User's Manual

IR810S
Explosion protected model Infrared Gas Analyzer Installation and Operation

IM 11G06D01-02EN

YOKOGAWA
Yokogawa Electric Corporation

IM 11G06D01-02EN
5th Edition

PREFACE

Thank you for purchasing Yokogawa's Infrared Gas Analyzer, Model: IR810S. Read this instruction manual carefully.

The related documents are as follows.

General Specifications:	GS 11G06D01-01EN	
User's Manual:	IM 11G06D01-01EN	IR810S Start-up and Safety Precautions
	IM 11G06D01-02EN	IR810S Installation and Operation (This manual)
	TI 11G06A01-01EN	Communication Functions (MODBUS)
	IM 11M13G01-02EN	ZR802S Explosion-proof Zirconia Oxygen Analyzer, Converter

The "EN" in the document number is the language code, meaning English

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.

For the latest User's Manual, download it from our website or scan the QR code.

Search by product model name (IR810S).

https://www.yokogawa.com/library/

CAUTION

- Incomplete installation may result in a fall, electric shock, fire, or injury.
- It is a heavy product. Install with care. Injury or accident may result from tipping over or falling.
- During installation work, care should be taken to keep the unit free from cable chips or other foreign objects. Otherwise, it may cause fire, trouble or malfunction of the unit.

WARNING

In piping, the following precautions should be observed. Wrong piping may cause gas leakage. If the leaking gas contains a toxic component, there is a risk of serious accident being induced. Also, if combustible gas is contained, there is a danger of explosion, fire or the like occurring.

- Connect pipes correctly referring to the instruction manual.
- Exhaust should be led outdoors so that it will not remain in the locker and installation room.
- Exhaust from the analyzer should be relieved in the atmospheric air in order that an unnecessary pressure will not be applied to the analyzer. Otherwise, any pipe in the analyzer may be disconnected to cause gas leakage.
- For piping, use a pipe and a pressure reducing valve to which oil and grease are not adhering. If such a material is adhering, a fire or the like accident may be caused.

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CAUTION

- Wiring work must be performed with the main power set to OFF to prevent electric shocks.
- Enforce construction of class-D grounding wire by all means. If the specified grounding construction is neglected, a shock hazard or fault may be caused.
- Wires should be the proper one meeting the ratings of this instrument. If using a wire which cannot endure the ratings, a fire may occur.
- Be sure to use a power supply of correct rating. Connection of power supply of incorrect rating may cause fire.

WARNING

- Do not smoke nor use a flame near the gas analyzer. Otherwise, a fire may be caused.
- Do not allow water to go into the gas analyzer. Otherwise, hazard shock or fire in the instrument may be caused.

WARNING

- When performing maintenance, inspection, or other work with the top cover (or front door) of the product open, be sure to safely shut off the measuring gas line and provide sufficient ventilation inside and around the product to prevent poisoning, fire, or explosion due to gas leakage or other causes.

CAUTION

- Do not power on the product with the top cover (or front door) of the product open. Otherwise, dust, foreign matter, etc. may stick on internal walls, thereby causing faults.

CAUTION

Be sure to observe the following for safe operation avoiding the shock hazard and injury.

• Do not touch the equipment with wet hands.

• Dispose of maintenance parts and other replacement parts in accordance with local rules.

Inspection of product

On receipt of the product, inspect the package and note it has no damage caused by the delivery. Confirm the specification of the product conforms with your order and accessories are all delivered. Check the product code labeled on a model plate is correct. See ■ Model and Suffix Code.

◆ CE marking products

■ Authorized Representative in EEA

The Authorized Representative for this product in EEA is Yokogawa Europe B.V. (Euroweg 2, 3825 HD Amersfoort, The Netherlands).

■ Identification Tag

This manual and the identification tag attached on a 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(塑料)	×	×	×	×	○	○
印刷电路板组件	×	×	×	×	○	○

○： 表示该有害物质在该部件中所有均质材料中的含有量都在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有量超出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。

◆ Safety Precautions

■ Safety, Protection, and Modification of the Product

- This manual is intended for the following personnel :
  - Engineers responsible for installation, wiring, and maintenance of the equipment
  - Personnel responsible for normal daily operation of the equipment.
- 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 and health including risk of injury, electric shock, or fatalities. or the damages to instruments. 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.

The following are signal words to be found only in our instruction manuals.

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.

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.
- This manual is an essential part of the product ; keep it in a safe place for future reference.

Symbols

Symbols in the instructions indicate the following

Symbols for key and button operations

Square brackets [ ]

In a key or button operation description, texts surrounded by [ ] indicates either a key on the keyboard, a button name displayed in the window, or a selection in a list box displayed in the window.

Example: (2) Touch [Calibration/Alarm setting] (on the screen the texts "Calibration/Alarm setting" is displayed.)

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 policy

- All names of company, brand of product used in this manual are registered trademarks.
- TM or ® to signify brand or trademarks are not used in this manual.

IR810S Fonts

Adobe-Helvetica

ISO10646-1 extension by Markus Kuhn <mkuhn@acm.org>, 2001-03-20
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After-Sales Warranty

Do not modify the product.

Yokogawa warrants the product for the period stated in the pre-purchase quotation. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be changed to the customer.

During the warranty period, for repair under warranty carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.

- Before returning a product for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.

In the following cases, customer will be charged repair fee regardless of warranty period.

- Failure of components which are out of scope of warranty stated in instruction manual.
- Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa did not supply.
- Failure due to improper or insufficient maintenance by user.
- Failure due to misoperation, misuse or modification which Yokogawa does not authorize.
- Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
- Failure caused by any usage out of scope of recommended usage
- Any damage from fire, earthquake, a storm and flood, lightning, disturbance, riot, warfare, radiation and other natural changes.

Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.

Yokogawa will not bear responsibility when the user configures the product into systems or resells the product.

Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair this product, please contact the nearest sales office described in this instruction manual.

Precautions in Handling Explosion Protected Instruments

The IR810S Explosion-protected model Infrared Gas Analyzer are designed as explosion protected instruments. Use only an explosion protected model IR810S infrared gas analyzer and accessories. Otherwise, the infrared gas analyzer and accessories may invalidate the explosion protection certification. When using the instrument in an explosion-susceptible hazardous area, note the following and observe the given precautions:

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

CAUTION

- IR810S has been tested and certified as being an explosion protected product. 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.
- Only trained personnel use this instrument in industrial locations.

IR810S (General Instruction)

Specification

Item		Descriptions
Applicable standards	IECEx	IEC 60079-0 Ed. 7.0 (2017) IEC 60079-1 Ed. 7.0 (2014) IEC 60079-2 Ed. 6.0 (2014)
	ATEX	EN IEC 60079-0:2018 EN 60079-1:2014 EN 60079-2:2014
	GB EX	GB/T 3836.1-2021 GB/T 3836.2-2021 GB/T 3836.5-2021
Certificate number	IECEx	IECEx DEK 21.0077X
	ATEX	DEKRA 21ATEX0130 X
	GB EX	GYJ24.1103X
Specific Ex marking	IECEx	Ex db pxb IIB + H2 T4 Gb
	ATEX	Ⓔx II 2 G Ex db pxb IIB + H2 T4 Gb
	GB EX	Ex db pxb IIB+H2 T4 Gb
Tamb and Tprotective gas	0ºC ≤ Ta ≤ +45ºC	
Process temperature	0ºC≤ Ta ≤ +45ºC	
Atmospheric pressure	80 kPa (0.8 bar) to 110 kPa (1.1 bar)	
Enclosure	IP4X	
Pollution degree	2	
Overvoltage category	II	
Power supply	100-240 V AC −15 % / +10 %	
Power consumption	≤120 VA	
Signals	AO : 4-20 mA DC x 4CH	
	AI : 4-20 mA DC x 1CH	
	DO : Contact capacity 24VDC 1A -1A contact relays x 11CH, -1C contact relays x 6CH	
	DI : No-voltage contact Contact resistance less than 200 ohm 8 CH	
	RS485	
Power for signal breakers	24 V DC 3W x 4CH for DO signal interrupters 24 V DC 1.5W x 1CH for RS485 and AI signal interrupters	
Optical source	An infrared lamp inside the pressurized enclosure	

Specific condition of use

- Precaution shall be taken to minimize the risk from electrostatic discharges on the nonmetallic parts (excluding glass parts) or coated parts of the equipment.
- Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
- The flow rate of the measured flammable gas should be 0.8L / min
- All externally powered input signals into the pressurized enclosure shall be isolated by external relays controlled by the Ex px protection system. (Ex px safety device).
- The only installation method is wall mounting.

Installation and erection

Refer to 3. INSTALLATION 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. 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	Non marking	N
Screw form/size	ISO M20x1.5	ANSI 1/2NPT

- The protective gas inlet is Rc1/4 or 1/4NPT. suitable for the thread form and the size of the inlet must be used on the equipment.
- Cable entry devices suitable for the size of the cable holes for M20 must be used.
- The equipment shall be installed in accordance with the following standards and relevant local codes and requirements.

Applicable Standard

IECEx :	IEC 60079-14
ATEX:	EN 60079-14
GB EX :	GB/T 3836.13 GB/T 3836.15 GB/T 3836.16 GB 50257

- 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 and setting-up (operation)

WARNING

POTENTIAL ELECTROSTATIC CHARGING HAZARD

- In hazardous areas, the risk from electrostatic discharge and propagating brush discharges caused by the rapid flow of dust shall be avoided. Avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth
- After de-energizing, delay 25 minutes before opening.
- Take care not to generate mechanical sparks when access to the equipment and the peripheral devices in hazardous locations.

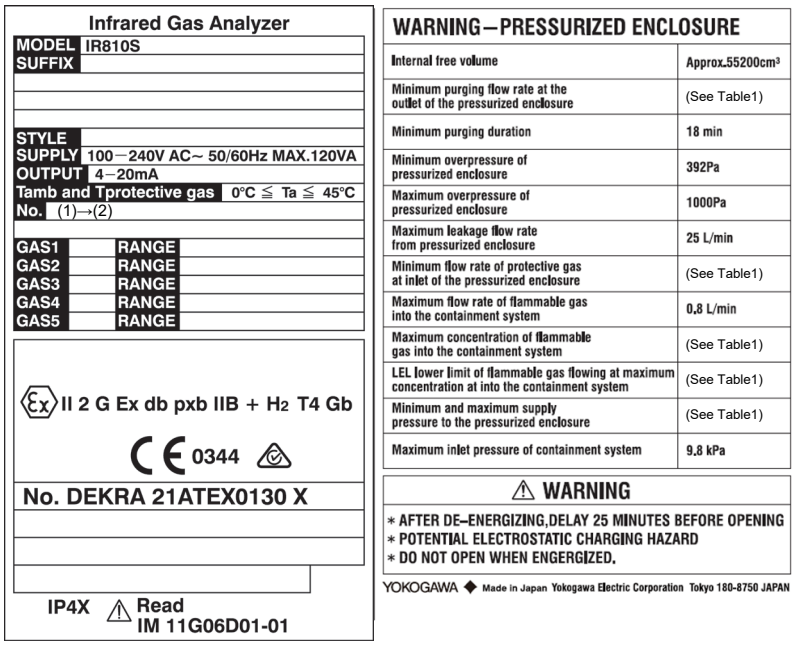
Maintenance and repair

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.

IR810S-AT (ATEX)

Marking



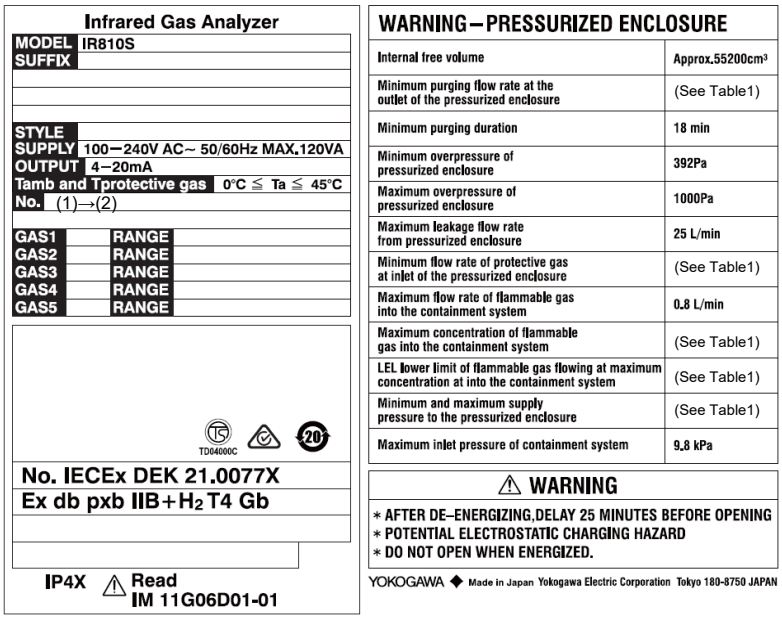
(1) Serial number
(2) Year of construction (YYYY-MM)

Example of nameplate (Design and texts may be changed)

Parameters	The contents to be printed by Air purge gas flow rate in Model and Suffix Code		
	02	05	10
Minimum purging flow rate at the outlet of the pressurized enclosure	10 L/min	40 L/min	90 L/min
Minimum flow rate of protective gas at inlet of the pressurized enclosure	20 L/min	50 L/min	100 L/min
Maximum concentration of flammable gas at into the containment system	10%	55%	100%
LEL lower limit of flammable gas flowing at maximum concentration at into the containment system	4.40%	4.40%	No limit
Minimum and maximum supply pressure to the pressurized enclosure	350 to 500 kPa	350 to 500 kPa	400 to 500 kPa

IR810S-EC (IECEx)

Marking



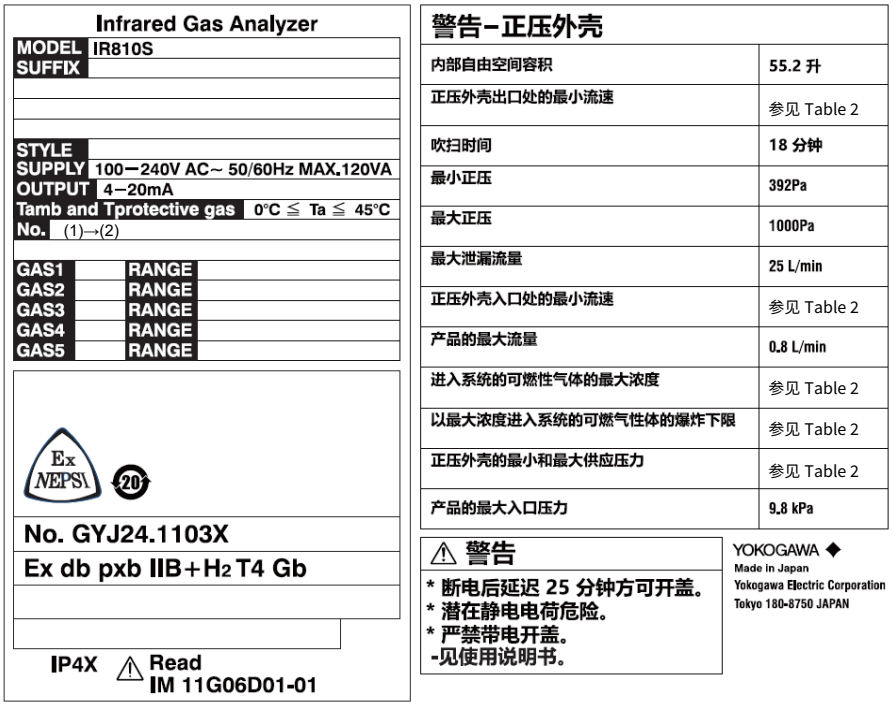
(1) Serial number
(2) Year of construction (YYYY-MM)

Example of nameplate (Design and texts may be changed)

Parameters	The contents to be printed by Air purge gas flow rate in Model and Suffix Code		
	02	05	10
Minimum purging flow rate at the outlet of the pressurized enclosure	10 L/min	40 L/min	90 L/min
Minimum flow rate of protective gas at inlet of the pressurized enclosure	20 L/min	50 L/min	100 L/min
Maximum concentration of flammable gas at into the containment system	10%	55%	100%
LEL lower limit of flammable gas flowing at maximum concentration at into the containment system	4.4%	4.4%	No limit
Minimum and maximum supply pressure to the pressurized enclosure	350 to 500 kPa	350 to 500 kPa	400 to 500 kPa

IR810S-NE (NEPSI)

Marking



(1) Serial number
(2) Year of construction (YYYY-MM)

Example of nameplate (Design and texts may be changed)

Parameters 参数	Model 型号 IR810S-a-*-b-*-*-*-*-*-*-*-*-c d-e-*-*-*-*/*		
	02	05	10
Minimum purging flow rate at the outlet of the pressurized enclosure 正压外壳出口处的最小流速	10 L/min	40 L/min	90 L/min
Minimum flow rate of protective gas at inlet of the pressurized enclosure 正压外壳入口处的最小流速	20 L/min	50 L/min	100 L/min
Maximum concentration of flammable gas at into the containment system 进入系统的可燃性气体的最大浓度	10%	55%	100%
LEL lower limit of flammable gas flowing at maximum concentration at into the containment system 以最大浓度进入系统的可燃气性体的爆炸下限	4.40%	4.40%	No limit 无限制
Minimum and maximum supply pressure to the pressurized enclosure 正压外壳的最小和最大供应压力	350 to 500 kPa 350~500 kPa	350 to 500 kPa 350~500 kPa	400 to 500 kPa 400~500 kPa

IR810S Explosion protected model Infrared Gas Analyzer Operation and Installation

IM 11G06D01-02EN 5th Edition

CONTENTS

1. OVERVIEW

The IR810S General Infrared Gas Analyzers use a non-dispersive infrared method to measure concentrations of NO, SO_2, CO_2, CO, and CH_4 in sample gases. O_2 can be measured by either magnetic or zirconia method. Simultaneous measurement of up to 5 components (O_2 + 4 components from NO/SO_2/CO/CO_2/CH_4) is possible. The single-beam measurement method is easy to maintain. The zero point is always corrected by switching with a reference gas, resulting in excellent long-term stability. In addition, a color touch interface panel allows for intuitive operation and high visibility.

The IR810S is the optimal instrument for gas concentration analysis in incinerator exhausts, boiler flue gases, and diverse industrial furnaces.

1.1 Name and description

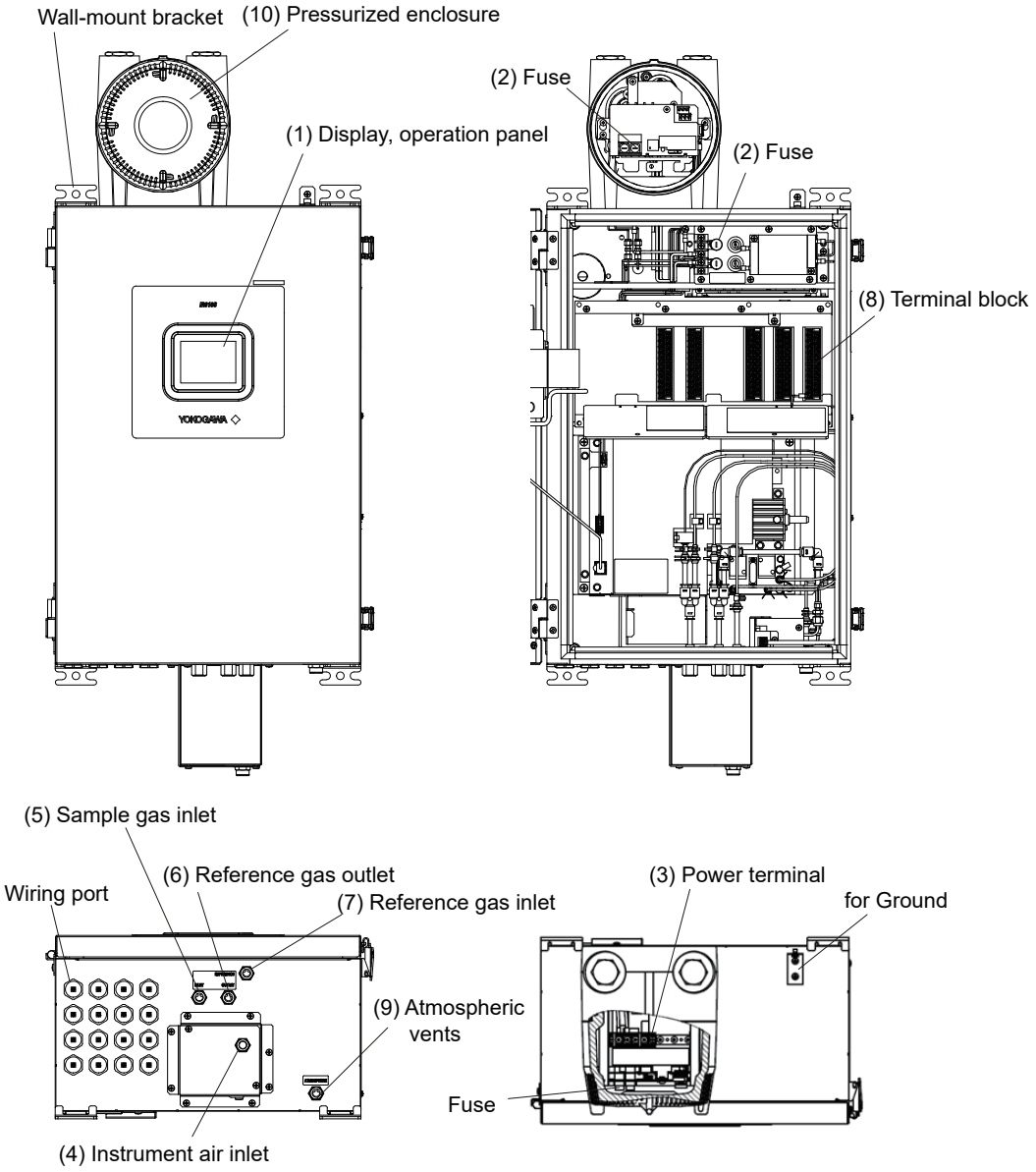


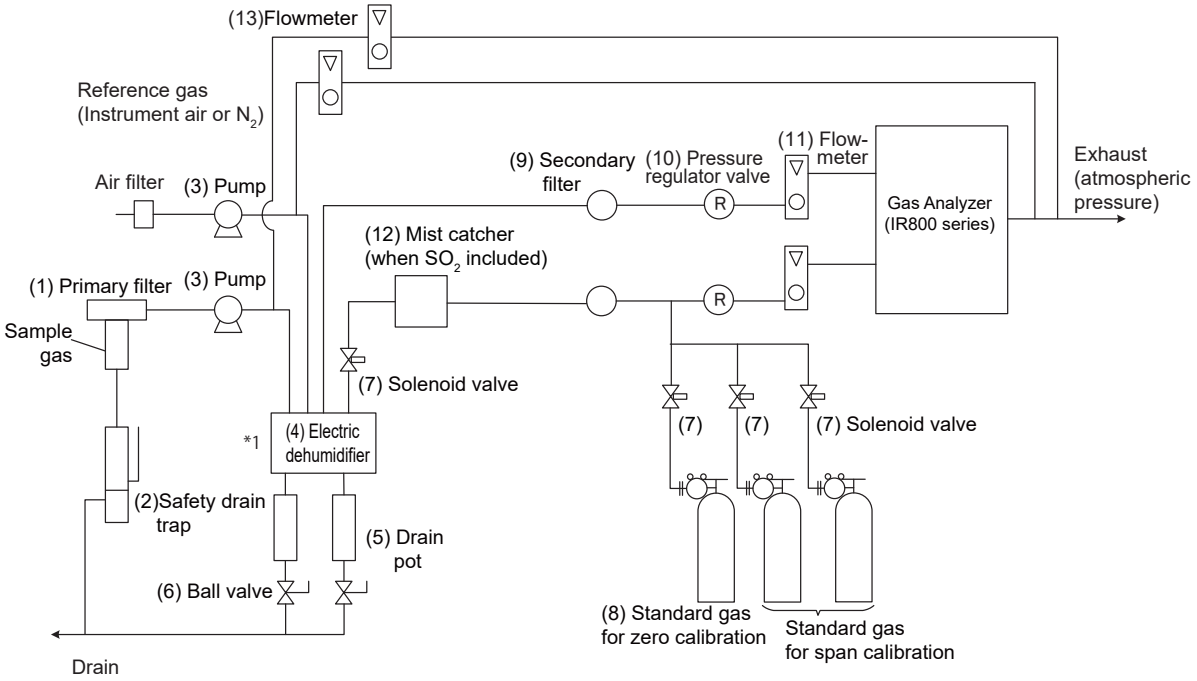
Figure 1.1

Name	Description	Name	Description
(1) Display, operation panel	LCD display and touch panel	(6) Sample gas (reference gas) outlet	Piping to exhaust line
(2) Fuse	for main unit: Use 5A-rated products.	(7) Reference gas inlet	Piping reference gas
	for the pressurized enclosure: Use 1.25A-rated products.	(8) Terminal block	—
(3) Power supply (terminal)	Connect the wires that supply power.	(9) Atmospheric vents	Do not block the atmosphere port and make sure the pressure is the same as the pressure around the sample gas outlet.
(4) Instrument air inlet	Piping instrument air (protective gas)	(10) Pressurized enclosure	Incorporates a protective circuit for the internal explosion protected structure of the instrument.
(5) Sample gas inlet	Piping the gas to be measured		

1.2 Example of sampling system configuration with IR810S

The following is a general configuration example. Please contact us for details. When used in hazardous area, use the corresponding explosion protected equipment parts.

