

Gas Detector with Signal Converter

SD-3 Series

Excerpt Manual

for FM Explosion Proof and Performance

(PT2E-356) rev.4

NOTE

- ▶ This manual contains excerpts from FM explosion-proof and performance certification related to the SD-3 series.
 - ▶ This manual is only included with FM Explosion Proof and Performance Certified products.
 - ▶ When using this product, please also refer to the Technical Manual for SD-3series (PT2E-287).
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Product Overview

1-1 Introduction

Thank you for purchasing the SD-3 Gas Detector with Signal Converter ("product" hereinafter). This operating manual describes product operating procedures and specifications. It provides information essential to correct use of the product.

When measuring combustible gases, follow the instructions provided in EN 60079-29-2.

1-2 Intended use and features

Please refer to the Technical Manual for SD-3series (PT2E-287).

1-3 Usage zones and conditions

Please refer to the Technical Manual for SD-3series (PT2E-287).

CAUTION

- Poses risk that combustible or explosive gases can be ignited. The product has not been tested in oxygen-enriched atmospheres (>21 %O₂).
 - Using this product in locations associated with explosion risks: Devices and components may be used in locations associated with explosion risks under the conditions specified by approval obtained under explosion prevention ordinances in Japan, Europe, or internationally.
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2

Important Safety Information

2-1 Danger information

Please refer to the Technical Manual for SD-3series (PT2E-287).

2-2 Warning information

Please refer to the Technical Manual for SD-3series (PT2E-287).

2-3 Caution information

Please refer to the Technical Manual for SD-3series (PT2E-287).

2-4 Safety information

<Product overview>

- The products have an explosion-proof construction.
- Sensors are divided into three different types, depending on the corresponding detection principles. The detection methods are divided into the diffusion type and suction type. Suction-type sensors should be used with a suction cap fitted.
- The product is a fixed, continuous monitoring detector. It can be connected to a gas monitoring control unit, recorder, or programmable control unit to output the measured gas readings as a 4 - 20 mA signal or HART signal.
- The following three product output options are available:
 - No alarm relay, no digital communication
 - 3 alarm relays (contact output) (alarm relays operate in conjunction with gas alarms and faults), no digital signal
 - No alarm relay, digital communication (RS-485 output)

<Detection principles and models>

- The models corresponding to the individual detection principles are as follows. The models are classified by detection principle and detection method.

Detection principle (Detection method: Diffusion type)		Model
Optical sensor	Non-dispersive infrared absorption type (infrared type)	SD-3RI
Solid state sensor	New ceramic type	SD-3NC
Electrochemical sensor	Electrochemical type	SD-3EC SD-3ECS

Detection principle (Detection method: Suction type)		Model
Optical sensor	Non-dispersive infrared absorption type (infrared type)	SD-3DRI
Solid state sensor	New ceramic type	SD-3DNC
Electrochemical sensor	Electrochemical type	SD-3DEC SD-3DECS

- When the SD-3SC is combined with the remote sensor head (GD-3), it forms the following models:

Detection principle (Detection method: Diffusion type)		Model	
		GD-3 (Remote sensor head)	SD-3
Optical sensor	Non-dispersive infrared absorption type (infrared type)	GD-3RI	SD-3SC
Solid state sensor	New ceramic type	GD-3NC	
Electrochemical sensor	Electrochemical type	GD-3EC GD-3ECS	

<Explosion-proof performance data>

The range of ambient temperatures in which explosion-proof performance can be maintained will differ depending on whether the optional lightning arrester is fitted.

Refer to the following performance data for each model:

【US Certification】

<Without lightning arrester>

Model	Explosion-proof construction	Class	Zone	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	I	1	AEx db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3DRI						
GD-3RI						
SD-3NC	d	I	1	AEx db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3DNC						
GD-3NC						
SD-3EC	d	I	1	AEx db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DEC						
GD-3EC						
SD-3ECS	d	I	1	AEx db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DECS						
GD-3ECS						
SD-3SC*2	d	I	1	AEx db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC*3	d	I	1	AEx db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC*4	d	I	1	AEx db IIC T6/T5/T4	Gb	-50 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

【US Certification】

<With lightning arrester>

Model	Explosion-proof construction	Class	Zone	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	I	1	AEx db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3DRI						
GD-3RI						
SD-3NC	d	I	1	AEx db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3DNC						
GD-3NC						
SD-3EC	d	I	1	AEx db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DEC						
GD-3EC						

SD-3ECS	d	I	1	AEx db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DECS						
GD-3ECS						
SD-3SC ^{*2}	d	I	1	AEx db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC ^{*3}	d	I	1	AEx db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC ^{*4}	d	I	1	AEx db IIC T6/T5/T4	Gb	-40 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

【Canadian Certification】

<Without lightning arrester>

Model	Explosion-proof construction	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	Ex db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3DRI				
GD-3RI				
SD-3NC	d	Ex db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3DNC				
GD-3NC				
SD-3EC	d	Ex db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DEC				
GD-3EC				
SD-3ECS	d	Ex db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DECS				
GD-3ECS				
SD-3SC ^{*2}	d	Ex db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC ^{*3}	d	Ex db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC ^{*4}	d	Ex db IIC T6/T5/T4	Gb	-50 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

【Canadian Certification】
<With lightning arrester>

Model	Explosion-proof construction	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	Ex db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3DRI				
GD-3RI				
SD-3NC	d	Ex db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3DNC				
GD-3NC				
SD-3EC	d	Ex db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DEC				
GD-3EC				
SD-3ECS	d	Ex db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DECS				
GD-3ECS				
SD-3SC*2	d	Ex db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC*3	d	Ex db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC*4	d	Ex db IIC T6/T5/T4	Gb	-40 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

【ATEX / IECEx Certification】

EN/IEC 60079-29-1

<Without lightning arrester>

Model	Explosion-proof construction	Group	Category	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	II	2G	Ex db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C /+70 °C
SD-3DRI						
GD-3RI						
SD-3NC	d	II	2G	Ex db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C /+70 °C
SD-3DNC						
GD-3NC						
SD-3EC	d	II	2G	Ex db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DEC						
GD-3EC						
SD-3ECS	d	II	2G	Ex db IIC T4	Gb	-50 °C ≤ Ta ≤ +70 °C
SD-3DECS						

GD-3ECS						
SD-3SC ^{*2}	d	II	2G	Ex db IIC T5/T4	Gb	-50 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC ^{*3}	d	II	2G	Ex db IIC T6/T5	Gb	-50 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC ^{*4}	d	II	2G	Ex db IIC T6/T5/T4	Gb	-50 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

【ATEX / IECEx Certification】

EN/IEC 60079-29-1

<With lightning arrester>

Model	Explosion-proof construction	Group	Category	Explosion-proof class	EPL	Ambient temperature*1
SD-3RI	d	II	2G	Ex db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3DRI						
GD-3RI						
SD-3NC	d	II	2G	Ex db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C /+70 °C
SD-3DNC						
GD-3NC						
SD-3EC	d	II	2G	Ex db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DEC						
GD-3EC						
SD-3ECS	d	II	2G	Ex db IIC T4	Gb	-40 °C ≤ Ta ≤ +70 °C
SD-3DECS						
GD-3ECS						
SD-3SC ^{*2}	d	II	2G	Ex db IIC T5/T4	Gb	-40 °C ≤ Ta ≤ +44 °C/+70 °C
SD-3SC ^{*3}	d	II	2G	Ex db IIC T6/T5	Gb	-40 °C ≤ Ta ≤ +60 °C/+70 °C
SD-3SC ^{*4}	d	II	2G	Ex db IIC T6/T5/T4	Gb	-40 °C ≤ Ta ≤ +47 °C/ +55 °C/+70 °C

*1 Ambient temperature refers to the temperature range in which the explosion-proof performance is maintained. It does not refer to the temperature range in which product performance is guaranteed. For information on the operating temperature range, refer to 'Detection target gases for individual detection principles'.

*2 When combined with GD-3NC

*3 When combined with GD-3RI

*4 When combined with GD-3EC and GD-3ECS

<Electrical data>

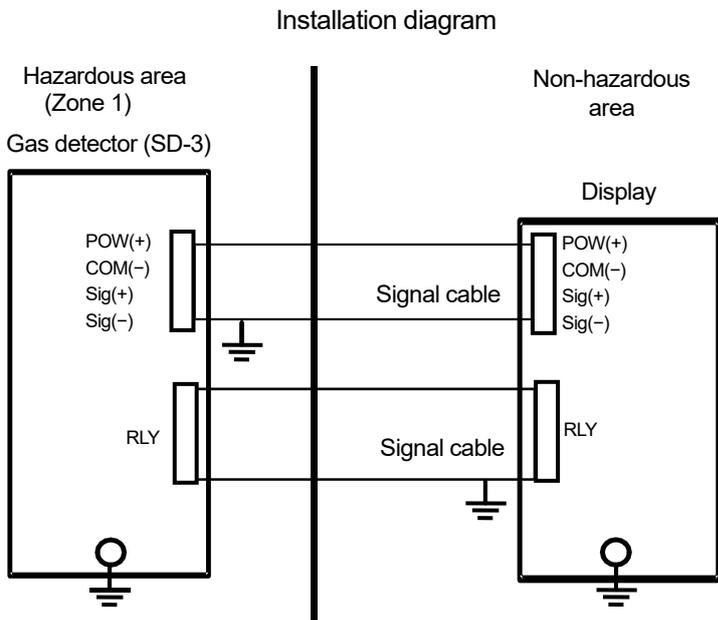
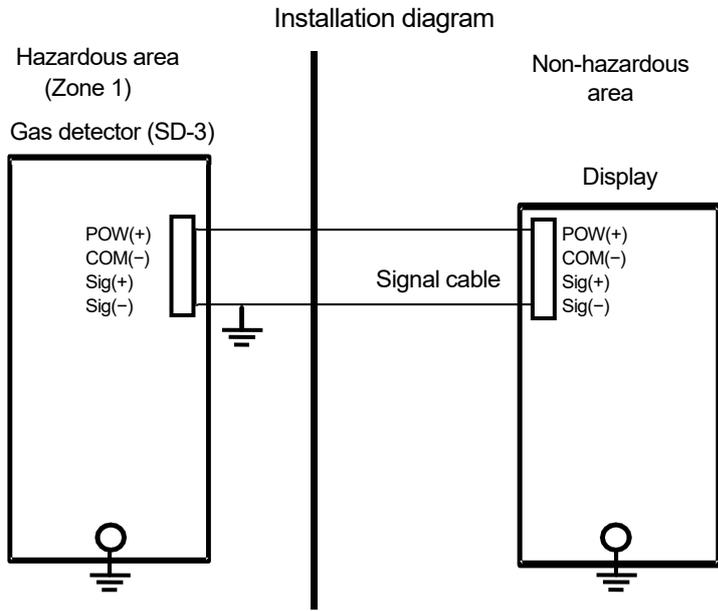
Model	Supply voltage	Power consumption	Signal output	Option (select one)		
				No alarm relay/ No digital communication	Alarm relay (contact output)/ Resistance load only	Digital communication
SD-3RI	24 V DC (18 V - 30 V DC Max)	3.8 W Max	0 - 22 mA with HART	—	30 V DC, 1 A 250 V AC, 2 A	RS-485 output
SD-3DRI		1.2 W Max	—	—	—	—
GD-3RI			—	—	—	—
SD-3NC	24 V DC (18 V - 30 V DC Max)	4.5 W Max	0 - 22 mA with HART	—	30 V DC, 1 A 250 V AC, 2 A	RS-485 output
SD-3DNC		2 W Max	—	—	—	—
GD-3NC			—	—	—	—
SD-3EC	24 V DC (18 - 30 V DC Max)	2.8 W Max	0 - 22 mA with HART	—	30 V DC, 1 A 250 V AC, 2 A	RS485 output
SD-3DEC		1 W Max	—	—	—	—
GD-3EC			—	—	—	—
SD-3ECS	24 V DC (18 - 30 V DC Max)	2.8 W Max	0 - 22 mA with HART	—	30 V DC, 1 A 250 V AC, 2 A	RS485 output
SD-3DECS		1 W Max	—	—	—	—
GD-3ECS			—	—	—	—
SD-3SC	24 V DC (18 V - 30 V DC Max)	5 W Max	0 - 22 mA with HART	—	30 V DC, 1 A 250 V AC, 2 A	RS-485 output

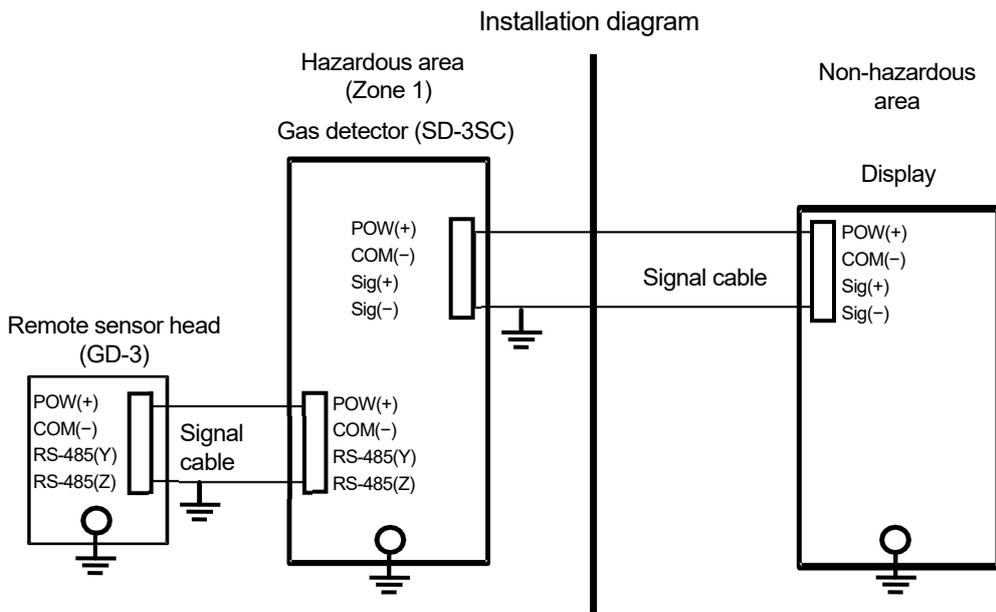
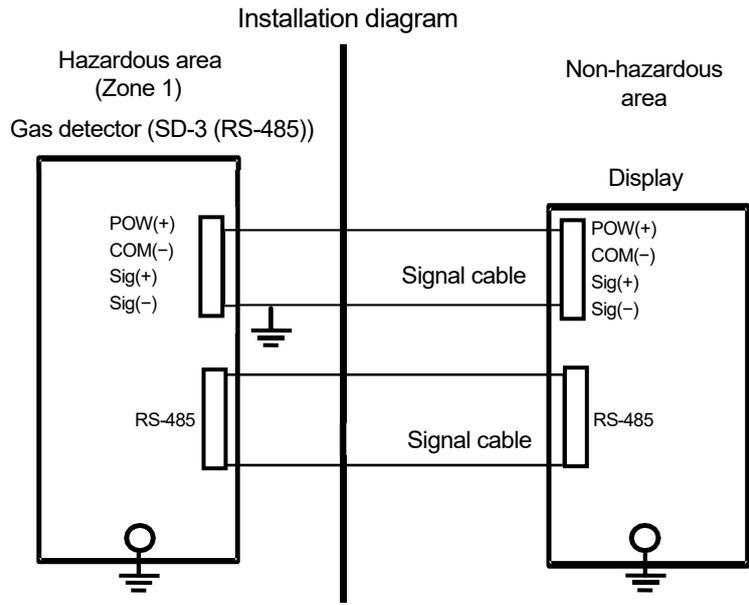
<Certificate numbers>

