact our sales representative or your local distributor.

■ Drawing Conventions

Some drawings may be partially emphasized, simplified, or omitted, for the convenience of description.

Some screen images depicted in the user's manual may have different display positions or character types (e.g., the upper / lower case). Also note that some of the images contained in this user's manual are display examples.

■ Trademark Notices

All other company and product names mentioned in this user's manual are trademarks or registered trademarks of their respective companies.

We do not use TM or ® mark to indicate those trademarks or registered trademarks in this user's manual.

■ Product Disposal

The instrument should be disposed of in accordance with local and national legislation/regulations.

■ Precautions in Handling Explosion-proof Zirconia Oxygen Analyzer

The explosion-proof zirconia oxygen analyzer (Model ZR22S) are designed as explosion-proof instruments.

When using either of these instruments in an explosion-susceptible hazardous area, note the following and observe the given precautions:

Use only the supplied, the explosion-proof zirconia oxygen analyzer (Model ZR22S) and accessories, or any explosion-proof certification may be invalidated.

For the details, refer to the system configurations in the manual.



CAUTION

Only trained persons use this instrument in industrial locations.

Explosion-proof Approval followings:

ZR22S-A (ATEX);	Ⓔ II 2 G Ex db IIB+H ₂ T4...T2 Gb and II 2 D Ex tb IIIC T300°C Db
ZR22S-B (FM);	Class I, Division 1, Groups B, C and D, Class II/III, Division 1, Groups E, F and G, T2
ZR22S-C (CSA);	Class I, Division 1, Groups B, C and D, Class II/III, Division 1, Groups E, F and G, T2
ZR22S-D (IECEx);	Ex db IIB+H ₂ T4...T2 Gb and Ex tb IIIC T300°C Db
ZR22S-K (KCS);	Ex d IIB+H ₂ T2
ZR22S-M (GB EX);	Ex db IIB+H ₂ T2...T4 Gb, Ex tb IIIC T300°C Db

■ For the safe use of this equipment



WARNING

ZR22S is very heavy. Handle it with care. Do not drop it. Handle safely to avoid injury.

Some process gas is dangerous to people. When removing this equipment from the process line for maintenance or other reasons, protect yourself from potential poisoning by using a protective mask or ventilating the area well.



CAUTION

Requirements for explosion-proof use:

The ambient temperature is in the range -20 to +60°C. The surface temperature of the ZR22S is provided by page 6-7 "Surface temperature".

Oxygen concentration of sample/reference /calibration gas shall not exceed that found in normal air, typically 21 vol%.

NOTE

The cell (sensor) at the tip of the detector is made of ceramic (zirconia element). Do not drop the detector or subject it to pressure stress.

- Do NOT allow the sensor (probe tip) to make contact with anything when installing the detector.
- Avoid any water dropping directly on the probe (sensor) of the detector when installing it.
- Check the calibration gas piping before introducing the calibration gas to ensure that there is no leakage of the gas. If there is any leakage of the gas, the moisture drawn from the sample gas may damage the sensor.
- The detector (especially at the tip) becomes very hot. Be sure to handle it with gloves.



CAUTION

This instrument is tested and certificated as explosion-proof type. Please note that the construction of the instrument, installation, external wiring, maintenance or repair is strictly restricted, and non-observation or negligence of this restriction would result in dangerous condition.

■ Precautions for the product



CAUTION

The Instrument is packed carefully with shock absorbing materials, nevertheless, the instrument may be damaged or broken if subjected to strong shock, such as if the instrument is dropped. Handle with care.

This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.

◆ Safety Precautions

■ Safety, Protection, and Modification of the Product

- In order to protect the system controlled by the product and the product itself and ensure safe operation, observe the safety precautions described in this user's manual. We assume no liability for safety if users fail to observe these instructions when operating the product.
- If this instrument is used in a manner not specified in this user's manual, the protection provided by this instrument may be impaired.
- If any protection or safety circuit is required for the system controlled by the product or for the product itself, prepare it separately.
- Be sure to use the spare parts approved by Yokogawa Electric Corporation (hereafter simply referred to as YOKOGAWA) when replacing parts or consumables.
- Modification of the product is strictly prohibited.
- The following safety symbols are used on the product as well as in this manual.



WARNING

This symbol indicates that an operator must follow the instructions laid out in this manual in order to avoid the risks, for the human body, of injury, electric shock, or fatalities. The manual describes what special care the operator must take to avoid such risks.



CAUTION

This symbol indicates that the operator must refer to the instructions in this manual in order to prevent the instrument (hardware) or software from being damaged, or a system failure from occurring.

CAUTION

This symbol gives information essential for understanding the operations and functions.

NOTE

This symbol indicates information that complements the present topic.



This symbol indicates Protective Ground Terminal.

■ Warning and Disclaimer

The product is provided on an "as is" basis. YOKOGAWA shall have neither liability nor responsibility to any person or entity with respect to any direct or indirect loss or damage arising from using the product or any defect of the product that YOKOGAWA can not predict in advance.

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◆ CE marking products

■ Authorized Representative in the EEA and the Importer into the EU/EEA Market

The Authorized Representative for this product in the EEA and the importer for this product into the EU/EEA market via Yokogawa sale channel is:

Yokogawa Europe B.V.
Euroweg 2, 3825 HD Amersfoort, The Netherlands

■ Identification Tag

This manual and the identification tag attached on packing box are essential parts of the product. Keep them together in a safe place for future reference.

■ Users

This product is designed to be used by a person with specialized knowledge.

■ Information of the WEEE Directive

This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive does not apply. This product should be disposed in accordance with local and national legislation/regulations. The WEEE Directive is only valid in the EU.

◆ Control of Pollution Caused by the Product

This is an explanation for the product based on "Control of Pollution caused by Electronic Information Products" in the People's Republic of China.

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
外壳(金属)	×	○	×	×	○	○
外壳(树脂)	×	○	×	×	○	○
加热器组件	×	○	×	×	○	○
内部接线的材料	×	○	×	×	○	○

○：表示该有害物质在该部件中所有均质材料中的含量都在GB/T26572所规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T26572所规定的限量要求。

环保使用期限：这个标志是基于SJ/T11364，在中国（不包括台湾，香港，澳门）贩售的电子电器产品所适用的环保使用期限。



只要遵守产品上关于安全及使用上的注意事项，从制造之日起计算在该年限内，不会发生制品内的有害物质外泄，突然变异，对环境或人体以及财产产生重大影响的情况。

（注）该年限是《环境保护使用期限》，不是产品的保质期限。

另外，关于替换部件的推荐替换周期，请阅读使用说明书。



Compliant Standards

Explosion-proof approval of major standards and directives:

ATEX:	Applicable Standard:	EN IEC 60079-0 EN 60079-1 EN 60079-31
	Type of protection	Ex II 2 G Ex db IIB+H ₂ T4...T2 Gb and II 2 D Ex tb IIIC T300°C Db
	Temperature class for Ex "db"	T4...T2
	The maximum surface temperature for Ex "tb"	T300°C
	Ambient temperature	-20°C to 60°C
	Surface Temperature	See page 7 Surface temperature of ZR22S (ATEX, IECEx, GB EX)
	Enclosure Rating	IP66
IECEx:	Applicable Standard:	IEC 60079-0 IEC 60079-1 IEC 60079-31
	Type of protection:	Ex db IIB+H ₂ T4...T2 Gb and Ex tb IIIC T300°C Db
	Temperature class for Ex "db"	T4...T2
	The maximum surface temperature for Ex "tb":	T300°C
	Ambient temperature	-20°C to 60°C
	Surface Temperature	See page 7 Surface temperature of ZR22S (ATEX, IECEx, GB EX)
	Enclosure Rating	IP66
US (by FM):	Applicable Standard	FM Class 3600 FM Class 3615 FM Class 3810 ANSI/NEMA 250
	Type of protection	Class I, Division 1, Groups B, C and D Class II/III, Division 1, Groups E, F and G
	Temperature Class:	T2
	Ambient temperature	-20°C to 60°C
	Enclosure Rating	Type4X
CANADIAN (CSA):	Applicable Standard:	C22.2 No.0 C22.2 No. 0.4-04 C22.2 No.0.5 C22.2 No.25 C22.2 No.30 C22.2 No.94 C22.2-No.61010-1-04
	Type of protection	Class I, Division 1, Groups B, C and D Class II/III, Division 1, Groups E, F and G
	Temperature class for Ex "db"	T2
	Ambient temperature	-20°C to 60°C
	Enclosure Rating	Type 4X
EAC:	Applicable Standard:	ГОСТ 31610.0 ГОСТ IEC 60079-1 ГОСТ IEC 60079-31
	Type of protection	1Ex db IIB+H ₂ T2 Gb X Ex tb IIIC T300 °C Db X
	Temperature class for Ex "db"	T2
	The maximum surface temperature for Ex "tb":	T300°C
	Ambient temperature	-20°C to 60°C
	Enclosure Rating	IP66
KOREA EX (by KTL):	Applicable Standard:	Notice of Ministry of Labor No. 2016-54
	Type of protection:	Ex d IIB+H ₂ T2
	Temperature class for Ex "db"	T2
	Ambient temperature	-20°C to 60°C
	Enclosure Rating	IP66
TAIWAN EX:	Registration	IECEx registered and approved for use in Taiwan. For explosion-proof specifications, please refer to the IECEx section.

GB EX	Applicable Standard	GB/T 3836.1
		GB/T 3836.2
		GB/T 3836.31
	Type of protection:	Ex db IIB + H ₂ T2...T4 Gb, Ex tb IIIC T300°C Db
	Temperature class for Ex "db"	T2...T4
	The maximum surface temperature for Ex "tb"	T300°C
	Ambient temperature	-20°C to 60°C
	Surface Temperature	See page 7 Surface temperature of ZR22S (ATEX, IECEx, GB EX)
	Enclosure Rating	IP66

Surface temperature of ZR22S (ATEX, IECEx, GB EX)

- Process temperature range for combustion (burning) process: -20°C to +700°C

ATEX, IECEx, GB EX

Temperature class or Maximum surface temperature	Maximum process flange temperature	Maximum terminal compartment temperature
T2 or T300°C	290°C	150°C
T3	190°C	150°C
T4	125°C	115°C

- Process temperature range for normal process: Ambient temperature

ATEX, IECEx

Temperature class or Maximum surface temperature
T3...T2 or T300°C, T4: Not available

GB EX

Temperature class or Maximum surface temperature
T2...T3 or T300°C, T4: Not available

Safety, EMC, and RoHS conformity standards

Installation altitude: 2000 m or less

Installation category: (IEC61010); II

Pollution degree: (IEC61010); 2

Measurement category: O (other)

- Note
- Installation category, called overvoltage category, specifies impulse withstanding voltage. Category II is for electrical equipment.
 - Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which reduce dielectric strength. Degree 2 is the normal indoor environment.