- **When the sample gas contains a high level of moisture (more than 5°C saturation)**
  When the reference gas is atmosphere

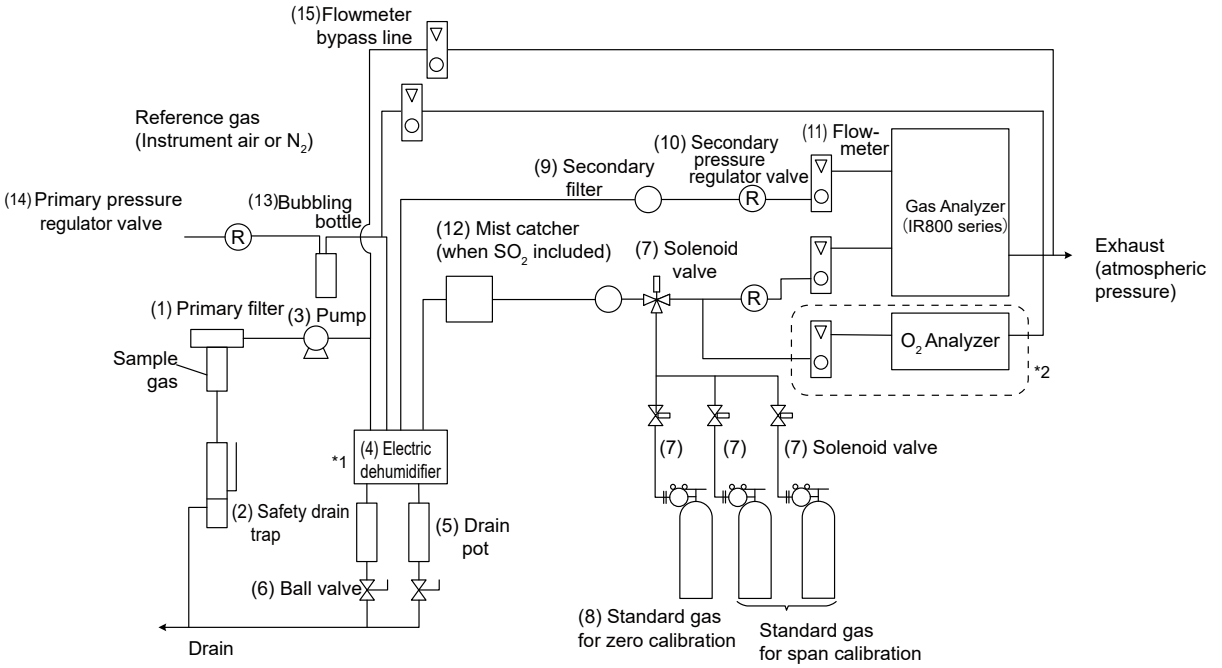


*1: In electric dehumidifiers, dehumidify to 5°C or less so that the moisture concentration on the sampling and reference sides is the same.

Figure 1.2

Item	Function	Item	Function
(1) Primary filter	Removes dust and mist from sample gas	(8) Standard gas for calibration	Reference gas to calibrate zero and span. Used according to measurement component Adjusts the pressure to correspond to the inlet pressure of (10).
(2) Safety drain trap	Separates and discharges the drainage in sample gas	(9) Secondary filter	Removes particulates from reference gas purifiers and NO_2/NO converters.
(3) Pump	For sample gas intake	(10) Pressure regulator valve	Adjusts pressure to 4.9-9.8 kPa. Variation to the set pressure is ±2%.
(4) Electric dehumidifier	Dehumidifies moisture in sample gas	(11) Flowmeter	Monitors the flow rate of gas entering the gas analyzer. Flow rate 0.5-0.8 L/min
(5) Drain pot	Stores dehumidified water from electronic dehumidifier	(12) Mist catcher	Collects sulfuric acid mist in the sample gas.
(6) Ball valve	For draining	(13) Flowmeter bypass line	Monitors and controls the flow rate of bypass lines.
(7) Solenoid valve	Switches the calibration gas and sample gas flow channel.		

● When the sample gas contains a high level of moisture (more than 5°C saturation) When the reference gas is instrument air, N_2



*1: In electric dehumidifiers, dehumidify to 5°C or less so that the moisture concentration on the sampling and reference sides is the same.
*2: Required for "External O_2 meter" or "ZR802S+ZR22S".

Figure 1.3

Item	Function	Item	Function
(1) Primary filter	Removes dust and mist from sample gas	(10) Secondary pressure regulator valve	Adjusts pressure to 4.9-9.8 kPa. Variation to the set pressure is ±2%.
(2) Safety drain trap	Separates and discharges the drainage in sample gas	(11) Flowmeter	Monitors the flow rate of gas entering the gas analyzer. Flow rate 0.5-0.8 L/min
(3) Pump	For sample gas intake	(12) Mist catcher	Collects sulfuric acid mist in the sample gas.
(6) Ball valve	For draining	(13) Bubbling bottle	Humidifies reference gases
(7) Solenoid valve	Switches the calibration gas and sample gas flow channel.	(14) Primary pressure regulator valve	Adjusts the pressure to correspond to the inlet pressure of (10).
(8) Standard gas for calibration	Reference gas to calibrate zero and span Used according to measurement component Adjusts the pressure to correspond to the inlet pressure of (10).	(15) Flowmeter bypass line	Monitors and controls the flow rate of bypass lines.
(9) Secondary filter	Removes particulates from reference gas purifiers and NO_2/NO converters.		

1.3 Measurement Principle

- **Infrared gas analyzer (NO, SO_2, CO_2, CO, CH_4)**

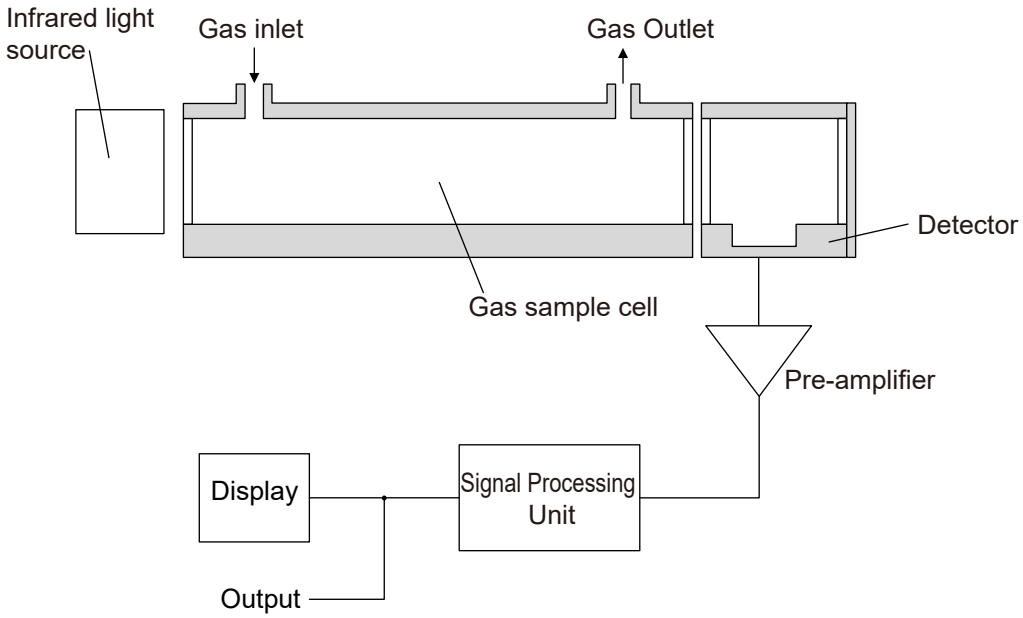


Figure 1.4

- **Magnetic oxygen analyzer (O_2)**

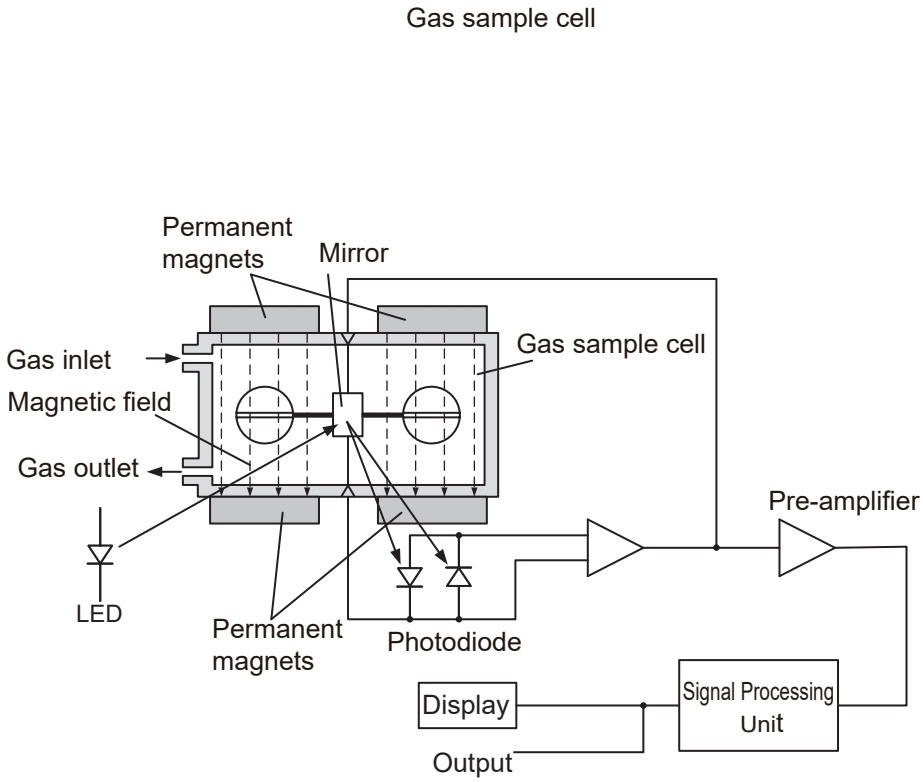


Figure 1.5

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2. SPECIFICATIONS

Measurement principle:

NO, SO_2, CO_2, CO, CH_4:
Non-dispersive infrared method
Single light source-single beam
O_2: Paramagnetic type (built-in), or analog input (external)

Measurable gas components and measurement range:

Table 2.1 Measurement range

	General Range	Optional range*
NO	0-200 to 0-5000 ppm	0-50 to 0-199 ppm
SO_2	0-200 to 0-5000 ppm	0-50 to 0-199 ppm
	0-2 to 0-10 vol%	—
CO	0-200 to 0-5000 ppm	0-50 to 0-199 ppm
	0-2 to 0-50 vol%	0-51 to 0-100 vol%
CO_2	0-0.5 to 0-5 vol%	0-1000 to 0-4999 ppm
	0-5 to 0-25 vol%	0-26 to 0-100 vol%
CH_4	0-2 to 0-50 vol%	0-51 to 0-100 vol%

* Measurement accuracy varies in optional ranges. See Performance.

Table 2.2 O_2 analyzer

	Min.range	Max.range
O_2 Built-in paramagnetic type	0-5 vol%	0-100 vol%
O_2 Built-in paramagnetic type for hydrogen background	0-25 vol%	0-100 vol%
O_2 External analyzer	0-5 vol%	0-100 vol%

Note: In the case of hazardous areaf use, oxygen concentration shall not exceed that found in normal air, typically 21%.

Display: QVGA LCD color touch panel
(Note) Due to the characteristics of the panel, chips, afterimages, and uneven brightness may appear on the display screen, but these are not defects.

- 4-digit display
- Instantaneous value display for each component
- Instantaneous value after O_2 correction (only in CO, SO_2, NO meters with O_2 measurement)
- Average value after O_2 correction (only in CO, SO_2, NO meters with O_2 measurement)

Analog output signal:
Isolated output: 4-20 mA DC
Maximum load capacity: 550 Ω
Number of outputs: 4
Output Item: NAMUR NE43 burnout
Hold function: available

Analog input (when O_2 analyzer: -1 or -2 is selected)
Number of input points; 1 point (for connection to external O_2 analyzer)
Input signal; 4-20 mA DC (Max 40 mA)
Functions: Oxygen concentration display, oxygen concentration conversion

Contact output
Contact type; 1a relay contact, 1c relay contact
Output points
1a; 11 points
1c; 6 points
Contact capacity;
24 V DC, 1A (resistance load)
Function; Instrument error, Calibration error, Automatic calibration in progress, Solenoid valve drive CH1 to CH5 for automatic calibration, Range identification CH1 to CH5, Blowback, alarms 1 to 6, Peak alarm output, Maintenance in progress, Power status

Contact input

Contact type; no-voltage or voltage contact input
Input points; 8 points
On/Off;
No-voltage contact input
Resistance value below 200 Ω; closed
Resistance value of 100 kΩ or more; open
Voltage contact input
Voltage -1 to +1 V DC; closed
Voltage +4.5 to +25 V DC; open
Contact capacity: Leakage current 3 mA or less when OFF
Insulation
Contacts mutual; non-insulating
Internal circuit; transformer isolation
Function; Remote hold, average value reset, automatic calibration start, auto zero calibration start, automatic validation start, remote range changeover, blowback contact for ZR802S, calibration error for ZR802S

Digital Communications:

RS-485 (Modbus RTU): 115200/38400/9600 bps
Cable length: Up to 600 m (115200 bps)
Up to 1200 m (38400/9600 bps)
shield ground

24 VDC for Signal interrupter output

Number of output points;
1 (for signal interrupter K8019KA) (*1)
4 (for signal interrupter K8019KB) (*2)
Functions; Monitors internal pressure inside equipment and provides 24 VDC power to signal circuit interrupters under normal conditions

*1: Used for the following combinations
• When O_2 analyzer 1 or 2 is selected
• When "-R" (digital communication) is specified.
• When both of the above are selected

*2: • One K8019KB can support up to 5 contact outputs.
• Prepare K8019KB according to the contact output to be used.
• If all 17 points are used, four K8019KB are required.

Annunciator contact output:

Number of contact points; 1
Functions; Outputs the internal pressure status (state 1 or state 2) of the equipment
state1; Outputs status during override, analyzer power off, scavenging, or insufficient internal pressure
state2; Outputs status after completion of sweeping
Contact type; Relay contact output,
1c relay contact (NC/NO/COM)
Contact capacity; 30 VDC, 100 mA
Contact operation; OPEN/CLOSE

Contact	Annunciator output	
	NC-COM	NO-COM
state 1	OPEN	CLOSE
state 2	CLOSE	OPEN

Operating conditions:

Ambient temperature;	0 to 45°C
Protective gas temperature;	5 to 45°C
Ambient humidity;	10 to 90%RH (at 40°C, no condensation)
Storage temperature	-10 to +50°C
Storage humidity;	35 to 85%R.H. (no condensation)

Power supply voltage:

Voltage rating;	100 to 240 V AC
Allowable range;	85 to 264 V AC

Power supply frequency;

Rated frequency;	50/60 Hz
Allowable range;	47 to 63 Hz

Power consumption:	Max. 120 VA
Dimensions (W x D x H):	429 x 243 x 947 mm
Weight:	approx. 35 kg
Finish color:	silver gray
Enclosure:	steel casing, for indoor use

Material of gas-contacting parts:

Gas inlet/outlet;	SUS316
Internal tubing;	SUS304, SUS316, Fluoropolymer (PTFE, PFA), PP, PPS, fluoroelastomer, calcium fluoride (CaF_2), PEEK (only for O_2 Analyzer "-3" or "-4")

Gas inlet/outlet: Rc1/4 or 1/4 NPT internal thread

Safety, EMC and RoHS conformity standards

Safety conformity standards:

CE	EN 61010-1, EN IEC 61010-2-030
GB	GB30439
Installation altitude:	2000 m or less
Installation category;	(IEC 61010)II (Note 1)
Pollution degree;	(IEC 61010); 2 (Note 2)

Note1: Installation category, so called overvoltage category, specifies impulse withstanding voltage. Category II overvoltage applies to equipment intended to be powered from the building wiring.

Note2: Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 indicates the normal indoor environment.

EMC:

CE	EN61326-1 Class A, Table 2 (For use in industrial locations) EN61326-2-3, EN61000-3-2, EN IEC 61000-3-2, EN61000-3-3
RCM	EN61326-1 CLASS A, Table2

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 ±15% of F.S.

Environmental regulation

RoHS; EN IEC 63000

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. The WEEE Directive is only valid in the EU.

REACH; Regulation EC 1907/2006

Explosion protection approval

Explosion protection approval		IR810S
EU-TYPE (ATEX):	Applicable Standard:	EN IEC 60079-0
		EN 60079-1
		EN 60079-2
	Type of protection	Ⓔx II 2 G Ex db pxb IIB + H2 T4 Gb
	Ambient temperature	0ºC to 45ºC
	Enclosure Rating	IP4X
IECEx:	Applicable Standard:	IEC 60079-0
		IEC 60079-1
		IEC 60079-2
	Type of protection:	Ex db pxb IIB + H2 T4 Gb
	Ambient temperature	0ºC to 45ºC
	Enclosure Rating	IP4X
GB EX (by NEPSI):	Applicable Standard:	GB/T 3836.1
		GB/T 3836.2
		GB/T 3836.5
	Type of protection:	Ex db pxb IIB+H2 T4 Gb
	Ambient temperature	0ºC to 45ºC
	Enclosure Rating	IP4X
TAIWAN EX:	Registration	IECEx registered and approved for use in Taiwan. For explosion protection specifications, please refer to the IECEx section.
INDIA EX:	Approval	IECEx approved for use in INDIA. For explosion protection specifications, please refer to the IECEx section. However, in India, only IECEx certificate of conformity for "d", "p" is applicable.

Standard Functions

Output signal hold: Measured value output can be held during calibration or operation by automatic or on-screen operation, or by remote execution instructions. The output at hold can be selected from the previous value and the set value.

Range changeover: The output range of measured values can be changed automatically or manually. Range changeover can also be turned off.

Range identification signal: When using the range changeover function, it is possible to output whether the low or high range is being used.

Blowback: Can open/close the contact output for blowback by a scheduled cycle or by an execution command. Blowback can set the blowback time and the gas displacement time after blowback (output hold time).

Auto calibration: Can be calibrated automatically by scheduled cycles or execution commands. If the calibration coefficient is outside the normal range, an alarm is issued. The alarm can be assigned to a contact output.

Auto zero calibration: Separate from the schedule set for Auto calibration, Auto calibration for Zero Point only can be set. If the timing of Auto calibration and the Auto zero calibration are to occur at the same time, the Auto calibration takes precedence.

Auto validation: -V is selected, the automatic validation function is available. The automatic validation function flows the calibration gas through the measurement line and records the measured value according to a scheduled cycle or execution command. If the measured value deviates from the set threshold value, an alarm can be issued and the alarm can be assigned to a contact output. This function allows the user to verify the normality of the instrument.

Contact output during auto-calibration/validation:
Displays the status of automatic calibration and validation. Status can be assigned to a contact output.

High/low limit alarm:
Upper or lower thresholds can be set and alarmed if exceeded. Alarms can be assigned to contact outputs.

Instrument error contact output:
If an instrument error occurs, an alarm is issued. The alarm is assigned to a contact output.

Calibration error contact output:

If calibration is not performed properly, an alarm is issued. The alarm is assigned to a contact output

Optional Functions

/U: unit conversion (mg/m^3, g/m^3)

Changes the units for instantaneous values, O_2 conversion, and average values of NO, SO_2 , and CO to mg/m^3or g/m^3. If the measurement range is set to vol%, no conversion is made. See Table 2.3 for the corresponding values.

Table 2.3 ppm-mg/m^3 range

ppm range	Corresponding range in mg/m^3		
	NO	SO_2	CO
0-50 ppm	0-65.0 mg/m^3	0-140 mg/m^3	0-60.0 mg/m^3
0-100 ppm	0-130 mg/m^3	0-280 mg/m^3	0-125 mg/m^3
0-200 ppm	0-260 mg/m^3	0-570 mg/m^3	0-250 mg/m^3
0-250 ppm	0-325 mg/m^3	0-700 mg/m^3	0-300 mg/m^3
0-300 ppm	0-400 mg/m^3	0-850 mg/m^3	0-375 mg/m^3
0-500 ppm	0-650 mg/m^3	0-1400 mg/m^3	0-600 mg/m^3
0-1000 ppm	0-1300 mg/m^3	0-2800 mg/m^3	0-1250 mg/m^3
0-2000 ppm	0-2600 mg/m^3	0-5600 mg/m^3	0-2500 mg/m^3
0-2500 ppm	0-3300 mg/m^3	0-7100 mg/m^3	0-3000 mg/m^3
0-3000 ppm	0-4000 mg/m^3	0-8500 mg/m^3	0-3750 mg/m^3
0-5000 ppm	0-6600 mg/m^3	0-14.00 g/m^3	0-6250 mg/m^3

/A: CO Peak Alarm:

An alarm is issued when the number of times the measured concentration of CO peaks above the upper limit exceeds the set value. The alarm is assigned to a contact output.

/K: O_2 correction;

Instantaneous O_2 correction values and O_2 correction average values of NO, SO_2, and CO can be calculated and output.

/NX: NO on the measurement screen is displayed as NOx:

NO is displayed as NOx. /U. When used in conjunction with /U, the units are converted as NO

/PR: Pressure regulator valve

(Set for sample gas/ reference gas): Includes one pressure regulator valve for reference gas and one for sample gas.

Pressure regulator valve for sample gas

Part Number: K8019GA
Inlet pressure: 7 to 18 kPa
Outlet pressure: 5±0.05 kPa
Gas contact material: Stainless steel
Pipe connection: Ø6 mm/Ø4 mm PTFE tube

Pressure regulator valve specifications for reference gas

Part Number: K8019GB
Inlet pressure: 7 to 18 kPa
Outlet pressure: 5±0.05 kPa
Gas contact material: aluminum
Pipe connection: ø6 mm/ø4 mm PTFE tube

/CG1~/CG4: Cable gland for wiring:

Cable gland for wiring is included. If you do not provide your own, please select the required number of cable glands.

Performance

$NO/SO_2/CO/CO_2/CH_4$

Repeatability: ± 0.5% F.S.
(±1% F.S. when the optional range is included)
Linearity: ±1% F.S.
Zero drift: ±1.0% F.S./week
(±2% F.S./week when the optional range is included)
Span drift: ± 2.0% F.S./week
Response time (90% F.S. response): 30 sec. or less
Interference: ± 2.0% F.S. (for sample gas compositions in the normal range)

Built-in paramagnetic oxygen analyzer

Repeatability: ±0.5% F.S.
Linearity: ±1% F.S.
Zero drift: ±2% F.S./week
Span drift: ±2% F.S./week
Response time (90% F.S. response) 30 sec. or less

Sample gas conditions

Flow rate: 0.5 to 0.8 L/min
Temperature: 5 to 40°C
Pressure: 4.9 to 9.8 kPa (Gas outlet side should be open to the atmospheric air.
The pressure fluctuation relative to the set pressure shall be within ±2%.)
Dust: 2 µm or less in particle size
Mist: Unallowable
Moisture: Below a level where saturation occurs at 5°C (No condensation)
No other corrosive gas

Reference gas conditions

Gas: Atmosphere, instrument air or N_2
Flow rate: 0.5 to 0.8 L/min
Temperature: 5 to 40°C
Pressure: 4.9 to 9.8 kPa (Gas outlet side should be open to the atmospheric air. The pressure fluctuation relative to the set pressure shall be within ±2%.)
Dust: 2 µm or less in particle size
Mist: Unallowable
Moisture: Below a level where saturation occurs at 5°C (No condensation). However, the moisture difference between the Sample gas and the Reference gas should be minimized.
Impurities other than CO_2: 0.1% F.S. or less of minimum measurement range.
When the measurement range of the CO_2 meter is C1, C2, C3, or C4, be sure to use N_2 as the reference gas.

Standard gas for calibration

Zero gas: Dry N_2
Span gas:
80 - 90% concentration of the range of each component to be measured (recommended)
Concentrations above 105% F.S. are not allowed.
Dry Air or Atmosphere can be used as the span gas for the O_2 analyzer.
However, if a zirconia type O_2 analyzer manufactured by YOKOGAWA is installed externally and calibrated with the same calibration gas line, use 1 to 2 vol% O_2 as Zero gas.