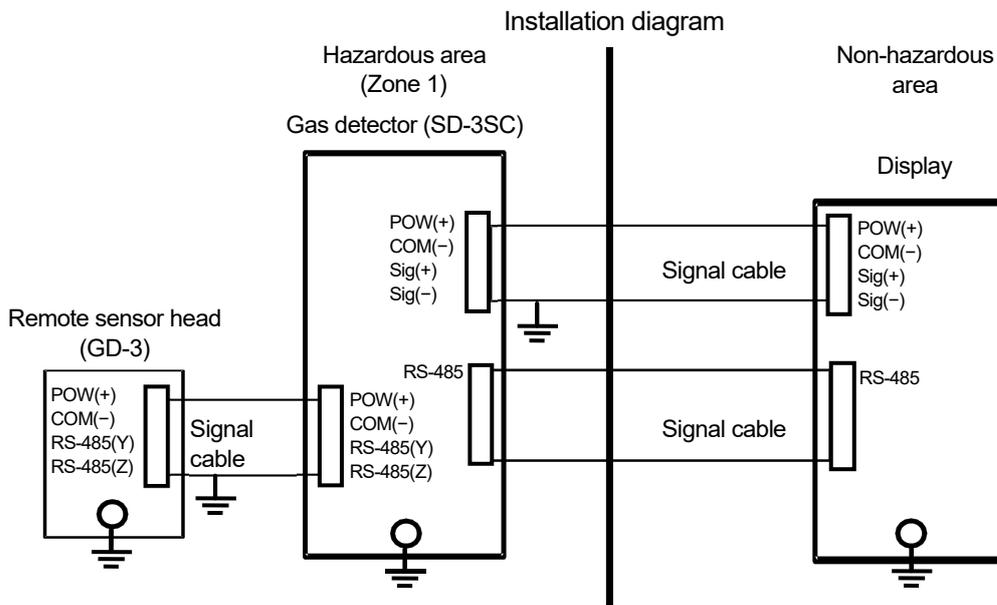
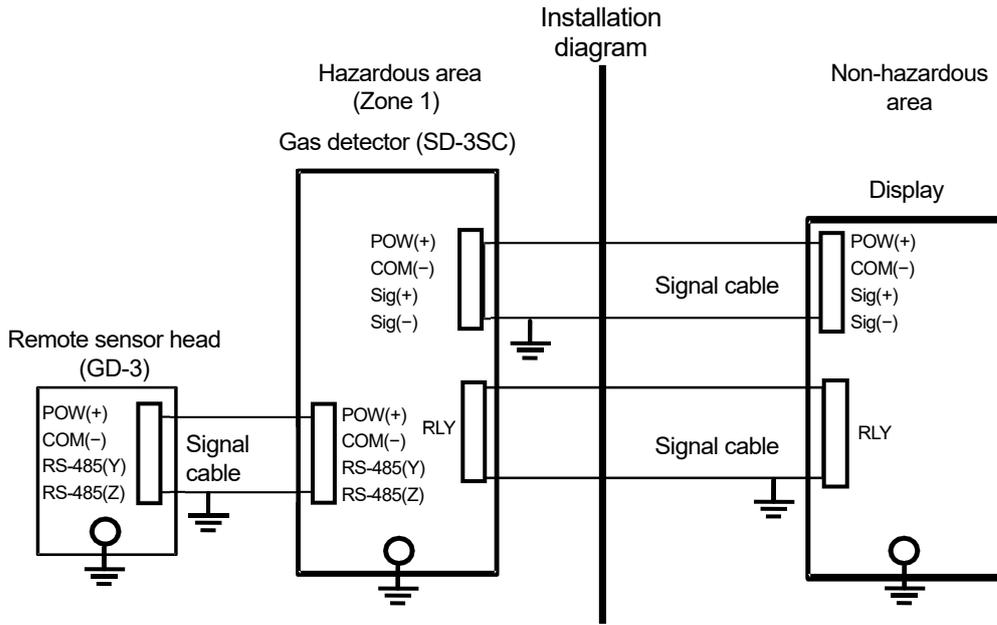
- FM22US0043X
- FM22CA0030X
- FM22ATEX0019X
- IECEx FMG 22.0011X

- * The "X" at the end of the certificate number indicates the following special operating conditions:
- The flameproof joints are not intended to be repaired
 - Equipment must only be placed in areas with low risk of mechanical danger (according to clause 26.4.2 of ANSI/UL 60079-0:2019, 26.4.2 of CAN/CSA-C22.2 No. 60079-0:2019).
 - Avoid rubbing the nameplate area with a dry cloth during use, maintenance, or cleaning. Doing so may result in a static charge buildup of up to 6 nF.
 - Refer to manufacturer's instructions for ambient temperature.
 - If the surge protection device (lightning arrester) is attached to the flameproof enclosure, it shall be provided with a high strength locking compound on the mounting thread.
 - The IP ratings are IP44 for the infra-red sensors and IP67 for the ceramic sensors. (according to clause ANSI/FM 60079-29-1)
 - The IP ratings of electrochemical sensors are IP44 for the ESF-A24R and IP67 for the ESF-A24R3.
 - For situations where the detector has been submerged in water, refer to the Safety Information section of the user manual.
 - The GD-3 Series remote gas detectors are only for use with the SD-3SC transmitter.

<System configuration diagrams>







 **CAUTION**

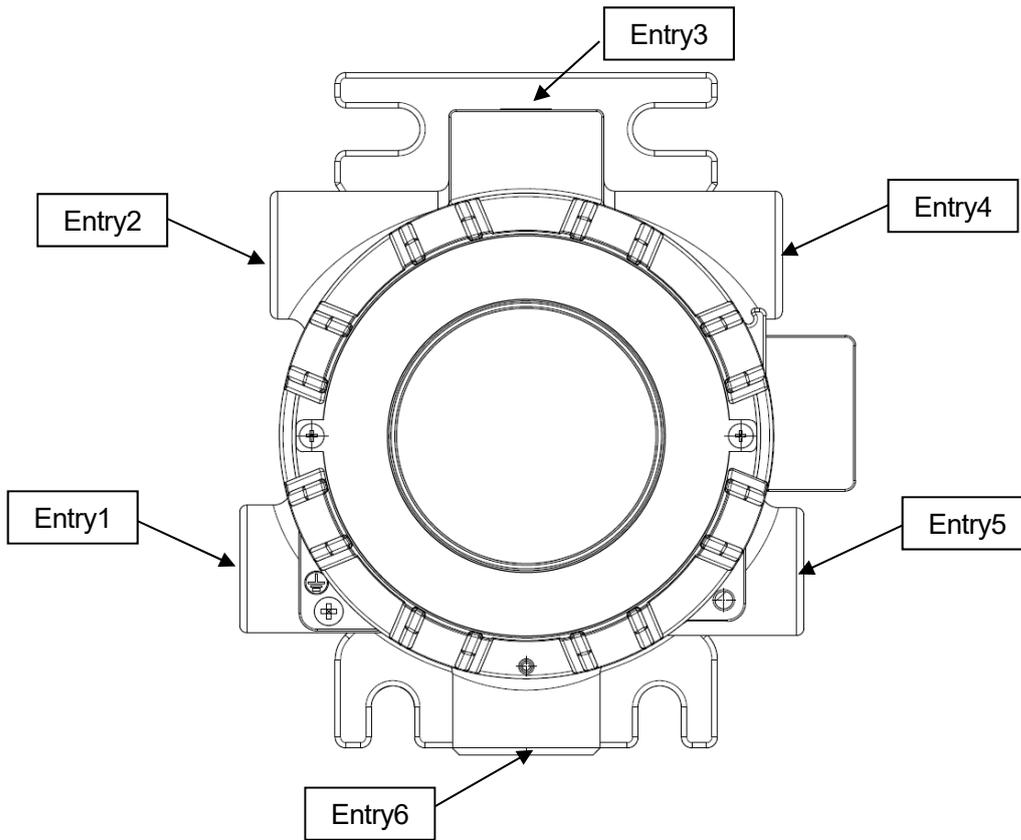
- Install the product in accordance with the required installation conditions.
 - Do not disassemble, modify, or alter the product.
 - Contact Riken Keiki to request readjustment or parts replacement including calibration.
 - Use cable lugs for grounding wire and bonding conductor connections. Make sure the bonding conductors are not loose or twisted.
 - Do not open the cover in locations where explosive gas may be present.
 - The maximum pressure inside the gas channels and sensor is 10.13 kPa (gauge pressure).
 - Be sure to connect the grounding terminal before turning on the power to the product.
 - Make sure the grounding is Class D equivalent (grounding resistance less than 100 Ω).
 - Use crimped terminals to connect the grounding wire to the grounding terminal inside the unit. Use a cable with a cross section area of at least 4 mm² to connect to the external grounding terminal.
 - Use approved cable glands when installing.
 - If the product is installed in a location where the ambient temperature exceeds 65 °C, use cables designed for use at temperatures at least 5 °C above the maximum ambient temperature.
 - Do not subject the window in the cover to strong forces or impact. Doing so may result in damage and impaired explosion-proof performance. (The low risk of mechanical hazards has been confirmed in testing [2 joules].)
 - Do not use more than one adapter per connector.
-
-

 **CAUTION****With suction type**

- Use with a flow rate of at least 0.4 L/min and not exceeding 1.5 L/min.
-

Putting into service

Type and size of screw at external entry of SD-3.



	Entry1	Entry2	Entry3	Entry4	Entry5	Entry6
M25×1.5	○	○	×	○	○	○
NPT1/2-14	○	○	○	○	×	×
NPT3/4-14	○	○	×	○	×	×
No hole	×	×	○	○	○	×

○ : Correspondence is possible

×

The above table shows type and size of screw at external entry of SD-3. Each of our component and sensor assembly can be connected to Entry 1 to Entry6.

The following table shows the connectable components of each entry. When connecting each component, the body needs to have screw holes suitable for each component. Entry1, Entry2, Entry4, Entry6 can be also be cable entry. Entry 6 is used to connect GD-3. When connecting GD-3, use a certified cable gland. The number of entry for external cable that can be used simultaneously is two (Excluding entry 6) .Use only certified components for entry 1 to entry 6. For entry 2 or for entry 4, can use a certified surge protection device. Entry 3 can use a certified wireless HART adapter. Unused opening entries must be closed off with plugs.

	Entry1	Entry2	Entry3	Entry4	Entry5	Entry6
Sensor Assembly	×	×	×	×	×	○
EC Barrier	×	×	×	×	×	○
Certified cable gland	○	○	×	○	×	○
M25 Plug	○	○	×	○	○	○
NPT1/2 Plug	○	○	○	○	×	×
Conversion adapter (M25⇔NPT1/2)	○	○	×	○	×	○
Conversion adapter (M25⇔NPT3/4)	○	○	×	○	×	○
Conversion adapter (M25⇔M20)	○	○	×	○	×	○
Surge protection device	×	○	○	○	×	×
Wireless HART adapter	×	×	○	×	×	×

○ : Connectable

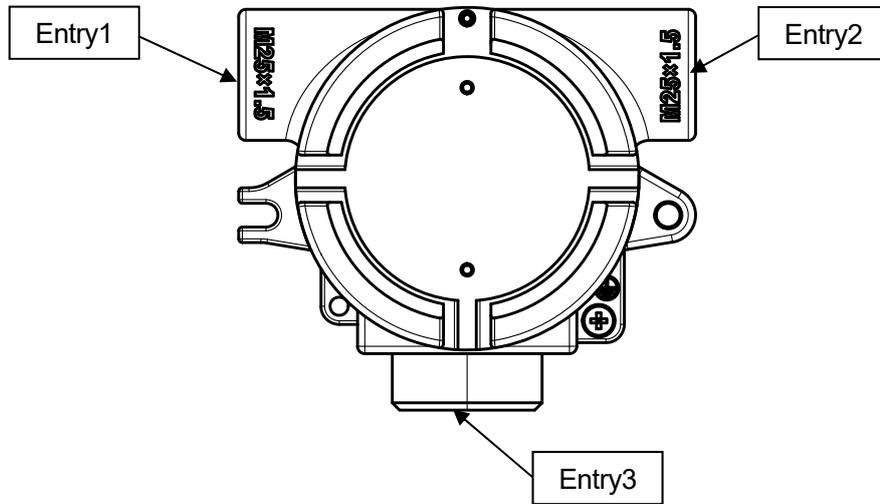
× : Unconnectable

Tighten 30 N·m or larger torque value to ensure the tightening M25 Plug and Conversion adapter.

Tighten 10 N·m or larger torque value to ensure the tightening NPT1/2 Plug.

The thread engagement should be 5 or more.

External entry of GD-3.



Combination table of external entry

	Entry1	Entry2	Entry3
Sensor Assembly	×	×	○
EC Barrier	×	×	○
Certified cable gland	○	○	×
M25 Plug	○	○	○
NPT1/2 Plug	○	○	○
Conversion adapter (M25⇔NPT1/2)	○	○	○
Conversion adapter (M25⇔NPT3/4)	○	○	○
Conversion adapter (M25⇔M20)	○	○	○

○ : Connectable

× : Unconnectable

Tighten 30 N·m or larger torque value to ensure the tightening M25 Plug and Conversion adapter.

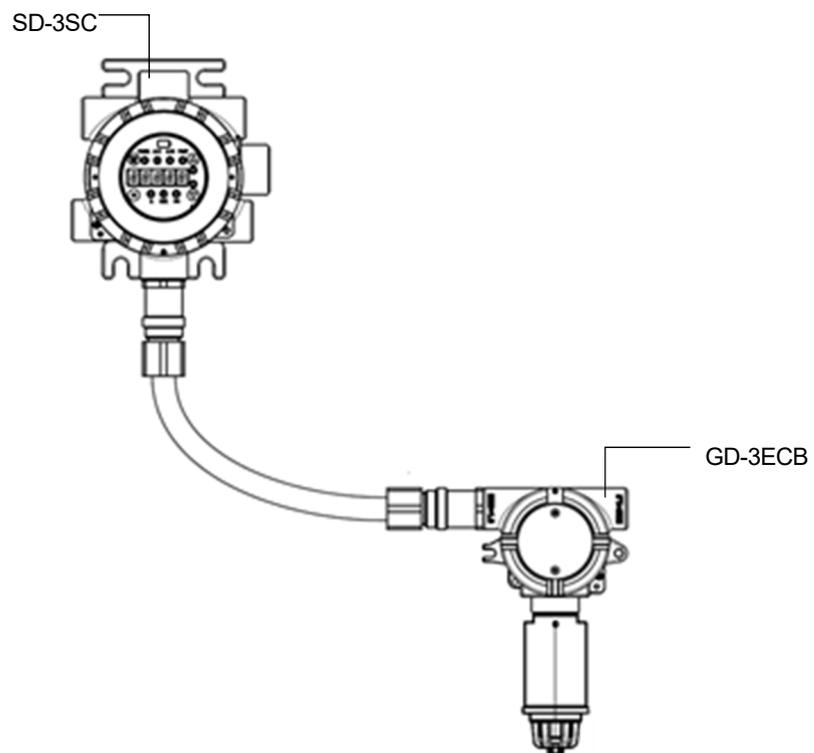
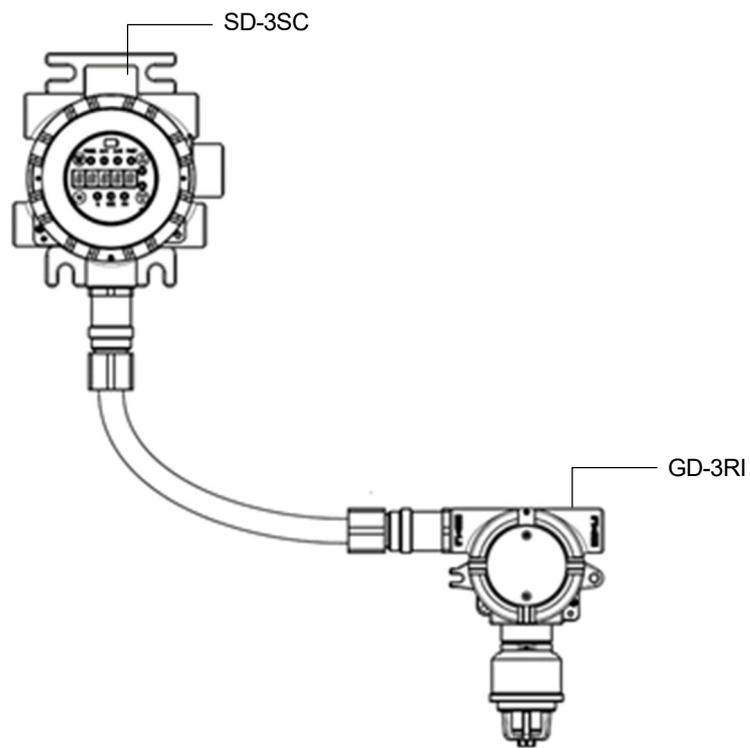
Tighten 10 N·m or larger torque value to ensure the tightening NPT1/2 Plug.