Safety:

CE	EN 61010-1
UL	UL61010-1
CSA	CAN/CSA-C22.2 No. 61010-1
GB	GB30439 Part 1
EAC	ГОСТ 12.2.007.0-75

EMC:

CE	EN 61326-1 Class A Table 2 EN 61326-2-3 EN 61000-3-2, EN IEC 61000-3-2
RCM	EN61326-1 Class A Table 2
KC	Korea Electromagnetic Conformity Standard 한국 전자파적합성 기준
EAC	ГОСТ 30804.6.2 (IEC 61000-6-2) ГОСТ IEC 61000-6-4

- Note
- This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.
 - Influence of immunity environment (Criteria A) : Output shift is specified within $\pm 20\%$ of F.S.

RoHS: EN IEC 63000

Others:

REACH Regulation EC 1907/2006
Information of the WEEE Directive
This product is purposely designed to be used in a large scale fixed installations only and, therefore, is out of scope of the WEEE Directive. The WEEE Directive is only valid in the EU.

ZR22S
**Separate type Explosion-proof
Zirconia Oxygen Analyzer, Detector
Start-up and Safety Precautions**

IM 11M13A01-02E 19th Edition

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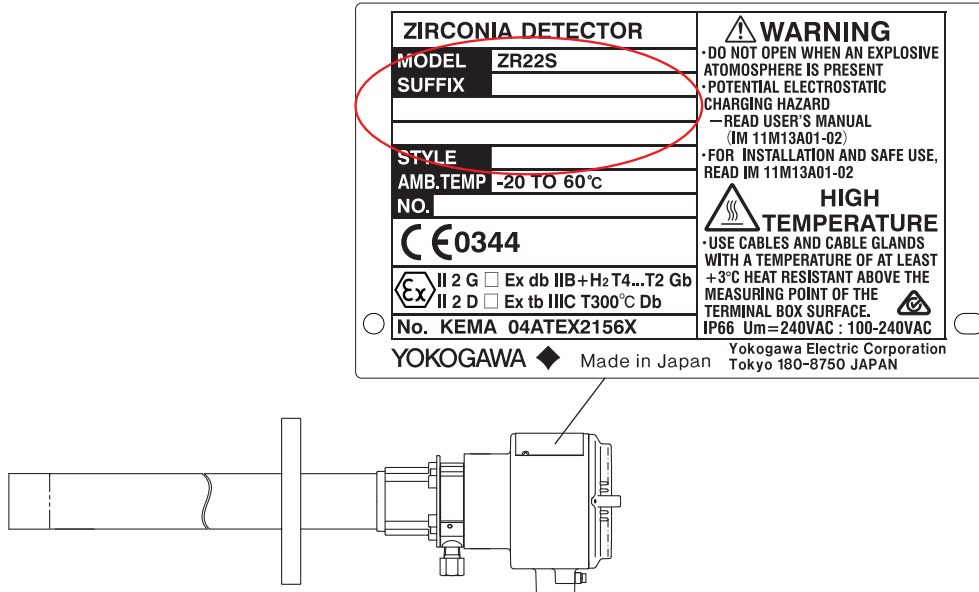
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1. Instrument Check

Upon delivery, unpack the instrument carefully and inspect it to ensure that it was not damaged during shipment. If damage is found, retain the original packing materials (including the outer box) and then immediately notify the carrier and the relevant Yokogawa sales office.

■ Checking the model and suffix code

Make sure the model and suffix code on the nameplate. Model and suffix code is shown in Table 2.



■ Checking accessories

The instrument is shipped with standard accessories. Optional accessories are sold separately if necessary. Make sure the accessories listed in Table 1 or Table 2 are included.

Table 1 Standard accessories

Item	Q'ty	Description
Allen wrench	1	For lock screw

Table 2 Model and suffix code

Model	Suffix code	Option code	Description
ZR22S	-----	-----	Separate type Explosion-proof Zirconia Oxygen Analyzer, Detector
Explosion-proof Approval (*1)	-A -B -C -D -Q -R -K -M	----- ----- ----- ----- ----- ----- ----- -----	ATEX certified flameproof (*2) FM certified explosion-proof CSA certified explosion-proof IECEx certified flameproof (*2) (*3) EAC certified explosion-proof with PA (*4) EAC certified explosion-proof without PA (*4) Korea Ex certification GB Ex certificated flameproof (by NEPSI) (*16)
Length	-015 -040 -070 -100 -150 -200	----- ----- ----- ----- ----- -----	0.15 m (*5) 0.4 m 0.7 m 1.0 m 1.5 m 2.0 m
Wetted material	-S -C	----- -----	Stainless steel Stainless steel with Inconel calibration gas tube (*6)
Flange (*7)	-A -B -C -E -F -G -K -L -M -P -Q -R -S -W	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----	ANSI Class 150 2 RF (*8) ANSI Class 150 3 RF ANSI Class 150 4 RF (*8) DIN PN10 DN50 A DIN PN10 DN80 A DIN PN10 DN100 A JIS 5K 65 FF JIS 10K 65 FF JIS 10K 80 FF JIS 10K 100 FF JIS 5K 32 FF (for high temperature use) (*9) JPI Class 150 4 RF JPI Class 150 3 RF Westinghouse
Reference gas	-E	-----	External connection (Instrument air) (*10)
Gas thread	-R -T	----- -----	Rc1/4 1/4 NPT (Female)
Connection box thread	-M -T	----- -----	M20 x1.5 mm 1/2 NPT (*11)
Instruction manual	-E -K	----- -----	English Korea (*12)
—	-A	-----	Always -A
Options	Valves Tag plates	/C /CV /SV /SCT /PT	Inconel bolt (*13) Check valve (*14) Stop valve (*14) Stainless steel tag plate (*15) Printed tag plate (*15)

*1: When using ZR22S as CE marking compliance product, select -A (ATEX certified flameproof).

*2: The cable entry devices (cable glands etc.) and blind plugs shall be certified in type of protection Ex “d(db) II C” or Ex “tb IIIC” according to the applicable regulatory requirement: ATEX (-A), IECEx (-D), suitable for the conditions of use and correctly installed. They shall provide a degree of ingress protection of at least IP66.

*3: Product registration is done by Yokogawa Taiwan Corporation as an importer in Taiwan.

*4: Please select -Q for final destination of Russian Federation.

Please select -R for final destination of Kazakhstan and Belarus.

For more information about certification availability, please contact Yokogawa office.

*5: For a high temperature detector, use with the ZO21P Probe Adapter and select Flange -Q.

*6: Recommended if sample gas contains corrosive gas like chlorine.

*7: The thickness of the flange depends on its dimensions.

*8: Confirm inside diameter of pipe attached to customer's flange in case that -A or -E is selected.

*9: The flange thickness does not conform to JIS specification.

*10: Piping for reference gas must be installed to supply reference gas constantly at a specified flow rate.

*11: When selecting code -B (FM certified explosion-proof) or -C (CSA certified explosion-proof), select code -T (1/2 NPT).

*12: If you want to order Korea Ex specification, please select -K.

*13: Inconel probe bolts and U shape pipe are used. Use this option for high temperature use (ranging from 600 to 700°C).

*14: Specify either /CV or /SV option code.

*15: Specify either /SCT or /PT option code.

*16: M20X1.5 or 1/2 NPT thread type cable entry, adapters and/or blanking elements, certified by notified body with type of protection Ex db II C Gb in accordance with GB/T 3836.1-2021 and GB/T 3836.2-2021, should be applied when installation in explosive gas atmosphere. The IP code should be IP66. M20X1.5 or 1/2 NPT thread type cable entry, adapters and/or blanking elements, certified by notified body with type of protection Ex tb IIIC Db in accordance with GB/T 3836.1-2021 and GB/T 3836.31-2021, should be applied when installation in combustible dust atmosphere. The IP code should be IP66.

2. Wiring and Installation

For details, refer to the User's Manual IM 11M13G01-02EN.

2.1 Installation site

The ZR22S is weatherproof and can be installed both inside and outside (Construction: NEMA 4X/IP66). It should, however, be installed as close as possible to the sensor to avoid long cable runs between the instrument and sensor.

Sample Gas Temperature:	0 to 700°C (Probe only) It is necessary to mount the cell using Inconel cell-bolts when the temperature is greater than 600°C. 700 to 1400°C (with High Temperature Probe Adapter)
For high-temperature sample gas, apply 0.15m length probe and High Temperature Probe Adapter ZO21P-H.	
	A flame arrester may corrode if sample gas contains the following corrosive gases under 380°C or over.
	Greater than 5000 ppm SO ₂ Greater than 1000 ppm NO Greater than 50 ppm HCl
Sample Gas Pressure:	-5 to +5 kPa For 0.15 m probe, -0.5 to +5 kPa. No pressure fluctuation in the furnace should be allowed.
Probe Length:	0.15, 0.4, 0.7, 1.0, 1.5, 2.0 m
Probe Material:	SUS316 (JIS)
Ambient Temperature:	-20 to +60°C (The surface temperature is provided by page 6 "Surface temperature")

The following should be taken into consideration when installing the detector:

- Easy and safe access to the detector for checking and maintenance work.
- An ambient temperature of not more than 60°C, and the terminal box should not be affected by radiant heat.
- A clean environment without any corrosive gases.
- No vibration.
- The sample gas satisfies the specifications described above.
- No sample gas pressure fluctuations.
- The installation must be in accordance with IEC 60079-14 and relevant local codes.

CAUTION

Make sure the power supply is switched off. Power rating must comply with ZR802S specification. Power voltage must match with the one indicated on the name plate.

2.2 Piping

- Ensure that each check valve, stop valve and joint used for piping do not allow leakage. Especially, if there is any leakage of the calibration gas from pipes and joints, it may cause clogging of the pipes or incorrect calibration.
- Be sure to conduct leakage test after piping.
- Basically, apply instrument air (dehumidified by cooling to the dew point -20°C or lower, and removing any dust, oil mist and the like) for the reference gas.