Installation Requirements

- Indoor use: Avoid exposure to direct sunlight, weather, and radiant heat from hot substances. Where exposure to such conditions is unavoidable, a protective hood or cover should be prepared.
- Vibration-free environment
- A clean atmosphere

- **Signal Interrupter specification**

Weight: Approx. 500 g
Installation environment: Non-hazardous locations
*: For installation in a hazardous area, use an explosion protected construction certified by the relevant explosion protection authentication entity.
Operating ambient conditions:
-10 to 50°C, 95%RH or less (no condensation)
Interpolated ambient conditions:
-40°C to 85°C, no condensation
Safety conformance standard: EN 61010-1
EMC: EN 61326-1 Class A, Table 2
(For use in industrial locations)
RoHS: EN IEC 63000

For RS-485: K8019KA

Number of communication ports: 1 port
Communication speed: 115200 bps max.
Power supply: 24 V DC (output from external signal interrupter terminal in IR810S)
Grounding: Functional grounding

For analog input: K8019KA

Analog input: 1 point
Input current: 4-20 mA DC
Power supply: 24 V DC (output from external signal interrupter terminal in IR810S)
Grounding: Functional grounding

For contact output (DC): K8019KB

Contact output: 5 points
Rated input: 30 V DC, 1A (resistive load)
Power supply: 24 V DC (output from external signal interrupter terminal in IR810S)
Grounding: Functional grounding

■ Model and Suffix Code

Model	Suffix code	Option code	Description
IR810S	·····	·····	Explosion-protected model Infrared Gas Analyzer
Type	-AT	·····	ATEX ZONE1
	-EC	·····	IECEx ZONE1 (*1)
	-NE	·····	NEPSI
Measuring Components	-A1	·····	NO
	-A2	·····	SO_2
	-A3	·····	CO
	-A4	·····	CO_2
	-A5	·····	CH_4
	-B1	·····	$NO+SO_2$
	-B2	·····	NO+CO
	-B4	·····	$CO+CO_2$
	-B5	·····	$CO+CH_4$
	-B6	·····	CO_2+CH_4
	-C1	·····	$NO+SO_2+CO$
	-C4	·····	$CO+CO_2+CH_4$
	-D1	·····	$NO+SO_2+CO+CO_2$
O_2 Analyzer	-N	·····	None
	-1	·····	ZR802S+ZR22S (*2)
	-2	·····	External O_2 analyzer (*2)
	-3	·····	Build-in paramagnetic O_2
	-4	·····	Build-in paramagnetic O_2 (H_2 background) (*3)
NO Measuring Range	- □□	·····	See ■ Measuring gas range
SO_2 Measuring Range	- □□	·····	See ■ Measuring gas range
CO Measuring Range	- □□	·····	See ■ Measuring gas range
CO_2 Measuring Range	- □□	·····	See ■ Measuring gas range
CH_4 Measuring Range	- □□	·····	See ■ Measuring gas range
O_2 Measuring Range	- □□	·····	See ■ Measuring gas range
Digital Communication	-N	·····	None
	-R	·····	RS-485
Automatic Validation	-N	·····	None
	-V	·····	Automatic Validation
Gas Connection	-R	·····	Rc1/4
	-T	·····	1/4 NPT
Protection system Cable Glands	-MN	·····	M25 (No cable glands) (*11)
	-TN	·····	3/4 NPT (No cable glands) (*11)
	-MC	·····	With Cable Glands (M25)
Air purge gas flow rate	-10	·····	100L/min For high flammable gas concentration (*4)
	-05	·····	50L/min For middle flammable gas concentration (*4)
	-02	·····	20L/min For low flammable gas concentration (*4)
Display Language	-E	·····	English
	-C	·····	Chinese
	-J	·····	Japanese
Mount Type	-W	·····	Wall mount
—	-NN	·····	Always "-NN"
—	-NN	·····	Always "-NN"
Option Code		/U	Unit change (mg/m^3, g/m^3) (*5)
		/CG1	Cable Glands for I/O wiring (ATEX, IECEx, NEPSI)x 6 (*6)
		/CG2	Cable Glands for I/O wiring (ATEX, IECEx, NEPSI)x 10 (*6)
		/CG3	Cable Glands for I/O wiring (ATEX, IECEx, NEPSI)x 12 (*6)
		/CG4	Cable Glands for I/O wiring (ATEX, IECEx, NEPSI)x 16 (*6)
		/A	Peak alarm (*7)
		/K	O_2 compensation (*8)
		/NX	Display NOx instead of NO (*9)
		/PR	Pressure Regulator (For Sample/Reference gas line, Pair) (*10)

(*1) Select -EC if you want to order Taiwan Ex specification (Taiwan Ex registration based on IECEx) or Indian Ex specification (Indian Ex approval based on IECEx).
(*2) Oxygen analyzer is not included. Please arrange it separately.
(*3) If the sample gas contains more than 100 ppm hydrogen, select the "-4" specification for H_2 background.

(*4) The flow rate of air purge gas must be determined according to the type and concentration of combustible gas contained in the sample gas. See ■ Purge flow rate decision flowchart for the selection.
(*5) Select this option when one or more of NO, SO_2, or CO is included in the measuring component.
(*6) Prepare one from the following (a) to (c).
(a) Order one from /CG1 to /CG4. Cable glands of the same type as in (b) are packaged with the product.
Select the amount you need. The following is for reference only.
/CG1: Wiring only RS-485 and power supply
/CG2: 1-2 Component measurement
/CG3: Three or more component measurements without RS-485 or without external zirconia (ZR802S+ZR22S)/ external O_2 analyzer.
/CG4: Other than the above
(b) Prepare Cable glands, U. I. Lapp GmbH article number 53112720 (SKINTOP MS-M20ATEX Thread size: M20 × 1.5, Cable diameter 7-13, Torque 12 N•m)
(c) Prepare Cable glands according to each applicable certification standard.
Cable glands with thread size M20 × 1.5, IP66 rating, and heat resistance of 85°C shall comply with Ex d(db) IIC or Ex e(eb) IIC protection standards and be certified according to the applicable regulatory requirement: ATEX (-AT), IECEx (-EC), and GB standard (-NE), and shall be installed to maintain the specified degree of protection of the equipment.
(*7) Available only when CO is included in the measuring component.
(*8) Available when the O_2 analyzer specification is other than "-N" and one or more of NO, SO_2, or CO is included in the measuring component.
(*9) NOx converter is not included. Prepare a product that conforms to the standard.
(*10) One pressure regulator valve for the sample gas and one for the reference gas are included. Select this option if input pressure is not stable.
(*11) Cable glands, adapters, and/or blanking elements shall have thread size M20 × 1.5, IP66 rating, and heat resistance of 85°C, and shall be certified to Ex d(db) IIC according to the applicable regulatory requirement: ATEX (-AT), IECEx (-EC), or GB standard (-NE), and shall be installed so as to maintain the specific degree of protection of the equipment.

Accessories

Name	Qty	Code Specification	Description
Fuse (for main body)	2	Pre-installed in equipment	250 V/5 A delay type 5×20 mm IEC 60127-2 sheet3
Ferrite Cores for Power Cable	1	none	A1179MN
Fuse (for pressurized enclosure)	2	Pre-installed in equipment	250 V/1.25 A delay type 5×20 mm IEC 60127-2 sheet3
Cable clip	2	none	—
Screw for fixing cable clip	2	none	M5, 8 mm length
Bolt	4	none	M8, 35 mm length
Washer	8	none	M8
Nut	4	none	M8
Thread conversion connector	4	Gas connection "-T"	Rc 1/4 male to 1/4 NPT female
Key for door opening/closing	2	none	—
Thread conversion connector	2	Protection system Cable Glands"-TN"	M25×1.5 male to 3/4 NPT female
O-ring	2	Protection system Cable Glands"-TN" or "-MC"	—
Cable glands	2	Protection system Cable Glands "-MC"	Applicable cable diameter Ø9.5 to 15.4 mm, Connecting thread M25×1.5
Cable glands	6	"/CG1"Cable Glands for I/O wiring x6	Applicable cable diameter Ø7 to Ø13 mm, Connecting thread M20×1.5
	10	"/CG2"Cable Glands for I/O wiring x10	
	12	"/CG3"Cable Glands for I/O wiring x12	
	16	"/CG4"Cable Glands for I/O wiring x16	
Pressure Regulator	1	"/PR" For Sample/Reference gas line, Pair	Pressure Regulator (Stainless)
	1	"/PR" For Sample/Reference gas line, Pair	Pressure Regulator (Aluminium)

Spare Parts

Name	Part No.	Q´ty	Name	Part No.	Q´ty
C-type snap ring	Y9011EV	1 (*1)	Filter	K8020PW	1
Plate	K9213FB	1	Snap ring plier	K9643ZE	1

*1: The minimum purchase quantity is 10 per order.

Optical Unit Parts

Maintenance and replacement of the optical unit are performed by our trained service engineers.

Name	Part No.	Qty for 1 unit	Description	Recommended replacement interval (Year)	Applicable model
Packing	K8020QJ	2 (*1)	Packing for Lamp unit	1	All model
Base block	K8020QK	1	Solenoid valve and Capillary mount base	1	All model
Solenoid Valve	A1050MS	2 (*1)	Solenoid Valve for switching sample gas and reference gas	1	All model
Packing	K8020QM	2 (*1)	Packing for Capillary	1	All model
Elbow connector	K8020QB	4 (*1)	Connector for low range Cell	1	Measuring range "-E□"
O-ring	K8020QD	3 (*2)	O-ring for low range cell	1	Measuring range "-E□"
O-ring	K8020QE	2 (*1)	O-ring for low range cell	1	Measuring range "-E□"
O-ring	K8020QF	2 (*1)	O-ring for high range cell	1	Measuring range "-P□"
Elbow connector	K8020QB	2	Connector for high range Cell	1	Measuring range "-P□"
Elbow connector	K8020QH	2 (*1)	Connector for high range Cell	1	Measuring range "-P□"
Spacer	K8020QN	1	Spacer for CO_2 Cell	1	CO_2 measurement included model
Sheet	K8020QQ	1	Sheet for CO_2 Cell	1	CO_2 measurement included model
O-ring	K8020QF	1	O-ring for CO_2 Cell (Lamp side)	1	CO_2 measurement included model
O-ring	K8020QR	1	O-ring for CO_2 Cell (Detector side)	1	CO_2 measurement included model
Packing	K8020QS	2	Packing for CO_2 Cell (Lamp side)	1	CO_2 measurement included model
Packing	K8020QA	1	Packing for CO_2 Cell (Detector side)	1	CO_2 measurement included model
Straight connector (3mm-6mm)	K8020PX	4 or 6 (*3)	3mm-6mm Straight connector	1	All model, Build-in O_2 model requires 2 extra connectors
Metal hose band for 3mm	K8020PY	10 (*4)	Metal Clip for 3mm hose	1	All model
Metal hose band for 6mm	K8020PZ	10 (*4)	Metal Clip for 6mm hose	1	All model
High range Cell	K8020QG	1	Short measuring cell	2	Measuring range "-P□"
Low range Cell	K8020QC	1	Long measuring cell	3	Measuring range "-E□"
CO_2 Cell	A1262UY	1	CO_2 cell for low range	3	CO_2 measuring range "-C1, -C2, -C3, -C4"
CO_2 Cell	A1260UY	1	CO_2 cell for middle range	3	CO_2 measuring range "-C5"
CO_2 Cell	A1261UY	1	CO_2 cell for high range	3	CO_2 measuring range "-C6"
Lamp unit	A1121PE	1	Infrared light source	5	All model
Capillary	K8020QL	2	Capillary for flow control	5	All model
Cell Heater	A1259UY	1	Heater to control cell temperature	5	Measuring range "-E□"

*1: The minimum purchase quantity is 2 per order.
*2: The minimum purchase quantity is 3 per order.
*3: The minimum purchase quantity is 6 per order.
*4: The minimum purchase quantity is 10 per order.

<Items specified at order IR810S>

TAGNO. (only if necessary)
You can create TAGNO. (tag number) with alphanumeric characters described in the next table. 16 characters at maximum can be used.
If you specify TAGNO., it is printed on the stainless name plate/tag label affixed to the instrument.

Symbol (Note)	-	Hyphen	_	Underscore
	=	Equal	+	Plus
	/	Slash	:	Colon
	(	Left parenthesis	)	Right parenthesis
	#	Hash	!	Exclamation mark
	.	Period		
Number	0, 1, 2, 3, 4, 5, 6, 7, 8, 9			
Upper case alphabetics	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z			
lower case alphabetics	a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z			

(Note): The spaces specified for the TAGNO. are removed. The string is left-squeezed.

Measuring gas range

Select the range for the sample gas selected under "Measuring Component". Select "None (-NN)" for gases not included in the measurement component. This product is free-range. You can set the range within the selected measurement range. The measurement accuracy varies when the measurement range is set within the optional range. For details, refer to Performance.
For multi-component meters, the measurement ranges for NO/SO_2/CO/CH_4 measurement cannot be combined with "-E□" and "-P□" together.

(Example) Measuring component code - B1 (NO+SO_2 meter)
NO measurement range: -E3 (0-200/2000 ppm), SO_2 measurement range: -E6 (0-500/5000 ppm)
=> Both are -E ranges, so they can be combined.
NO measurement range: -E3 (0-200/2000 ppm), SO_2 measurement range: -P1 (0-2/10 vol%)
=> Not possible due to a mix of -E and -P ranges.

/U: See Table 2.3 for unit conversion options.

Table 2.4 NO

Range	Code	Note
None	-NN	—
0-50/500 ppm	-E1	Optional range
0-100/1000 ppm	-E2	Optional range
0-200/2000 ppm	-E3	—
0-250/2500 ppm	-E4	—
0-300/3000 ppm	-E5	—
0-500/5000 ppm	-E6	—

Table 2.5 SO_2

Range	Code	Note
None	-NN	—
0-50/500 ppm	-E1	Optional range
0-100/1000 ppm	-E2	Optional range
0-200/2000 ppm	-E3	—
0-250/2500 ppm	-E4	—
0-300/3000 ppm	-E5	—
0-500/5000 ppm	-E6	—
0-2/10 vol%	-P1	—

Table 2.6 CO

Range	Code	Note
None	-NN	—
0-50/500 ppm	-E1	Optional range
0-100/1000 ppm	-E2	Optional range
0-200/2000 ppm	-E3	—
0-250/2500 ppm	-E4	—
0-300/3000 ppm	-E5	—
0-500/5000 ppm	-E6	—
0-2/20 vol%	-P1	—
0-3/30 vol%	-P2	—
0-5/50 vol%	-P3	—
0-10/100 vol%	-P4	Optional range

Table 2.7 CO_2

Range	Code	Note
None	NN	—
0-1000/5000 ppm (*1)	-C1	Optional range
0-2000/10000 ppm (*1) (*2)	-C2	Optional range
0-0.5/2.5 vol% (*1) (*3)	-C3	—
0-1/5 vol% (*1)	-C4	—
0-5/25 vol%	-C5	—
0-20/100 vol% (*4)	-C6	Optional range

(*1) For multi-component meters, other components can only be selected from "-E□".
Always use N_2 for reference gas.
(*2) Measured values exceeding 9999 ppm are displayed as ++++.
(*3) Measurements are displayed in vol% only.
(*4) For multi-component meters, other components can only be selected from "-P□".

Table 2.8 CH_4

Range	Code	Note
None	-NN	—
0-2/20 vol%	-P1	—
0-3/30 vol%	-P2	—
0-5/50 vol%	-P3	—
0-10/100 vol%	-P4	Optional range

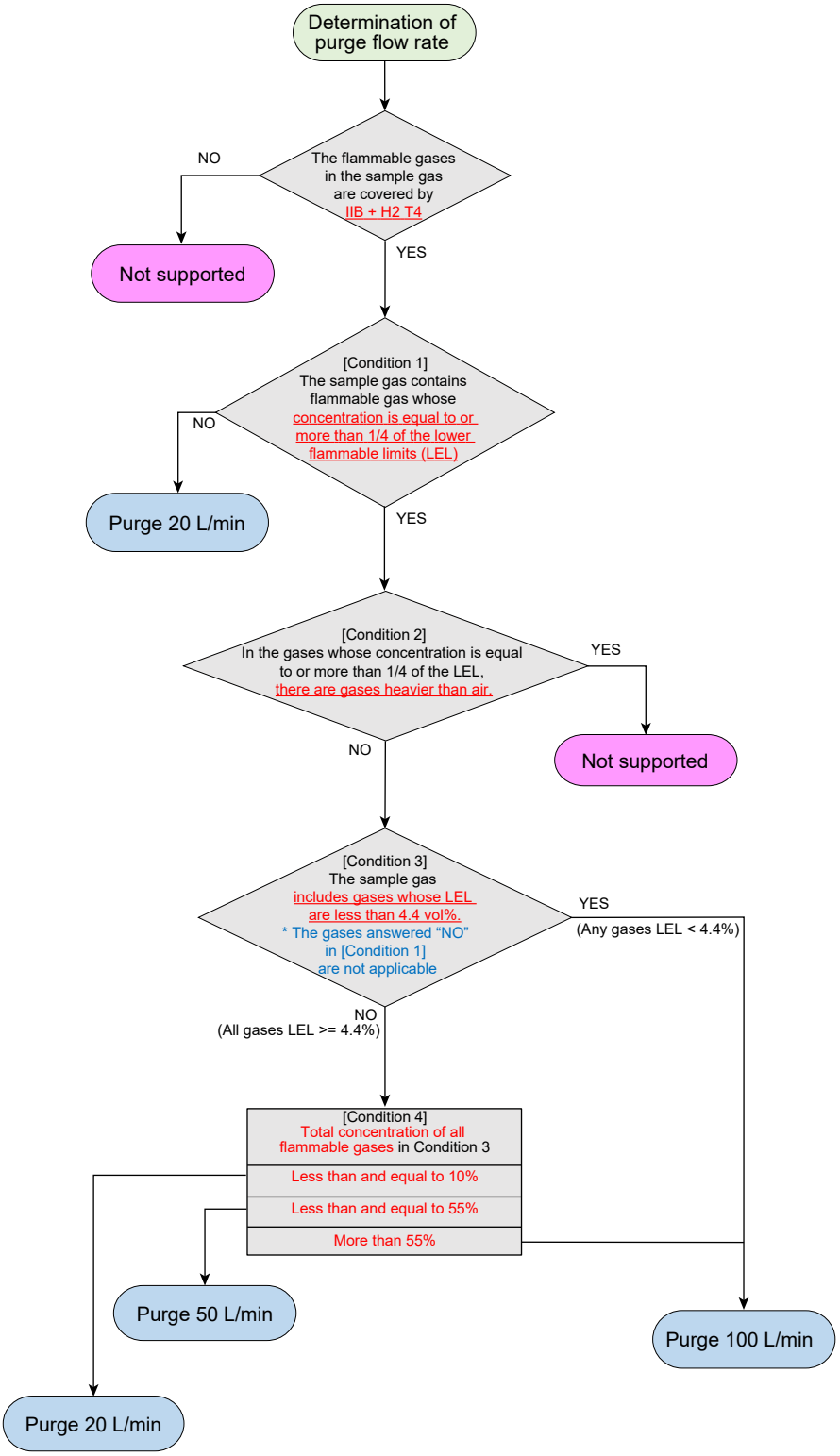
Table 2.9 O_2

Range	Code	Note
None	-NN	—
0-5/25 vol% (*1)	-M1	for built-in paramagnetic O_2 analyzer
0-25/100 vol% (*2)	-M2	for built-in paramagnetic O_2 analyzer
0-5/100 vol% (*3)	-R1	For ZR802S and other external O_2 analyzer

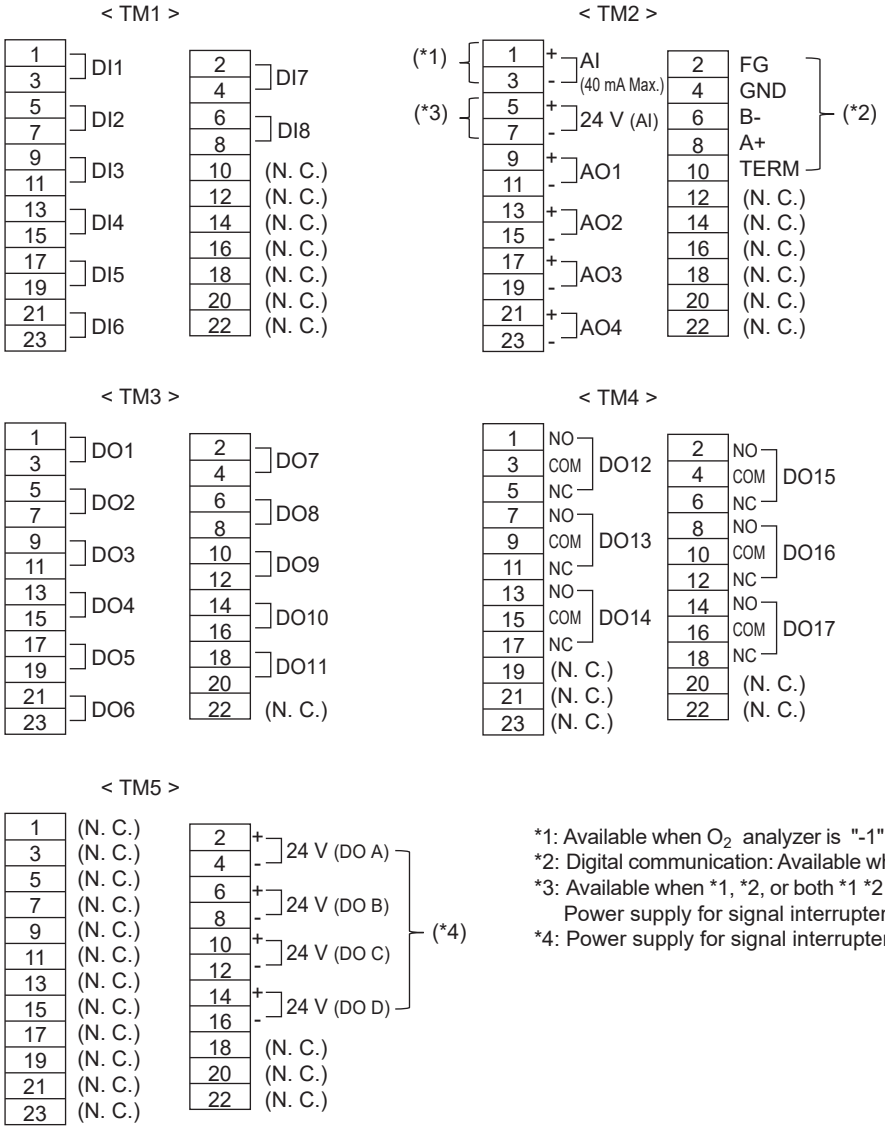
(*1) Available when the O_2 analyzer is "-3".
(*2) Available when the O_2 analyzer is "-3" or "-4".
(*3) Select this option when the O_2 Analyzer is "-1" or "-2".

Purge flow rate decision flowchart

Select the appropriate air purge flow rate depending on the gas component to be measured. Follow the flowchart below to specify the suffix code for the air purge flow rate. If you do not determine the type of gas or flammable gas to which T4 is applicable or its LEL (Lower Explosive Limit), refer to TI 11G06D01-01EN for selection.