The thread engagement should be 5 or more.

No	COMPONENT			CERTIFICATES		RATINGS
	manufacturer	name/ code	protection	number&edition	standards	voltage, current, temperature
1	Eaton Electric Limited	TP48 and TP32 Series Surge Protection Devices	II 2 G Ex db IIC T6 Gb	IECEX BAS 15.0056X Issue 1 Baseefa 04 ATEX 0053X	EN 60079- 0:2012+A11:2013 EN 60079-1:2014 IEC 60079-0:2011 Edition:6.0 IEC 60079-1:2014 Edition:7.0	-40°C to+70°C 48 VDC NPT 1/2"
2	Pepperl+Fuchs GmbH	WHA-BLT-F9D0-N-A0- Z1-1	II 2 G Ex db IIC T6...T5 Gb	IECEX FMG 17.0020X Issue 0 FM 17 ATEX 0046 X	EN 60079- 0:2012+A11:2013 , EN 60079-1:2014 IEC 60079-0:2011 Edition:6.0 IEC 60079-1:2014 Edition:7.0	T6 : -40°C to 75°C, T5 : -40°C to 85°C 7~32 V DC NPT 1/2"

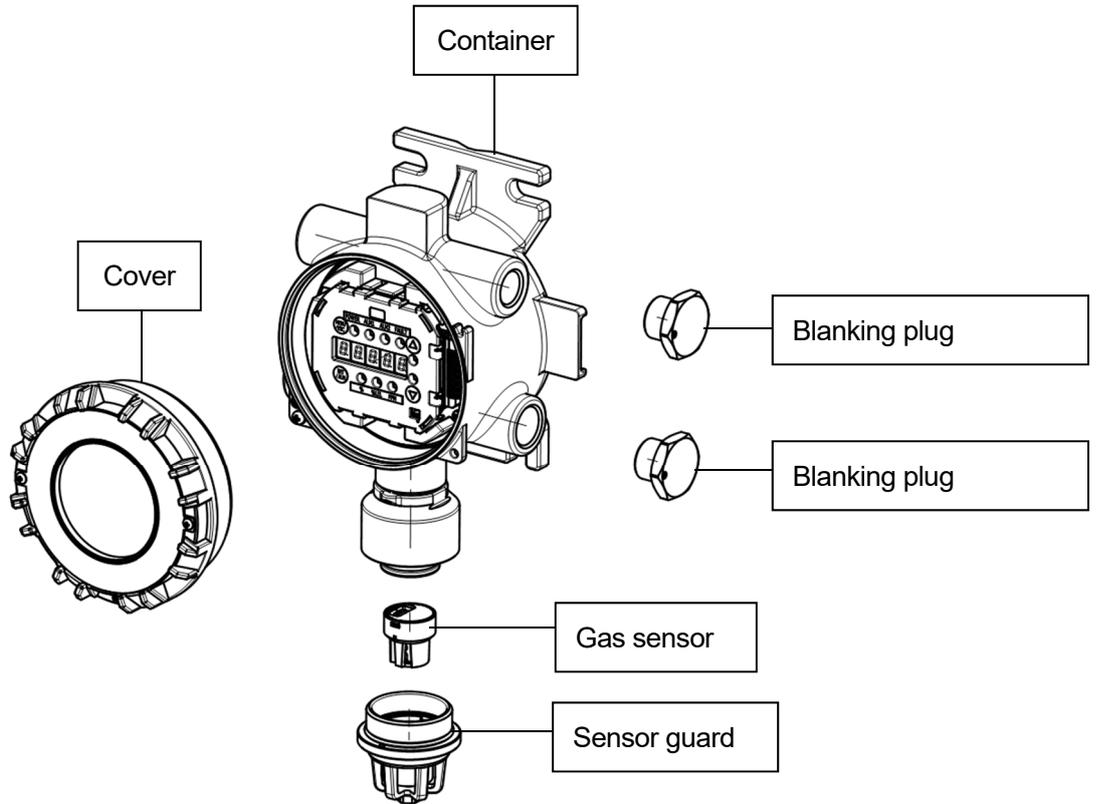
- In the case of using Surge Protection Devices, the lower limit of ambient temperature of SD-3 or GD-3 is -40°C.
- In the case of using WHA-BLT-F9D0-N-A0-Z1-1(WirelessHART Adaptor), the lower limit of ambient temperature of SD-3 or GD-3 is -40°C.

<Connection examples>

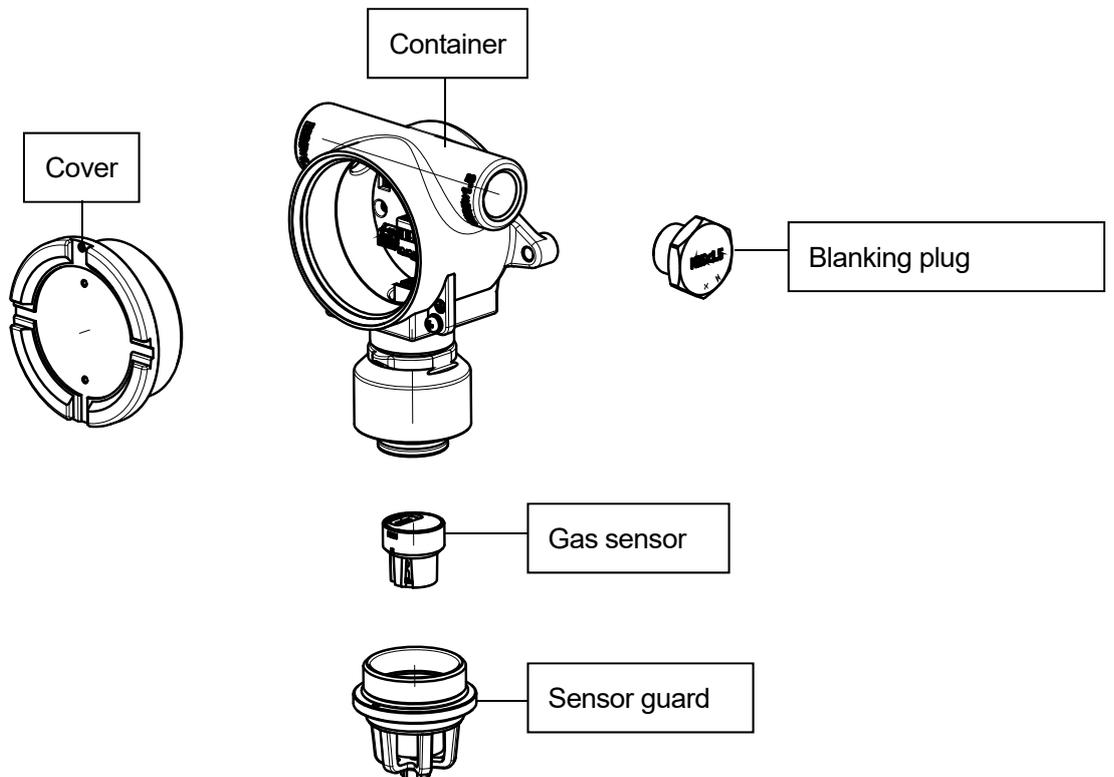


<Exploded view>

<SD-3>



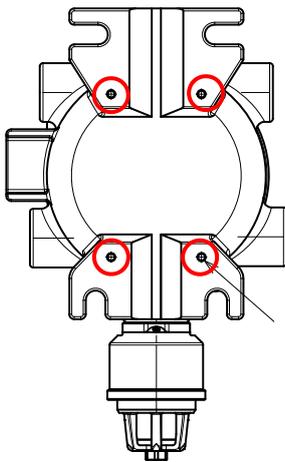
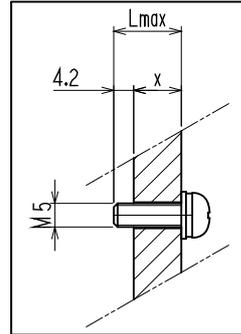
<GD-3>



<Screw holes on rear of container (SD-3)>

Four screw holes are located on the rear of the main unit container.

- Screw size: M5
- Pitch: 0.8
- Screw depth: 5
- Maximum allowable length of male screw:
 $L_{max} = 4.2 \text{ mm} + x$
 ("x" is the intermediate part thickness.)

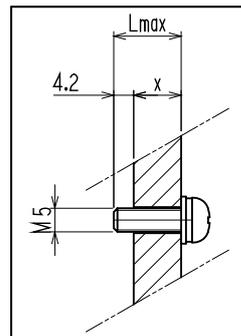


Screw holes on rear of container (four locations)

<Screw holes on rear and underside of container (GD-3)>

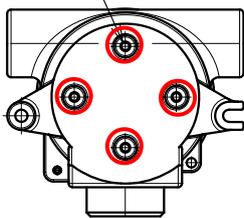
There are four screw holes on the rear of the container and four screw holes on the underside.

- Screw size: M5
- Pitch: 0.8
- Screw depth: 5
- Maximum allowable length of male screw:
 $L_{max} = 4.2 \text{ mm} + x$
 ("x" is the intermediate part thickness.)



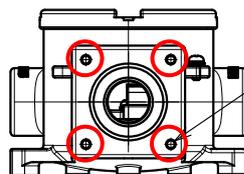
<Container rear>

Screw holes on rear of container (four locations)



<Container underside>

Screw holes on underside of container (four locations)



3

Product Configuration

3-1 Main unit and accessories

Please refer to the Technical Manual for SD-3series (PT2E-287).

3-1-1 Main unit (SD-3)

Please refer to the Technical Manual for SD-3series (PT2E-287).

3-1-2 Main unit (SD-3SC)

Please refer to the Technical Manual for SD-3series (PT2E-287).

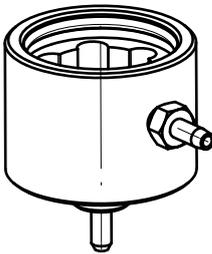
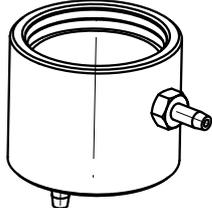
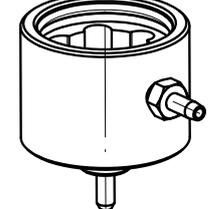
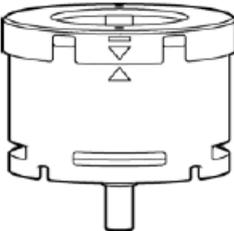
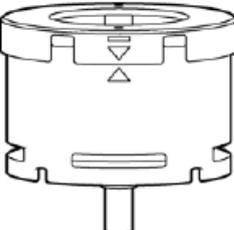
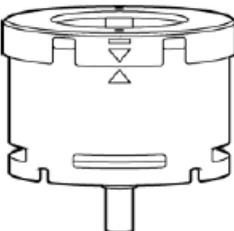
3-1-3 Remote sensor head (GD-3)

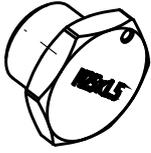
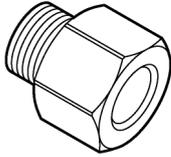
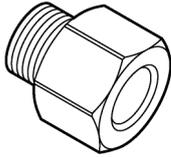
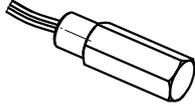
Please refer to the Technical Manual for SD-3series (PT2E-287).

3-1-4 Standard accessories

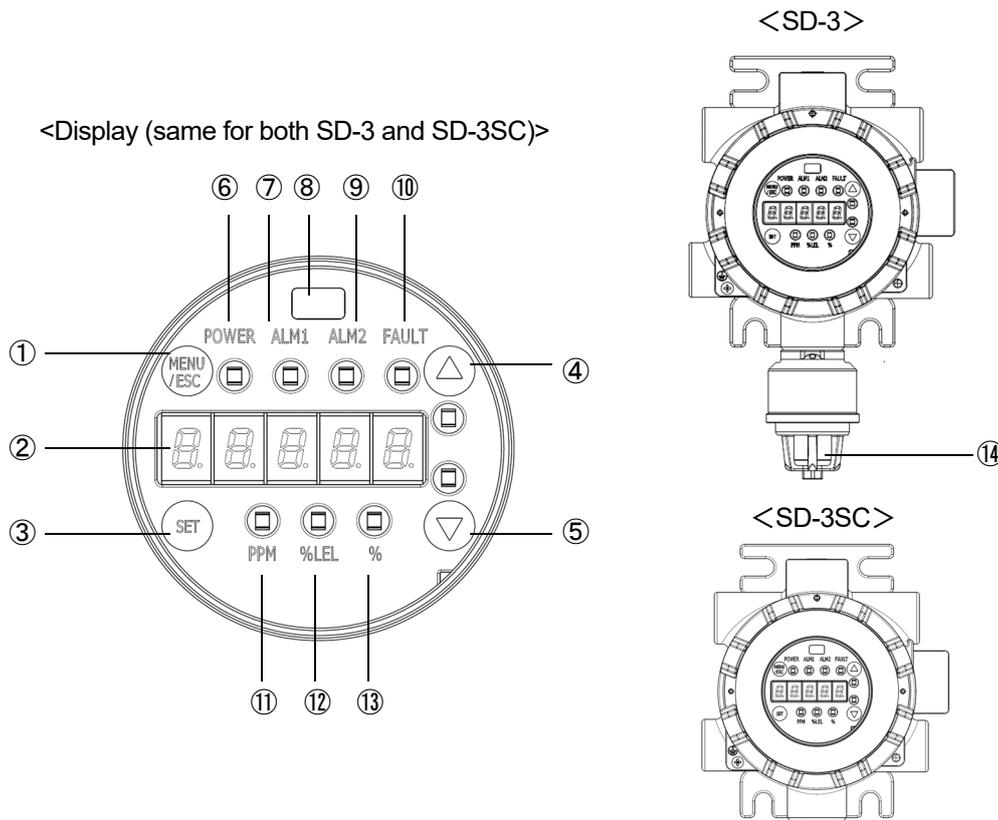
Please refer to the Technical Manual for SD-3series (PT2E-287).