2.3 Wiring

WARNING

- Use the heat resistant cables listed below.
ATEX, IECEx, GB EX: Use cables with a temperature of at least +3°C heat resistant above the measuring point of the terminal box surface. When the terminal box surface temperature is unclear, use at least 153°C heat resistant cables.
- Other than ATEX, IECEx, GB EX: Use at least 150°C heat resistant cable.
- Wiring work should be performed to meet IP66 or higher requirements.
- Use cables that comply with UL2556VW-1 or equivalent.
- Always place the shield cover over the power supply and contact terminals for safety reasons and to avoid interference.

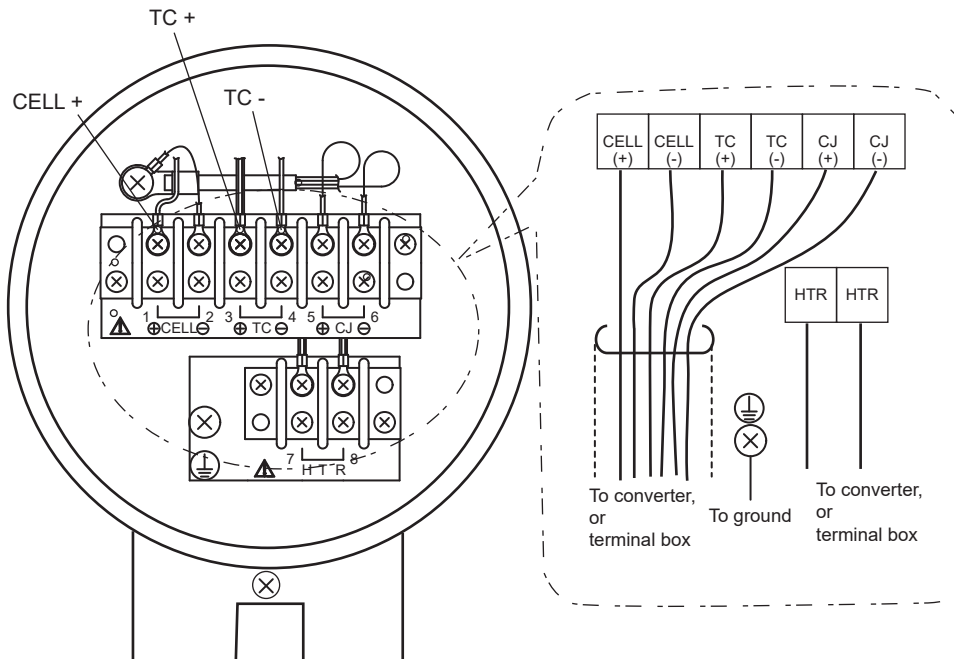
Cable Specifications

Basically, the 2-core and 6-core heat-resistant cables listed immediately above are used for this wiring.

When the ambient temperature of the detector exceeds 75°C, install a terminal box, and connect with the detector using six-piece 600V silicon rubber insulated glass braided wire.

● Grounding

For the safety of the user and to protect the instrument against interference, the housing must always be connected to ground. This has to be done by a cable with large cross-sectional area. This cable can be fixed to the bottom of the housing or the internal ground connections.



Detector terminals

WARNING

The minimum cross sectional area of the protective grounding wire should be 0.75 mm². Use cables with a cross section of 0.75 to 2.1 mm².

3. Operation

When all wiring is completed, turn on the power to the instrument.
For details, refer to the User's Manual IM 11M13G01-02EN.

4. Maintenance

WARNING

When checking the detector, carefully observe the following:

- The instrument modification or parts replacement by other than authorized representation of Yokogawa Electric Corporation is prohibited and will void all Explosion-proof Certificate.
- Do NOT touch the probe if it has been in operation immediately just before being checked. (The sensor at the tip of the probe heats up to 750°C during operation. If you touch it, you will get burned.)

CAUTION

- Do not subject the probe to shock or cool it rapidly.
The sensor is made of ceramic (zirconia). If the detector is dropped or bumped into something, the sensor may be damaged and no longer work.
- Do not reuse the metal O-ring to seal the cell assembly. If you replace the cell or remove it from the probe for checking, be sure to replace the metal O-ring. Otherwise, the furnace gas may leak, and then the leaking corrosive gas will cause the built-in heater or thermocouple to become an open circuit, or the detector may corrode.
- Before opening or closing the terminal box, first remove dust, sand, or the like from the terminal box cover.

4.1 Inspection and Maintenance of the Detector

4.1.1 Cleaning the Calibration Gas Tube

The calibration gas, supplied through the calibration gas inlet of the terminal box into the detector, flows through the tube and comes out at the tip of the probe. The tube might become clogged with dust from the sample gas. If you become aware of clogging, such as when a higher pressure is required to achieve a specified flow rate (600 ± 60 ml/min), clean the calibration gas tube.

To clean the tube, follow these steps:

- (1) Remove the detector from the installation assembly. Remove the Flame Arrestor Assembly from Sensor Assembly (See Figure 4.2)
- (2) Following Subsection 4.1.2, later in this manual, remove the four bolts (and associated spring washers) that tighten the sensor assembly, and the pipe support as well as the U-shaped pipe.
- (3) Use a rod 2 to 2.5 mm in diameter to clean the calibration gas tube inside the probe. In doing this, keep air flowing from the calibration gas inlet at about 600 ml/min and insert the rod into the tube (3-mm inside diameter). However, be careful not to insert the rod deeper than 40 cm for a general-purpose detector, or 15 cm for a high temperature detector.
- (4) Clean the U-shaped pipe. The pipe can be rinsed with water. However, it should be dried out thoroughly before reassembly.
- (5) Restore all components you removed for cleaning. Follow Subsection 4.1.2 to restore all components in their original positions. Be sure to replace the O-ring(s) with new ones.

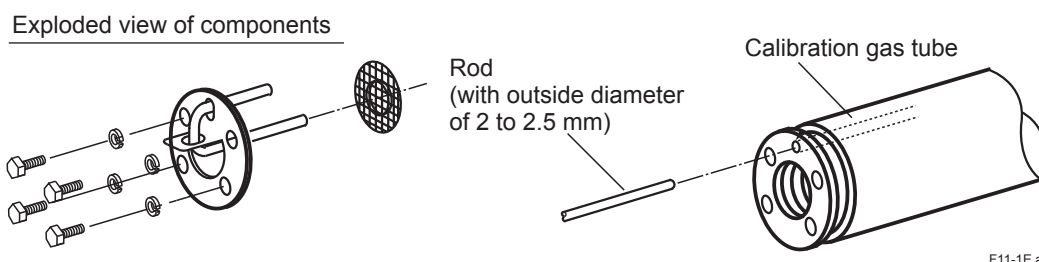


Figure 4.1 Cleaning the Calibration Gas Tube

4.1.2 Replacing the Sensor Assembly

The performance of the sensor (cell) deteriorates as its surface becomes soiled during operation. Therefore, you have to replace the sensor when its life expectancy expires, for example, when it can no longer satisfy a zero correction ratio of $100 \pm 30\%$ or a span correction ratio of $0 \pm 18\%$. In addition, the sensor assembly is to be replaced if it becomes damaged and can no longer operate during measurement.

If the sensor becomes no longer operable (for example, due to breakage), investigate the cause and remedy the problem as much as possible to prevent recurrence.

CAUTION

- If the sensor assembly is to be replaced, allow enough time for the detector to cool down from its high temperature. Otherwise, you may get burned.
- If the cell assembly is to be replaced, be sure to replace the metal O-ring and the contact together. Additionally, even in a case where the cell is not replaced, if the contact becomes deformed and cannot make complete contact with the cell, replace the contact.
- If there is any corroded or discolored area in the metal O-ring groove in which the contact is embedded, sand the groove with sandpaper or use a metal brush, and then sand further with a higher grade of sandpaper (no. 1500 or so), or use an appropriate metal brush to eliminate any sharp protrusions on the groove. The contact's resistance should be minimized.
- Use sensor assemblies manufactured in or after Sept. 2000: the serial number on the side of the sensor assembly should be 0J000 or later (for example: 0K123, 1AA01).

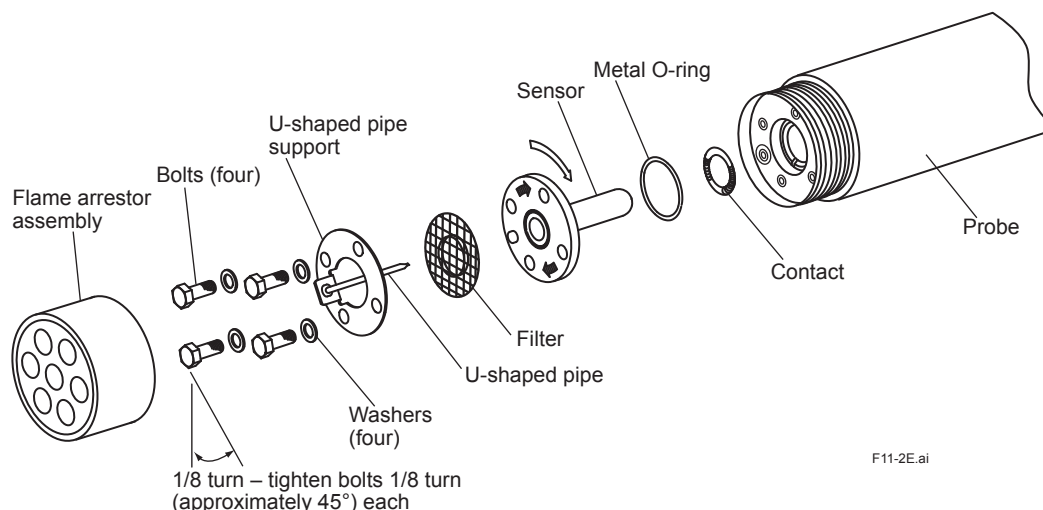


Figure 4.2 Exploded View of Sensor Assembly

CAUTION

Optional Inconel bolts have a high coefficient of expansion. If excess torque is applied while the bolts are being tightened, abnormal strain or bolt breakage may result. So, tighten the bolts according to the instructions given above.

1. Identifying parts to be replaced

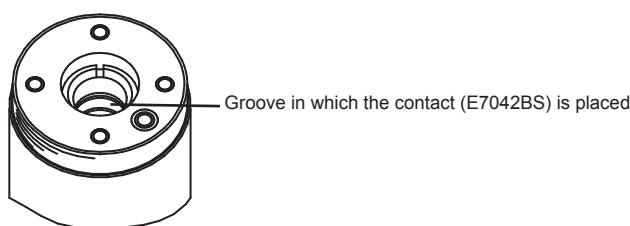
In order not to lose or damage disassembled parts, identify the parts to be replaced from among all the parts in the sensor assembly. Normally, replace the sensor, metal O-ring and contact together at the same time. If required, also replace the U-shaped pipe, bolts, filter and associated spring washers.