Terminal assignment

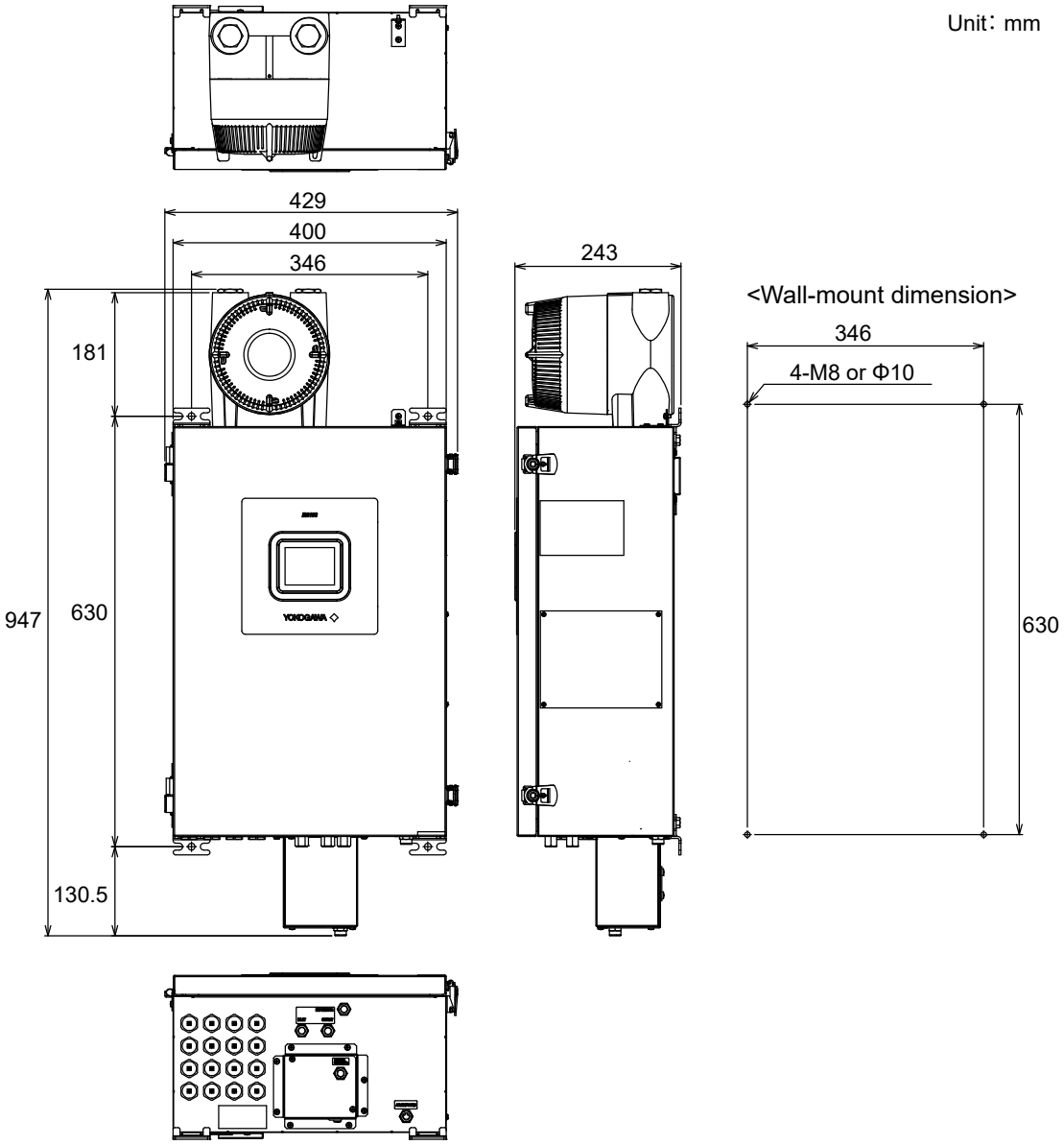


*1: Available when O_2 analyzer is "-1" or "-2"
*2: Digital communication: Available when "-R"
*3: Available when *1, *2, or both *1 *2 are selected
Power supply for signal interrupter (K8019KA)
*4: Power supply for signal interrupter (K8019KB)

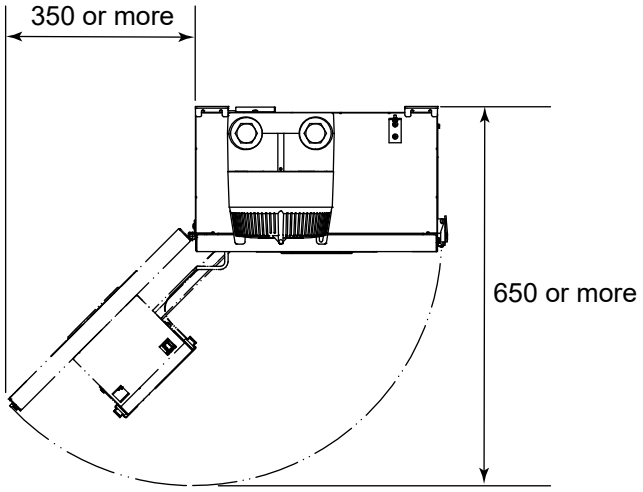
External Dimensions

IR810S

Unit: mm



Maintenance space

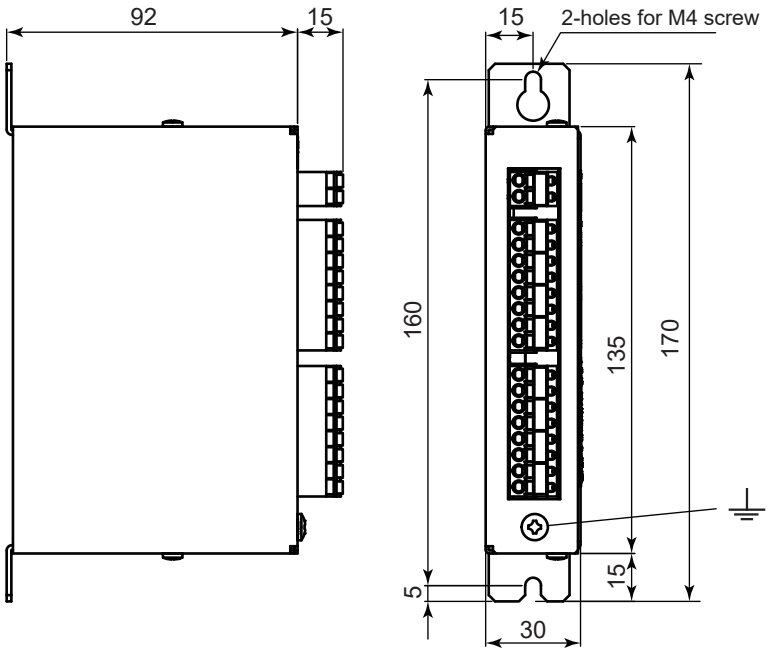


Signal interrupter

Rack mount

- **For RS-485 and Analog input: K8019KA**

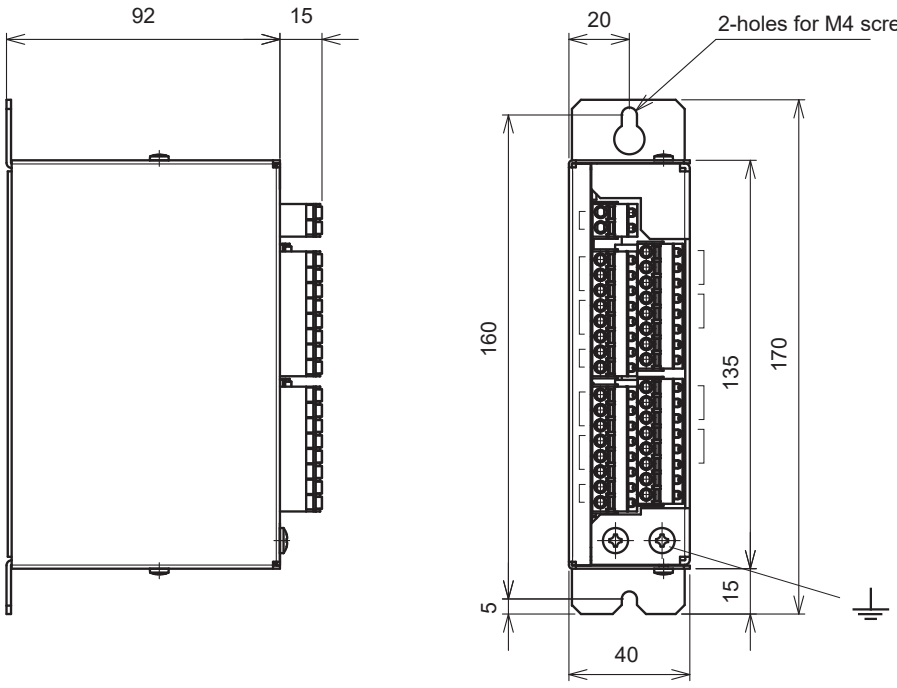
Unit: mm



Weight：Approx. 500 g

- **For contact output (DC): K8019KB***

Unit: mm



Weight：Approx. 500 g

Note：
- Racks must be installed vertically.
- * require a minimum distance of 10 mm between each other when mounting.

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3. INSTALLATION

CAUTION

- Inappropriate installation may cause a hazardous accident such as a tip-over, electric shock, fire, and injury.
- IR810S is a heavy product. It should be handled carefully to install. Otherwise, it may cause tip-over, fall, injury, and hazardous accidents.
- During installation work, care should be taken to keep the unit free from cable chips or other foreign objects. Otherwise, it may cause fire, trouble, or malfunction of the unit.

WARNING

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

3.1 Where to install equipment

Installation Requirements

- The product is for indoor use. Avoid exposure to direct sunlight, weather, and radiant heat from hot substances. If exposure to such conditions are unavoidable, a protective hood or cover should be prepared.
- Vibration-free environment
- A clean atmosphere

<Operation conditions>

Ambient temperature: 0 to 45°C

Ambient humidity: 10 to 90%RH (at 40°C, no condensation)

<Maintenance space>

Clear the space as below if the analyzer is installed by itself.

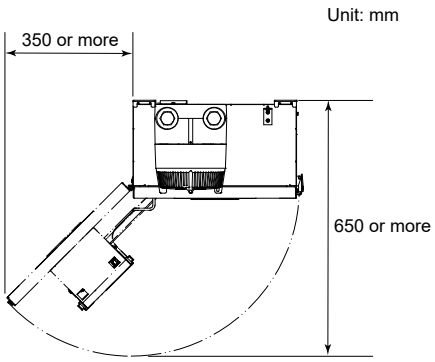


Figure 3.1 Maintenance space

To install the analyzer for optimum performance, select a location that meets the following conditions;

- Install a circuit breaker in the non-hazardous area.
- Install the external switch or the circuit breaker in the same room where the IR810S is installed. Place it where the operator can access and indicate that it is the power switch of the IR810S.

3.2 Installation

See ■ External Dimensions for installation dimensions.

CAUTION

Note the following points when installing the product.

- Do not place any objects on the enclosure.
- Turn off the power supply before installing or removing the unit.
- Install in the correct orientation with the front, horizontal, and vertical directions so that the front is vertical.
- At least 3 personnel are required to install the IR810S. (IR810S lifting: 2 or more persons, screw installation: 1 or more persons)
- Mount on wall that can withstand 140kg.

■ Location

Mount the four brackets on the enclosure on a sufficiently sturdy wall using the supplied bolts or equivalent. Mount at a height where the status/alarm display is clearly visible.

■ Mounting orientation

Mount in the correct orientations: front, horizontal, and up/down.

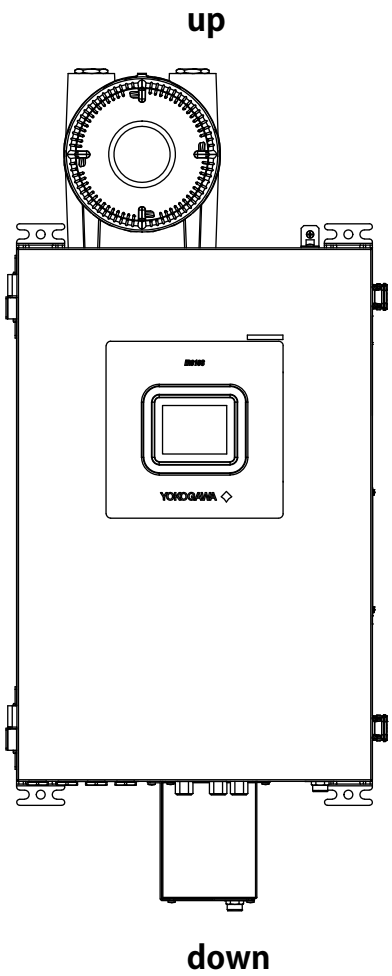


Figure 3.2 Mounting orientation of IR810S

3.3 Piping

WARNING

In piping, the following precautions should be observed.

Wrong piping may cause gas leakage.

If the leaking gas contains a toxic component, there is a risk of serious accident being induced.

Also, if combustible gas is contained, there is a danger of explosion, fire or the like occurring.

- Connect pipes correctly referring to the instruction manual.
- Exhaust should be led outdoors so that it will not remain inside the sampling equipment or indoor.
- Exhaust from the analyzer should be relieved in the atmospheric air in order that an unnecessary pressure will not be applied to the analyzer. Otherwise, any pipe in the analyzer may be disconnected to cause gas leakage.
- For piping, use a pipe and a pressure reducing valve to which oil and grease are not adhering. If such a material is adhering, a fire or the like accident may be caused.

CAUTION

Piping connection must be secured. Gas connection have several types: reference gas inlet/ outlet and purge gas inlet. When the connection is insecure or wrong, combustible, toxic, explosive gas may be accumulated inside the analyzer or system.

Observe the following when connecting the gas pipes.

- The pipes should be connected to the gas inlet and outlet on the analyzer, respectively.
- Connect the sampling system to the instrument by using corrosion-resistant tube. The material should be such as Fluoropolymer (PTFE), stainless steel, or polyethylene. In case where there is no danger of corrosion, don't use rubber or soft vinyl tube. Analyzer indication may become inaccurate due to the adsorption of gases.
- Piping connections are Rc1/4 (1/4 NPT) female-threaded. Cut the pipe as short as possible for obtaining quick response. Pipe of approx. ∅4 mm (inside diameter) is recommended.
- Entry of dust in the instrument may cause operation fault. Use clean pipes and couplings.

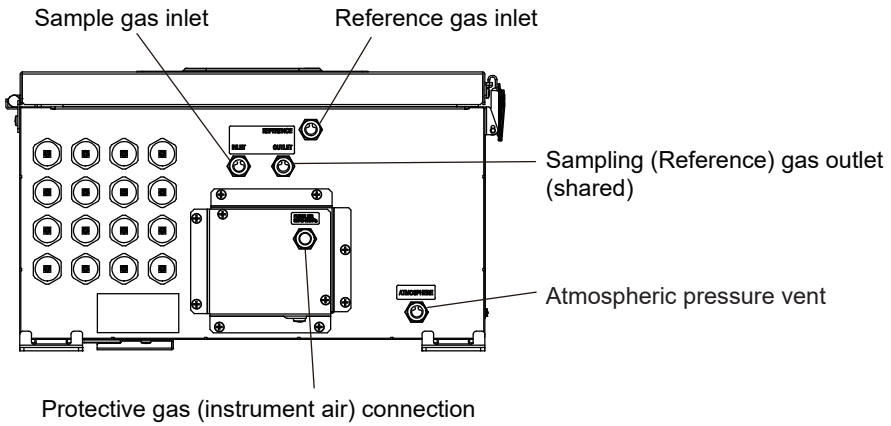


Figure 3.3

Sample gas inlet: Connect the pipe so that zero/span calibration standard gas or measured gas pretreated with dehumidification is supplied properly.
Gas inlet pressure to be introduced (at the inlet of the analyzer);
4.9 to 9.8 kPa (both sample and reference). Note that the variations with respect to the set pressure are ±2%.

Sample gas (reference gas) outlet: Measured gas is exhausted after measurement. Connect the pipe so that the gas may escape through the gas outlet into the atmosphere.

Protective gas (Instrument air) connection: Used to purge the pressurized enclosure. Use dry N_2 or instrument air as the protective gas. Since the protective gas requires the following pressure, use general instrument air as the air source and pipe it through a pressure regulator valve to the instrument.

Suffix code		Description	Protective gas pressure
Air purge gas flow rate	-10	100 L/min For high flammable gas concentration	400-500kPa
	-05	50 L/min For middle flammable gas concentration	350-500kPa
	-02	20 L/min For low flammable gas concentration	350-500kPa

Reference gas inlet: The IR810S can use air, instrument air or N_2 with a stable moisture content below 5°C saturation. Minimize the moisture difference between the sample gas and the reference gas.
However, if atmosphere or instrument air is used when the CO measuring range is less than 500 ppm (-E1), remove CO from the reference gas using a reference gas purifier or similar.
If the CO_2 measuring range is less than 5 vol%, use N_2 as the reference gas.

Gas inlet pressure to be introduced (at the inlet of the analyzer);

4.9 to 9.8 kPa (both sample and reference)
Note that the variation with respect to the set pressure is ±2%.

3.4 Sampling

See 1.1 Name and description.

Standard requirements of sampling gas

Inlet pressure of the analyzer:

4.9 to 9.8 kPa (both samples and references)

However, the variation against the set pressure is ±2 %

Analyzer outlet pressure:

Atmospheric open

Inlet gas temperature of analyzer:

0 to 50°C

In case of 5°C or lower, the temperature difference between the sample and the reference should be eliminated.

Dust : Particle size should be smaller than 0.3μm and the mass concentration should be less than 100μg / $Nm^{3.}$

Mist : Not allowed

Moisture lower than 5°C saturation (If the temperature is 5°C or lower, the temperature difference between the sample and the reference should be within 3°C).

Corrosive element : less than 1 ppm

Use sampling gas with care as below;

- The dust contained in sample gas should be eliminated completely with filters. The filter at the final stage should be capable of eliminating dust of 0.3 microns.
- The dew point of sample gas must be lower than the ambient temperature for preventing formation of drain in the analyzer. If water vapor is contained in sample gas, its dew point should be reduced down to about 0°C through a dehumidifier.
- If SO_3 mist is contained in sample gas, the mist should be eliminated with a mist filter, cooler, etc. Eliminate other mist in the same way.
- If a large amount of highly corrosive gas such as Cl_2, F_2 or HCl is contained in sample gas, the service life of analyzer will be shortened. So, avoid such gases.
- Sample gas temperature is allowed within a range from 0 to 50°C. Pay attention not to lead hot gas directly into the analyzer.
- Flow rate must not be changed during a measurement.
- Install a flowmeter as shown in a configuration 1.2 Example of sampling system configuration with IR810S, and check the flow rate.

Standard gas for calibration

Periodic calibration with standard gas (about once a week) is required for the normal use of IR810S. Prepare a standard gas cylinder for zero/span calibration.

Measuring components excluding O_2

Zero gas: N_2 gas

Span gas: Gas with a concentration of 90 to 100% in the range of each corresponding component (N_2 is recommended as the base gas.)

Measuring O_2 (Built-in paramagnetic O_2 analyzer)

Zero gas: N_2 gas

Span gas: O_2 gas with a concentration of 90 to 100% of the O_2 range (N_2 is recommended as the base gas.)
or atmosphere (21% O_2)

It is understood to influence the calibration model of the infrared gas analyzer when a lot of H_2, He, and Ar are included in the measurement gas (pressure broadening).
The span gas must use a gas near the composition of the measurement gas when you measure the gas like the above-mentioned.

Pressure at sampling gas outlet

Pressure at the sampling gas outlet should be adjusted to atmospheric pressure.

3.5 Wiring

WARNING

- Never power on the product with the top cover (or front door) of the product open. Turn off external switches and circuit breakers when working with the top cover (or front door) of the product open.
- NEVER energize the converter or equipment connected to the converter until all wiring work has been completed.

CAUTION

This equipment conforms to the CE marking

The following wiring installation is required when CE Mark compliant performance is required.

- An external switch or circuit breaker should be installed to power the converter.
- Use external switches or circuit breakers rated 10 A and compliant with IEC947-1 or 947-3.
- It is recommended that the external switch or circuit breaker be installed in the same room where the converter is installed
- External switches or circuit breakers should be located within reach of the operator and marked as being the power switch for this equipment.

How to wire

Signal and power lines should be installed under the following conditions.

(1) Protective grounding should be provided by either the terminal in the pressurized enclosure or external protective grounding.
Wiring should be equivalent to JIS D (Class 3) grounding (grounding resistance 100 ohms or less).

(2) The shield must be connected to the FG terminal of the converter. (The object is the RS-485 cable.)

WARNING

Use cables with a heat resistance of 85°C or higher for wiring.

NOTE

Grounding of Shielded Cable

Shielded cables are effective for noise rejection. The method of grounding the shield depends on the usage conditions.

Single-ended grounding, in which the shield is connected only to the ground of the product, is effective for noise rejection when the cable length is long and there is a potential difference between the ground of the connection partner and the ground of the product.

If there is no electric potential difference between the ground of the connection partner and the ground of this device, double-ended grounding may be effective by connecting to the ground of the connection partner as well. It may also be effective to ground both ends and connect a capacitor in series to one side of the ground.

3.5.1 Wiring type and location

Provide the following types of wiring. NOTE: The type of wiring required will vary depending on the specifications.

(A) For power wiring
(B) Wiring for annunciator contact output
(C) For external grounding wiring
(D) For input/output wiring

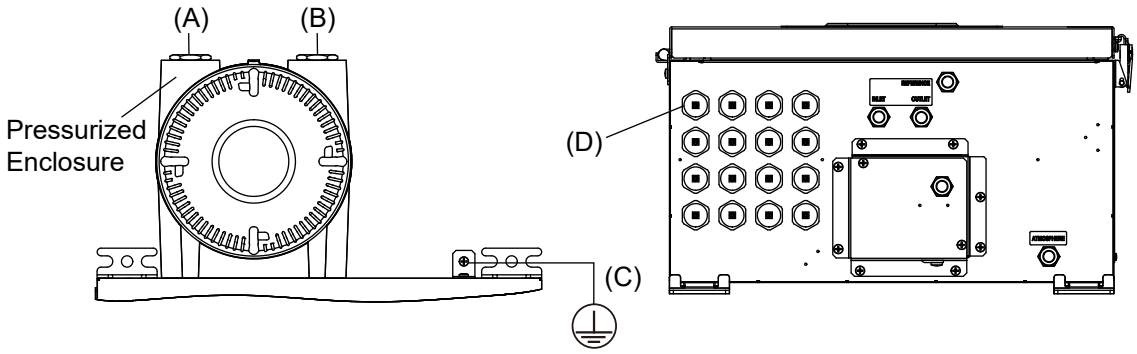


Figure 3.4 Cable position

3.5.2 Recommended Cables

WARNING

- Use cables with a heat resistance of 85°C or higher for wiring.
- Use cables with a cross section of 0.75 to 2.1 mm2 for protective grounding.

Port	Applicable cable diameter at cable port	Purpose	Terminal
A	Suffix code: -MC; diameter Ø9.5 to 15.4 mm (*1)	Power	M4 screw crimp-on terminal
B		Annunciator contact output	MKKDSN (*2)
C	not specified	External grounding	M4 screw terminal
D	Ø7.0 to 13.0 mm (Option code /CG and U. I. Lapp GmbH article number 53112720 (SKINTOP MS-M20ATEX) For other cases, use cable compatible with the respective cable gland.	Input-output	M3 screw terminal

(*1) For the suffix code -MN and -TN, use the recommended cable diameter for the cable gland to be used.
(*2) For detail see .

3.5.3 Cable port, cable gland mounting

WARNING

- All wiring shall comply with IEC/EN 60079-14, Local Electric Codes and Requirements.
- In a hazardous area, use appropriate flameproof-certified parts for connecting cables.
- All externally powered input signals into the pressurized enclosure shall be isolated by external relays controlled by the Ex px protection system (Ex px safety device).

CAUTION

- The unused electrical connection ports should be closed with an appropriate flameproof-certified plug.
- Analyzers have pressurized enclosures. The cable end should be sealed in order to apply pressure to the pressurized enclosure. Otherwise, power does not supplied to the electronics section.

Connection port for power supply and annunciator contact outputs

(1) Remove the Plug attached at the time of shipment.

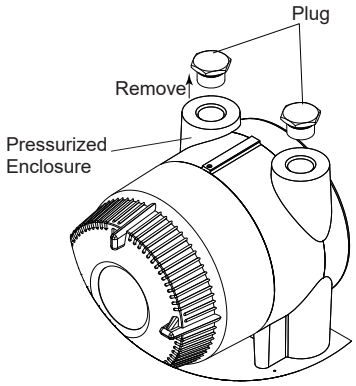


Figure 3.5

(2) Attach cable connection components for each suffix code.
For the suffix code “-MN”, use explosion protection certified cable connection parts conforming to M25 x 1.5.
Cable glands, adapters, and/or blanking elements shall have an IP66 rating, heat resistance of 85°C, and shall be certified to Ex d(db) IIC according to the applicable regulatory requirement: ATEX (-AT), IECEx (-EC), or GB standard (-NE). They shall be installed so as to maintain the specific degree of protection of the equipment.

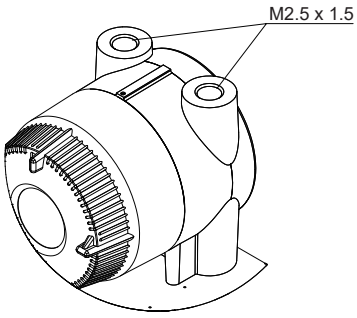


Figure 3.6

- For the suffix code -TN (3/4NPT), attach an O-ring to the supplied connector and attach the connector to the pressurized enclosure. Use cable connection parts approved for the explosion protection type compatible with 3/4NPT.
  Cable glands, adapters, and/or blanking elements shall have an IP66 rating, heat resistance of 85°C, and shall be certified to Ex d(db) IIC according to the applicable regulatory requirement: ATEX (-AT), IECEx (-EC), or GB standard (-NE). They shall be installed so as to maintain the specific degree of protection of the equipment.

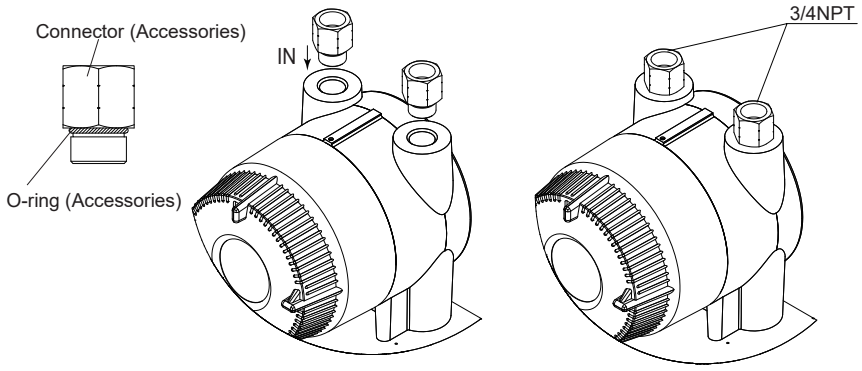


Figure 3.7

For the suffix code -MC (With Cable glands (M25)), attach an O-ring onto the supplied cable glands and install them on the pressurized enclosure.

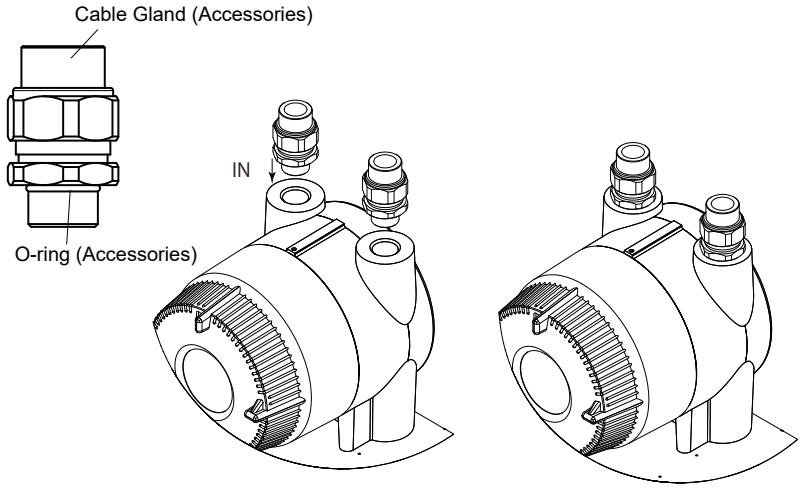


Figure 3.8

Opening/closing the door

This product has a door fastener with a lock. Lock the door when operating these devices. The same key is used for all the door fasteners. Keep the key safe and do not lose it. Confirm that the lever cannot be lifted up after locking.