3-1-5 Optional accessories

Optional accessory	Part No.	Description
	Calibration adapter (for IRF sensor)	4283 9011 00 Calibration adapter for the SD-3RI <Material> Body: PP Nipple: Stainless steel/Teflon
	Calibration adapter (for NCF gas sensor)	4283 9012 70 Calibration adapter for the SD-3NC <Material> Body: PP Nipple: Stainless steel/Teflon
	Calibration adapter (for ESF sensor)	4283 9013 40 Calibration adapter for the SD-3EC/ECB <Material> Body: PP Nipple: Stainless steel/Teflon
	Splash guard (for IRF sensor)	4283 9076 10 SD-3RI cover to protect sensor from water and dust The identification number "1" is engraved on the underside. <Material> Resin
	Splash guard (for NCF gas sensor)	4283 9077 80 SD-3NC cover to protect sensor from water and dust The identification number "2" is engraved on the underside. <Material> Resin
	Splash guard (for ESF gas sensor)	4283 9078 50 SD-3EC/ECS cover to protect sensor from water and dust The identification number "3" is engraved on the underside. <Material> Resin

Optional accessory		Part No.	Description
	Blanking plug	4283 9018 10	M25 × 1.5 blanking plug <Material> Equivalent to SUS316
	Adapter	4283 9058 70	Adapter to convert M25 × 1.5 screw thread to 1/2NPT screw thread <Material> Equivalent to SUS316
	Adapter	4283 9057 00	Adapter to convert M25 × 1.5 screw thread to 3/4NPT screw thread <Material> Equivalent to SUS316
	Adapter	4283 9047 10	Adapter to convert M25 × 1.5 screw thread to M20 × 1.5 screw thread <Material> Equivalent to SUS316
	Lightning arrester (3-wire connection) (TP48-3-N-NDI)	2032 0099 50	Device to limit momentary surge voltages caused by lightning strikes
	Lightning arrester (4-wire connection) (TP48-4-N-NDI)	2032 0116 40	Device to limit momentary surge voltages caused by lightning strikes

3-2 Part names and functions

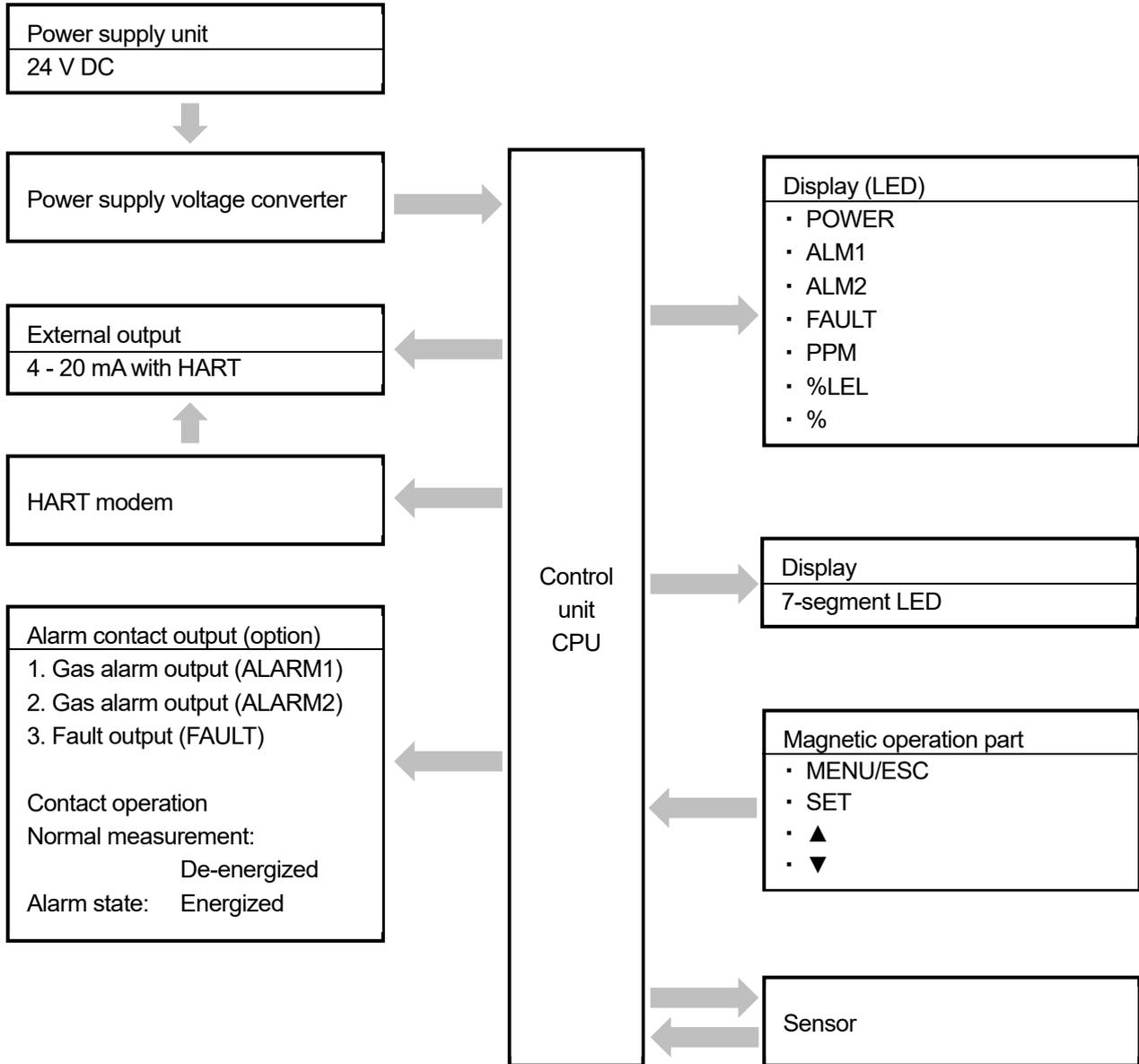


No.	Name	Function
①	MENU/ESC key	Hold down this key in detection mode to switch to user mode. In user mode and maintenance mode, this key is used to cancel a setting or return to the previous screen. Hold down this key in user mode or maintenance mode to return to detection mode.
②	7-segment LED display	Displays the gas concentration and other information.
③	SET key	Press in detection mode to display the ALM1 (first alarm) and ALM2 (second alarm) alarm setpoints. In user mode and maintenance mode, this key is used to confirm a value or select a setting.
④	▲ key	In user mode and maintenance mode, this key is used to select a setting item and adjust (increase) a value.
⑤	▼ key	In user mode, this key is used to switch menus or adjust (lower) a value. Press in detection mode to display the external output.
⑥	Power lamp (POWER)	Power lamp. Lights up in green when the power is on. The lamp flashes in green in user mode and maintenance mode.
⑦	Alarm lamp (ALM1)	ALM1 (first alarm) alarm lamp. Lights up in red when the ALM1 (first alarm) alarm setpoint is reached.
⑧	Infrared port	IrDA communication port
⑨	Alarm lamp (ALM2)	ALM2 (second alarm) alarm lamp. Lights up in red when the ALM2 (second alarm) alarm setpoint is reached.
⑩	Fault lamp (FAULT)	Fault lamp. Lights up in yellow when an abnormality is detected in the product.
⑪	PPM lamp	Lights up in green when a ppm concentration range gas concentration is displayed.
⑫	%LEL lamp	Lights up (green) when a gas concentration within the %LEL concentration range is displayed.
⑬	% lamp	Lights up in green when a vol% concentration range gas concentration is displayed.
⑭	Sensor	Incorporates a gas-detecting sensor.

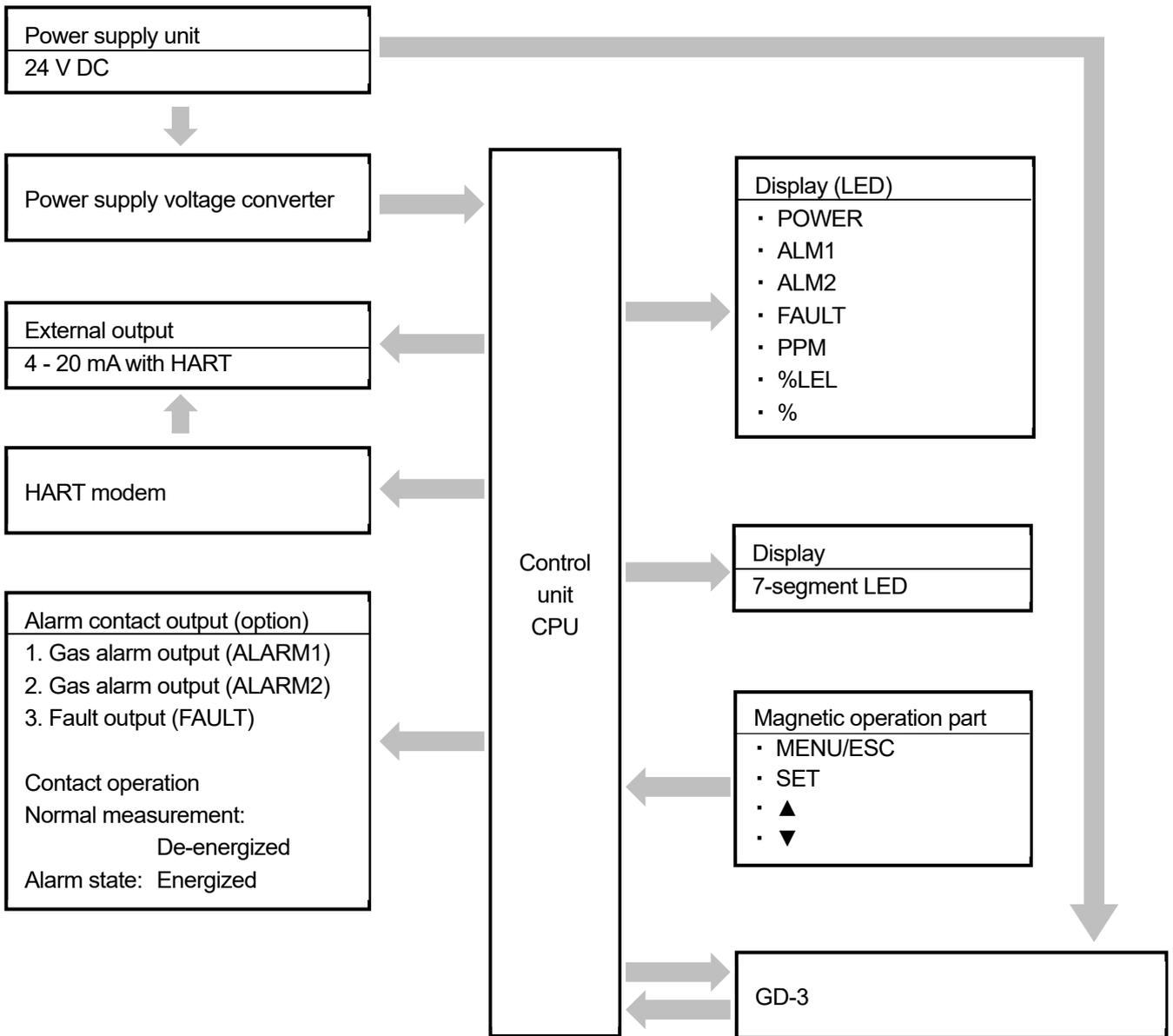
3-3 Block diagrams

The block diagrams (electrical circuit diagrams) for the product are given below.

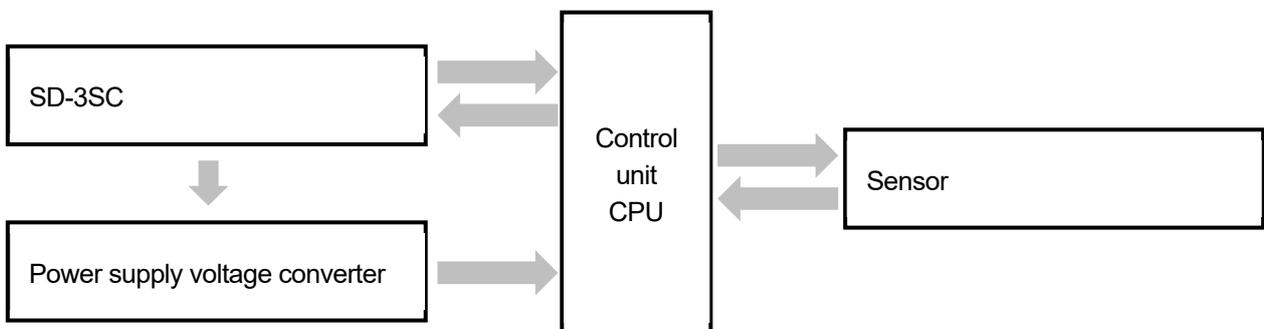
<SD-3>



<SD-3SC>



<GD-3>



4

Installation

4-1 Installation precautions

4-1-1 General installation information

- It is not permitted to prevent gases and vapors contacting the sensor.
Dirt, snow, mud, external devices, etc.
- If there is dust or water droplets on the sensor, remove them as appropriate. If there is dust or water in the splash guard, remove them.
- If the sensor is damaged, replace it.
- The IP class does not mean that the device is capable of detecting gas during or after exposure to these conditions.
- It is recommended that the detector is installed so that the sensor faces downward. If the sensor is protected from mechanical damage, dirt, and water, then it can be installed facing in another direction.
- The NCF and ESF sensor may slow down its response if water adheres to the Teflon membrane. In the event of heavy rain or submersion, visually check the surface of the Teflon film on the NCF and ESF sensor.

[Confirmation procedure]

- ① Turn off the power of SD-3.
- ② Remove the sensor guard.
- ③ Wipe off the Teflon film if water droplets are attached.
* For wiping, use paper such as Kimwipe that is hard to tear and does not generate paper dust.
- ④ Visually check the Teflon film and confirm that the water droplets have disappeared.
- ⑤ Install the sensor guard.
- ⑥ Turn on the power of the main unit.
- ⑦ In order to completely dry the Teflon film, warm it up for 10 minutes before use.

4-1-2 Restrictions regarding installation

<Do not install in locations exposed to water, oil, or chemicals.>

Avoid installing in locations associated with risk of splashing water, oil, chemicals, or other liquids. Deploy the optional protective cover (main unit protection) and splash guard (sensor protection) if the product must be installed in a location where it may be exposed to these factors.

<Note when installing in locations where interference gases are present.>

Take care when installing in locations where the following interference gases are present:

Sensor type	Interference gas
NCF	Hydrocarbons, alcohols, organic solvents, etc. other than the target gas
IRF	Combustible gas sensor: Hydrocarbons, alcohols, organic solvents, H ₂ O, etc., other than the target gas CO ₂ sensor: CO, N ₂ O, NO, etc.
ESF	Differs depending on sensor. (e.g., H ₂ with CO sensor)

<Use the appropriate power supply and power cable.>

The product requires a 24 V DC (18 V - 30 V DC) power supply to operate. The power cable used should have a cross section of 1.308 mm² (AWG16) or 2.082 mm² (AWG14). Use shielded 3-core cable or 4-core cable.

For the installation of cables and power supply

Due to the resistor value of the cable, a voltage drop occurs, causing the actual voltage supply to SD-3 (at the SD-3 terminal) to be lower than the voltage supply at the power source. Because of this, when the voltage drop by the cable causes the actual voltage supply to become below 18VDC, the voltage supply at the power source needs to be increased.

This voltage drop is determined by the type and length of the cable, ambient temperature, as well as the current consumption value of SD-3.

The current consumption value of SD-3 varies depending on the sensor type and the alarm relay state in the SD-3.

<How to obtain the voltage supply at the power source -1>

Use the equation below to obtain the voltage supply value at the power source.

Voltage supply at the power source

$$= A (\text{Current consumption of SD-3}) \times B (\text{Resistor value of the cable to be installed}) + 18V$$

A: Current consumption of SD-3

Choose from the list below. (@18V)

Type	Current consumption (max.)	Remarks
SD-3RI	170mA	
SD-3NC	200mA	
SD3-EC	140mA	
SD-3ECS	140mA	
SD-3SC + GD-3RI	180mA	
SD-3SC + GD-3NC	220mA	
SD-3SC + GD-EC	150mA	
SD-3SC + GD-3ECS	150mA	

B: Resistor value of the cable to be installed

The maximum resistor value can be determined by the type and length of the cable to be installed, and the upper limit of the operating temperature.

e.g.)