2. Removal procedures

- (1) Remove the flame arrestor assembly with a special wrench (part no. K9471UX).
- (2) Remove the four bolts and associated washers from the tip of the detector probe.
- (3) Remove the U-shaped pipe support together with the U-shaped pipe. Remove filter also.
- (4) Pull the sensor assembly toward you while turning it clockwise. Also, remove the metal O-ring between the assembly and the probe. Remove filter also.
(When replacing the assembly, be careful not to scratch or dent the tip of the probe with which the metal O-ring comes in contact (the surface with which the sensor flange also comes in contact). Otherwise, the sample gas will not be sealed.)
- (5) Use tweezers to pull the contact out of the groove in the tip of the probe.
- (6) Clean the sensor assembly, especially the metal O-ring contact surface to remove any contaminants adhering to that part. If you can use any of the parts from among those removed, also clean them up to remove any contaminants adhering to them.
(Once the metal O-ring has been used, it cannot be reused. So, be sure to replace it.)

3. Part assembly procedure

- (1) First, install the contact. Being careful not to cause irregularities in the pitch of the coil spirals (i.e., not to bend the coil out of shape), place it in the ringed groove properly so that it forms a solid contact.



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Figure 4.3 Installing the Contact

- (2) Next, make sure that the O-ring groove on the flange surface of the sensor is clean. Install the metal O-ring in that O-ring groove, and then insert the sensor in the probe while turning it clockwise. After inserting it until the metal O-ring comes in contact with the probe's O-ring contact surface, properly align the U-shaped-pipe insertion holes with the bolt openings.
- (3) Attach the U-shaped pipe to its support with filter, then fully insert the U-shaped pipe and its support into the probe.
- (4) Coat the threads of the four bolts with anti-seize grease and then screw them in along with the washers. First, tighten the four bolts uniformly by hand, and then use a torque wrench to tighten all areas of the metal O-ring uniformly, that is, to make sure the sensor flange is perfectly horizontal to the O-ring's working face in the probe.
This is done by tightening first one bolt and then its opposing bolt each 1/8 turn, and then one of the other bolts followed by its opposing bolt, each also 1/8 turn. This continues in rotating fashion until they are all fully tightened with the torque wrench preset to approximately 5.9 N • m. If they are not uniformly tightened, the sensor or heater may be damaged.
Replacement of the sensor assembly is now complete. Attach and fix the flame arrestor assembly. Install the detector and restart operation. Calibrate the instrument before making a measurement.

4.1.3 Replacement of the Heater Unit (Assembly)

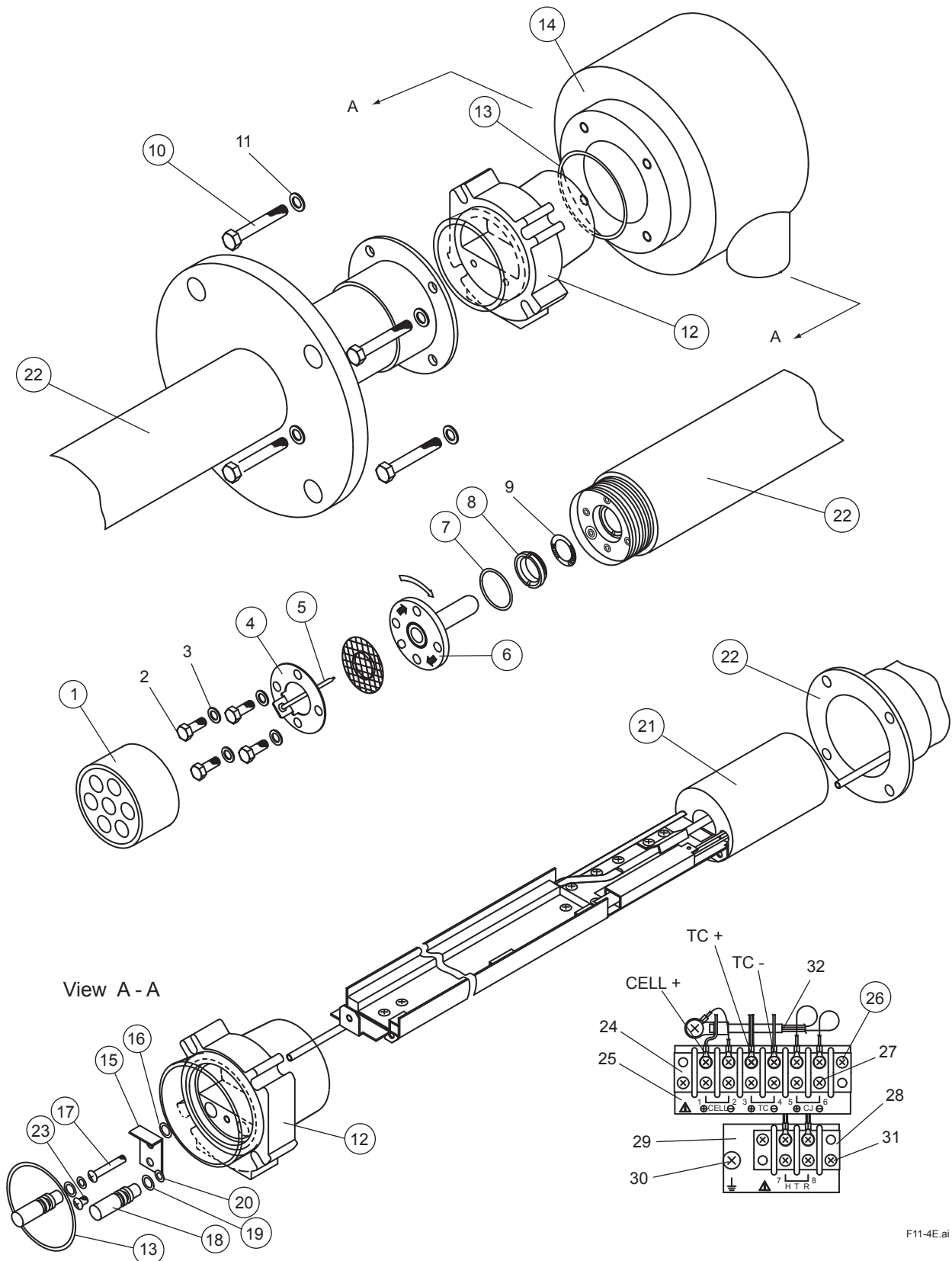
This Subsection describes the replacement procedure for the heater unit.

The sensor or ceramic heater-furnace core internal structure is subject to fracturing, so do NOT subject it to strong vibrations or shock. Additionally, the heater unit reaches high temperatures and is subjected to high voltages. So, maintenance services should be performed after the power is off and the heater unit temperature has returned to normal room temperature.

For details, refer to IM11M12A01-21E "Heater Assembly".

NOTE

If the heater strut assembly cannot be removed because a screw has fused to its thread, one of our service representatives can fix it.



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Figure 4.4 Exploded View of Detector

Replacement of heater strut assembly

Refer to Figure 4.4 as an aid in the following discussion.

Remove the U-shaped pipe support (4), the U-shaped pipe (5), the Filter and the Sensor (Cell) (6) according to Subsection 4.1.2 Replacing the Sensor Assembly. Open the terminal box (14) and remove the three terminal connections – CELL +, TC + and TC -. Before disconnect the HTR terminals, remove the terminal block screw (26). Keeping the other terminal remaining to be connected. Disconnect the two HTR connections. (These terminals have no polarity.)

Remove the four bolts (10) and terminal box (14) with care so that the already disconnected wire will not get caught in the terminal box.

Loosen Screw (17) until the plate (15) of heater strut assembly (21) can be removed. There's no need to remove O-ring (16) which prevents Screw (17) from coming out. Pull out connector (12).

Loosen and remove the screw for the heater assembly fixation (8) with a special wrench (part no. K9470BX or equivalent) and then remove the heater strut assembly (21) from the detector (22).

To reassemble the heater strut assembly, reverse the above procedure:

Insert the heater strut assembly (21) into the detector (22), while inserting the calibration pipe in the detector (22) into the heater section in the heater strut assembly (21) as well as in the bracket hole. Coat the screw for the heater assembly fixation (8) with grease (NEVER-SEEZ: G7067ZA) and tighten the screw for the heater assembly fixation (8) with a special wrench (part no. K9470BX or equivalent) with a tightening torque of $12\text{N}\cdot\text{m} \pm 10$ percent.

Next, to install the O-rings (20) on the calibration gas and reference gas pipes, disassemble the connector (12) in the following procedure:

First, remove the screw (23) and then remove the plate (15) and two caps (18). If the O-ring (20) remains in the hole, pull them out from the back. Pass the heater and thermocouple lead wire through the connector (12). Also, pass the calibration gas and reference gas pipes through the opening of the connector (12). If the O-ring (20) fails, replace it with a new one.

Push the two caps (18) into the associated opening of the connector (12). Insert the plate (15), aligning it with the groove of the cap (18), and tighten it with the screw (23). If you attempt to insert the calibration gas and reference gas pipes into the connector (12) without disassembling the connector (12), the O-ring may be damaged. Tighten Screw (17) to the plate (15) of heater strut assembly (21) until connector (12) cannot move.

Reassemble in reverse order to the above disassembly procedure.

The two wires with ceramic insulators from the heater strut assembly are heater wires, and the single-core shielded wire is the cell signal + terminal; for the two-core shielded cable, the semi-translucent rubber-sheathed wire is the thermocouple + terminal, and the other wire is the – terminal. (If the wires are marked, match the markings with those on the terminal board).

When installing the sensor (cell) (6), replace the metal O-ring (7) with a new one.

4.1.4 Replacement of Flame Arrestor Assembly

If it takes longer for the analyzer to return to read the concentration of a sample gas after calibration, the flame arrestor may have become clogged. Inspect the flame arrestor and if necessary, clean or replace it.

Set the flame arrestor assembly ① in place using a special pin spanner (with a pin 4.5 mm in diameter: part no. K9471UX or equivalent). If a flame arrestor assembly that has already been replaced once is used again, apply grease (NEVER-SEEZ: G7067ZA) to the threads of the flame arrestor assembly.

If the flame arrestor assembly is clogged with dust, replace it with new one or wash it.