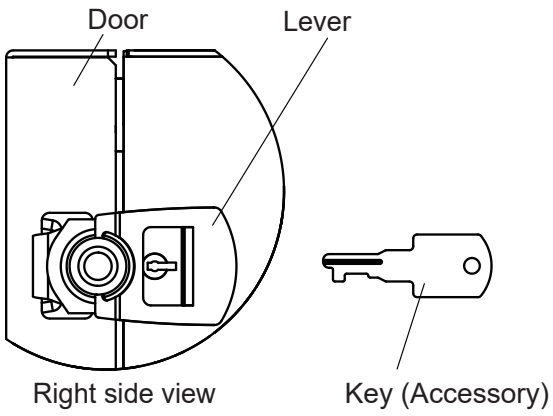


Figure 3.9

For cable glands, prepare one from the following (a) to (c).

(a) Order one from /CG1 to /CG4. Cable glands of the same type as in (b) are packaged with the product.

(b) Prepare cable glands, U. I. Lapp GmbH article number 53112720 (SKINTOP MS-M20ATEX Thread size: M20 × 1.5, cable diameter 7-13, Torque 12 N·m)

(c) Prepare cable glands according to each applicable certification standard.
Cable glands with thread size M20 × 1.5, IP66 rating, and heat resistance of 85°C shall comply with Ex d(db) IIC or Ex e(eb) IIC protection standards and be certified according to the applicable regulatory requirement: ATEX (-AT), IECEx (-EC), and GB standard (-NE), and shall be installed to maintain the specified degree of protection of the equipment.

Installation of IR810S cable gland for input/output/signal line wiring

Remove the plug and attach the cable gland to the specified torque. Unused wiring holes should remain plugged as supplied.

CAUTION

- Avoid injury from the edge of the housing hole, etc.
- To install the cable gland selected in (a) (b) or (c), tighten it with the specified torque: 12 N·m for (a), (b), and as specified for (c).

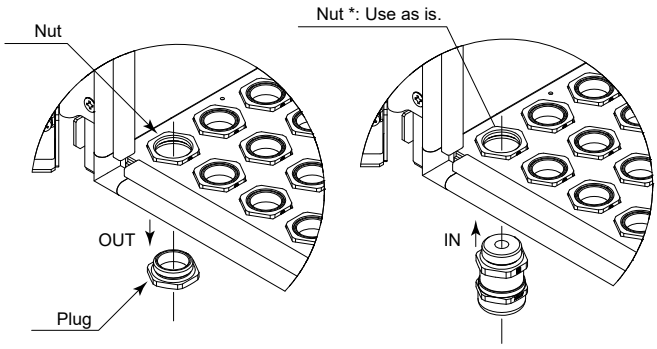


Figure 3.10 IR810S I/O (or signal) cable gland installation

3.5.4 Connecting power, ground cables

CAUTION

- Wire the power supply cable keeping the distance of 1 cm or more from other signal wires.
- The power supply cable shall comply with UL or CSA.
- Do wiring after securing protective grounding.

Power supply line to the pressurized enclosure

Provide power wiring for electrical circuits to the pressurized enclosure.

Install the supplied ferrite core.

Ground wire must also be wired.

After wiring, be sure to install the wiring protection film cover.

WARNING

When the cover of the protection system is uninstalled, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

The protection system is a flameproof enclosure.

When handling the screws on the cover of the protection system, note the following to avoid damaging the screws since they cannot be repaired.

- Use a hex wrench (Nominal size:2.5 mm) to tighten/loosen the hexagon socketset screw.
- The cover should be placed in a clean plastic bag or on a clean space to prevent it from contamination.

Before installing the cover, confirm that the body and screws are not contaminated. If they are, make sure to clean them.

- Since the screws are coated with MOLYKOTE, do not lubricate them.
- When installing the cover, tighten the screws by hand; never use tools.

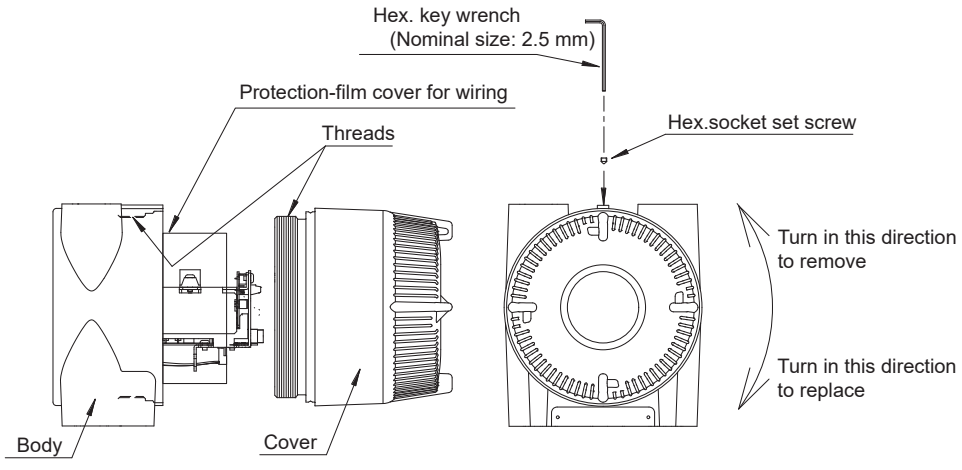
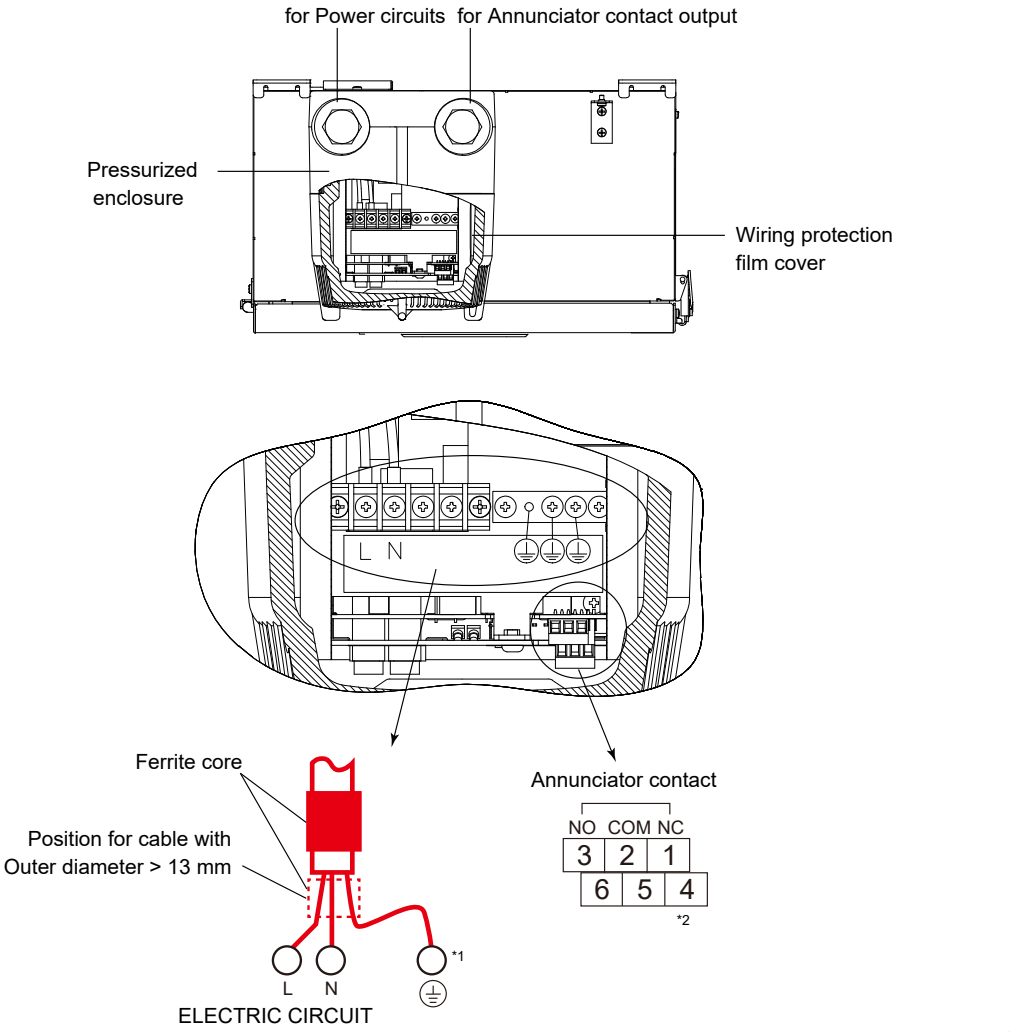


Figure 3.11 Opening/closing the cover of the protection system



*1: Ground the unit at any one of the three locations marked ⏚ on the main unit.
*2: Grounding should be made at one location, anywhere from the three locations.
Two screws are provided, but use only one.

Figure 3.12

⚠ CAUTION

Use cables with a maximum allowable temperature of 85°C or higher.

● Wiring power supply

Connect the wires from the power supply to the L and N terminals. Follow the instructions below. (In the case of 3-core, one wire should be grounded.)

(1) Use 2- or 3-core cables for this wiring.

(2) Use M4 terminal screws. Use crimp terminals that are compatible with these screws and apply terminal treatment to the cable.

Connect the ground wire to the ground terminal.
Connect the ground wire to the ground terminal in the pressurized enclosure or to the external ground terminal ⏚

The ground terminal screws are all M4 screws.

The tightening torque is 1.2 N·m.

Annunciator wiring

The annunciator terminal uses the MKKDSN series from Phoenix Contact. The company's AI series is recommended as crimp terminals for these terminals. See Table 3.1 to select the appropriate crimp terminal for each wire diameter.

Table 3.1 Specifications for Annunciator terminal models

Terminal series	Nominal cross section area	Outer diameter	Model number	Coating stripping length
MKKDSN	0.75 mm^2	less than Ø 2.8 mm	AI 0.75 - 6GY	Approx. 6 mm
	1 mm^2	less than Ø 3.0 mm	AI 1 - 6RD	
	1.5 mm^2	less than Ø 3.4 mm	AI 1.5 - 6BK	

External ground wiring

CAUTION

Enforce construction of class-D grounding wire by all means, 100 Ω or less.

Connect the ground terminal to the upper-right as shown on Figure 3.13.

To prevent loosening of the ground terminal, tighten the screws to approximately 1.2 N·m . Be careful not to twist the wires.

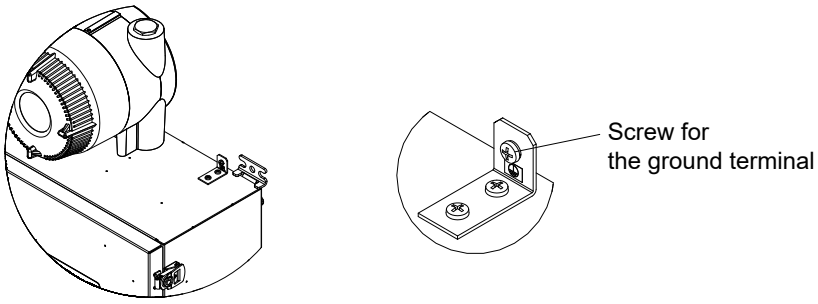
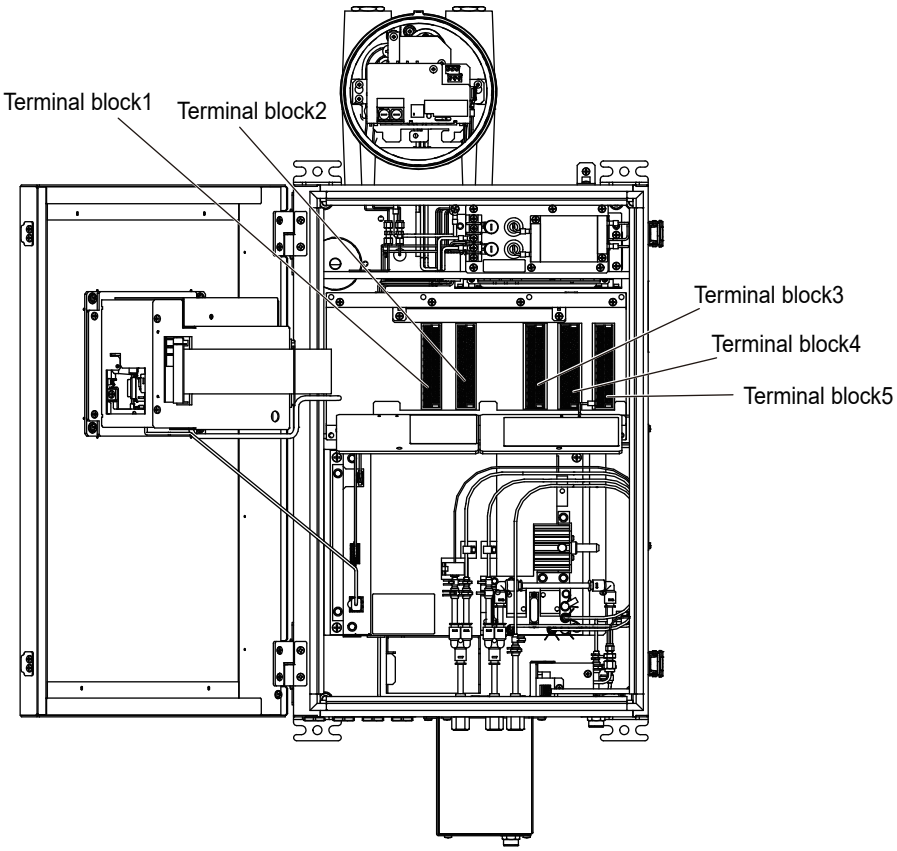


Figure 3.13

3.5.5 I/O wiring connection



■ I/O terminals

NOTE

- Analog outputs are mutually non-isolated. We recommend that signals be isolated individually to eliminate unwanted signal wraparound and disturbance effects when drawing wiring outdoors, wiring longer than 30 m, or connecting multiple outputs to the outside.
- Isolated output (isolated between each DO and from the ground)
  To eliminate external influences on signals, separate the wiring to the power supply and contact output from the wiring to analog signals, O_2 detector input, and contact input.
- Be sure to earth ground the IR810S to prevent malfunctions due to external noise, etc.
- Do not connect to the N.C. pin (unused pin). This may cause malfunction of the equipment.

Terminal block 1

Contact input

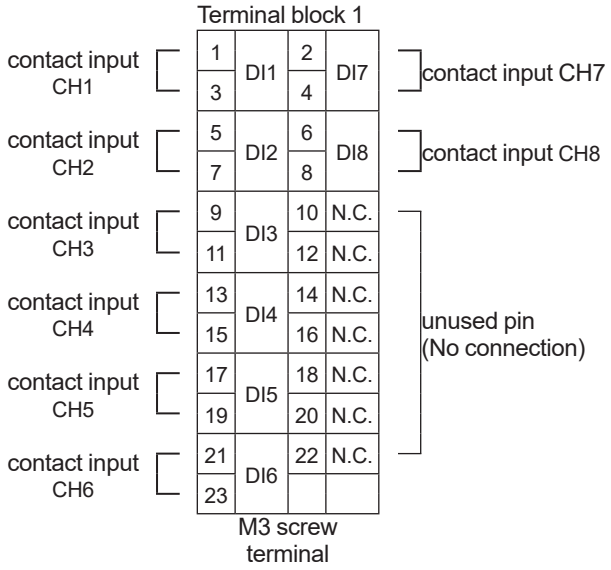


Figure 3.14 Terminal block 1: Contact input terminal

The converter receives a contact signal and performs the configured function.

Cable specifications:

Each CH requires two cores for this wiring.

Select the number of cores according to the number of contacts to be used.

Wiring instructions:

(1) The terminal screw of the converter is an M3 screw. The tightening torque is 0.6 N·m. Use crimp terminals compatible with these screws to terminate the cable.

(2) Resistance or voltage values determine the “ON/OFF” of this contact input. Switches must meet the conditions shown in the table below.

Table 3.2 ON/OFF” identification of contact input

	CLOSE	OPEN
Resistance	200 Ω or less	100 kΩ or more
Voltage value	-1 to 1 VDC	4.5 to 25 VDC

Terminal block 2

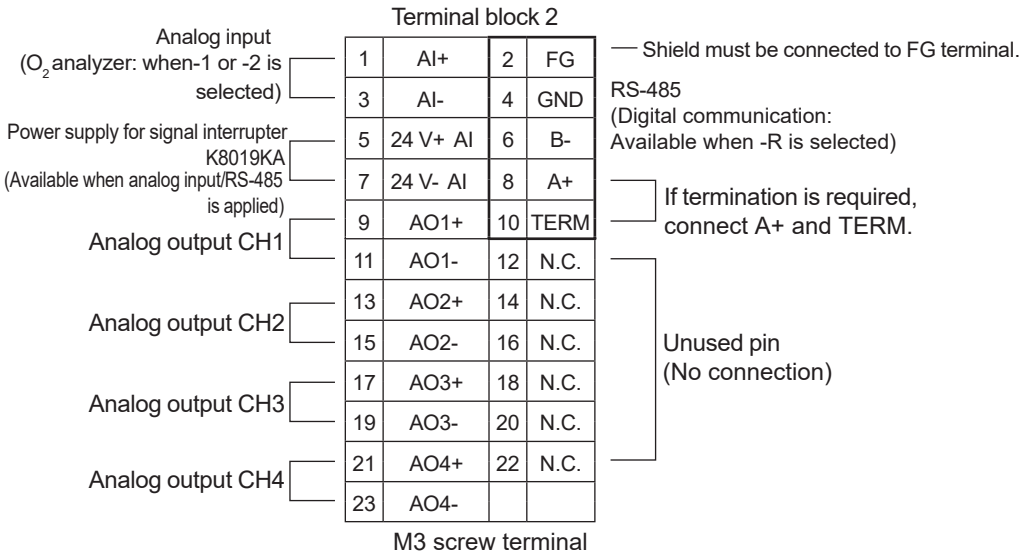


Figure 3.15 Terminal block 2: analog input/analog output/RS-485

This terminal block has the following three functions.

Analog input (O_2 detector: -1, available when "-1" or "-2" is selected)

When using an external oxygen analyzer to input the O_2 detector, use this terminal for current input (4-20 mA). Use two-core cables for this wiring.

Wiring instructions:

(1) Use an M3 screw for the terminal screw of the converter. The tightening torque is 0.6 N·m.
Use crimp terminals compatible with these screws to terminate the cable.

(2) Do not wire with reversed polarity. Wire carefully to avoid mistaking the "+" and "-" polarity.

Analog output

This wiring is used to transmit the 4-20mA DC signal to a recorder or other device. The load resistance including wiring resistance should be 550 Ω or less

Cable specifications:

Each CH requires 2 cores for this wiring.

Select the number of cores according to the number of contacts to be used.

Wiring instructions:

(1) Use M3 threaded terminal screws on the converter. The tightening torque is 0.6 N·m.
Use crimp terminals compatible with these screws to terminate the cable.

(2) Do not wire with reversed polarity. Wire carefully to avoid mistaking the "+" and "-" polarity.

- **RS-485 communication (digital communication: available when -R is selected)**

  RS-485 (Modbus RTU) can be selected as an option for this product.

  Use shielded cables to prevent malfunction due to external noise and to avoid radiation noise from the IR810S from affecting other equipment.

Table 3.3 RS-485 terminal assignment

Terminal block 2 Terminal No.	Terminal name	use
2	FG	Shield
4	GND	Signal GND
6	B-	Data (anode)
8	A+	Data (cathode)
10	TERM	For connecting a terminating resistor (110 Ω)

Use multi-core shielded cables with stranded (twisted pair) cores.

Connect the shield to terminal 2 on terminal block 2.

Terminate the signal with a built-in signal terminator (110 Ω resistance) according to the communication environment.

Connect terminals 8 and 10 of terminal block 2 when terminating.

Use M3 terminal screws. The tightening torque is 0.6 N·m.

- **Power supply for signal interrupters**

Monitors the internal pressure inside the instruments when analog input and RS485 communication are applied. Provides 24VDC power to the signal interrupter (K9806AE) when internal pressure is normal.

Wiring instructions:

(1) Use M3 threaded terminal screws on the converter. The tightening torque is 0.6 N·m.
Use crimp terminals compatible with these screws to terminate the cable.

(2) Do not wire with reversed polarity. Wire carefully to avoid mistaking the “+” and “-” polarity.

(3) See Figure 3.7 on how to connect the K9806AE. The K9806AE terminal uses the FKC series from Phoenix Contact. We recommend the AI series from Phoenix Contact as crimp terminals for this terminal. See Table 3.4 to select the model of the crimp terminal to match the wire diameter. This also applies to the K9806AJ used in terminal blocks 3 and 4.

Table 3.4 Crimp terminal for K8019KA, K8019KB

Terminal series	Nominal cross section area	Outer diameter	Model number	Coating stripping length
FKC	0.5 mm^2	less than Ø2.5 mm	AI 0.5 - 10WH	Approx. 10 mm
	0.75 mm^2	less thanØ2.8 mm	AI 0.75 - 10GY	
	1 mm^2	less than Ø3.0 mm	AI 1 - 10RD	
	1.5 mm^2	less than Ø3.4 mm	AI 1.5 - 10BK	

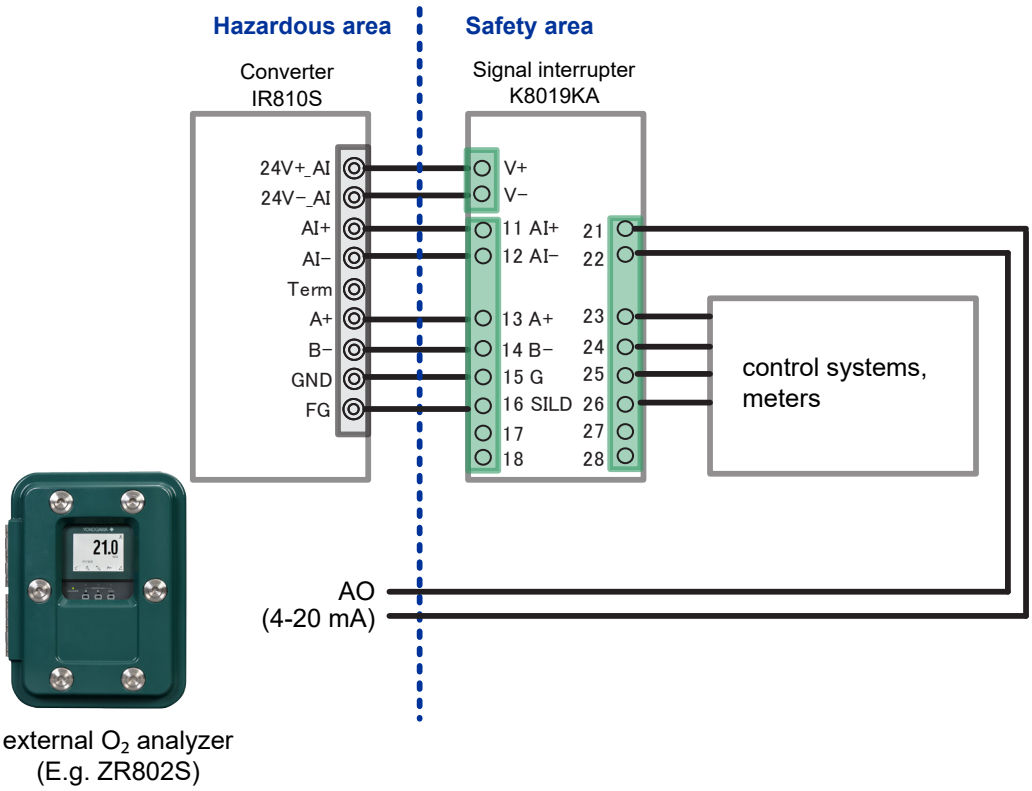


Figure 3.16 Connection of IR810S and single interrupters

Terminal block 3

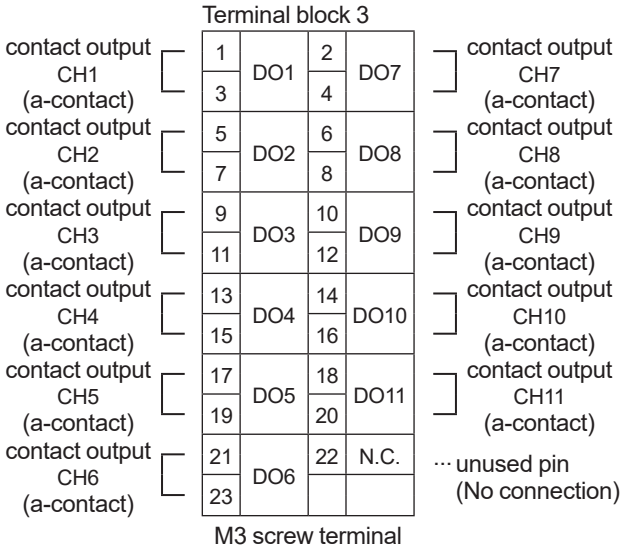


Figure 3.17 Terminal block 3: Contact output (a-contact)

The converter outputs up to 11 a-contact signals.

The function of contact outputs 1-4 is fixed, but the function of 5-11 is selectable (details in 5.2.4 Contact output setting)

Cable specifications:

Each CH requires 2 cores for this wiring.

Select the number of cores according to the number of contacts to be used.

Use a cable with a diameter that fully satisfies the current capacity of the connection point.

Wiring instructions:

(1) Use M3 screws on the converter. The tightening torque is 0.6 N·m.
Use crimp terminals compatible with these screws to terminate the cable.

(2) The contact capacity of the relay for contact output is 30V DC 1 A. Connect loads (indicator lights, solenoid valves, etc.) so that these values are not exceeded.