A: The maximum current consumption value = 170 mA (SD-3RI)

B: The maximum resistor value of the cable to be installed = 24Ω (CVV-S, 1.308 mm², 1250m, @70°C)

$$\begin{aligned} \text{Voltage supply at the power source} &= 170\text{mA} \times (24\Omega \times 2) + 18V \\ &= 8.16V + 18V \\ &= 26.16V \quad (\text{or higher}) \end{aligned}$$

<How to obtain the voltage supply at the power source -2>

When the method in 1 cannot be applied because the type and length of the cable to be installed is unknown, or to make sure if the voltage calculated in 1 poses no problem for the actual voltage to supply, use this method described here.

Alarm test is performed under the following conditions (refer to '7-3-2 Performing alarm test' in the Technical Manual for SD-3 series (PT2E-287)).

- Set the contact action ON.

Press ▲ key to increase the indicator until it reaches full scale over (nnnn), and when that happens, make sure that the voltage of the SD-3 terminal block is over 18VDC.

Fault test is performed under the following conditions (refer to '7-3-3 Performing fault test' in the Technical Manual for SD-3 series (PT2E-287)).

- Set the Fault test ON.

When that happens, make sure that the voltage of the SD-3 terminal block is over 18VDC.

If it's below 18VDC, then increase the voltage supply at the power source. If the temperature at this point increases during the operation, give enough margin to the voltage supply by compensating the voltage drop caused by the increase of the cable resistor value.

4-2 System design precautions

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-3 Providing maintenance space

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-4 Main unit installation

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-5 Remote sensor head (GD-3) installation

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-6 Connecting the grounding terminal

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-7 Connecting the power and signal cables

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-8 Mounting the sensor

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-9 Alarm relay setting (option)

Please refer to the Technical Manual for SD-3series (PT2E-287).

4-10 Mounting the splash guard

Please refer to the Technical Manual for SD-3series (PT2E-287).

5

Usage Instructions

Please refer to the Technical Manual for SD-3series (PT2E-287).

6

Alarm Activation

6-1 Gas alarm activation

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-1-1 Alarm activation

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-1-2 Contact operation (auto reset)

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-1-3 Contact operation (self-latching)

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-1-4 Alarm response

If an alarm is triggered, respond promptly in accordance with the user's management rules.

The typical procedures are as follows:

Step 1 Check the reading on the product.



- In the case of momentary gas leaks, the reading may have already dropped by the time the reading is checked. The reading may also drop while in a temporary alarm state due to factors other than gas alarms, such as noise or incidental conditions.

Step 2 Keep all individuals out of the monitored zone to ensure safety in accordance with your alarm control concentrations.

Step 3 If the concentration display continues, close the main valve for the gas involved and confirm that the gas concentration reading has fallen.

Step 4 Approach the gas leak location and use a portable gas detector to check for the presence of any remaining gas.



- To avoid hazards while carrying out this work, assume that the gas is still present and wear the appropriate gear.

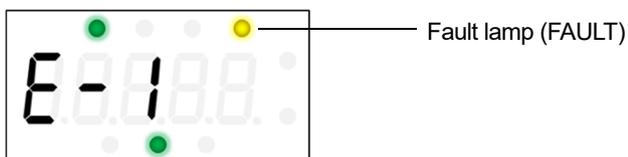
Step 5 Once you have determined that no hazard remains, take action to fix the gas leak.

6-2 Fault alarm activation

A fault alarm is triggered if an abnormality is detected in the product.

If a fault alarm occurs, the fault lamp (FAULT) illuminates in yellow, and an error code is displayed as follows:

<In case of sensor abnormality>



FAULT lit (yellow)

NOTE

- ▶ After the product has successfully recovered from the fault, it will initialize and restart.
- ▶ For more information on fault details (error codes) and appropriate corrective action, refer to '9. Troubleshooting'.
- ▶ If a fault alarm occurs, determine the cause and take appropriate action. If the product has problems and faults occur repeatedly, contact Riken Keiki immediately.

6-3 Warning operation

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-4 External output operation

Please refer to the Technical Manual for SD-3series (PT2E-287).

6-5 Functions to ensure correct alarm activation

6-5-1 Zero suppression function

The sensors used in the product are susceptible to the effects of ambient fluctuations (e.g., temperature and humidity characteristics) and interference gases (interference characteristics), which affect the readings given by the product. Therefore, readings may fluctuate around zero levels even under normal conditions.

The zero suppression function is designed to minimize the effects of these ambient fluctuations and interference gases around the zero level. Use this function to suppress reading fluctuations below the preset value to give a zero reading (or [20.9] (vol%) for oxygen).

<Zero suppression function disabled>



The reading fluctuates around the zero level.

<Zero suppression function enabled>



Displays zero up to the preset value.

6-5-2 Automatic sensor recognition function

Please refer to the Technical Manual for SD-3series (PT2E-287).

7

Maintenance

7-1 Maintenance intervals and items

The following items should be maintained regularly before using the product:

- Daily maintenance: Perform maintenance before commencing work.
- Monthly maintenance: Inspect the alarm circuit (alarm test) once a month.
- Regular maintenance: Confirm and adjust the measurement accuracy with the calibration gas concentration. The order of calibration is zero adjustment first and then span adjustment.

Maintenance item	Maintenance details	Daily maintenance	Monthly maintenance	Regular maintenance
Power supply check	Check to confirm that the power lamp is lit.	○	○	○
Concentration display check	Check to confirm that the concentration reading is zero (or [20.9] (vol%) for oxygen). If the reading is offset, perform zero adjustment after confirming that no interference gas is present in the vicinity.	○	○	○
Alarm test	Use the alarm test function to check the alarm circuit. If you use an optional alarm relay, check the relay at the same time.	—	○	○
Calibration	Perform sensitivity calibration using a calibration gas.	—	—	○
Gas alarm check	Check the gas alarm using a calibration gas.	—	—	○
Grounding cable check	To ensure EMC performance, check to confirm that the grounding cable connection is secure and free of corrosion.	—	—	○

<Maintenance services>

Riken Keiki provides services related to regular maintenance including calibration, adjustments, and servicing. Preparing a calibration gas requires dedicated equipment, including gas cylinders of the specified concentration and gas sampling bags.

Our certified service engineers have expert knowledge of the dedicated tools and products. We recommend taking advantage of our maintenance service to ensure safe use of the product.

The main details of the maintenance services are as follows. Please contact Riken Keiki for more information.

Service	Service details
Power supply check	<ul style="list-style-type: none"> ▪ Check the power supply voltage. ▪ Check to confirm that the power lamp is lit. (Confirm that the power lamp (POWER), alarm lamps (ALM1, ALM2), fault lamp (FAULT), unit lamps (PPM, %LEL, %) are clearly visible on the display.) ▪ Check the operation of the UPS (uninterruptible power system), if used.
Concentration display check	<p>Check to confirm that the concentration reading indicates zero using a zero calibration gas. Perform zero calibration if the reading is not zero.</p> <p>With the oxygen deficiency alarm specifications, introduce clean air and check that the concentration reading indicates [20.9] (vol%). Perform span adjustment if the reading is offset.</p>
Filter check	<p>Check to confirm that the dust filter is neither contaminated nor clogged.</p> <p>Replace the filter if the filter is dirty or clogged.</p>
Alarm test	<p>Use the alarm test function to inspect the alarm circuit.</p> <ul style="list-style-type: none"> ▪ Check alarm lamps. (Check the ALM1 and ALM2 operations.) ▪ Check external alarms. (Check the buzzer, reset signal, and other external alarm operations.)
Calibration	<p>Perform sensitivity calibration using a calibration gas.</p>
Gas alarm check	<p>Check the gas alarm using a calibration gas.</p> <ul style="list-style-type: none"> ▪ Check alarms. (Confirm alarm activation when alarm setpoint is reached.) ▪ Check delay time. (Check delay time until alarm activation.) ▪ Check alarm lamps. (Check the ALM1 and ALM2 operations.) ▪ Check external alarms. (Check the buzzer, reset signal, and other external alarm operations.)
Product cleaning and repair (visual inspection)	<p>Check the product exterior, cover, and interior for dirt and damage. Clean/repair problem areas.</p> <p>Replace cracked or damaged parts.</p>
Product operation check	<p>Operate the keys to check individual functions and parameters.</p>
Consumable part replacement	<p>Replace degraded components such as sensors and filters.</p>

<Proof tests>

Regular proof testing is a requirement according to the standards regarding the degradation of measurement performance. The effects of the environment and changes to the application of the detector can have negative effects on measurement and signal performance. Proof tests must be performed regularly. Determine the interval for proof tests according to the application of the detector.

<Checking indication accuracy>

Regular proof testing is a requirement according to the standards regarding the degradation of measurement performance. Maintenance must be performed regularly. The inspection interval depends on the ambient conditions in which the sensor operates. The sensor drifts due to ambient conditions and aging deterioration. Sensor drift has an adverse effect on measurement accuracy. This accuracy can be recovered by calibration. Shorter check intervals may need to be established according to the severity of the drift. To evaluate the ambient conditions in a new facility, it is necessary to establish shorter check intervals to record the drift. It is necessary for the plant operator to establish the check intervals based on the data they acquire. Under normal circumstances, RIKEN KEIKI recommends the following check intervals.

[Recommended check intervals]

IRF: 6 to 12 months

NCF: 6 to 12 months

ESF: 6 months to 12 months

[Check items]

Indication accuracy: zero reading, gas reading

Response

<Visual inspection>

It is necessary to perform a visual inspection of the gas detector to check whether there are external obstructions to the flow of gas/vapor to the sensor. Things that may be included are debris, dirt, snow, mud, external devices, etc. Corrective measures include removal of such blockages if they exist.

Depending on the environment, it may be necessary to make inspections at short intervals.

1. If necessary, remove protective devices (splash guard, etc.).
2. Check whether there are external obstructions to the detector. For example, debris, dirt, snow, mud, external devices, etc.
3. If such blockages exist, remove them.
4. Check the status LED/display.

7-2 Maintenance mode

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-3 Performing tests (test mode)

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-4 Performing calibration

7-4-1 Calibration preparation

Before performing calibration (zero calibration and span adjustment), prepare the calibration gas. Also connect the calibration equipment required to the product before starting.

- Zero calibration gas
- Span adjustment gas (in gas sampling bag or gas can)
- Gas sampling bag for exhaust gas
- Calibration adapter or splash guard

<List of adjustment jigs>

Item name	Applicable specifications	
Calibration adapter	Dedicated adapter for IRF sensor	Part No.: 4283 9011 00
	Dedicated calibration adapter for combustible F sensors	Part No.: 4283 9012 70
	Dedicated adapter for ESF sensor	Part No.: 4283 9013 40
Pump	One that can provide a flow rate of 0.5 mL or greater	
	Explosion-proof specifications	
Flowmeter	Measures tolerances to 0.1 ml.	
	Has passed regular inspection.	
Stopwatch	Has passed regular inspection	
Piping	For general combustible gases	Material: polyurethane Internal diameter: 4 mm Pipe length between gas and adapter: Within 1m
	For organic solvents	Material: Teflon Internal diameter: 4 mm Pipe length between gas and adapter: Within 1m
	For strongly adsorptive gases	Material: Teflon Internal diameter: 4 mm Pipe length between gas and adapter: Within 10cm

<List of adjustment conditions>

Gas detector model	Sensor model	Detection target	Chemical formula	Detection concentration	Zero gas	Calibration gas (alternative gas)	Dilution gas	Calibration gas concentration (alternative gas concentration)	Calibration cap	Applicable flow rate for calibration jig	Time required for calibration	Sample flow rate	Remarks
SD-3RI SD-3DFI GD-3RI	IRF-1301	Methane	CH ₄	100%LEL	N ₂	Methane	N ₂	50%LEL	For IRF sensor (4283 9011 00)	0.5 ± 0.1 L/min	120 seconds	0.4 - 1.5 L/min	Warm up for at least 10 minutes before making adjustments.
	IRF-1317	Propane Propane	C ₃ H ₈	100%LEL	N ₂	Propane (isobutane)	N ₂	50%LEL (40%LEL)					
	IRF-1315	Propane	C ₃ H ₈	100 vol%	N ₂	Propane	N ₂	80vol%					
SD-3NC SD-3DNC GD-3NC	NC-6318	Methane	CH ₄	100%LEL	Atmospheric air	Methane	Atmospheric air	50%LEL	For combustible F sensor (4283 9012 70)	0.5 ± 0.1 L/min	60 seconds	0.4 - 1.5 L/min	Warm up for at least 30 minutes before making adjustments.
		Hydrogen	H ₂	100%LEL	Atmospheric air	Hydrogen	Atmospheric air	50%LEL					
SD-3EC SD-3DEC GD-3EC	ESF-A24R3	Hydrogen sulfide	H ₂ S	100 ppm	N ₂	Hydrogen Sulfide	N ₂	32 ppm	For ESF sensor (4283 9013 40)	0.5 ± 0.1 L/min	60 seconds	0.4 - 1.5 L/min	At temperatures below -25°C, allow to acclimatize for the operating environment before adjustments.
SD-3ECS SD-3DECS GD-3ECS	ESF-A24R	Hydrogen sulfide	H ₂ S	100 ppm	N ₂	Hydrogen Sulfide	N ₂	32 ppm	For ESF sensor (4283 9013 40)	0.5 ± 0.1 L/min	60 seconds	0.4 - 1.5 L/min	At temperatures below -25°C, allow to acclimatize for the operating environment before adjustments.

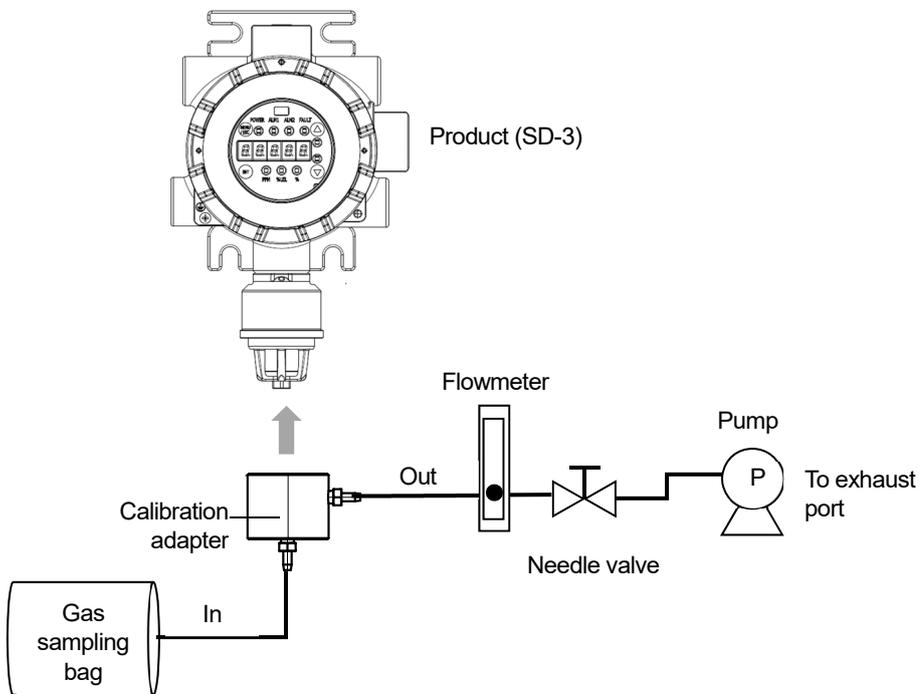
* For FM specifications, do not use alternative gas for adjustment.