In case of the ATEX flameproof model (MS Code: ZR22S-A-...), or IECEx flameproof model (MS Code: ZR22S-D-...), GB EX flameproof model (MS Code: ZR22S-M-...), the flame arrestor assembly ① is bonded to the detector ② with an ceramic adhesive. To remove the flame arrestor assembly ①, crack the hardened adhesive on the joint by tapping it with a flat blade screwdriver and a hammer or appropriate tools. After reattaching the flame arrestor assembly ①, apply a small amount of ceramic adhesive (part no. G7018ZA), with a diameter not exceeding 10 mm, to the joint part. Be careful not to allow the ceramic adhesive to enter between the female and the male screws. Before applying, stir the ceramic adhesive thoroughly. The ceramic adhesive should be stored in a cool, dark place and has a shelf life of 6 months from the date of shipment.

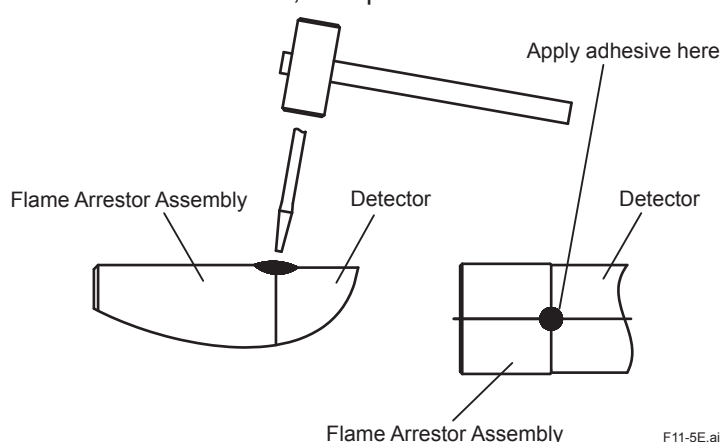


Figure 4.5 Removal of Flame Arrestor Assembly

4.1.5 Replacement of O-ring

The detector uses three different types of O-rings ⑬, ⑰, and ⑳, two O-rings of each type.

	Part No.	Description
⑦	K9470BJ	Metal O-ring
⑬	K9470ZS	O-ring with grease
⑰ ⑳	K9470ZP	Two pairs of O-rings with grease

4.1.6 Cleaning the High Temperature Probe Adapter



CAUTION

- Do NOT subject the probe of the High Temperature Probe Adapter (ZO21P) to shock. This probe uses silicon carbide (SiC) which may become damaged if it is subjected to a strong shock or thermal shock.

The high temperature detector is structured so that the gas to be measured is directed toward the detector with the high temperature probe adapter. Therefore, if the probe or the sample gas outlet clogs, a precise measurement is no longer possible because of no gas flow. If you use the high temperature detector, you have to inspect it periodically and, if any part of it is significantly clogged with dust, clean it.

Dust found sticking to the probe should be blown off. If any dust still remains after the blowing, clean it with a metal rod, etc., inserted. In addition, if dust is found on the auxiliary ejector assembly or needle valve (choke) at the sample gas outlet, remove these parts from the high temperature probe adapter and then clean them. To remove dust, blow air on them or rinse them with water.

4.1.7 Stopping and Re-starting Operation

<Stopping Operation>

When operation is stopped, take care of the followings so that the sensor of the detector cannot become unused.



CAUTION

When operating an instrument such as boiler or industrial furnace is stopped with the zirconia oxygen analyzer operation, moisture can condensate on the sensor portion and dusts may stick to it.

If operation is restarted in this condition, the sensor, which is heated up to 750°C, may become permanently contaminated. The dust can greatly degrade sensor performance. If a large amount of water is condensed, the sensor can be broken and never reusable.

To prevent the above nonconformity, take the following action when stopping operation.

- (1) If possible, keep on supplying the power to converter and flowing reference gas to the sensor.
If impossible to do the above, remove the detector.
- (2) If impossible to supply the power or remove the detector, at least keep on flowing air at 600 mL/min into the calibration gas pipe.

<Restarting Operation>

When restarting operation, be sure to flow air, for 5-10 minutes, at 600 mL/min into the calibration gas pipe before supplying the power to converter.

5. Explosion protected Type Instrument

In this section, further requirements and differences for explosion proof type instrument are described. For explosion protected type, the description in this section is prior to other description in this User's Manual.



CAUTION

ZR22S has been tested and certified as being explosion proof. Please note that severe restrictions apply to these instrument's construction, installation, external wiring, maintenance and repair. A failure to abide by these restrictions could make the instrument a hazard to operate.

■ General Instruction

● Installation

Refer to the IM 11M13G01-02EN for other than that described below.

- In order to prevent the earthing conductor from loosening, the conductor must be secured to the terminal, tightening the screw with torque of approx. 2.0 N·m (M5) or 1.2 N·m (M4). Care must be taken not to twist the conductor.
- Unused entries shall be closed with suitable certified blanking elements.
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment

Marking	Screw form / size
M	ISO M20x1.5
N	ANSI 1/2NPT

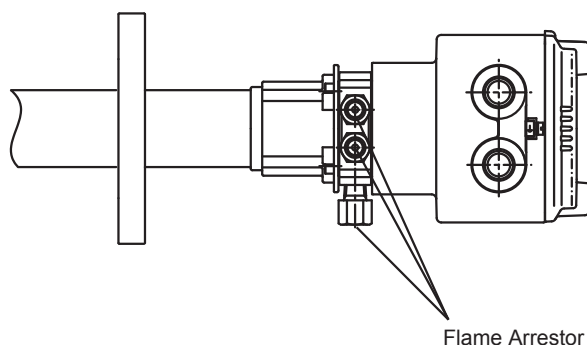
- When installing the equipment, the selected Type of Protection should be ticked as follows.
 - ☒ Ex db IIB + H₂ T4...T2 Gb
 - ☐ Ex tb IIIC T300 °C Db
- The cable entry devices (cable glands etc.) and blind plugs shall be in type of protection Ex "d (db) IIC" or Ex "tb IIIC" according to the applicable regulatory requirement, suitable for the conditions of use and correctly installed. They shall provide a degree of ingress protection of at least IP66.
- The installation must be in accordance with IEC 60079-14 and relevant local codes.
- No intermediate parts are used for the internal ground terminal of the detector. Use crimping terminal for connection to the internal ground terminal in order to avoid corrosion by high contact potentials.



CAUTION

Do not loosen or remove any Flame Arrestor of gas inlet/outlet during piping.

The detector modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void all Explosion-proof Certificate.



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● Operation

WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

- In hazardous areas, risk from electrostatic discharge and propagating brush discharges caused by rapid flow of dust shall be avoided. Avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.

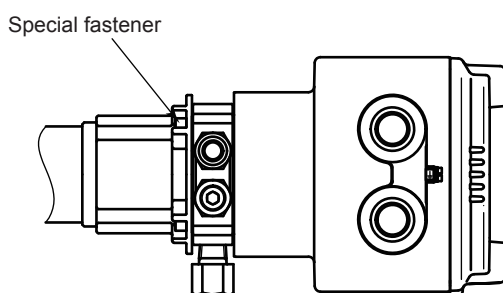
WARNING

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

- Take care not to generate mechanical spark when access to the equipment and the peripheral devices in hazardous locations.
- Do not damage the mating surface of the case and cover.

● Specific condition of use

- Special conditions for safe use
Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth.
If it is mounted in the area where the use of Ex “tb” apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.
- Special fastener
Hexagon socket head cap screws below are special fastener according to EN IEC 60079-0: 2018 (see the figure below). Material property classes of them are A2-50 or better.



Special fastener

● Maintenance and repair

WARNING

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

■ Installation of General-purpose Detector

● Installation Location

The following should be taken into consideration when installing the detector:

- Easy and safe access to the detector for checking and maintenance work.
- An ambient temperature of not more than 60°C, and the terminal box should not be affected by radiant heat.
- A clean environment without any corrosive gases.

- No vibration.
- The sample gas satisfies the specifications described in Section 2.1.
- No sample gas pressure fluctuations.
- The installation must be in accordance with IEC 60079-14 and relevant local codes.

● ATEX Flameproof Type

ZR22S-A Detector for use in hazardous locations:

Note 1: Applicable Standard: EN IEC 60079-0: 2018, EN 60079-1: 2014, EN 60079-31: 2014

Certificate Number: KEMA 04ATEX2156X
The symbol "X" placed after certificate number indicates that the equipment is subjected to special conditions for safe use. Refer to Note 6.

Type of protection:  II 2 G Ex db IIB+H₂ T4...T2 Gb and II 2 D Ex tb IIIC T300°C Db

Equipment Group: II

Category: 2G, 2D

Temperature class for Ex "db": T4...T2

The maximum surface temperature for Ex "tb": T300°C

Degree of protection of enclosure: IP66

ZIRCONIA DETECTOR	
MODEL	ZR22S
SUFFIX	
STYLE	
AMB. TEMP	-20 TO 60°C
NO.	
C 0344	
☒ II 2 G ☐ Ex db IIB+H ₂ T4...T2 Gb ☐ II 2 D ☐ Ex tb IIIC T300°C Db	
No. KEMA 04ATEX2156X	
YOKOGAWA  Made in Japan	

WARNING

• DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT

• POTENTIAL ELECTROSTATIC CHARGING HAZARD

— READ USER'S MANUAL (IM 11M13A01-02)

• FOR INSTALLATION AND SAFE USE, READ IM 11M13A01-02

HIGH TEMPERATURE

• USE CABLES AND CABLE GLANDS WITH A TEMPERATURE OF AT LEAST +3°C HEAT RESISTANT ABOVE THE MEASURING POINT OF THE TERMINAL BOX SURFACE.

IP66 Um=240VAC : 100-240VAC

MODEL : Specified model code
 SUFFIX : Specified suffix code
 STYLE : Style code
 AMB. TEMP : Ambient temperature
 NO. : Serial No. and year of production*1
 Yokogawa Electric Corporation : The manufacturer name
 Tokyo 180-8750 JAPAN : The manufacturer address*2

The country of origin

*1: The third to seventh figure from the last shows the year of production.
 e.g. 27D327560 2005.02

↑ The year of production

*2: "180-8750" is a zip code which represents the following address.
 2-9-32 Nakacho, Musashino-shi, Tokyo Japan

Note: "□" is the checkbox for selecting type of protection.

Apply a permanent mark in the checkbox of selected the type of protection.

Once the type of protection is selected, it shall not be changed.

Note 2: Wiring

- All wiring shall comply with local installation requirement.

Note 3: Use and setting-up (operation)

- If the equipment is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.
- Keep to "WARNING" on the Detector.

WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
 POTENTIAL ELECTROSTATIC CHARGING HAZARD-READ USER'S MANUAL (IM11M13A01-02)
 FOR INSTALLATION AND SAFE USE, READ IM11M13A01-02
 USE CABLES AND CABLE GLANDS WITH A TEMPERATURE OF AT LEAST+3°C HEAT RESISTANT ABOVE THE MEASURING POINT OF THE TERMINAL BOX SURFACE.

- Take care not to generate mechanical sparking when accessing to the detector and peripheral devices in hazardous location
- When the terminal box surface temperature is unclear, use at least 153°C heat resistant cables and cable glands.

Note 4: Maintenance and Repair

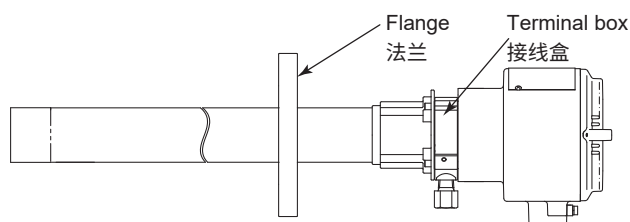
- WARNING:
- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
 - Only personnel authorized by Yokogawa Electric Corporation can repair the equipment
 - The detector modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

Note 5: Cable Entry

- The threaded type of cable entry is marked beside the cable entry according to the following markings.
 Threaded type : Marking
 M20 x 1.5 : M
 1/2 NPT : N
- The cable entry devices (cable glands etc.) and blind plugs shall be in type of protection Ex “db” or Ex “tb”, suitable for the conditions of use and correctly installed. They shall provide a degree of ingress protection of at least IP66.

Note 6: Specific conditions for safe use

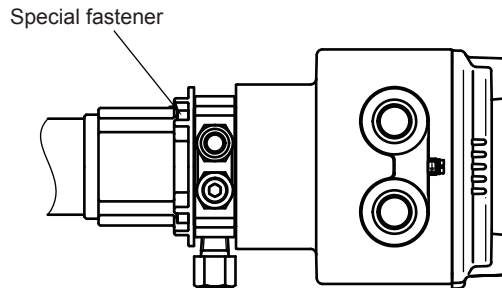
- Repair of the equipment is only allowed when done by the manufacturer or an authorised representative.
 Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
 - The property class of the fasteners used to fasten the enclosure is at least A2-50.
 (The property class of the fasteners used to fasten the cover and case is at least A*-50.
 Note: The “*” shown is replaced by a property grade numeral.)
 - Precautions shall be taken to minimize the risk of electrostatic discharge of painted parts.
 (Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts (excluding glass parts) or coated parts of the equipment.)
 - See page 6 “Surface temperature” of this certificate for the surface temperature limitations.
 ZR22S can be used in environments where the surface temperature meets page 6 “Surface temperature” .
 Surface temperature measurement method
 * No flammable gas in the facility.
- Install the ZR22S on the facility.
 - Start up the facility.
 - Supply power from the converter to the ZR22S and wait until warmup is complete.
 - Measure the flange and terminal box surface temperature, and confirm that they meet the flange and terminal box surface temperature specifications. Refer to the below figure for the position to measure the surface temperature.



Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth. If it is mounted in the area where the use of Ex “tb” apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.

Note 7: Special fastener

Hexagon socket head cap screws below are special fastener according to EN IEC 60079-0: 2018 (see the figure below). Material property classes of them are A2-50 or better.



Note 8: Installation

- The equipment shall be installed in accordance with EN 60079-14 and relevant local codes and requirements.
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment. (Refer to Note 5)
- When installing the equipment, the selected Type of Protection should be ticked as follows.
 - ☐ Ex db IIB + H₂ T4...T2 Gb
 - ☐ Ex tb IIIC T300 °C Db
- No intermediate parts are used for the internal ground terminal in the aluminum alloy case. Use crimping terminal for connection to the internal ground terminal in order to avoid corrosion by high contact potentials. In order to prevent the earthing conductor from loosening, the conductor must be secured to the terminal, tightening the screw with appropriate torque.
- Care must be taken not to twist the conductor.
- Cable glands, adapters and/or blanking elements shall be installed so as to maintain the specified type of protection(s) and the rating of the equipment.
- Use cables and cable glands with a temperature of at least +3°C heat resistant above the measuring point of the terminal box surface.
- Do not mount the probe with the tip higher than the probe base.
- Only for connection to converter type ZR402G, ZR802G, ZR802S or AV550G according to the user manual.

● **FM Explosion-proof Type**

ZR22S-B Detector for use in hazardous locations:

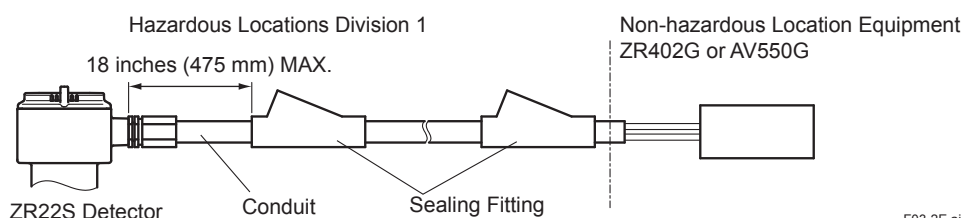
- Note 1:** Applicable Standard: FM3600 2011, FM3615 2006, FM3810 2005, ANSI/NEMA 250 1991
- Type of protection: Explosion-proof for Class I, Division 1, Groups B, C and D
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G
- Enclosure Rating: NEMA 4X
- Temperature Class: T2

Note 2: Wiring

- All wiring shall comply with National Electrical Code ANSI/NEPA 70 and Local Electrical Code.

- In hazardous location, wiring shall be in conduits as shown in the figure.

WARNING: SEAL ALL CONDUITS WITHIN 18 INCHES OF THE ENCLOSURE.

**Note 3: Operation**

- Keep the "WARNING" label to the Detector.

WARNING: OPEN CIRCUIT BEFORE REMOVING COVER. USE AT LEAST 150°C HEAT RESISTANT CABLES.

- Take care not to generate mechanical sparking when accessing to the detector and peripheral devices in hazardous location

Note 4: Maintenance and Repair

- The detector modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosion-proof Approval.

● CSA Explosion-proof Type

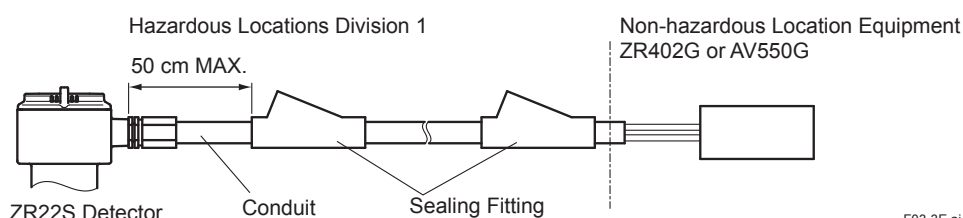
ZR22S-C Detector for use in hazardous locations:

- Note 1:** Applicable Standard: C22.2 No.0-M1991, C22.2 No.0.4-04, C22.2 No.0.5-1982, C22.2 No.25-1966, C22.2 No.30-M1986, C22.2 No.94-M91, C22.2-No.61010-1-04
- Certificate Number: 1649642
- Type of protection: Explosion-proof for Class I, Division 1, Groups B, C and D
Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G
- Enclosure: Type 4X
- Temperature Class: T2

Note 2: Wiring

- All wiring shall comply with Canadian Electrical Code Part 1 and Local Electrical Code.
- In hazardous location, wiring shall be in conduits as shown in the figure.

WARNING: SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE.
UN SELLE DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BÎTIER.

**Note 3: Operation**

- Keep the "WARNING" label to the Detector.

WARNING: OPEN CIRCUIT BEFORE REMOVING COVER. REFER TO IM 11M13A01-02E. USE AT LEAST 150°C HEAT RESISTANT CABLES.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE. UTILISEZ DES CÂBLES RÉSISTANTS À 150°C MINIMUM. VEUILLEZ VOUS RÉFÉRER AU IM 11M13A01-02E.

- Take care not to generate mechanical sparking when accessing to the detector and peripheral devices in hazardous location

Note 4: Maintenance and Repair

- The detector modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Canadian Standards Explosion-proof Certification.

● IECEx Flameproof Type

ZR22S-D Detector for use in hazardous locations:

Note 1: Applicable Standard: IEC 60079-0: 2017, IEC 60079-1: 2014,
IEC 60079-31: 2013

Certificate Number: IECEx KEM 06.0006X

The symbol "X" placed after certificate number indicates that the equipment is subjected to special conditions for safe use. Refer to Note 6.

Type of protection: Ex db IIB+H₂ T4...T2 Gb and Ex tb IIIC T300°C Db

Temperature class for Ex "db": T4...T2

The maximum surface temperature for Ex "tb": T300°C

Degree of protection of enclosure: IP66

ZIRCONIA DETECTOR		 WARNING ·DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT ·POTENTIAL ELECTROSTATIC CHARGING HAZARD — READ USER'S MANUAL (IM 11M13A01-02) ·FOR INSTALLATION AND SAFE USE, READ IM 11M13A01-02
MODEL	ZR22S	
SUFFIX		 HIGH TEMPERATURE ·USE CABLES AND CABLE GLANDS WITH A TEMPERATURE OF AT LEAST +3°C HEAT RESISTANT ABOVE THE MEASURING POINT OF THE TERMINAL BOX SURFACE. IP66 Um=240VAC:100-240VAC
STYLE		
AMB. TEMP	-20 TO 60°C	YOKOGAWA ◆ Made in Japan Yokogawa Electric Corporation Tokyo 180-8750 JAPAN
NO.		
 		
No. IECEx KEM 06.0006X		
☐ Ex db IIB+H₂ T4...T2 Gb		
☐ Ex tb IIIC T300°C Db		

MODEL : Specified model code

SUFFIX : Specified suffix code

STYLE : Style code

AMB. TEMP : Ambient temperature

NO. : Serial No. and year of production*1

Yokogawa Electric Corporation : The manufacturer name

Tokyo 180-8750 JAPAN : The manufacturer address*2

The country of origin.

*1: The third to seventh figure from the last shows the year of production.
e.g. 27D327560 2005.02

*2: "180-8750" is a zip code which represents the following address.
2-9-32 Nakacho, Musashino-shi, Tokyo Japan

Note: "☐" is the checkbox for selecting type of protection.

Apply a permanent mark in the checkbox of selected the type of protection.