● Terminal block 4

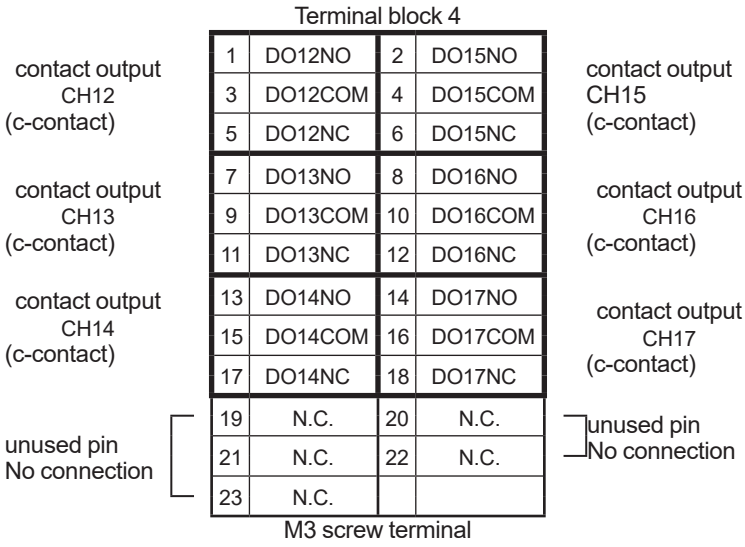


Figure 3.18 Terminal block 4: Contact output (c-contact)

The converter outputs up to 6 c-contact signals. The function of Contact outputs 12 to 17 can also be configured. See 5.2.4 Contact output setting for details.

Cable specifications:

Each CH requires 3 cores for this wiring.

Select the number of cores according to the number of contacts to be used.

Use a cable with a diameter that fully satisfies the current capacity of the connection point.

Wiring instructions:

(1) Use M3 screws for the terminal screws of the converter. The tightening torque is 0.6 N·m.

Use crimp terminals compatible with these screws to terminate the cable.

(2) The contact capacity of the relay for contact output is 30V DC 1 A. Connect loads (indicator lights, solenoid valves, etc.) so that these values are not exceeded.

● Connection with the signal interrupter K8019KB

A signal interrupter K8019KB is required to connect the wiring of Terminal block 3 to external equipment. See ● Terminal block 5 for details.

Terminal block 5

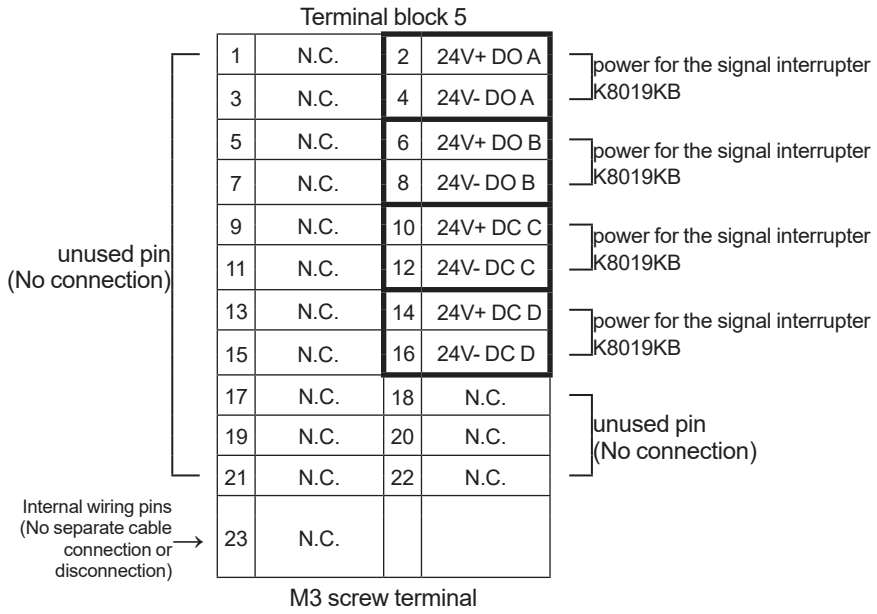
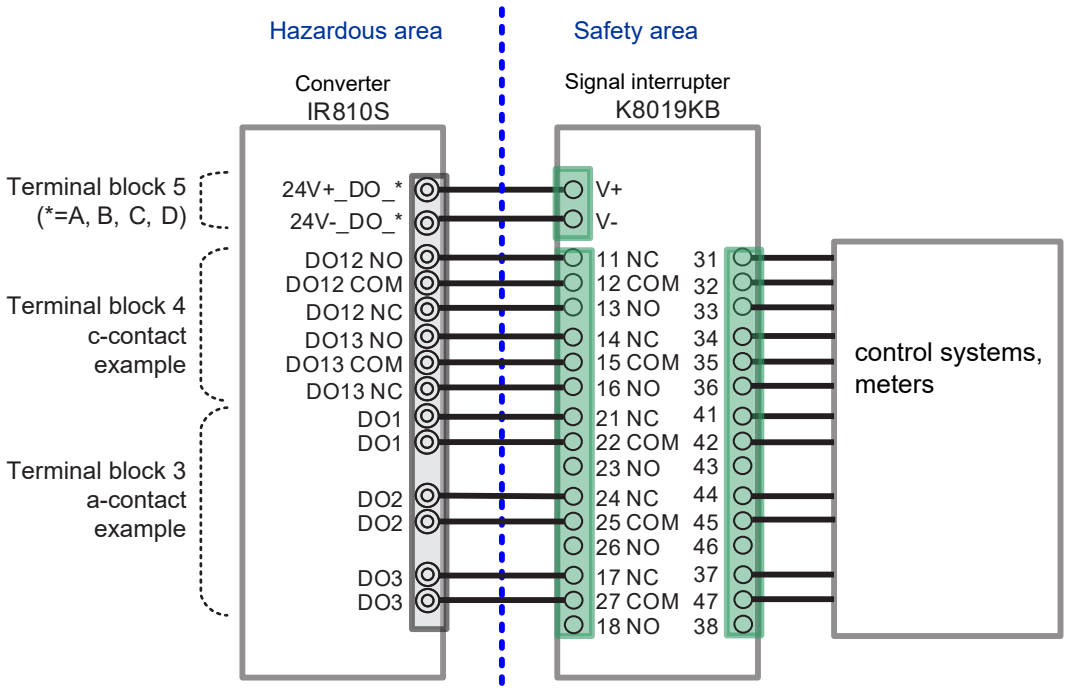


Figure 3.19 Terminal block 5: Power supply for the signal interrupter



*: Although the label on the K8019KB shows only c- contact, it is possible to connect a-contact by not using the NC terminal as shown in the figure above.

Figure 3.20 Connection of IR810S and the signal interrupter

- **Wiring the signal interrupter K8019KB**

  The internal pressure inside the equipment is monitored with respect to the DO terminals on terminal blocks 3 and 4. 24 VDC power is supplied to the signal interrupter (K8019KB) when the internal pressure is normal.

  Up to four K8019KB can be connected. Install K8019KB according to the contact outputs to be used.

  Wiring instructions:

  (1) Use M3 screws for the terminal screws of the converter. The tightening torque is 0.6 N·m.
  Use crimp terminals compatible with these screws to terminate the cable.

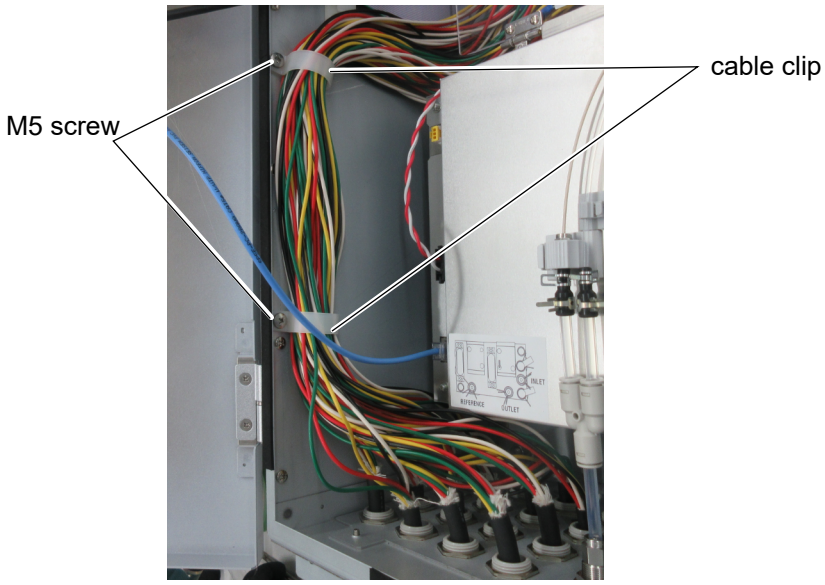
  (2) Do not wire with the wrong polarity of “+” and “-”.

  (3) See Figure 3.16 Connection of IR810S and single interrupters on how to connect K8019KB. The terminal of K8019KB is the same as that of K8019KA. Refer to its table.

CAUTION

Do not remove or co-tighten the cable attached to pin 23 of terminal block 5. Otherwise, the equipment will not work correctly and will fail to meet explosion protection standards.

Wiring routing image



Route the cable from the left side. After wiring, fasten the cable with the supplied cable clip and M5 screws. The tightening torque is 2.0 N·m.

Figure 3.21 IR810S Wiring

<Measurable Components and the Corresponding Channel Numbers>

The following chart shows the output components of each channel corresponding to the specification codes

Table 3.5 Channel (Ch) Number - display/output component correspondence chart

Comp	Spec.	O_2 Anal.	Option Code*	Output and corresponding channels											
				Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	Ch8	Ch9	Ch10	Ch11	Ch12
-A1	NO	-N	not specified	NO	-	-	-	-	-	-	-	-	-	-	-
-A2	SO_2	-N	not specified	SO_2	-	-	-	-	-	-	-	-	-	-	-
-A3	CO	-N	not specified	CO	-	-	-	-	-	-	-	-	-	-	-
-A4	CO_2	-N	not specified	CO_2	-	-	-	-	-	-	-	-	-	-	-
-A5	CH_4	-N	not specified	CH_4	-	-	-	-	-	-	-	-	-	-	-
-B1	NO+SO_2	-N	not specified	NO	SO_2	-	-	-	-	-	-	-	-	-	-
-B2	NO+CO	-N	not specified	NO	CO	-	-	-	-	-	-	-	-	-	-
-B4	CO+CO_2	-N	not specified	CO	CO_2	-	-	-	-	-	-	-	-	-	-
-B5	CO+CH_4	-N	not specified	CO	CH_4	-	-	-	-	-	-	-	-	-	-
-B6	CO_2+CH_4	-N	not specified	CO_2	CH_4	-	-	-	-	-	-	-	-	-	-
-C1	NO+SO_2 +CO	-N	not specified	NO	SO_2	CO	-	-	-	-	-	-	-	-	-
-C4	CO+CO_2 +CH_4	-N	not specified	CO	CO_2	CH_4	-	-	-	-	-	-	-	-	-
-D1	NO+SO_2 +CO+CO_2	-N	not specified	NO	SO_2	CO	CO_2	-	-	-	-	-	-	-	-
-A1	NO	-1 -2 -3 -4	not specified	NO	O_2	-	-	-	-	-	-	-	-	-	-
-A2	SO_2	-1 -2 -3 -4	not specified	SO_2	O_2	-	-	-	-	-	-	-	-	-	-
-A3	CO	-1 -2 -3 -4	not specified	CO	O_2	-	-	-	-	-	-	-	-	-	-
-A4	CO_2	-1 -2 -3 -4	not specified	CO_2	O_2	-	-	-	-	-	-	-	-	-	-
-A5	CH_4	-1 -2 -3 -4	not specified	CH_4	O_2	-	-	-	-	-	-	-	-	-	-
-B1	NO+SO_2	-1 -2 -3 -4	not specified	NO	SO_2	O_2	-	-	-	-	-	-	-	-	-
-B2	NO+CO	-1 -2 -3 -4	not specified	NO	CO	O_2	-	-	-	-	-	-	-	-	-
-B4	CO+CO_2	-1 -2 -3 -4	not specified	CO	CO_2	O_2	-	-	-	-	-	-	-	-	-
-B5	CO+CH_4	-1 -2 -3 -4	not specified	CO	CH_4	O_2	-	-	-	-	-	-	-	-	-
-B6	CO_2+CH_4	-1 -2 -3 -4	not specified	CO_2	CH_4	O_2	-	-	-	-	-	-	-	-	-
-C1	NO+SO_2 +CO	-1 -2 -3 -4	not specified	NO	SO_2	CO	O_2	-	-	-	-	-	-	-	-
-C4	CO+CO_2 +CH_4	-1 -2 -3 -4	not specified	CO	CO_2	CH_4	O_2	-	-	-	-	-	-	-	-
-D1	NO+SO_2 +CO+CO_2	-1 -2 -3 -4	not specified	NO	SO_2	CO	CO_2	O_2	-	-	-	-	-	-	-
-A1	NO	-1 -2 -3 -4	/K	NO	O_2	Correct NO	Correct NO Ave.	O_2 Ave.	-	-	-	-	-	-	-
-A2	SO_2	-1 -2 -3 -4	/K	SO_2	O_2	Correct SO_2	Correct SO_2 Ave.	O_2 Ave.	-	-	-	-	-	-	-
-A3	CO	-1 -2 -3 -4	/K	CO	O_2	Correct CO	Correct CO Ave.	O_2 Ave.	-	-	-	-	-	-	-

Comp	Spec.	O_2 Anal.	Option Code*	Output and corresponding channels											
				Ch1	Ch2	Ch3	Ch4	Ch5	Ch6	Ch7	Ch8	Ch9	Ch10	Ch11	Ch12
-B1	$NO+SO_2$	-1 -2 -3 -4	/K	NO	SO_2	O_2	Correct NO	Correct SO_2	Correct NO Ave.	Correct SO_2 Ave.	O_2 Ave.	-	-	-	-
-B2	NO+CO	-1 -2 -3 -4	/K	NO	CO	O_2	Correct NO	Correct CO	Correct NO Ave.	Correct CO Ave.	O_2 Ave.	-	-	-	-
-B4	$CO+CO_2$	-1 -2 -3 -4	/K	CO	CO_2	O_2	Correct CO	Correct CO Ave.	O_2 Ave.	-	-	-	-	-	-
-B5	$CO+CH_4$	-1 -2 -3 -4	/K	CO	CH_4	O_2	Correct CO	Correct CO Ave.	O_2 Ave.	-	-	-	-	-	-
-C1	$NO+SO_2$ +CO	-1 -2 -3 -4	/K	NO	SO_2	CO	O_2	Correct NO	Correct SO_2	Correct CO	Correct NO Ave.	Correct SO_2 Ave.	Correct CO Ave.	O_2 Ave.	-
-C4	$CO+CO_2$ $+CH_4$	-1 -2 -3 -4	/K	CO	CO_2	CH_4	O_2	Correct CO	Correct CO Ave.	O_2 Ave.	-	-	-	-	-
-D1	$NO+SO_2$ $+CO+CO_2$	-1 -2 -3 -4	/K	NO	SO_2	CO	CO_2	O_2	Correct NO	Correct SO_2	Correct CO	Correct NO Ave.	Correct SO_2 Ave.	Correct CO Ave.	O_2 Ave.

*: Selections other than the option code /K (O_2 compensation) have no influence on channel content.

How to read the table

- SO_2 in the column of Ch1 means that Ch1 for display and output corresponds to the SO_2 component
- When the option code /K (O_2 compensation) is specified, select the option code "/NX", if you want the NO meter to display NOx as a component.
- "Correct" refers to O_2 conversion.

3.6 External Oxygen Analyzer Settings

This section describes necessary and restrictive settings when using the ZR802S as an oxygen analyzer.

(For details on setting items, see the ZR802S user's manual, IM 11M13G01-02EN).

For the use of other external oxygen analyzers, also refer to this section for settings.

● Equipment settings - mA output settings

Set the "20 mA" point of the current output used as output to IR810S to "O_2 analyzer input range: 20 mA". See 5.2.3 mA intput settings.

■ Setting for automatic calibration at the same time as the schedule set by IR810S.

● Maintenance - Calibration Settings

- **Calibration mode**

  Set to "semi-automatic."

- **Stability time**

  Set to 0 minutes and 0 seconds. If there is insufficient time for the oxygen concentration to stabilize after calibration, tune the replacement time of the IR810S. (See 5.1.2 Auto Calibration Setting for more information on replacement time)

  There are no restrictions on the calibration procedure, zero gas concentration, span gas concentration, or calibration time [mm:ss]. Set appropriate values.

● Setting - Contact setting - Contact output setting

To notify IR810S of the end of calibration or errors during calibration, the following settings are required for one of the contact outputs 1 to 3.

- **For contact output operation**

  Set to "closed."

- **For contact output**

  Assign the contact output to "Calibrating" to notify the end of calibration.

  The assigned contact output should be connected to the contact to which "O_2 analyzer input" is assigned in the IR810S contact input setting.

  Assign "Calibration factor alarm" and "Calibration stability alarm" to one contact for notification of errors during calibration. Connect the assigned contact output to the contact to which "O_2 analyzer error" is assigned at the IR810S contact input. (For error notification during calibration, calibration will operate even if no assignment is made to a contact.)

● Setting - Contact setting - Contact input setting

The following settings are required to receive semi-automatic calibration initiation from IR810S.

- **Operation selection for contact input X (X is 1 or 2)**

  Set to "Operate on Close".

- **Selection of contact input X (X is 1 or 2)**

  Set to "Calibration start command

4. OPERATION

Check that the pipes are correctly connected to the gas sampling port and drain port. Check that the analyzer is correctly wired as specified.

4.1 Internal pressure condition of the pressurized enclosure

● Pressurized enclosure protection system

The pressurized enclosure is a flame proof construction and incorporates the protection circuit for the internal explosion protected construction part of the instrument. Inside are power relays, pressure switches, timers, relays, illumination sensors, and override switches.

If the internal pressure of the pressurized enclosure falls below 392 Pa while the power is being supplied, the protection system will shut down the power supply.

The “override function” intentionally disables the function of the protection system.
To activate the override function, remove the cover of the pressurized enclosure and press the override switch while the illuminance sensor is detecting over 100 lx (lux) (*).

If the light detected by the illumination sensor falls below 10 lx, the override function is disabled and the pressurized- enclosure protection system activates to shut off the power supply to the control unit and the oven unit.

The override function allows users to open the door of the pressurized enclosure while the power supply is being supplied. When repairing equipment, use this function only after confirming that the surrounding area is not an explosive atmosphere.

***Illumination and brightness reference**

Fluorescent lights in offices	400 to 500 lx
Street lamp	50 to 100 lx
Candlelight (about 20 cm away)	10 to 15 lx

According to The Ordinance on Industrial Safety and Health

Division of Work	Standards
Precision work	300 luces or more
Ordinary work	150 luces or more
Rough work	70 luces or more

Excerpted a table (Lighting and Illumination) in Article 604 Chapter IV “Lighting and Illumination” of The Ordinance on Industrial Safety and Health.

● Override function

WARNING

When the override function is used, use a gas detector to check that the concentration of explosive gases in the ambient atmosphere is less than the allowable limit.

In this analyzer, if the pressure of the pressurized enclosure (electronics section) drops below a specified level while the power is on, the protection system is activated to stop power supply. Therefore, if the door of the electronics section is inadvertently opened for maintenance while the power is on, the protection system is activated to cut off the power.

The override function forcibly disables this protection system.

The override function allows operators to open the door or cover of the pressurized enclosure while the power is still on.

The override function is activated by removing the cover of the protection system and pressing the override switch while the light sensor is detecting more than 100 (lx) of light. (See Figure 4.1)

The override function is automatically disabled when the cover of the internal pressure protection device is installed after the maintenance has been completed.

● Checking the pressure in the pressurized enclosure

The LED of “POWER” is turned ON and the LED of “ALARM” is turned OFF when the pressure is in the normal condition.

The pressurized enclosure consists of an “Electronics section”. How to check the pressure in the enclosure is as follows.

<Electronics section>

⚠ WARNING

Before removing the cover of the pressurized enclosure, confirm that the ambient atmosphere is below the lower explosive limit with a gas detector or similar device.

Check the status of the protection system with the LEDs as shown in Figure 4.1.

The following shows the name and meaning of each LED.

POWER: ON when power is supplied to the protection system

PRESSURE: ON when the specified internal pressure is applied to the electronics section. This LED is ON in the normal condition. If the internal pressure becomes low, it turns off.

PURGING: ON when purging the electronics section. After purging, it turns off. When power is supplied and “PRESSURE” LED is on, this LED turns ON and purging begins. After the electronics section is purged for 21 ± 3 min and completes the purging, the LED turns off and power is supplied to the electronics section.
If the purging ends incompletely, the status of purging is reset and purging begins again.

OVERRIDE: ON when the override function is activated.

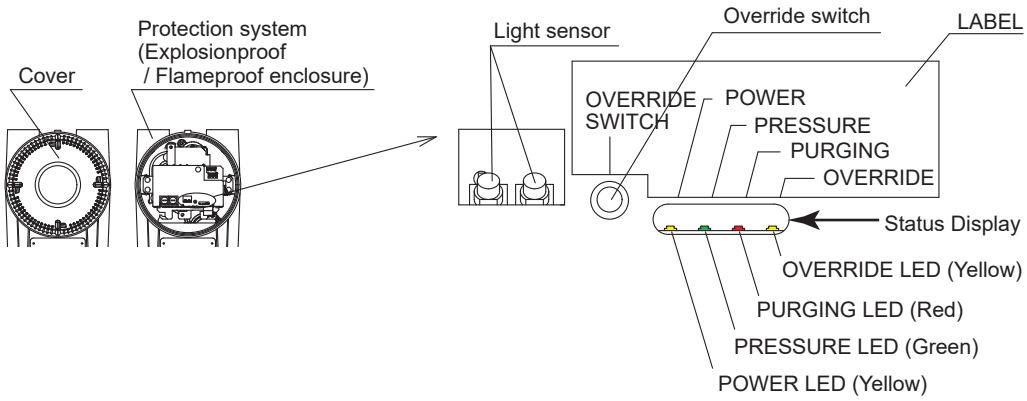


Figure 4.1

4.2 Power supply

Follow the procedure below when supplying the power.

<Power on>

(1) Supply power to the protection system (pressurized enclosure).
(2) Supply protective gas (instrument air) to the protective gas inlet.
(3) Power is supplied to the electrical section after the internal pressure of the equipment exceeds 392 (Pa) and has been purged for 21 ± 3 minutes.

<Power off>

(1) Shut off the power supply to the protection system (pressurized enclosure).
(2) Wait at least 25 minutes after the shutdown.
(3) Shut off the supply of protective gas (instrumentation air).

CAUTION

In an emergency, shut off the power supply immediately.

<Low pressure in the pressurized enclosure>

Electronics section

(1) If the internal pressure of the electronic section falls below 392 (Pa), the protection system (pressurized enclosure) immediately shuts off the power supply to the electronics section.
(2) When the internal pressure of the electronics section returns to normal, <Power on> (3) and subsequent operations are automatically performed.

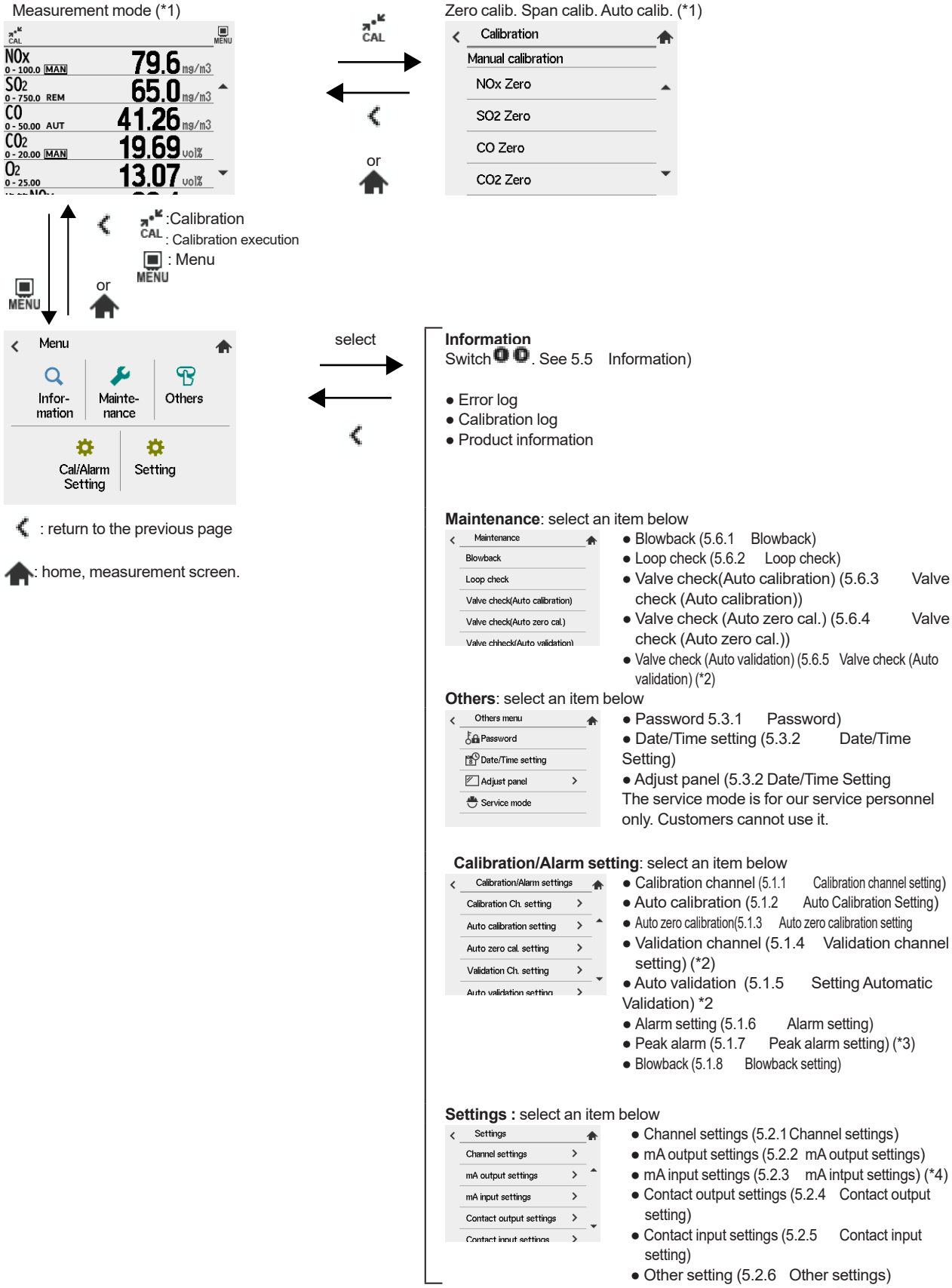
4.3 Warm-up operation and regular operation

Procedure

(1) The operation described in <Power on> above proceeds and the IR810S turns on when the power supply is connected.
The measurement screen appears on the front display panel.
(2) Warm-up operation for about 4 hours
(3) See 5. SCREENS to make the necessary settings.
(4) Perform zero/span calibration after the warm-up operation (see 5.4 Calibration and Validation).
(5) Lead the sample gas into the IR810S and start measurement.