<When using the calibration adapter>

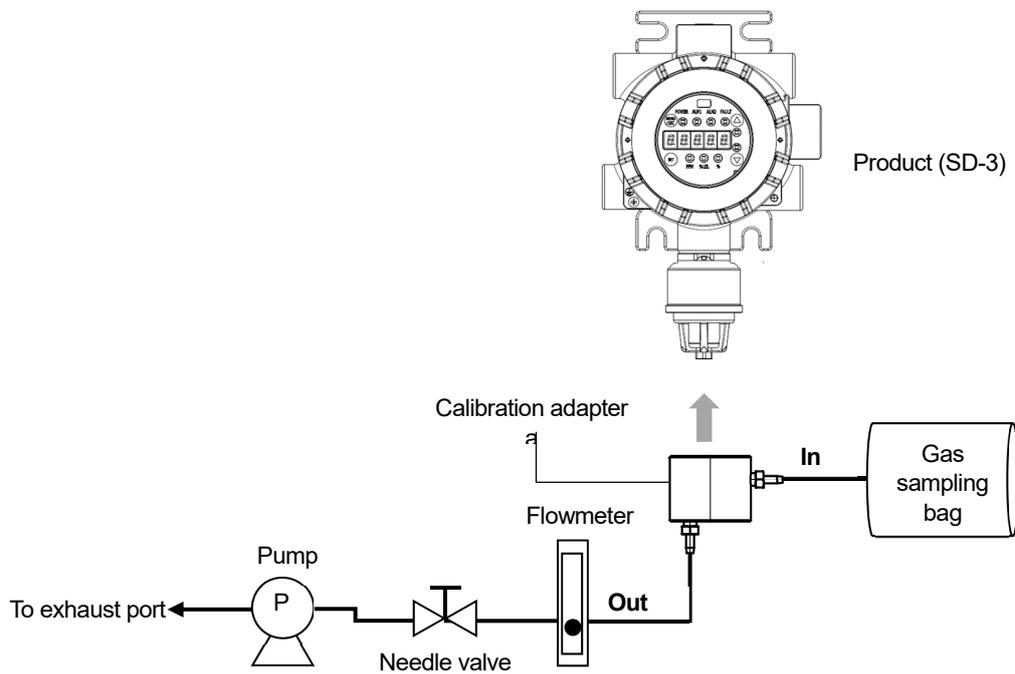
NOTE

- ▶ Use a flow rate of 0.5 ± 0.1 L/min when calibrating. Calibration accuracy may be reduced if calibration is performed using a different flow rate.
- ▶ Leaving the suction cap and calibration adapter attached in a windless state for 10 minutes or more may cause adsorbed gas to accumulate, which can cause the reading rise. If this occurs, push clean air through to return the reading to zero. Furthermore, as the sensor will be shut off from the atmosphere in this state, it will not be monitoring.

<Using a gas sampling bag>

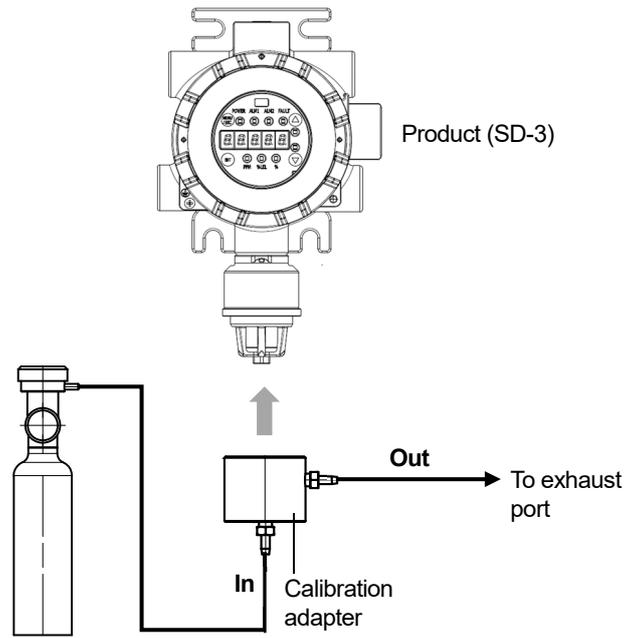


<Using a gas sampling bag> **NC**

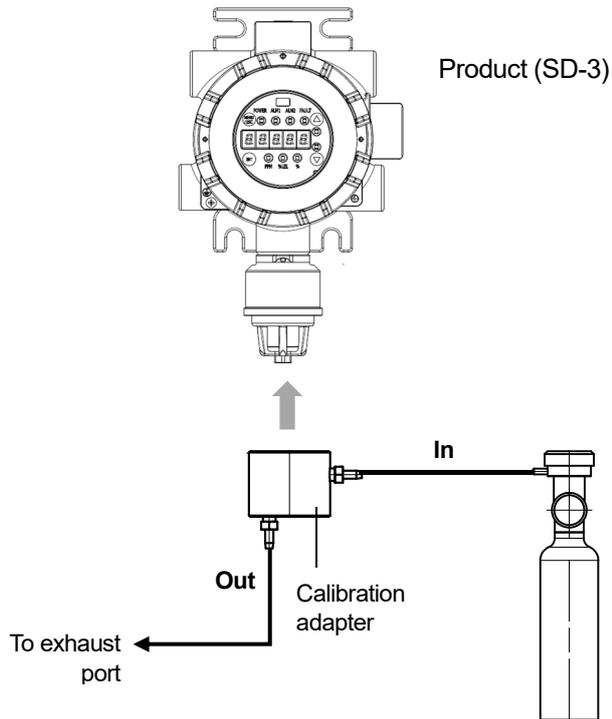


* The diagram illustrates the SD-3. The connection method is the same for the remote sensor head (GD-3).

<Using a gas can> **RI** **EC**



<Using a gas can> **NC**



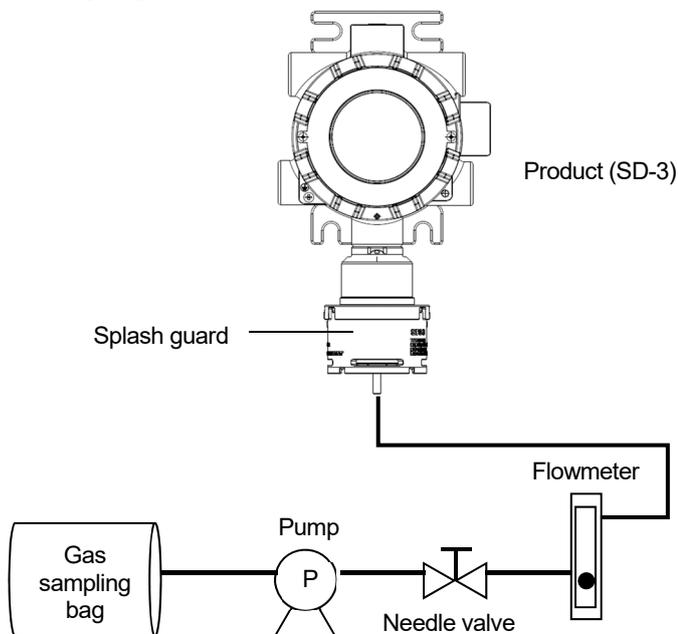
* The diagram illustrates the SD-3. The connection method is the same for the remote sensor head (GD-3).

<When using the splash guard>**NOTE**

- ▶ The calibration adapter is not required when using the splash guard.
- ▶ When using the splash guard, calibrate using the following wind speed:

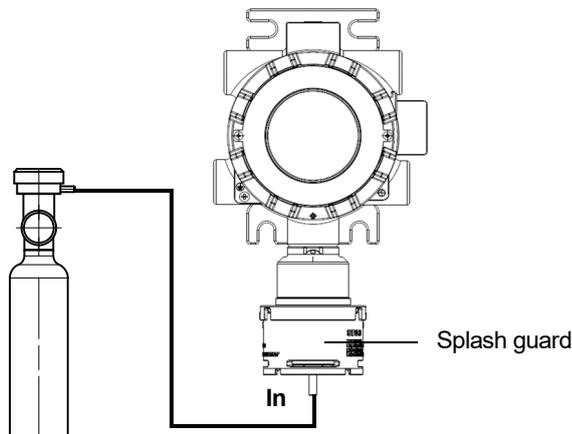
Detection principle	Wind speed
Non-dispersive infrared absorption type (infrared type)	Max. 6 m/s
New ceramic type	
Electrochemical type	Max. 1 m/s

- ▶ If calibration is unsuccessful, fit the calibration adapter and calibrate again.
- ▶ When calibrating adsorptive gas, fit the calibration adapter.
- ▶ Use a flow rate of 0.5 L/min \pm 0.1 L/min when calibrating. Calibration accuracy may be reduced if calibration is performed using a different flow rate.

<Using a gas sampling bag>

*The diagram illustrates the SD-3. The connection method is the same for the remote sensor head (GD-3).

<Using a gas can>



* The diagram illustrates the SD-3. The connection method is the same for the remote sensor head (GD-3).

<Checking for piping leaks>

- Make a visual inspection for cracks in the pipes.
- When installed according to the piping diagram and with the calibration adapter covering the gas inlet, confirm that the flowmeter indicates zero.
- If the flowmeter does not indicate zero, there is a leak between the gas inlet and the pump.
- Make a visual inspection for cracks in the rubber seals on the pipes and calibration adapter.
- When using a gas cylinder for calibration, use the pump to perform checks for leaks using the same method before connecting the cylinder.
- If this does not solve the issue, the matter needs to be checked by a qualified service engineer. To ensure safety and the stable operation of the product, request checking by a qualified service engineer. Also, as a method for determining the locations of leaks, we recommend our leak tester. Contact RIKEN KEIKI to request checking.

WARNING

- If you use a method of applying pressure by introducing air through the gas inlet and blocking the gas outlet, adapters and pipes may become disconnected with great force.

<Calibration adapter>

- There are different calibration adapters for different models.
- For IRF, use the dedicated adapter for IRF sensors; for NCF, use the dedicated adapter for combustible gas sensors; for ESF, use the ESF dedicated adapter.

Dedicated adapter for IRF sensor

Calibration adapter

- (for IRF sensor)

<Calibration procedure>

- Perform zero adjustment and span adjustment in the determined order.
- Characteristics may be affected if not performed in the correct order.

<Zero gas>

- Zero gas is a test gas for calibrating the zero point. The ambient air can be used as the zero gas if there are no interfering impurities or target gases present. For O₂ and CO₂ sensors, nitrogen (N₂) is used.

<Calibration gases>

- Calibration gas is a gas for calibrating the sensitivity of the sensors during span adjustment. Calibration gas is a known concentration of the target gas diluted with clean air or nitrogen. For O₂ sensors, the oxygen in the ambient atmosphere is used, so a calibration gas is not required.
- We recommend calibrating the device using the detection target gas. This method is more accurate than using a replacement gas. Use of a replacement gas for calibration is permissible in circumstances when it is not possible to use target gas calibration.
- It is necessary to calibrate for methane and hydrogen using only the actual gases. Do not use replacement gases for calibration.
- It is necessary to perform span adjustment within 24 hours of the most recent valid zero adjustment.
- For managing the concentration of calibration gases, we recommend the use of a RIKEN KEIKI portable detector.
- Contact RIKEN KEIKI.



- If harmful calibration gas is inhaled, your health may be harmed and there is also the possibility of death.
 - Do not inhale the calibration gas.
-

<Confirming response time (t90)>

- Checking is performed against the piping diagram.
- 1. Confirm response time after air calibration and span adjustment.
- 2. Select Maintenance mode 2-0.0 to enter the gas test.
- 3. Use a stopwatch to measure the time it takes between when the calibration gas is introduced through the calibration adapter and the reading reaching a gas concentration of 90 %.
- 4. Compare the response time with the t90 value indicated on the corresponding sensor data sheet.
- Confirm that the required response time is being maintained.

<When using the splash guard>

- Response
Gas response times can be affected when a splash guard is used. The gas response time increases and this can increase the time until the alarm occurs.
In case of the splash guard is installed, the IRF is not included in the performance certification (it does not meet the response).
 - Adjustment
When adjusting highly adsorptive gases, replace with the adjustment adapter before performing the adjustments. Adjusting with a splash guard has an effect on the wind speed.
 - The allowable range depends on the sensor, so refer to the table.
-

7-4-2 Performing zero calibration

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-4-3 Performing span adjustment

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-5 Setting environmental settings 1

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-6 Setting environmental settings 3

Please refer to the Technical Manual for SD-3series (PT2E-287).

7-7 Parts replacement

7-7-1 Sensor replacement

Please contact Riken Keiki for sensor replacement.

<Sensor replacement intervals>

Gas detector model	Sensor model	Detection target gas	Chemical formula	Detection concentration	Units	Sensor replacement interval
SD-3RI SD-3DRI GD-3RI	IRF-1301	Methane	CH ₄	100 %LEL	%LEL	3 years
	IRF-1317	Propane	C ₃ H ₈	100 %LEL	%LEL	
	IRF-1315	Propane	C ₃ H ₈	100 vol%	vol%	

Gas detector model	Sensor model	Detection target gas	Chemical formula	Detection concentration	Units	Sensor replacement interval
SD-3NC SD-3DNC GD-3NC	NC-6318	Methane	CH ₄	100 %LEL	%LEL	3 years
		Hydrogen	H ₂			

Gas detector model	Sensor model	Detection target gas	Chemical formula	Detection concentration	Units	Sensor replacement interval
SD-3ECS SD-3DECS GD-3ECS	ESF-A24R	Hydrogen sulfide	H ₂ S	100 ppm	ppm	3 years
SD-3EC SD-3DEC GD-3EC	ESF-A24R3	Hydrogen sulfide	H ₂ S	100 ppm	ppm	3 years

CAUTION

- Precautions regarding sensor replacement
- Be sure to turn OFF the power supplied to the sensor before replacing the sensor.
- Refer to '4-8 Mounting the sensor' for instructions on how to mount the sensor.
- Perform air calibration and span adjustment after replacing the sensor.
- The sensor can be replaced in zones classified as hazardous without turning off the main unit power supply.
- If the same type of sensor (the same part number) was previously installed, the particular configurations of the device (detection target gas, measurement range, alarm setpoints, zero suppression, etc.) are maintained. In other cases, the default factory settings of the new sensor are uploaded, overwriting the current configurations. The sensor is recognized by the automatic sensor recognition function. Refer to '6-5-2 Automatic sensor recognition function' for information on the automatic sensor recognition function.

- Use the "Sensor replacement" item from the sensor replacement function menu to replace the sensor without triggering a fault signal on the main unit.

NOTE

- ▶ Please contact RIKEN KEIKI to request sensor replacement. Calibration using a calibration gas is required after sensor replacement.

7-7-2 Replacement of periodic replacement parts

The recommended replacement parts for this product are as follows: Replace using the recommended replacement intervals as a guide.

<Recommended periodic replacement parts list>

Name	Recommended check interval	Recommended replacement interval	Quantity (per unit)	Remarks
Sensor guard for SD-3RI	6 months	3 - 8 years	1	
Sensor guard for SD-3NC				
Sensor guard for SD-3EC/ECS				
Gas sensor		Refer to separate sensor specifications.		*1

*1: A functional check by a qualified service engineer is required after replacement. To ensure safety and the stable operation of the product, request checking by a qualified service engineer. Contact RIKEN KEIKI to request checking.

8

Storage, Relocation, and Disposal

8-1 Procedures for storage or when not in use for extended periods

<Storage conditions (Sensor)>

Model	Storage limit (years)	Temperature (°C)		Humidity*1 (% RH)		Pressure (kPa)		Remarks
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
NCF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> The sensor must be stored in the specified packing case. Store in a location away from direct sunlight. Store in an environment free of corrosive gas, vibration, and dust. Avoid condensation and moisture. Store in an environment free of gases that may act as a catalyst poison (e.g., silicone, chlorine, sulfur gases).
IRF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> The sensor must be stored in the specified packing case. Store in a location away from direct sunlight. Store in an environment free of corrosive gas, vibration, and dust. Avoid condensation and moisture.
ESF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> The sensor must be stored in the specified packing case. Store in a location away from direct sunlight. Store in an environment free of corrosive gas, vibration, and dust. Avoid condensation and moisture. • Store in an environment free of gases that may act as a catalyst poison (e.g., silicone, chlorine, sulfur gases).