Once the type of protection is selected, it shall not be changed.

Note 2: Wiring

- All wiring shall comply with local installation requirement.

Note 3: Use and setting-up (operation)

- If the equipment is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.
- Keep to "WARNING" on the Detector.

WARNING: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
POTENTIAL ELECTROSTATIC CHARGING HAZARD-READ USER'S MANUAL (IM11M13A01-02)
FOR INSTALLATION AND SAFE USE, READ IM11M13A01-02
USE CABLES AND CABLE GLANDS WITH A TEMPERATURE OF AT LEAST +3°C HEAT RESISTANT ABOVE THE MEASURING POINT OF THE TERMINAL BOX SURFACE.

- Take care not to generate mechanical sparking when accessing to the analyzer and peripheral devices in hazardous area.
- When the terminal box surface temperature is unclear, use at least 153°C heat resistant cables and cable glands.

Note 4: Maintenance and Repair

- WARNING:**
- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
 - Only personnel authorized by Yokogawa Electric Corporation can repair the equipment

- The analyzer modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

Note 5: Cable Entry

- The threaded type of cable entry is marked beside the cable entry according to the following markings.

Threaded type : Marking

M20 × 1.5 : M

1/2 NPT : N

- In case of ANSI 1/2 NPT plug, ANSI hexagonal wrench should be applied to screw in.
- The cable entry devices (cable glands etc.) and blind plugs shall be in type of protection Ex “db” or Ex “tb”, suitable for the conditions of use and correctly installed. They shall provide a degree of ingress protection of at least IP66.

Note 6: Specific conditions for safe use

- Repair of the equipment is only allowed when done by the manufacturer or an authorised representative.

Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.

- The property class of the fasteners used to fasten the enclosure is at least A2-50.

(The property class of the fasteners used to fasten the cover and case is at least A*-50.

Note: The “*” shown is replaced by a property grade numeral.)

- Precautions shall be taken to minimize the risk of electrostatic discharge of painted parts.

(Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts (excluding glass parts) or coated parts of the equipment.)

- See page 6 “Surface temperature” of this certificate for the surface temperature limitations.

ZR22S can be used in environments where the surface temperature meets page 6 “Surface temperature” .

Surface temperature measurement method

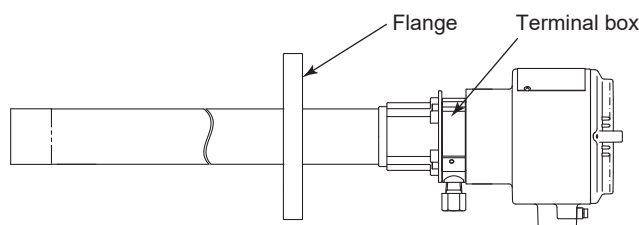
No flammable gas in the facility.

- Install the ZR22S on the facility.

- Start up the facility.

- Supply power from the converter to the ZR22S and wait until warmup is complete.

- Measure the flange and terminal box surface temperature, and confirm that they meet the flange and terminal box surface temperature specifications. Refer to the below figure for the position to measure the surface temperature.

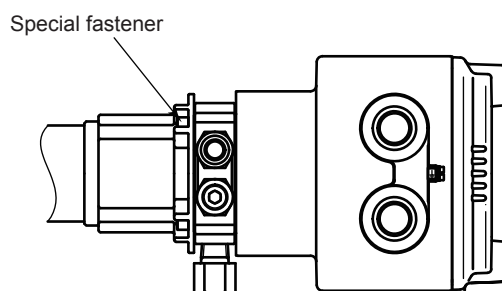


Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth.

If it is mounted in the area where the use of Ex “tb” apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.

Note 7: Special fastener

Hexagon socket head cap screws below are special fastener according to IEC 60079-0: 2011 (see the figure below). Material property classes of them are A2-50 or better.

**Note 8: Installation**

- The equipment shall be installed in accordance with EN 60079-14 and relevant local codes and requirements.
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment. (Refer to Note 5)
- When installing the equipment, the selected Type of Protection should be ticked as follows.
 - ☐ Ex db IIB + H₂ T4...T2 Gb
 - ☐ Ex tb IIIC T300 °C Db
- No intermediate parts are used for the internal ground terminal in the aluminum alloy case. Use crimping terminal for connection to the internal ground terminal in order to avoid corrosion by high contact potentials. In order to prevent the earthing conductor from loosening, the conductor must be secured to the terminal, tightening the screw with appropriate torque.
- Care must be taken not to twist the conductor.
- Cable glands, adapters and/or blanking elements shall be installed so as to maintain the specified type of protection(s) and the rating of the equipment.
- Use cables and cable glands with a temperature of at least +3°C heat resistant above the measuring point of the terminal box surface.
- Do not mount the probe with the tip higher than the probe base.
- Only for connection to converter type ZR402G, ZR802G, ZR802S or AV550G according to the user manual.

- **EAC Flameproof: ZR22S-Q / ZR22S-R**

Applicable Standard: ГОСТ 31610.0, ГОСТ IEC 60079-1, ГОСТ IEC 60079-31
 Certificate Number: EA3C RU C-JP.AA87.B.01254/24
 Type of Protection: 1Ex db IIB+H₂ T2 Gb X, Ex tb IIIC T300°C Db X
 Temperature class for Ex “db”: T2
 The maximum surface temperature for Ex “tb”: T300°C
 Degree of Protection of Enclosure: IP66

- **KOSHA Explosion-proof: ZR22S-K**

Applicable Standard: Notice of Ministry of Labor No. 2016-54
 Certificate Number: 18-AV4BO-0061X
 Type of protection: Ex d IIB+H₂ T2
 Temperature class for Ex “d”: T2
 Degree of protection of enclosure: IP66

● GB EX Flameproof Type

ZR22S-M Detector for use in hazardous locations:

ZR22S-M Detector用于危险场所:

Note 1: Applicable Standard 适用标准: GB/T 3836.1-2021, GB/T 3836.2-2021, GB/T 3836.31-2021

Certificate Number 证号: GYJ25.1154X

Symbol "X" placed after the certification number denotes specific conditions of use, which are specified in the attachment to Note 6.
认证编号后的符号 "X" 表示特定的使用条件, 详见附Note 6 的附件。

Type of protection 防爆标志: Ex db IIB + H₂ T2...T4 Gb, Ex tb IIIC T300°C Db

Temperature class for Ex "db"(Ex "db"的温度组别): T2...T4

The maximum surface temperature for Ex "tb"(最高表面温度): T300°C

Degree of protection of enclosure(外壳防护等级): IP66

ZIRCONIA DETECTOR	
MODEL	ZR22S
SUFFIX	
STYLE	
AMB. TEMP	-20 TO 60°C
NO.	
☐ Ex db IIB + H ₂ T2...T4 Gb ☐ Ex tb IIIC T300°C Db	
No. GYJ25.1154X YOKOGAWA ◆ Made in Japan	

警告

- 存在爆炸性气氛时请勿打开。
- 潜在的静电充电危险(中国语追加)。
- 见使用说明书(IM 11M13A01-02)
- 安装和安全使用请阅读 IM 11M13A01-02

注意高温

- 使用高于接线盒表面测量点的耐热温度至少为+3°C的电缆和电缆接头。

IP66 Um=240VAC:100-240VAC

Yokogawa Electric Corporation
Tokyo 180-8750 JAPAN

MODEL : Specified model code

SUFFIX : Specified suffix code

STYLE : Style code

AMB. TEMP : Ambient temperature

NO. : Serial No. and year of production*1

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Tokyo 180-8750 JAPAN : The manufacturer address*2

The country of origin.

*1: The third to seventh figure from the last shows the year of production.
e.g. 27D327560 2005.02

*2: "180-8750" is a zip code which represents the following address.
2-9-32 Nakacho, Musashino-shi, Tokyo Japan

Note: "□" is the checkbox for selecting type of protection.

Apply a permanent mark in the checkbox of selected the type of protection.

Once the type of protection is selected, it shall not be changed.

注: "□" 为选择保护类型的复选框。

在所选保护类型的复选框中应用永久标记。

保护类型一旦选择, 不得更改。

Note 2: Wiring 接线

- All wiring shall comply with local installation requirement.
所有接线应符合当地安装要求。

Note 3: Use and setting-up (operation) 使用和设置 (操作)

- If the equipment is mounted in an area where explosive atmospheres may be present, it must be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust are avoided.

如果设备安装在可能存在爆炸性环境的区域, 则必须以适当的方式安装, 以避免由快速流动的粉尘引起的静电放电和传播刷状放电的危险。

- Keep to "WARNING" on the Detector. 保持 Detector 上的“警告”。
- WARNING 警告: DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
POTENTIAL ELECTROSTATIC CHARGING HAZARD
-READ USER'S MANUAL (IM11M13A01-02)
FOR INSTALLATION AND SAFE USE, READ IM11M13A01-02
USE CABLES AND CABLE GLANDS WITH A TEMPERATURE OF AT LEAST +3°C HEAT RESISTANT ABOVE THE MEASURING POINT OF THE TERMINAL BOX SURFACE.
存在爆炸性气氛时请勿打开。潜在的静电充电危险。
-见使用说明书(IM11M13A01-02)使用高于接线盒表面测量点的耐热温度至少为+3°C 的电缆和电缆接头。

- Take care not to generate mechanical sparking when accessing to the analyzer and peripheral devices in hazardous area.
操作分析仪时注意不要产生机械火花 以及危险区域的外围设备。
- When the terminal box surface temperature is unclear, use at least 153°C heat resistant cables and cable glands.
当不清楚接线盒表面温度时, 至少使用153°C加热耐腐蚀电缆和电缆密封套。

Note 4: Maintenance and Repair 维护和修理

- WARNING 警告:
- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
对设备进行的修改将不再符合证书文件中描述的结构。
 - Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
只有横河电机公司授权的人员才能维修设备。
- The analyzer modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.
非授权人员对分析仪进行改装或更换零件横河电机公司的代表被禁止, 这将使认证。

Note 5: Cable Entry 电缆入口

- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment.
必须根据设备上的以下标记, 使用适合螺纹形式和电缆入口尺寸的电缆入口装置。

Marking 记号	Screw form / size 螺杆/尺寸
M	M20 × 1.5
N	1/2-14NPT

- Refer to Note 9, about cable entry devices(cable glands etc.) and blind plugs.
参见Note 9, 关于电缆引入装置(电缆密封套等)和盲塞。

Note 6: Specific conditions for safe use 产品安全使用特殊条件

The suffix "X" placed after the certificate number indicates that this product is subject to special conditions for safe use.
防爆合格证号后缀 "X" 表明产品具有安全使用特殊条件:

- Precaution shall be taken to minimize the risk from electrostatic discharges on the non-metallic parts (excluding glass parts) or coated parts of the equipment.
应采取预防措施, 尽量减少设备非金属部件(玻璃部件除外)或涂层部件上的静电放电风险。
- Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
防火接头不宜修理。请联系横河电机代表或横河电机办事处。
- The property class of the fasteners used to fasten the cover and case is at least A*-50.