4.4 Display/operation panel flow chart

The display/operation panel functions as shown in the flow chart below (Figure 4.2).



*1: The display layout differs depending on the component being measured. The display screen scrolls up and down by touching the ▲ ▼ keys.
*2: Displayed when automatic validation is specified in the basic code.
*3: Displayed only when the option "/A" (Peak alarm) is specified and CO components are present.
*4: Displayed when an external oxygen analyzer is used as an O_2 detector.

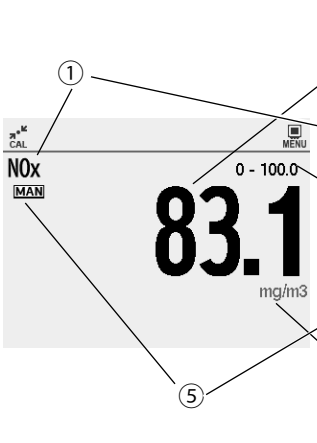
Figure 4.2

4.5 General operation of display/operation panel

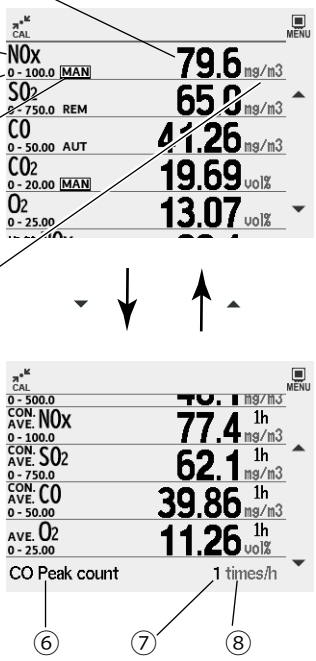
(1)Measurement screen (This screen always appears when the power is turned on.)

The measurement screen varies depending on the number of components. The following screen configuration is an example of NOx (1 component channel) and NOx, SO_2, CO, CO_2, and O_2 (12 component channels).

Example1: NOx (Component1 channel)



Example2: NOx、SO_2、CO、CO_2、O_2 (Component 12 channel)



If there are more than 6 channels of components or more than 5 channels + peak alarm displays, you can scroll through them with the ▲ ▼ icons.

Figure 4.3

No.	Name	Function
1	Component	Component display of instantaneous value, O_2-converted instantaneous value, O_2-converted average value, etc.
2	Concentration	Display of measured concentration values
3	Range	Display of range values
4	Unit	Indication of ppm, vol%, mg/m3 (*1)
5	Range switching mode	Indication of how to switch between Range 1 and Range 2
6	Peak alarm component display (*2)	CO Peak Alarm Component Indication
7	Peak Alarm Count (*2)	Indication of the number of times the peak value was exceeded
8	Peak Alarm Unit Display (*2)	Peak alarm unit display

*1: For NO, SO_2, and CO components, if each measuring range is specified in ppm and the option "/U" (Unit change) is selected, the units are displayed in mass units (mg/m3 or g/m3). However, if the calibration gas concentration is specified in ppm, the calibration gas concentration on the calibration-related screen will be displayed in both ppm and mass units.

*2: Peak alarm-related displays are only shown when the Peak Alarm option (/A) is specified and the function is ON. (See 5.1.7 Peak alarm setting" for the function settings.

CAUTION

The IR810S does not have a clock battery. The clock is reset when the power is turned on and an unset clock warning dialog appears. See (6) Unset Clock Warning Dialog.

- Instantaneous concentration value: gas component such as “CO_2”, “CO”, “O_2” indicate what gas component is currently being measured and each corresponding instantaneous concentration value
- O_2 correction concentration values: Channels (Ch) with “cv” indicate O_2 correction concentration value of each designated gas component. The O_2 correction concentration value is calculated from the following equation, based on which sampling component is measured, what is the O_2 instantaneous concentration value, and O_2 correction reference value. (see (1) O_2 correction settings in 5.2.6 Other settings with the following formula.)

$$\text{Correction formula: } C = \frac{21 - On}{21 - Os} \times Cs$$

Where

C: Sample gas concentration after O_2 correction

On: Reference O_2 concentration (Value set by application)

Os: Oxygen concentration in exhaust gas (%)

Cs: Concentration of target gas in exhaust gas

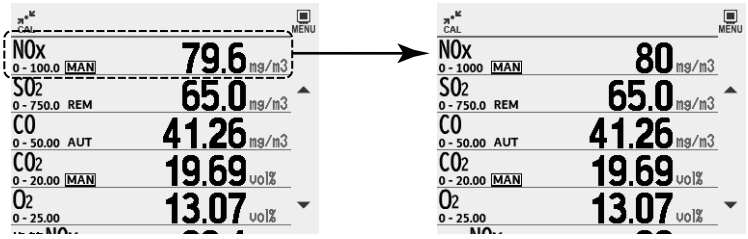
However, Os does not take a value higher than the oxygen concentration limit setting. The upper limit for the fractional part is 4.

Only NO, SO_2, and CO can be converted.

- O_2 correction concentration average value: Ch (component) and O_2 averages indicated as “Converted ** average” in the component display, such as “Converted CO average”, are the O_2-converted concentration value or O_2 concentration value of the component to be measured, taken once every 30 seconds, and the O_2 average is the average of the O_2-converted concentration value or O_2 concentration value of the component to be measured, taken once every 30 seconds. The O_2-converted average value is averaged over a certain period of time (30 second average of the data acquired once every 30 seconds for 500 ms).
  The average time can be set to a variable value from 1 to 59 minutes or from 1 to 4 hours (the set time is displayed on the range display as “1h” or similar) using the average time setting (see Section 5.2.1 “Channel Settings”).

  (NOTE) The measurement range of the O_2-converted concentration value and the O_2-converted average value is the same as that of the component to be measured. The measurement range of the O_2 average is the same as the measurement range of O_2.

- Range switching There are three range-switching modes: MAN (manual), REM (remote), and AUT (automatic). in MAN (manual) mode, the range can be switched by touching the component display area. See 5.2.1 Channel settings for setting the range switching mode.



In the confirmation dialog that appears after touching, select “Yes” to switch.

Figure 4.4

- CO Peak Count dialog:

  The “Peak Counts” dialog allows you to view the current peak counts and alarm settings (concentration). In this dialog, the current peak count and alarm settings (concentration value and frequency) can be viewed. You can also clear the peak counts by pressing the Reset button.

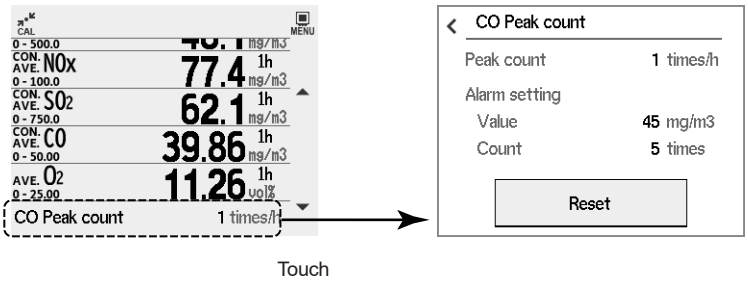


Figure 4.5

● Display items

Peak Counts How many times the alarm concentration value exceeded the threshold value in one hour.

Alarm Setting

Concentration value One count for each concentration value exceeded

Count Number of times to generate a peak count alarm

● Reset Button

Pressing the Reset button displays a confirmation dialog box, and selecting “Yes” clears the current peak count.

(2) Settings and selection screens

Figure 4.6 shows the configuration of each setting and selection screen.

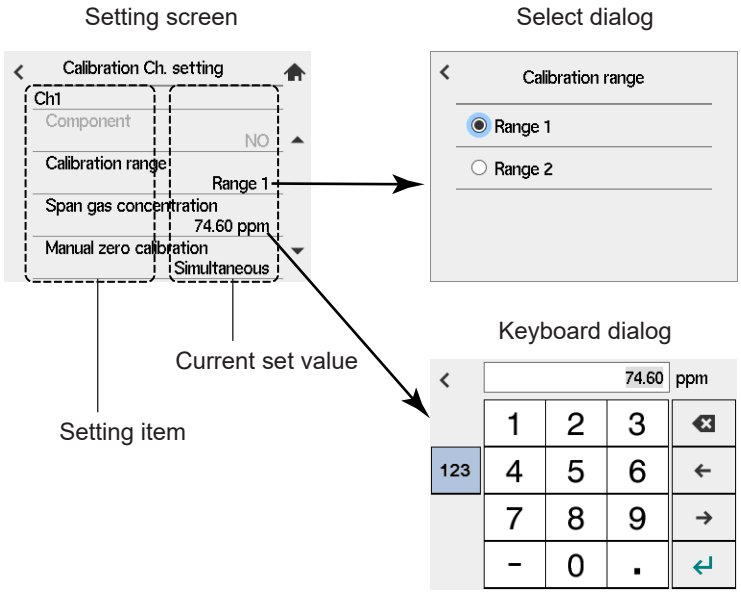
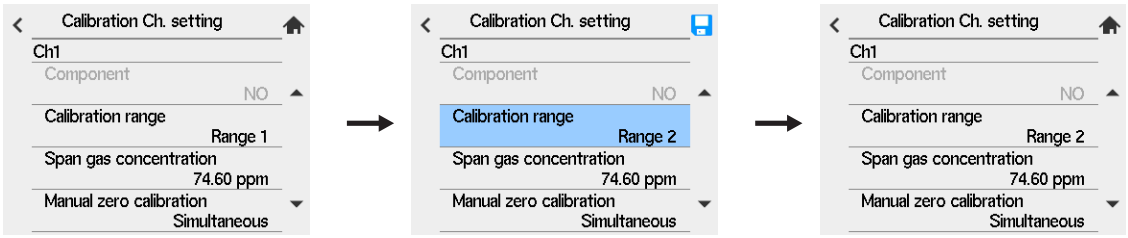


Figure 4.6

- The upper left string in each line is the name of the setting item and the lower right string is the current setting value. Press ▲ ▼ icon to move and touch each item to change the setting value. (The text of the setting items that cannot be changed are grayed out.
- When each item is touched, a choice dialog appears if the set value is a choice, or a keyboard dialog appears if the set value is a number.

- When a setting value is changed, the background of the changed item is displayed in blue and the home icon changes to a save icon. By touching the save icon, the save icon changes to the home icon to confirm the change.



Calibration range changed from “Range 1” to “Range 2

Touch the save icon to confirm the change.

Figure 4.7

(3)Ch (channel) measurement value correspondence table

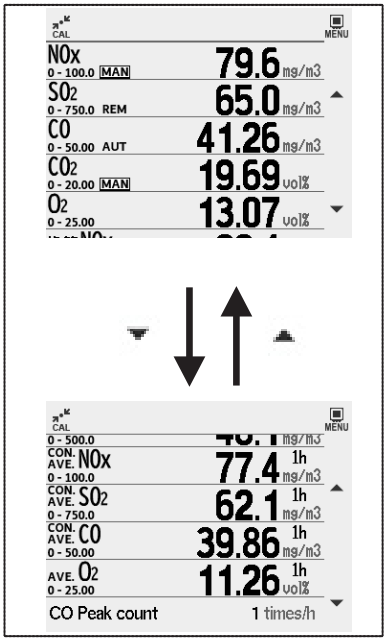
See Table 3.5

(4)Basic Operations

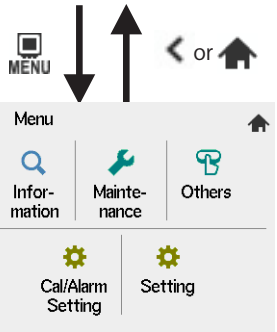
Measurement screen

Measurement screen displays up to 5 Channels per screen.

Push the ▼ ▲ icon to scroll the screen by 3 Channels if the number of displayed Channels goes beyond this number.



CAL 5.4 Calibration and Validation



Menu

Information

Maintenance

Others

Cal/Alarm Setting

Setting

Figure 4.8

See 4.5 General operation of display/operation panel 4.4 Display/operation panel flow chartabout what is displayed when you touch each item.

(5)Alarms

Problems with the equipment will trigger an alarm. There are two types of alarms, Fault or Warning. When multiple alarms occur, the highest priority alarm is displayed at the top of the screen (representative alarm).

Severity Priority >

For some alarms, a text icon indicating the contents of the alarm is displayed in a region for each channel (individual alarms).

Individual alarm	Character Icons
Zero calibration alarm Span calibration alarm Automatic calibration alarm Calibration Stability Alarm Zero Calibration Caution Span Calibration Caution	CAL
Zero-validation alarm Span Validation Alarm	VAL
High high limit alarm	LL
High limit alarm	H
Low limit alarm	L
Low low limit alarm	LL

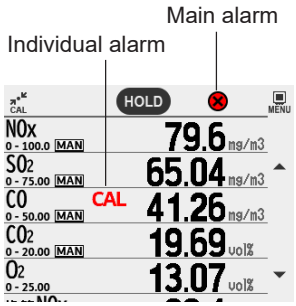


Figure 4.9

See 7.1Alarms for the types of alarms displayed and their contents

Screen operation when an alarm occurs

The screen operation in the event of an alarm is shown below. See 7.1 Alarms for details.

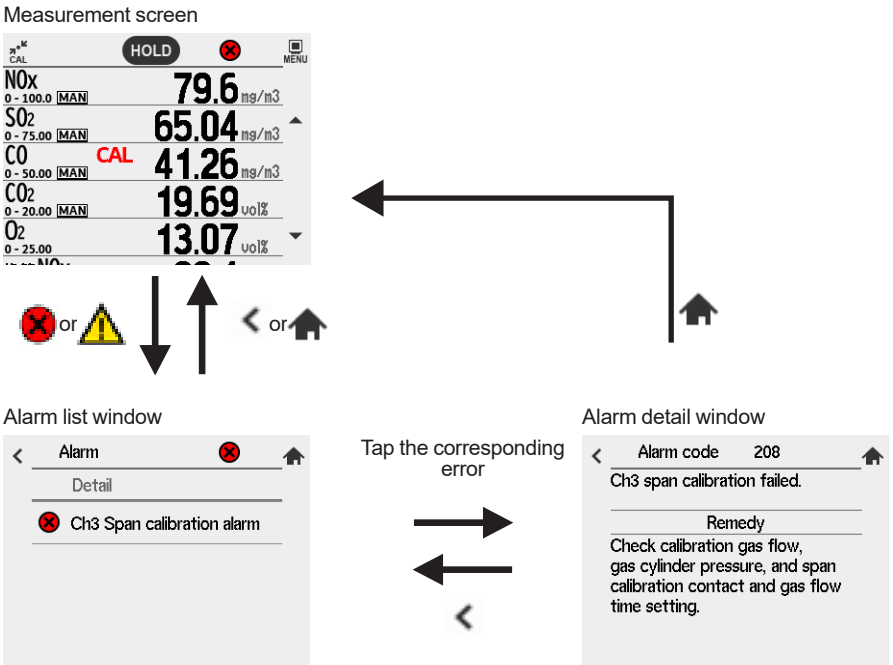


Figure 4.10

(6)Unset Clock Warning Dialog

The IR810S does not have a clock battery. The clock is reset when the power is turned on. An unset clock warning dialog appears.

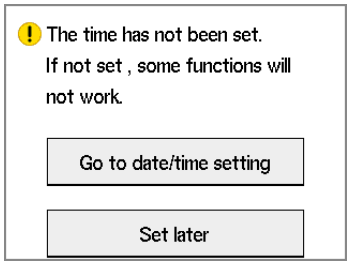


Figure 4.11 Unset Clock Warning

Press “Go to date/time setting “ to move to the Date/Time Setting Screen, where you can set the date and time. For details on the date/time setting screen, see 5.3.2 Date/Time Setting
Press “Set later” to clear the dialog box and display the measurement screen. You can use the instrument without setting the clock, but in that case, the automatic processing of the following functions will not work.

- Auto calibration
- Auto zero calibration
- Auto validation
- Blowback

5. SCREENS

5.1 Calibration/Alarm setting

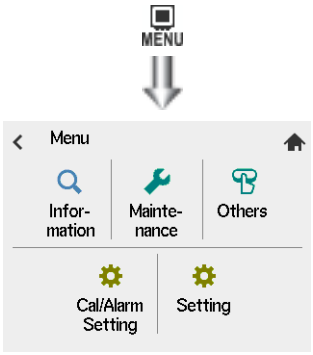
5.1.1 Calibration channel setting

The Calibration Channel setting is used to set the calibration range, span gas concentration, and operation. There are four items to be set: Calibration Range, Span Gas Concentration, Manual Zero Calibration, and Auto Calibration/Auto Zero Calibration.

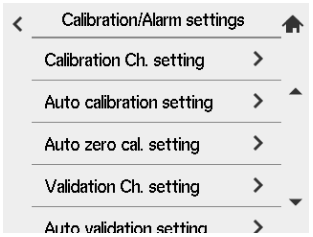
(1) On Main screen, touch MENU to go to the Menu.

Menu is displayed.

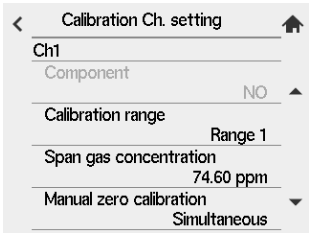
(2) Touch [Cal/Alarm Setting]
Calibration/Alarm setting is displayed.



(3) Touch [Calibration Ch. setting]
For each channel, the component (text is displayed in gray and cannot be changed), calibration range, span gas concentration, manual zero calibration, and Auto Calibration/Auto Zero Calibration items and their set values are displayed.



(4) Touch each item to set.



- **Items to set**

Calibration Range	Setting the range to be calibrated during calibration
Span gas concentration	Set the span gas concentration to be used during calibration
Manual Zero Calibration	Setting whether to calibrate other measurement components at the same time or individually during manual zero calibration
Auto Calibration/Auto Zero Calibration	Ch (component) setting for automatic calibration/auto zero calibration

Calibration range setting

Touch the Calibration Range item to select the range (Range 1 or Range 2) to be used for calibration from the selection dialog that appears.

During calibration, it automatically switches to this set range and returns to the original range at the end of calibration.

The range identification contact is linked to the range at the time of switching, but if the hold setting is set to "ON", the contact state is held in the state before calibration

Set span gas concentration

Set the span gas concentration in the keyboard dialog that appears by touching the Span Gas Concentration item.

CAUTION

- Enter the setpoint corresponding to the calibration range. If an external oxygen analyzer is used for the oxygen analyzer, set the external oxygen analyzer itself according to the instructions for use of the external oxygen analyzer
- If an external oxygen analyzer is subject to automatic validation, refer to the span gas concentration set in the external oxygen analyzer and set the value. Used as a judgment value during validation
- Even if the unit display of Ch (component) is "mg/m^3" or "g/m^3", the unit for span gas concentration setting is set in "ppm".

Numeric setting rang

NOx, SO_2, CO_2, CO and built-in magnetic oxygen analyzer

Span gas concentration	0 to 105% FS (Full scale (FS) is the upper range value.) Values outside the above range cannot be set.

Manual Zero Calibration Setting

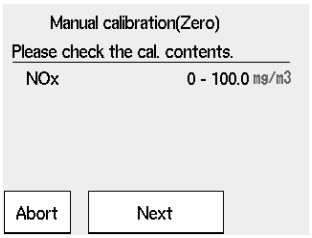
Sets whether manual zero calibration is performed simultaneously with other measurement components or individually. From the selection dialog that appears by touching the Manual Zero Calibration item, select the action (individual or simultaneous) to be taken during manual zero calibration.

- Zero calibration is performed for each Ch (component) when "Individual" is selected.
- When set to "Simultaneous", all Ch (components) set to "Simultaneous" are zero-calibrated at the same time.

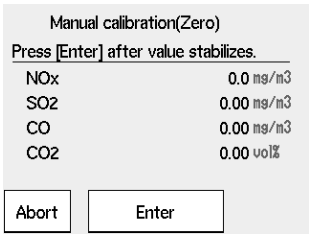
* Set "Simultaneous" if a standard gas cylinder or atmosphere is used as zero gas.

Manual calibration (Zero)

- When a Ch (component) with "Individual" set on the Calibration Execution screen is selected, manual zero calibration is performed only on the selected Ch (component).



- When a Ch (component) set to "Simultaneous" is selected on the Calibration Execution screen, manual zero calibration is performed simultaneously on all Ch (components) set to "Simultaneous".



● Auto calibration/Auto zero calibration setting

Set the Ch (component) for automatic/auto zero calibration. From the selection dialog that appears by touching the Auto Calibration/Auto Zero Calibration item, select whether the Ch (component) to be set is subject to automatic calibration or auto zero calibration (enable/disable).

Operation by setting

Automatic/ Simplified Zero Calibration setting will perform automatic calibration as follows.

1. When zero calibration is performed by automatic calibration or auto zero calibration, Ch (component) set to "Enable" is zero calibrated at the same time. (Excluding zero calibration of external oxygen analyzer.)
2. Span calibration is performed sequentially in the order of the youngest Ch (component) for which span calibration is set to "Enable" during auto-calibration. (The external oxygen analyzer will perform auto-calibration according to the external oxygen analyzer's auto-calibration setting after span calibration of all other components has been performed.)

NOTE

Zero calibration at the time of automatic calibration and auto zero calibration of the component set to "Enable" is performed at once regardless of "● Manual Zero Calibration Setting" in "5.1.1 Calibration channel setting".

5.1.2 Auto Calibration Setting

IR810S automatically calibrates the zero and span points at set times.

(1) Tap MENU on the Home/Main screen > Menu

(2) Tap [Cal/Alarm Setting] > Cal/Alarm setting

(3) Tap [Auto calibration setting] > Auto calibration setting

(4) Tap each item to set.

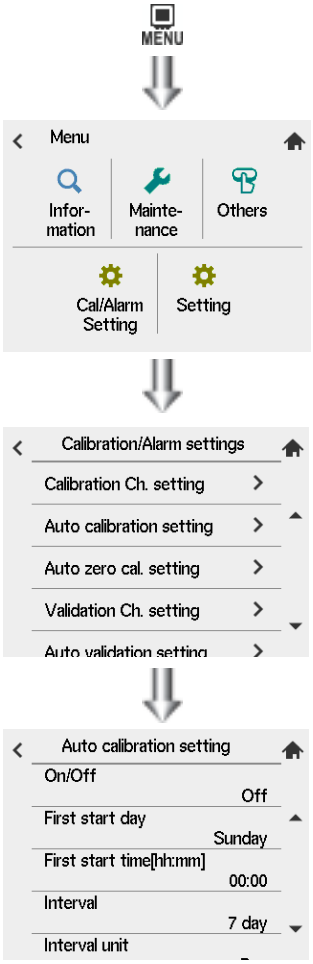


Figure 5.1

Items to set

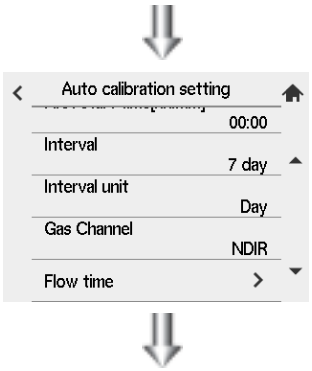
On/Off	On/Off setting of the automatic calibration
First start day	Set the starting day of the week for the first calibration
First start time [hhmm]	Set what time and minute to start the first calibration
Interval	The time interval between the last calibration and the next one.
Interval unit	Set the unit of cycle (hours/day)
Gas Channel	Gas flow path (analyzer/sampling system) setting for automatic calibration (gas flow path for manual calibration also follows this setting)
Flow time	Time to replace with calibration gas and time to replace sample gas after calibration is completed (set for each calibration gas; see "Gas flow time setting".