*1: Maximum humidity corresponds to an absolute humidity of 33 g/m³ (33.6 °C, 90 %RH).

<Storage conditions (Sensor-fitted SD-3)>

Model	Storage limit (years)	Temperature (°C)		Humidity* ¹ (% RH)		Pressure (kPa)		Remarks
	—	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	
NCF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> • Store in a location away from direct sunlight. • Store in an environment free of corrosive gas, vibration, and dust. • Avoid condensation and moisture. • Store in an environment free of gases that may act as a catalyst poison (e.g., silicone, chlorine, sulfur gases).
IRF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> • Store in a location away from direct sunlight. • Store in an environment free of corrosive gas, vibration, and dust. • Avoid condensation and moisture.
ESF	0.5	-10	40	0	90	80	120	<ul style="list-style-type: none"> • Store in a location away from direct sunlight. • Store in an environment free of corrosive gas, vibration, and dust. • Avoid condensation and moisture. • Store in an environment free of gases that may act as a catalyst poison (e.g., silicone, chlorine, sulfur gases). • Store in the dedicated sensor storage container.*² Open the dedicated container just before use, remove the sensor, and mount in the detector.

*1: Maximum humidity corresponds to an absolute humidity of 33 g/m³ (33.6 °C, 90 %RH).

*2: If not stored in the container, fluid leakage may occur under high humidity conditions of 90 %RH or more.

8-2 Procedures for relocation or reuse

Please refer to the Technical Manual for SD-3series (PT2E-287).

8-3 Product disposal

Please refer to the Technical Manual for SD-3series (PT2E-287).

9

Troubleshooting

This troubleshooting section does not address causes of all problems that may occur with the product. It provides brief explanations to assist in determining the causes of common problems.

If you encounter symptoms not addressed here or if problems persist even after taking corrective action, contact RIKEN KEIKI.

9-1 Product abnormalities

Symptom/display	FAULT lamp	Cause	Action
The power cannot be turned on.	—	The wires are incorrectly connected.	Wire correctly.
		The wires are detached from the terminal plate.	Connect correctly.
		Abnormalities or instantaneous interruptions in the power supply circuit	Check to confirm that the rated voltage is supplied. Consider use of an uninterruptible power system, power supply line filter, or insulated transformer, and add such devices where appropriate.
		Cable abnormality (Disconnection, cable not connected, short circuit)	Check the wiring for the product and peripheral devices.
		Fuse blown	Replacement required. Contact Riken Keiki.
		Internal circuit abnormality	Replacement required. Contact Riken Keiki.
Abnormal operation	—	Disturbances due to sudden noise, etc.	Turn off the power and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source. If the problem persists even with noise prevention measures, contact Riken Keiki.
Sensor abnormality (E-1)	 (Lamp on)	The sensor is not connected or connected improperly.	Turn off the power and check the sensor connection.
		A sensor fault has occurred.	Replace with a new sensor.
		Effects of sudden surge noise	Turn off the power and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source. If the problem persists even with noise prevention measures, contact Riken Keiki.
		The main unit (SD-3/SD-3SC) or remote sensor head (GD-3) internal wiring is connected incorrectly.	Connect internal wiring of the main unit (SD-3/SD-3SC) or remote sensor head (GD-3) correctly.

Symptom/display	FAULT lamp	Cause	Action
		Cable abnormality between the main unit (SD-3SC) and remote sensor head (GD-3)	Check the cable between the main unit (SD-3SC) and remote sensor head (GD-3).
Sensor abnormality (E-1)	 (Lamp on)	A main unit (SD-3/SD-3SC) or remote sensor head (GD-3) fuse has blown.	Replacement required. Contact Riken Keiki.
		Main unit (SD-3/SD-3SC) or remote sensor head (GD-3) internal circuit abnormality	Replacement required. Contact Riken Keiki.
System abnormality (E-9)	 (Lamp on)	4 - 20 mA output disconnection	Turn off the power and check the 4 - 20 mA output connection.
		Internal ROM, RAM, or EEPROM fault	Turn off the power and restart. If the problem persists, replacement is necessary. Contact Riken Keiki.
GD-3 abnormality (E-1A)	 (Lamp on)	The sensor is not connected or connected improperly.	Turn off the power and check the sensor connection.
		A sensor fault has occurred.	Replace with a new sensor.
		Effects of sudden surge noise	Turn off the power and restart. If similar symptoms recur frequently, take appropriate measures to address the noise source. If the problem persists even with noise prevention measures, contact Riken Keiki.

9-2 Reading abnormalities

Please refer to the Technical Manual for SD-3series (PT2E-287).

10

Product Specifications

10-1 SD-3 specifications

10-1-1 SD-3 (model without EC barrier)

Model	SD-3	SD-3 (contact model)
Specifications	Standard	Contact
Display	7-segment LED (5 digits)	
Sensor	F sensor (Riken Keiki)	
Detection principle	Infrared/electrochemical/new ceramic/semiconductor/hot-wire semiconductor	
Detection target gas	Depends on sensor specifications.	
Detection range	Depends on sensor specifications.	
Sampling method	Diffusion type/suction type (introduced via external unit)	
Set flow rate	0.4 - 1.5 L/min	
Power supply indication	Power lamp lit (green)	
External output	Gas concentration signal (4 - 20 mA DC with HART output)	
Alarm setpoints	Depends on sensor specifications.	
Alarm accuracy	Depends on sensor specifications.	
Alarm delay time	Depends on sensor specifications.	
Repeatability (for identical conditions)	Depends on sensor specifications.	
Indication accuracy (for identical conditions)	Depends on sensor specifications.	
Gas alarm type	Two-step alarm (H-HH, H-L, or L-LL)	
Gas alarm indication	Alarm lamp lit (red)	
Gas alarm reset operation	Auto reset or self-latching	
Fault alarm/self diagnosis	System abnormality (E-9)/sensor abnormality (E-1)	
Fault alarm indication	Fault lamp lit (yellow)/error code display	
Fault alarm reset operation	System abnormality: Self-latching Sensor abnormality: Auto reset (self-latching if sensor is disconnected)	
Contact operation	—	SPDT (× 3): 2 alarms, 1 fault output 250 V AC, 2 A; 30 V DC, 1 A (resistance load) Minimum load 5 V DC, 0.1 A
Warnings	Sensor life assessment/clock abnormality diagnosis/communication diagnosis/sensor warning	
Warning display	Blinking display alternating between gas concentration and error code	
Warning operation	Same as normal operation	
Functions	Alarm delay/suppression/HART communication	

Model	SD-3	SD-3 (contact model)
Transmission method (4 - 20 mA)	3-wire analog transmission (common power supply <power supply, signal, common>) or 2-wire analog transmission (current source)	
Transmission specifications (4 - 20 mA)	4 mA - 20 mA DC (non-insulated linear output) Maximum load resistance 600 Ω (with derating depending on power supply voltage) Resolution: max. 250 divisions (depending on specifications)	
Transmission cable (4 - 20 mA)	Shielded cable 1.25 sq (1.308 mm ² /AWG16) or 2.0 sq (2.08 mm ² /AWG14) (same as power supply cable) *To ensure explosion protection, use a cable designed for use in temperatures at least 5 °C above the maximum anticipated ambient temperature.	
Transmission distance (4 - 20 mA)	For 1.25 sq (1.308 mm ² /AWG16): Not exceeding 1.25 km For 2.0 sq (2.08 mm ² /AWG14): Not exceeding 2 km (with derating depending on supply voltage)	
Power source	24 V DC (18 V - 30 V DC) *Use a power supply capable of minimum temporary output of 2.5 A to ensure that fuses blow normally in the event of a product abnormality.	
Power supply cable	Shielded cable 1.25 sq (1.308 mm ² /AWG16) or 2.0 sq (2.08 mm ² /AWG14) (same as transmission cable) *To ensure explosion protection, use a cable designed for use in temperatures at least 5 °C above the maximum anticipated ambient temperature.	
Power consumption	Refer to '10-1-3 Electrical ratings (SD-3)'.	
Cable connectors	M25 × 1.5	
Operation method	Dedicated magnet control key	
Operating temperature range	-40 °C - +70 °C (no sudden changes) In accordance with sensor specifications if restrictions apply due to sensor specifications	
Operating humidity range	0 %RH - 95 %RH (no condensation) In accordance with sensor specifications if restrictions apply due to sensor specifications	
Housing material	Stainless steel (SCS14)	
Protection level	**IP44/67 equivalent	
Installation type	Wall mounting (standard)/2B pole mounting (optional)	
Explosion-proof construction	Flame-proof construction	
Explosion-proof class	Varies depending on model. Refer to <Explosion-proof performance data> in '2-4 Safety information'.	
External dimensions	Diffusion type: Approx. 171 mm (W) × 277 mm (H) × 127 mm (D) (excluding projections) Suction type: Approx. 171 mm (W) × 289 mm (H) × 127 mm (D) (excluding projections)	
Weight	Diffusion type: approx. 6.7 kg/Suction type: approx. 7.0 kg	

*When used with the contacts closed, the contacts may seize due to vibration. Keep this precaution in mind.

** In case of ANSI/FM 60079-29-1 is applied. IP44 when IRF and ESF-A24R is installed. IP67 when NCF and ESF-A24R3 is installed.

10-1-2 SD-3 (model with EC barrier)

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-1-3 Electrical ratings (SD-3)

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-2 SD-3SC + GD-3 specifications

10-2-1 SD-3SC + GD-3 (model without EC barrier)

Model	SD-3SC + GD-3	SD-3SC (contact model) + GD-3
Specifications	Standard	Contact
Display	7-segment LED (5 digits)	
Sensor	F sensor (Riken Keiki)	
Detection principle	Infrared/electrochemical/new ceramic/semiconductor/hot-wire semiconductor	
Detection target gas	Depends on sensor specifications.	
Detection range	Depends on sensor specifications.	
Sampling method	Diffusion type	
Power supply indication	Power lamp lit (green)	
External output	Gas concentration signal (4 - 20 mA DC with HART output)	
Alarm setpoints	Depends on sensor specifications.	
Alarm accuracy	Depends on sensor specifications.	
Alarm delay time	Depends on sensor specifications.	
Repeatability (for identical conditions)	Depends on sensor specifications.	
Indication accuracy (for identical conditions)	Depends on sensor specifications.	
Gas alarm type	Two-step alarm (H-HH, H-L, or L-LL)	
Gas alarm indication	Alarm lamp lit (red)	
Gas alarm reset operation	Auto reset or self-latching	
Fault alarm/self diagnosis	System abnormality (E-9)/sensor abnormality (E-1)	
Fault alarm indication	Fault lamp lit (yellow)/error code display	
Fault alarm reset operation	System abnormality: Self-latching Sensor abnormality: Auto reset (self-latching if sensor is disconnected)	
Contact operation	—	SPDT (× 3): 2 alarms, 1 fault output 250 V AC, 2A; 30 V DC, 1 A (resistance load) Minimum load 5 V DC, 0.1 A
Warnings	Sensor life assessment/clock abnormality diagnosis/communication diagnosis/sensor warning	
Warning display	Blinking display alternating between gas concentration and error code	
Warning operation	Same as normal operation	
Functions	Alarm delay/suppression/HART communication	
Transmission method (4 - 20 mA)	3-wire analog transmission (common power supply <power supply, signal, common>) or 2-wire analog transmission (current source)	
Transmission specifications (4 - 20 mA)	4 mA - 20 mA DC (non-insulated linear output) Maximum load resistance 600 Ω (with derating depending on power supply voltage) Resolution: max. 250 divisions (depending on specifications)	

Model	SD-3SC + GD-3	SD-3SC (contact model) + GD-3
Transmission cable (4 - 20 mA)	Shielded cable 1.25 sq (1.308 mm ² /AWG16) or 2.0 sq (2.08 mm ² /AWG14) (same as power supply cable) *To ensure explosion protection, use a cable designed for use in temperatures at least 5 °C above the maximum anticipated ambient temperature.	
Transmission distance (4 - 20 mA)	For 1.25 sq (1.308 mm ² /AWG16): Not exceeding 1.25 km For 2.0 sq (2.08 mm ² /AWG14): Not exceeding 2 km (with derating depending on supply voltage)	
Transmission cable (between GD-3 units)	Shielded twisted pair cable 1.25 sq (1.308 mm ² /AWG16) *To ensure explosion protection, use a cable designed for use in temperatures at least 5 °C above the maximum anticipated ambient temperature.	
Transmission distance (between GD-3 units)	20 m (maximum)	
Power source	24 V DC (18 V - 30 V DC) *Use a power supply capable of minimum temporary output of 2.5 A to ensure that fuses blow normally in the event of a product abnormality.	
Power supply cable	Shielded cable 1.25 sq (1.308 mm ² /AWG16) or 2.0 sq (2.08 mm ² /AWG14) (same as transmission cable) *To ensure explosion protection, use a cable designed for use in temperatures at least 5 °C above the maximum anticipated ambient temperature.	
Power consumption	Refer to '10-2-3 Electrical ratings (SD-3SC + GD-3)'.	
Cable connectors	M25 × 1.5	
Operation method	Dedicated magnet control key	
Operating temperature range	-40 °C - +70 °C (no sudden changes) In accordance with sensor specifications if restrictions apply due to sensor specifications	
Operating humidity range	0 %RH - 95 %RH (no condensation) In accordance with sensor specifications if restrictions apply due to sensor specifications	
Housing material	Stainless steel (SCS14)	
Protection level	**IP44/67 equivalent	
Installation type	Wall mounting (standard)/2B pole mounting (optional)	
Explosion-proof construction	Flame-proof construction	
Explosion-proof class	Varies depending on model. Refer to <Explosion-proof performance data> in '2-4 Safety information'.	
External dimensions (SD-3SC)	Diffusion type: Approx. 125 mm (W) × 195 mm (H) × 88 mm (D) (excluding projections)	
Weight (SD-3SC)	Approx. 6.0 kg	
External dimensions (GD-3)	Approx. 125 mm (W) × 195 mm (H) × 88 mm (D)	
Weight (GD-3)	Approx. 3.0 kg	

*When used with the contacts closed, the contacts may seize due to vibration. Keep this precaution in mind.

** In case of ANSI/FM 60079-29-1 is applied. IP44 when IRF and ESF-A24R is installed. IP67 when NCF and ESF-A24R3 is installed.

10-2-2 SD-3SC + GD-3 (model with EC barrier)

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-2-3 Electrical ratings (SD-3SC + GD-3)

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-3 Detection target gases for individual detection principles

10-3-1 Non-dispersive infrared absorption type (Infrared type)

Sensor model	Gas name	Gas symbol	F.S.	1 digit	First Alarm setpoint	Second Alarm setpoint	Calibration gas	Operating temperature range	Operating humidity range	Years of warranty
IRF-1301*	Methane	CH ₄	100 %LEL	0.5 %LEL	25 %LEL	50 %LEL	CH ₄	-40 °C - 70 °C	95 %RH or less (no condensation)	3 years
IRF-1317*	Propane	C ₃ H ₈	100 %LEL	0.5 %LEL	25 %LEL	50 %LEL	C ₃ H ₈ i-C ₄ H ₁₀			
IRF-1315	Propane	C ₃ H ₈	100 vol%	0.5 vol%	25 %vol%	50 vol%	C ₃ H ₈			

*Interference occurs due to other hydrocarbon gases.

NOTE

- ▶ When calibrating, allow the product to warm up for at least 10 minutes before performing zero calibration and span adjustment.
- ▶ Use the IRF sensor adapter when calibrating. Calibration accuracy may be impaired without the IRF sensor adapter.