Note: The "*" shown is replaced by a property grade numeral. (Refer to Note 7)
用于固定盖板和箱体的紧固件性能等级至少为A*-50。

注: 所示的 "*" 由性能等级数字代替。(参见Note 9)

- The ambient temperature range 环境温度范围为-20°C ~ +60°C.
ZR22S is available for normal and combustion (burning) process.ZR22S 可用于正常和燃烧（燃烧）过程。

The process temperature range for normal process 正常工艺的工艺温度范围:
-20°C ~ +60°C.

The process temperature range for combustion (burning) process 燃烧（燃烧）过程的工艺温度范围: -20°C ~ +700°C.

The temperature class or maximum surface temperature of ZR22S for normal process

ZR22S 正常工艺的温度等级或最高表面温度

Temperature class or Maximum surface temperature 温度组别或最高表面温度
T2...T3 or T300°C

ZR22S can be used for combustion (burning) processes in environments where the surface temperatures meet the following conditions.

ZR22S 可用于表面温度满足以下条件的环境中的燃烧过程

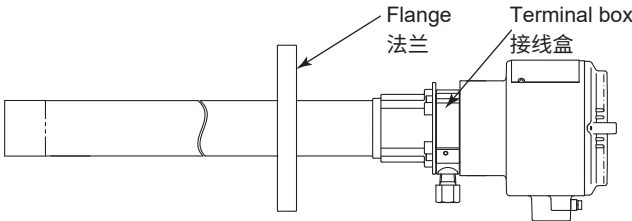
Temperature class 温度组别	Flange surface temperature 法兰表面温度	Terminal box surface temperature 接线盒表面温度
T2 or T300°C (T2/T300°C)	290°C or less 290°C或更低	150°C or less 150°C或更低
T3	190°C or less 190°C或更低	150°C or less 150°C或更低
T4	125°C or less 125°C或更低	115°C or less 115°C或更低

- ZR22S can be used in environments where the surface temperature meets the following conditions.
ZR22S 可在表面温度满足下列条件的环境中使用的。

Temperature class 温度组别	Flange surface temperature 法兰表面温度	Terminal box surface temperature 接线盒表面温度
T2 or T300°C (T2 / T300°C)	290°C or less 290°C 或更低	150°C or less 150°C 或更低
T3	190°C or less 190°C 或更低	150°C or less 150°C 或更低
T4	125°C or less 125°C 或更低	115°C or less 115°C 或更低

Surface temperature measurement method 表面温度测量方法
(No flammable gas in the facility.) (设施内无易燃气体。)

- (i) Install the ZR22S on the facility. 在设施上安装 ZR22S。
- (ii) Start up the facility. 启动设施。
- (iii) Supply power from the converter to the ZR22S and wait until warmup is complete. 从转换器向 ZR22S 供电并等待预热完成。
- (iv) Measure the flange and terminal box surface temperature, and confirm that they meet the flange and terminal box surface temperature specifications. Refer to the below figure for the position to measure the surface temperature.
测量法兰及端子盒表面温度，确认满足法兰及端子盒表面温度规范。测量表面温度的位置请参考下图。



Electrostatic charge may cause an explosion hazard. Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth. If it is mounted in the area where the use of Ex "tb" apparatus is required, it shall be installed in such a way that the risk from electrostatic discharges and propagating brush discharges caused by rapid flow of dust is avoided.

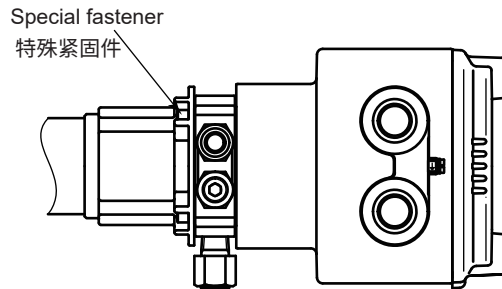
静电可能会导致爆炸危险。避免任何以下行为导致静电荷的产生，例如用干布擦拭。

如果安装在需要使用Ex "tb" 设备的区域，则应以这样的方式安装，以防止静电放电和避免了灰尘快速流动引起的刷放电传播。

Note 7: Special fastener 特殊紧固件

Hexagon socket head cap screws below are special fastener according to GB/T 3836.1-2021 (see the figure below). Material property classes of them are A2-50 or better.

下面的内六角螺钉是符合GB/T 3836.1-2021的专用紧固件（见下图）。它们的材料性能等级为A2-50或更好。



Note 8: Installation 安装和架设

- Installation and maintenance of the equipment shall be done in accordance with GB/T 3836.13, GB/T 3836.15, GB/T 3836.16.
设备的安装和维护按GB/T 3836.13、GB/T 3836.15、GB/T 3836.16。
- The equipment shall be installed in accordance with GB/T 3836.15-2017 and relevant local codes and requirements.
设备应按照 GB/T 3836.15-2017 和当地相关规范和要求进行安装
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment. (Refer to Note 5)
必须根据设备上的以下标记，使用适合螺纹形式和电缆入口尺寸的电缆入口装置。（参见Note 5）
- When installing the equipment, the selected Type of Protection should be ticked as follows. 安装设备时，选择的保护类型应如下勾选。
☐ Ex db IIB + H₂ T2...T4 Gb
☐ Ex tb IIIC T300°C Db
- No intermediate parts are used for the internal ground terminal in the aluminum alloy case. Use crimping terminal for connection to the internal ground terminal in order to avoid corrosion by high contact potentials. In order to prevent the earthing conductor from loosening, the conductor must be secured to the terminal, tightening the screw with appropriate torque. Care must be taken not to twist the conductor.
铝合金机壳内部接地端子未采用任何中间零件。使用压接端子连接到内部接地端子，以避免高接触电位造成腐蚀。为了防止接地导体松动，必须将导体固定到端子上，并用适当的扭矩拧紧螺丝。必须小心不要扭曲导体。
- Cable glands, adapters and/or blanking elements shall be installed so as to maintain the specified type of protection(s) and the rating of the equipment.
应安装电缆接头、适配器和/或遮蔽件，以保持指定的防护类型和设备额定值。
- Use cables and cable glands with a temperature of at least +3 °C heat resistant above the measuring point of the terminal box surface.
使用高于接线盒表面测量点的耐热温度至少为+3 °C 的电缆和电缆接头。
- Do not mount the probe with the tip higher than the probe base.
安装探头时，请勿使探头尖端高于探头底座。

Note 9: Conditions for safe use 产品使用注意事项

- ZR22S: Only for connection to converter type ZR402G, ZR802G, ZR802S or AV550G according to the user manual.ZR22S:
根据用户手册, 仅用于连接ZR402G、ZR802G、ZR802S 或AV550G 型转换器。
- M20X1.5 or 1/2 NPT thread type cable entry, adapters and/or blanking elements, certified by notified body with type of protection Ex db II C Gb in accordance with GB/T 3836.1-2021 and GB/T 3836.2-2021, should be applied when installation in explosive gas atmosphere. The IP code should be IP66.
在爆炸性气体环境中安装时, 应使用经公告机构认证的M20X1.5 或1/2 NPT 螺纹型电缆引入线、适配器和/或封堵元件, 其防护类型为Ex db II C Gb, 符合GB/T 3836.1-2021 和 GB/T 3836.2-2021。IP 代码应为IP66。
- M20X1.5 or 1/2 NPT thread type cable entry, adapters and/or blanking elements, certified by notified body with type of protection Ex tb II C Db in accordance with GB/T 3836.1-2021 and GB/T 3836.31-2021, should be applied when installation in combustible dust atmosphere. The IP code should be IP66.
在可燃粉尘环境中安装时, 应使用经公告机构认证的M20X1.5 或1/2 NPT 螺纹型电缆引入线、适配器和/或盲板元件, 其防护类型为Ex tb II C Db, 符合GB/T 3836.1-2021 和GB/T 3836.31-2021。IP 代码应为IP66。
- Forbid end user to change the configuration to ensure the equipment's explosion protection performance.
用户不得自行随意更换该产品的电气零部件, 应会同产品制造商共同解决运行中出现的故障, 以免影响防爆性能和损坏现象的发生。
- When installation, use and maintenance of Oxygen Detector, observe following standards
GB/T3836.13-2021 "Explosive atmospheres - Part 13: Equipment repair, overhaul and reclamation"
GB/T3836.15-2017 "Electrical atmospheres - Part 15: Electrical installations in design, selection and erection"
GB/T3836.16-2022 "Electrical atmospheres - Part 16: Electrical installations inspection and maintenance"
GB 50257-2014 "Code for construction and acceptance of electric equipment on fire and explosion hazard electrical equipment installation engineering"
GB15577-2018 "Safety regulations for dust explosion prevention and protection."
产品的安装、使用和维护应同时遵守
产品使用说明书及下列相关标准、规范的要求:
GB/T 3836.13-2021 爆炸性环境 第13 部分: 设备的修理、检修、修复和改造
GB/T 3836.15-2017 爆炸性环境 第15 部分: 电气装置的设计、选型和安装
GB/T 3836.16-2022 爆炸性环境 第16 部分: 电气装置的检查与维护
GB50257-2014 电气装置安装工程爆炸和火灾危险环境电气装置施工及验收规范
GB15577 – 2018 粉尘防爆安全规程

Note 10: Manufacturer's Responsibility 制造厂责任

- Special conditions for safe use specified above should be included in the instruction manual.
产品制造厂必须将上述使用注意事项及产品安全使用特殊条件纳入该产品的使用说明书中。
- Manufacturing should be done according to the documentation approved by NEPSI.
产品制造厂必须严格按照NEPSI 认可的文件资料生产。

Revision Information

Aug. 2025 / 19th Edition

GB EX Standards Compliance

June 2025 / 18th Edition

IECEX for TAIWAN was approved. (pages 6, 9, 25)

May 2025 / 17th Edition

Correction of errors (page 25)

Mar. 2025 / 16th Edition

Completely revised.

Deleted due to discontinuation of orders for the ZR402G, and re-created as a manual specifically for the ZR22S.

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