10-3-2 New ceramic type

Sensor model	Gas name	Gas symbol	F.S.	1 digit	First Alarm setpoint	Second Alarm setpoint	Calibration gas	Operating temperature range	Operating humidity range	Years of warranty
NCF-6318	Methane	CH ₄	100 %LEL	0.5 %LEL	25 %LEL	50 %LEL	CH ₄	-40 °C - 70 °C	0 %RH - 95 %RH*1 (no condensation)	3 years
NCF-6318	Hydrogen	H ₂	100 %LEL	0.5 %LEL	25 %LEL	50 %LEL	H ₂			

* Absolute humidity not exceeding 46 g/m³ (equivalent to 37 °C, 95 %RH)

10-3-3 Semiconductor type

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-3-4 Hot-wire semiconductor type

Please refer to the Technical Manual for SD-3series (PT2E-287).

10-3-5 Electrochemical type

Sensor model	Gas name	Gas symbol	F.S.	1 digit	First Alarm setpoint	Second Alarm setpoint	Calibration gas	Operating temperature range	Operating humidity range	Years of warranty
ESF-A24R	Hydrogen sulfide	H ₂ S	100 ppm	1 ppm	20 ppm	40 ppm	H ₂ S	-40 to 70 °C*1	95 %RH or less (no condensation)	3 years
ESF-A24R3	Hydrogen sulfide	H ₂ S	100 ppm	1 ppm	20 ppm	40 ppm	H ₂ S	-40 to 70 °C*1	95 %RH or less (no condensation)	3 years

*1 Allow the product to fully adjust to the usage conditions before adjusting if below -25 °C.

NOTE

- ▶ Perform maintenance if a warning appears while the life assessment or self-diagnostic function is active.
- ▶ Use the ESF sensor adapter when calibrating. Calibration accuracy may be reduced without the ESF sensor adapter.
- ▶ Use a flow rate of 0.5 ± 0.1 L/min when calibrating. Calibration accuracy may be reduced if calibration is performed using a different flow rate.
- ▶ When using a diffusion type detector, gas sensitivity will be affected by ambient wind speeds.

11

Appendix

11-1 Detection principle

Please refer to the Technical Manual for SD-3series (PT2E-287).

11-2 Sensor Specifications

11-2-1 IR sensor specification

Gas detector model	SD-3RI/SD-3DRI/GD-3RI		
Sensor model	IRF-1301	IRF-1317	IRF-1315
Parts No.	620102	620202	620402
Measuring principle	Non-dispersive infrared absorption method (infrared type)		
Detection target gas	Methane (CH ₄)	Propane (C ₃ H ₈)	Propane (C ₃ H ₈)
Maximum detection concentration	100 %LEL	100 %LEL	100 vol%
Units	%LEL	%LEL	vol%
Digit	0.5%LEL	0.5%LEL	0.5vol%
LEL value to apply (BS EN ISO 80079-20-1:2019)	4.4vol%	1.7vol%	—
Operating temperature range	-40 to +70 °C (no sudden fluctuations) Accuracy: -20 to 60 °C (equivalent to EN 60079-29-1:2016)		
Operating humidity range	Up to 95 %RH (no condensation)		
Operating pressure range	80 - 120 kPa (no sudden changes in pressure, explosion proof is guaranteed at 80kPa~110kPa)		
Operating wind speed range	0 - 6m/s (equivalent to EN 60079-29-1:2016)		
Orientation*1	Body (SD-3) + Sensor : within ± 90 ° from the normal position Remote sensor head (GD-3) + Sensor : No limit		
Sample flow rate range	0.4 - 1.5 L/min		
Warmup time	EN setting: 60 seconds		
Calibration gas	Methane 1.98~2.42 vol%	Propane 0.77~0.94 vol%	Propane 72.0~88.0 vol%
Calibration jig flow rate	0.5 ± 0.1 L/min		
Calibration time	120 seconds		
Response(T90)	without splash guard : within 60 seconds (equivalent to EN 60079-29-1: 2016.)		
Remarks	Different gases: C ₂ H ₄ , 1,3-C ₄ H ₆	Different gases: i-C ₄ H ₁₀ , i-C ₄ H ₈	Different gases: i-C ₄ H ₁₀ , i-C ₄ H ₈
	The reading may fluctuate due to temperature, humidity, and pressure characteristics and in some cases may exceed the zero suppression level. *1 The main body and remote sensor head have no directional restrictions. However, there may be restrictions when optional items (protective cover, etc.) are attached. The splash guard itself has no directional restrictions. A note will be added to the installation guide of the instruction manual.		

11-2-2 Combustible gas sensor specification

Gas detector model	SD-3NC/SD-3DNC/GD-3NC		
Sensor model	NCF-6318		
Parts No.	600019	600050	600003
Measuring principle	New ceramic type		
Detection target gas	Methane (CH ₄)		Hydrogen
Maximum detection concentration	100 %LEL		
Units	%LEL		
Digit	0.5%LEL		
LEL value to apply (BS EN ISO 80079-20-1:2019)	4.4vol%		4.0vol%
Operating temperature range	-40 to +70 °C (no sudden fluctuations) Accuracy: -20 to 60 °C (equivalent to EN 60079-29-1:2016)		
Operating humidity range	Up to 95 %RH (no condensation) ^{*1}		
Operating pressure range	80 - 120 kPa (no sudden changes in pressure, explosion proof is guaranteed at 80kPa~110kPa)		
Operating wind speed range	0 - 6m/s (equivalent to EN 60079-29-1:2016)		
※1 Orientation	Body (SD-3) + Sensor : within ± 90 ° from the normal position Remote sensor head (GD-3) + Sensor : No limit		
Sample flow rate range	0.4 - 1.5 L/min		
Warmup time	EN setting: 60 seconds		
Calibration gas	Methane 1.98~2.42 vol%		Hydrogen 1.80~2.2 vol%
Calibration jig flow rate	0.5 ± 0.1 L/min		
Calibration time	60 seconds		
Response(T90)	within 60 seconds (equivalent to EN 60079-29-1: 2016,)		
Remarks	Different gases: i-C ₄ H ₁₀ , C ₂ H ₄	Different gases: H ₂	
	*1 The main body and remote sensor head have no directional restrictions. However, there may be restrictions when optional items (protective cover, etc.) are attached. The splash guard itself has no directional restrictions. A note will be added to the installation guide of the instruction manual.		

11-2-3 EC sensor specification

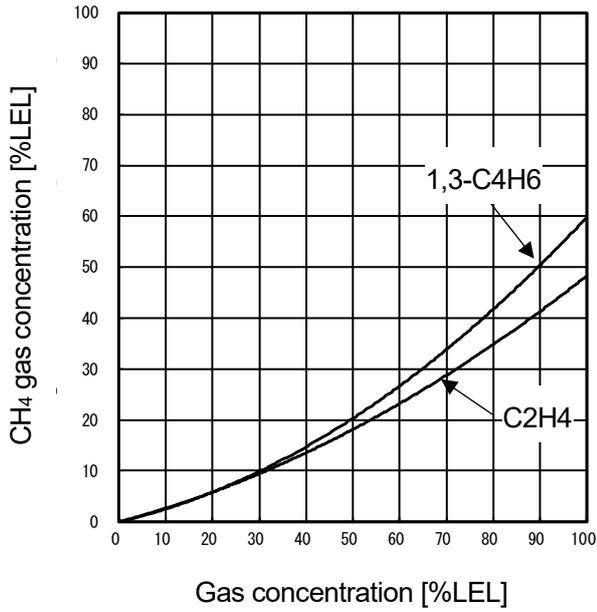
Gas detector model	SD-3ECS/SD-3DECS/GD-3ECS	SD-3EC/SD-3DEC/GD-3EC
Sensor model	ESF-A24R (equivalent to ANSI92.00.01)	ESF-A24R3 (equivalent to ANSI92.00.01)
Parts No.	610004	610049
Measuring principle	Electrochemical	
Detection target gas	Hydrogen sulfide(H ₂ S)	
Maximum detection concentration	100 ppm	
Units	ppm	
Digit	1 ppm	
LEL value to apply (BS EN ISO 80079-20-1:2019)	—	
Operating temperature range	-40 to +70 °C (no sudden fluctuations)–	
Operating humidity range	95% RH or less (No condensation, Conditions to meet performance requirements : 5%RH~95%RH)	
Operating pressure range	80 - 120 kPa (no sudden changes in pressure, explosion proof is guaranteed at 80kPa~110kPa)	
Operating wind speed range	0 - 6m/s	
Orientation*1	Body (SD-3) + Sensor : within ± 90 ° from the normal position Remote sensor head (GD-3) + Sensor : No limit	
Sample flow rate range	0.4 - 1.5 L/min	
Warmup time	EN setting: 30 seconds	
Calibration gas	Hydrogen sulfide 30.4~33.6ppm	
Calibration jig flow rate	0.5 ± 0.1 L/min	
Calibration time	60 seconds	
Response(T90)	without splash guard : within 150 seconds	
Accuracy/repeatability	±10% of reading	
Remarks	The reading may fluctuate due to temperature, humidity, and pressure characteristics and in some cases may exceed the zero suppression level. *1 The main body and remote sensor head have no directional restrictions. However, there may be restrictions when optional items (protective cover, etc.) are attached. The splash guard itself has no directional restrictions. A note will be added to the installation guide of the instruction manual.	

11-3 Calibration curve

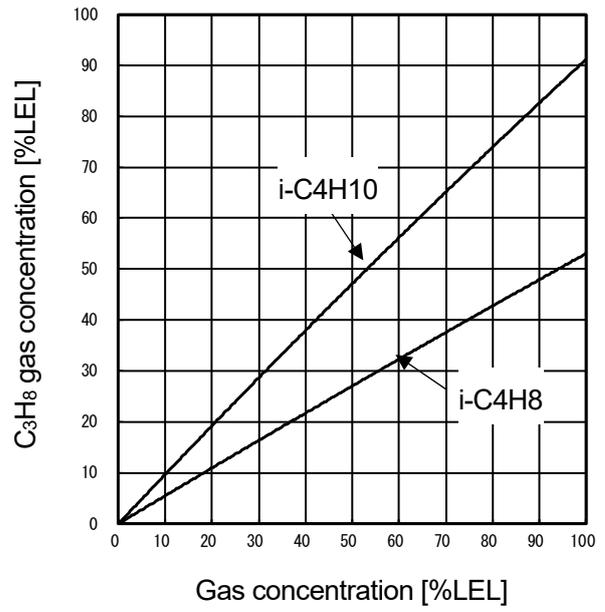
11-3-1 IRF sensor

Calibration curve for infrared gas detector (Typical Value)

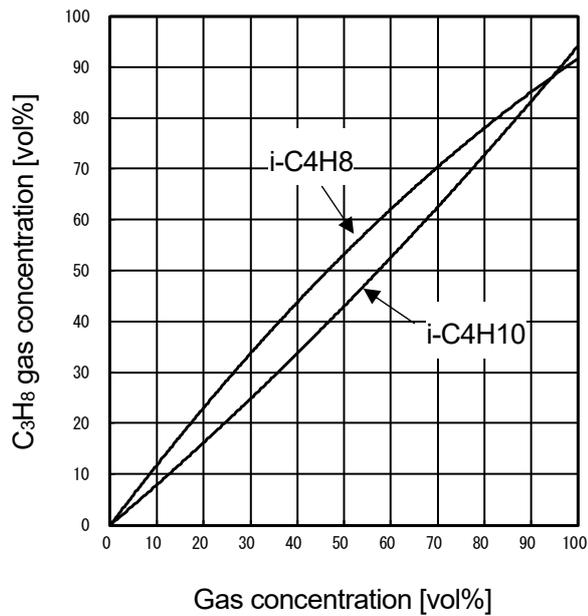
IRF-1301



IRF-1317



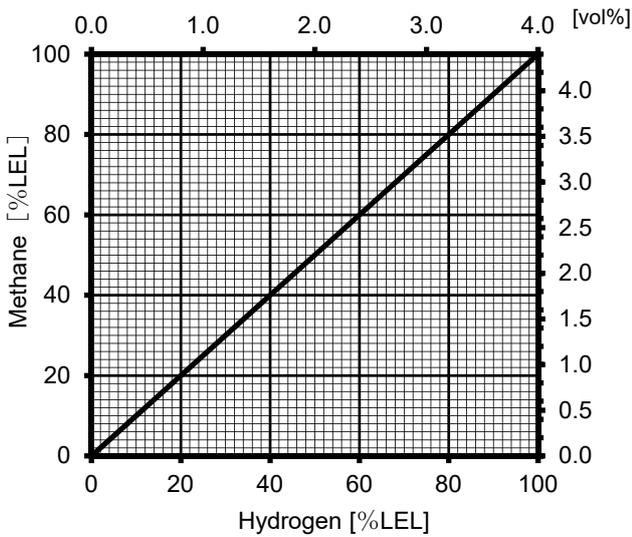
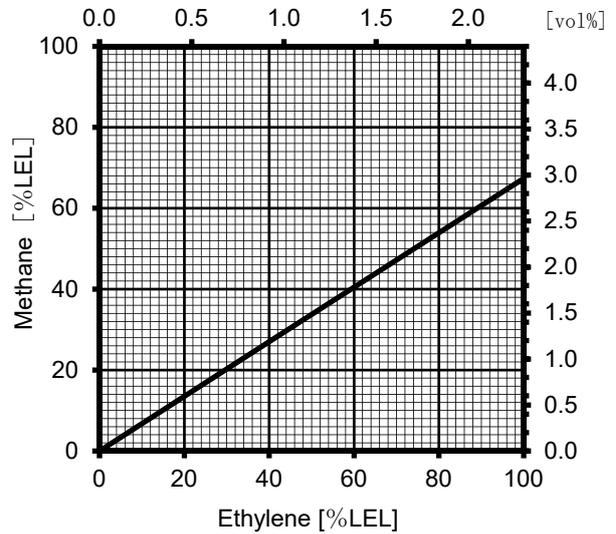
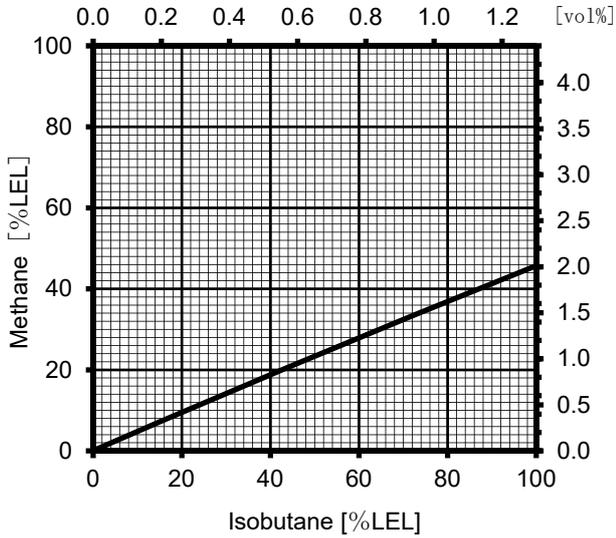
IRF-1315



11-3-2 NCF sensor

Calibration curve for Combustible gas detector (Typical Value)

NCF-6318



11-4 Terminology

Please refer to the Technical Manual for SD-3series (PT2E-287).

Product warranty

Please refer to the Technical Manual for SD-3series (PT2E-287).

Sensor warranty

Please refer to the Technical Manual for SD-3series (PT2E-287).

Revision History

Issue	Revision details	Issue date
0	First issue	6/15/2023
1	ATEX / IECEx Certification *6 delete	6/22/2023
2	Update Calibration curve	6/26/2023
3	Update EC sensor specification & General installation information	7/11/2023
4	Change of temperature and humidity range for ESF sensor Change of part number for optional accessory adapters	12/18/2023