CAUTION

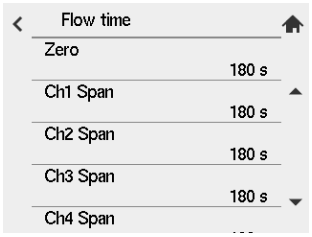
- To execute auto-calibration, assign "Chx for span calibration" of the target channel to the contact output. ("x" is the channel number of the target channel. For more information on contact output, refer to "5.2.4 Contact output setting"
- When the gas flow channel is set to "Analyzer", assign "For Sample Switching" to the contact output, and when the gas flow channel is set to "Sampling system", assign "System Calibration" to the contact output.
- If the gas flow channel setting is changed, watch out for excess or deficient flow time setting.
- Even during manual calibration, the system operates according to the gas flow channel and displacement time set here
- For the operation of the contact output resulting from different gas flow channels, refer to "5.4.1 Manual Zero Calibration", "5.4.2 Manual span calibration" and "5.4.3 Automatic calibration".
- If an external oxygen analyzer and its channel is the target channel, set the following.
- Assign "Chx for span calibration" to the contact output for calibration indication.
- Assign "O_2 analyzer input" to the contact input to receive calibration completion. (See "5.2.5 Contact input setting" for more information on contact inputs.
- The replacement time to wait for the switchover from the calibration gas to the measurement gas is set by the product, so set the replacement time of the external oxygen analyzer (named "stability time" in the ZR802S) to 0 minutes and 0 seconds. The displacement time of the external oxygen analyzer (named "stability time" in the ZR802S) should be set to 0 minutes and 0 seconds.

Gas flow time setting

(1) On Auto calibration setting screen, tap ▼ to scroll down and tap [Flow time]. Flow time setting screen is displayed.



(2) Tap ▲ ▼ to display the item to set. Tap the item to set. A keyboard dialog appears
Enter a numerical value.



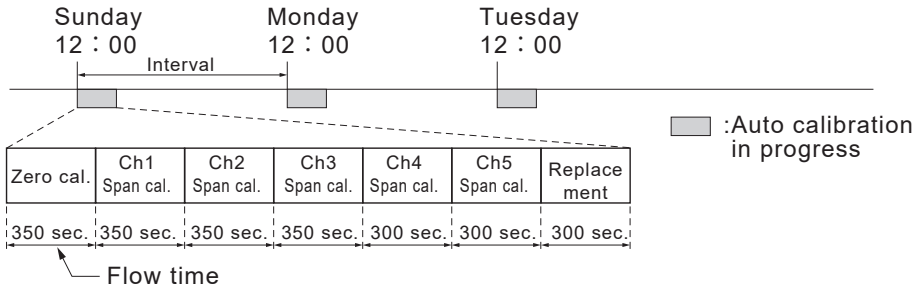
CAUTION

- The flow time setting screen will only display the currently used Ch.
- The replacement time is the extended time to hold the output signal after the calibration is completed. It is extended only when the hold setting is On. The replacement time set here is also the hold extension time during manual calibration.
- Flow time setting should be long enough to allow the concentration value to stabilize.
- When a mixed gas containing multiple components is used as the calibration gas, the flow time setting can be set to 5 seconds, the shortest possible time, because the continuous calibration of those components eliminates the need for a second and subsequent flow time setting. (The assignment of components to Ch is fixed and cannot be changed.)

Example of the setting

On/Off		On
First start day		Sunday
First start time		12:00
Interval		1
Interval unit		day
Flow time	Zero	350 sec.
	Ch1 span	350 sec.
	Ch2 span	350 sec.
	Ch3 span	350 sec.
	Ch4 span	300 sec.
	Ch5 span	300 sec.
	Replacement	300 sec.

When auto-calibration is performed with the above settings:



(This is an example when Ch1 to Ch5 are set to "Enable" in "IManual Zero Calibration Setting" of "5.1.1 Calibration channel setting". and the oxygen analyzer is a built-in oxygen analyzer.)

Figure 5.2

Setting range

Interval	1 to 99 hours or 1 to 40 days (default 7 days)
Flow time (zero gas, replacement time)	60 to 900 seconds (default 180 seconds)
Flow time (each span gas)	5 to 900 seconds (default: 180 seconds)

CAUTION

- When auto-calibration starts, the measurement screen is automatically displayed.
- After the power is turned off (including power failure, etc.) and then turned on again, the next automatic calibration is performed at the time set for the start time, and then at intervals of cycles.
- Regardless of whether auto-calibration is On or Off, auto-calibration can be performed from the screen or by remote start.

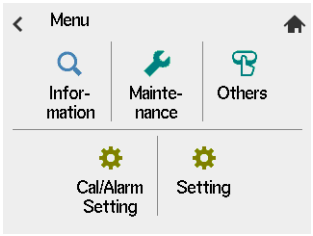
5.1.3 Auto zero calibration setting

Automatically performs zero point calibration at a set time.

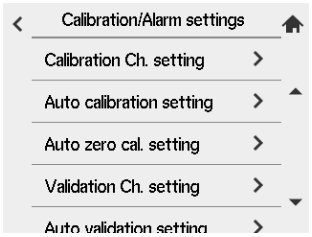
The component to be calibrated is determined by "● Automatic/Auto Zero Calibration Setting" in "5.1.1 Calibration channel setting".

(1) Tap MENU on the Home/Main screen > Menu

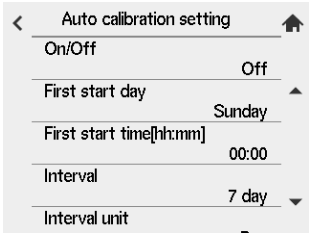
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



(3) Tap [Auto zero cal.setting] > Auto zero calibration setting



(4) Tap each item to set.



● Items to set

On/Off	On/Off setting of the automatic zero calibration
First start day	Set the starting day of the week for the first calibration
First start time [hhmm]	Set what time and minute to start the first calibration
Interval	The time interval between the last calibration and the next one.
Interval unit	Set the unit of cycle (hours/day)
Gas Channel	Gas flow channel (analyzer/sampling system) setting for automatic zero calibration
Flow time	Time to replace with calibration gas and time to replace sample gas after calibration is completed

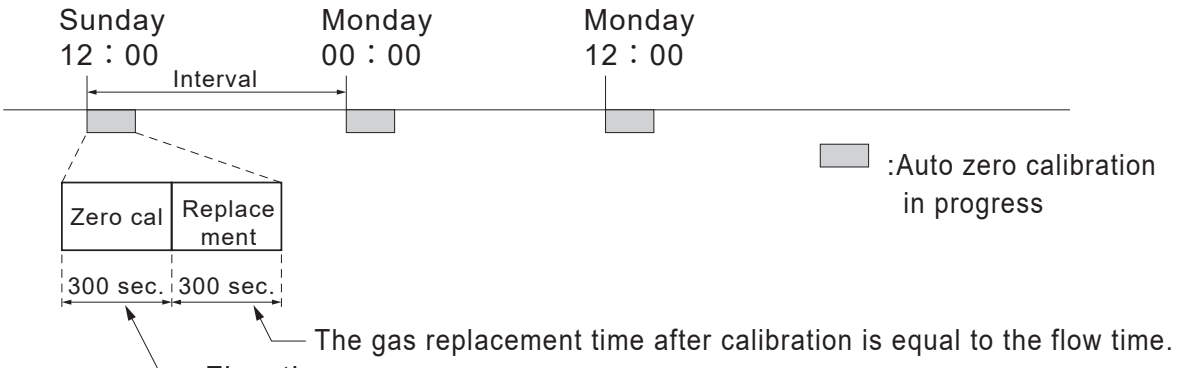
CAUTION

- When the Gas Channel setting is set to "Analyzer", assign "Sample Switching" to the contact output, and when the gas flow channel setting is set to "Sampling system", assign "System Calibration" to the contact output. (See "5.2.4 Contact output setting" for more information on contact outputs.
- If the gas flow channel setting is changed, make sure that the flow time setting is appropriate so that there is no excess or deficiency in flow time.
- For the operation of the contact output due to different gas flow channels, refer to "5.4.4 Auto Zero Calibration".
- Flow Time should be set to sufficient time for the concentration value to stabilize.

Setting example

On/Off		On
First start day		Sunday
First start time		12:00
Interval		12
Interval unit		hour
Flow time	zero	300 sec.

When auto zero calibration is performed with the above settings:



(The components set to "Enable" (Ch1 to Ch5) in "l Manual Zero Calibration Setting" of "5.1.1 Calibration channel setting" will be zero-calibrated all at once.)

Figure 5.3

Setting range

Interval 1 to 99 hours or 1 to 40 days (default 7 days)

Flow time 60 to 900 seconds (default 180 seconds)

CAUTION

- When auto zero calibration starts, the measurement screen is automatically displayed
- If the cycles of auto calibration and auto zero calibration overlap, priority is given to auto calibration, and auto zero calibration is ignored for that cycle.
- For the gas replacement time after calibration, the hold of the contact and measured value output signal for which automatic calibration is set is extended only when the hold setting is "ON".
- After the power is turned off (including power failure, etc.) and then turned on again, the next automatic calibration is performed at the time set for the start time, and then at intervals of cycles.
- Regardless of whether auto zero calibration is ON or OFF, auto zero calibration can be performed from the screen or by remote start.

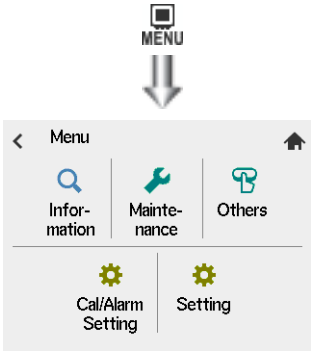
5.1.4 Validation channel setting

Set the range and behavior of alarms during automatic validation. There are two items to set: validation alarm range and automatic validation

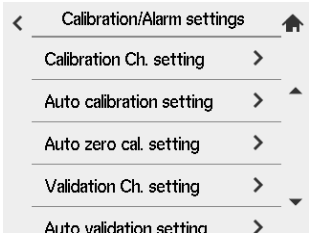
This setting screen is displayed only when the code "-V" in the Automatic Validation is specified.

(1) Tap MENU on the Home/Main screen > Menu

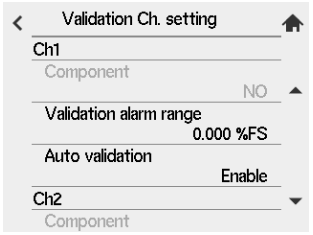
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



(3) Tap [Validation Ch.setting].
For each channel, the components (the text is displayed in gray and cannot be changed), the validation alarm range, and the auto validation items and their set values are displayed.

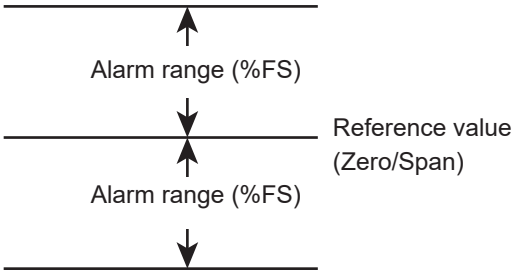


(4) Tap each item to set.



● Setting Validation Alarm Ranges

During automatic validation, you can check the validity of the measurement and whether calibration is necessary or unnecessary by confirming that the difference between the flowing calibration gas (zero/span) and the actual measured value is within the validation alarm range. Touch the Validation Alarm Range item and enter a value in the keyboard dialog that appears. During the automatic validation, if the measured value exceeds this validation alarm range, a validation alarm is triggered.



● Setting Auto Validation

Ch (component) settings for automatic verification. First, touch the "Automatic Validation" item. In the selection dialog that appears, select the automatic validation (enable/disable) for the target Ch (component).

CAUTION

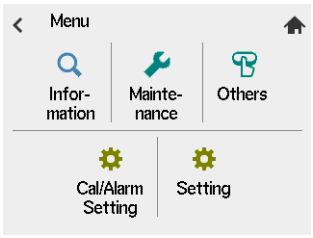
- If you have made the external oxygen analyzer subject to automatic validation, refer to the calibration settings of the external oxygen analyzer and set the calibration span concentration. That value will be used as the reference value for alarm determination. (Refer to "5.1.1 Calibration channel setting" for details on setting the calibration span concentration.)
- Validation of the external oxygen analyzer is performed during zero validation. Since the solenoid valve operation of the oxygen component is not performed from this product, span validation is not performed.

5.1.5 Setting Automatic Validation

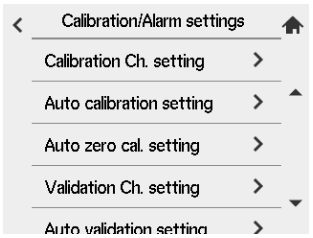
Zero and span point validation is automatically performed at a set time. This setting screen is displayed only when the code "-V" in the Automatic Validation is specified.

(1) Tap MENU on the Home/Main screen > Menu

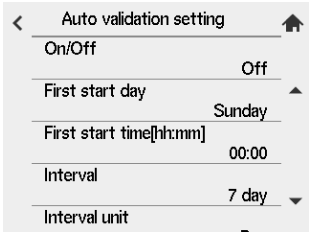
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



(3) Tap [Auto validation setting].



(4) Tap each item to set.



Items to set

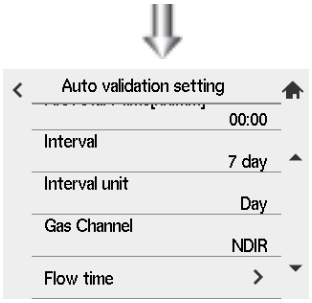
On/Off	On/Off setting of the automatic validation
First start day	Set the starting day of the week for the first validation
First start time [hhmm]	Set what time and minute to start the first validation
Interval	The time interval between the last calibration and the next one.
Interval unit	Set the unit of cycle (hours/day)
Gas Channel	Gas flow channel (analyzer/sampling system) setting for automatic validation
Flow time	Time to replace with calibration gas and time to replace sample gas after validation is completed. (Set for each calibration gas; see "Gas flow time setting".

CAUTION

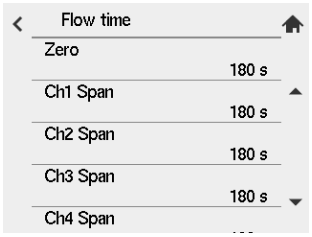
- To perform automatic validation, assign "Ch 0 for span calibration" of the target channel to the contact output. ("Ch 0" is the channel number of the target channel. For more information on contact outputs, see "5.2.4 Contact output setting"
- When the gas flow channel is set to "Analyzer", assign "For Sample Switching" to the contact output, and when the gas flow channel is set to "Sampling system", assign "System Validation" to the contact output.
- If the gas flow channel setting is changed, be careful not to exceed or shortchange the flow time setting.
- See "5.4.5 Automatic Validation" for the operation of the contact outputs for different gas flow channels.

Gas flow time setting

1 Tap the ▼ on the Automatic validation setting screen, scroll down, and touch "Flow time". The flow time setting screen will appear.



2 Touch the ▲ ▼ on the flow time setting screen to display the gas for which you want to change the setting, and then touch the item.
A keyboard dialog appears.
Please enter a numerical value.



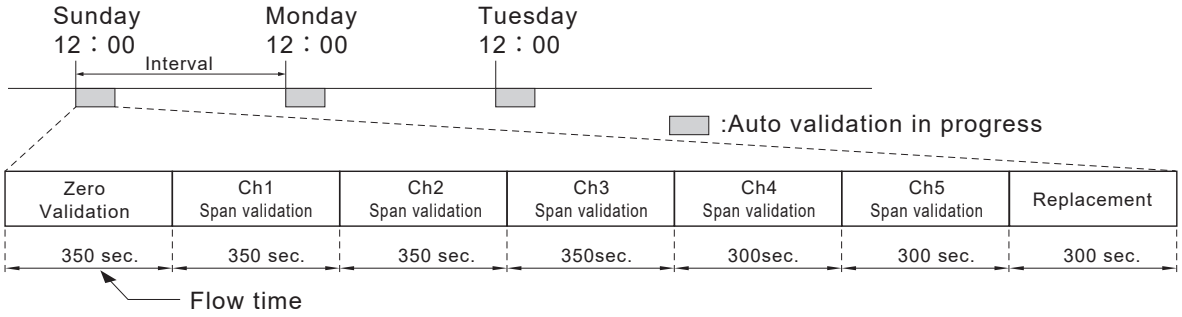
CAUTION

- The flow time setting screen will only display the currently used Ch.
- The replacement time is the output signal hold extension time after the end of validation. (This is valid only for the hold setting.)
- Flow time setting should be long enough to allow the concentration value to stabilize
- When a mixed gas containing multiple components is used as the calibration gas, the flow time setting can be set to the shortest possible time of 5 seconds, since the second and subsequent flow times are not needed by validating those components in succession. (The assignment of components to Ch is fixed and cannot be changed.)

Example

On/Off		On
First start day		Sun.
First start time		12:00
Interval		1
Interval unit		day
Flow time	zero	350 sec.
	Ch1 span	350 sec.
	Ch2 span	350 sec.
	Ch3 span	350 sec.
	Ch4 span	300 sec.
	Ch5 span	300 sec.
	Replacement	300 sec.

When automatic validation is performed with the above settings:



(This is an example when Ch1 to Ch5 are set to "Enable" in "5.1.5 Setting Automatic Validation" and the oxygen analyzer is a built-in oxygen analyzer.)

Figure 5.4

Setting range

Interval	1 to 99 hours or 1 to 40 days (default 7 days)
Flow time (zero, replacement time)	60 to 900 seconds (default 180 seconds)
Flow time (each span gas)	5 to 900 seconds (default 180 seconds)

CAUTION

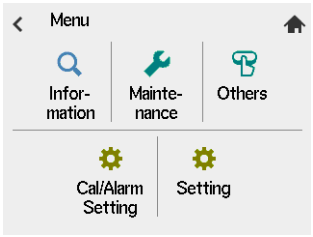
- When automatic validation starts, the measurement screen is automatically displayed.
- After the power is turned off (including power failure, etc.) and then turned on again, the next automatic validation is executed at the time set for the start time, and then at intervals of cycles.
- Regardless of whether automatic validation is On or Off, it can be performed from the screen or by remote start.

5.1.6 Alarm setting

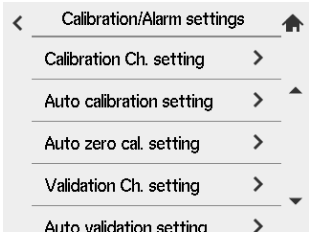
Set to generate upper and lower limit alarms for measured concentrations during measurement. To output the set alarm externally, assign the alarm set here to any contact output. (For details on contact output settings, see "5.2.4 Contact output setting")

(1) Tap MENU on the Home/Main screen > Menu

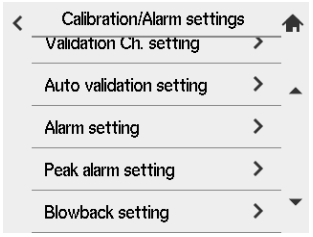
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



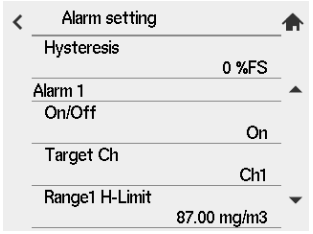
(3) Tap ▼ to go to Alarm setting



(4) Tap [Alarm setting].
Alarm setting will be displayed.



(5) Tap each item to set.



Items to set

Hysteresis Function to prevent chattering of alarms near alarm setpoints. Common to all alarms.

Set the following items for each alarm (1~6)

On/Off	On" to enable the alarm function, "Off" to disable it.
Target Ch	Set the channel for the alarm. The same Ch. No. can be set for multiple alarms.
H-Limit	Set the upper limit (concentration) of the alarm
L-Limit	Set the lower limit (concentration) of the alarm
Contact	Select from 5 options: upper limit, lower limit, upper or lower limit, upper or lower limit, lower or upper limit, lower or lower limit

H-limit, HH-limit; Alarm ON only when the value exceeds the H-limit value.

L-Limit, LL-Limit; Alarm ON only when the value falls below the LL-Limit value.

H-Limit or L-Limit; Alarm ON when the value is above the H-Limit or below the L-Limit.

NOTE

- Set the value so that H-Limit > L-Limit. In addition, set the value so that (H-Limit value - L-Limit value) > hysteresis width. If you want to set the H-Limits below the already set L-Limit, lower the L-Limit at first, and then set the H-Limit. Do the equivalent for the L-Limit value.
- In error checking during setup, the judgment as to whether H-Limit/L-Limit is within the range of the range is made when On/Off is On and the range is valid. (Range 2 is enabled when the number of ranges is 2 in the Range setting. For more information on range setting, see "5.2.1 Channel settings" for more information on range settings)

Setting range

Hysteresis: 0 to 20% FS

H-Limit/L-Limit: 0 to 100% FS (Settable for each range)

FS (Full Scale) is the ratio of the range width of each component to 100%.

Hysteresis behavior (for upper limit alarms)

As shown in the figure below, the alarm turns "ON" when the H-Limit value is exceeded. After the alarm turns "ON", it turns "OFF" when the value falls below the hysteresis width preset from the H-Limit value.

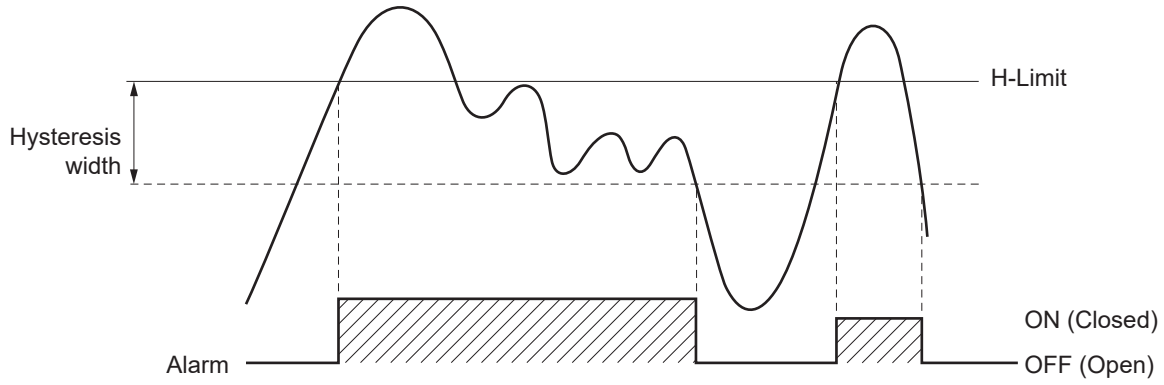


Figure 5.5

● Example of screen when alarm occurs

When an upper limit alarm occurs, the **H** icon lights up on Ch (component).
(In the case of a L-Limit alarm **L** , HH-Limit : **HH** , LL-Limit: **LL** are displayed.)

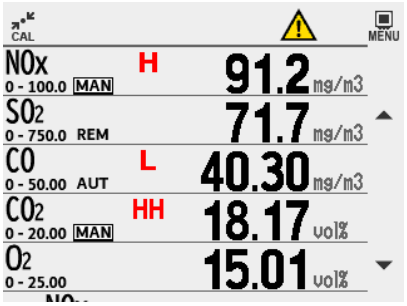


Figure 5.6

NOTE

No alarm judgment is made for 10 minutes after power-on.

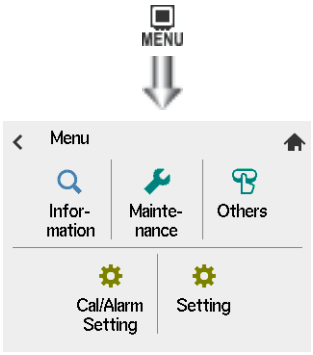
5.1.7 Peak alarm setting

During measurement, the peak count alarm turns ON when the number of peaks exceeding the upper limit of CO measurement concentration exceeds the set number of times. To output the peak count alarm externally, assign the peak count alarm to any contact output. (For details on contact output settings, see "5.2.4 Contact output setting".)

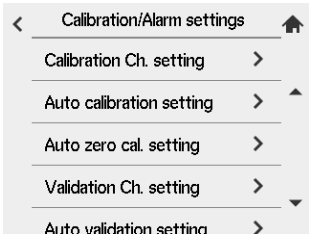
This setting screen is displayed only when the option (/A) for peak alarm is specified.

(1) Tap MENU on the Home/Main screen > Menu

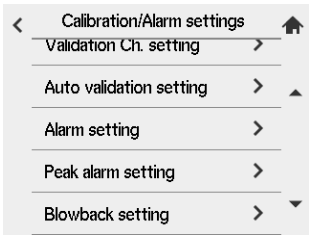
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



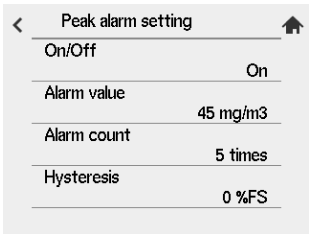
(3) Tap ▼ to go to Peak alarm setting



(4) Tap [Peak alarm setting]



(5) Tap each item to set.



Items to set

On/Off	"On" to enable the peak alarm function, "Off" to disable it.
Alarm value	Counts once when the preset value is exceeded
Alarm count	The alarm occurs when the number of peaks exceeds the preset number of times
Hysteresis	Prevents chattering. Even after the Alarm value (peak concentration) has been exceeded once, it will not be counted as if the Alarm value is exceeded again unless it falls below a certain width: Alarm value (peak concentration value) minus Hysteresis width.

Setting range

Alarm value: 1 to 1000 ppm (default 500 ppm)

Alarm count: 1 to 99 times (default 5 times)

Hysteresis: 0 to 20% FS (default 0% FS)

% FS is the ratio of the upper range of CO to 100%.

Example of Peak Alarm Operation

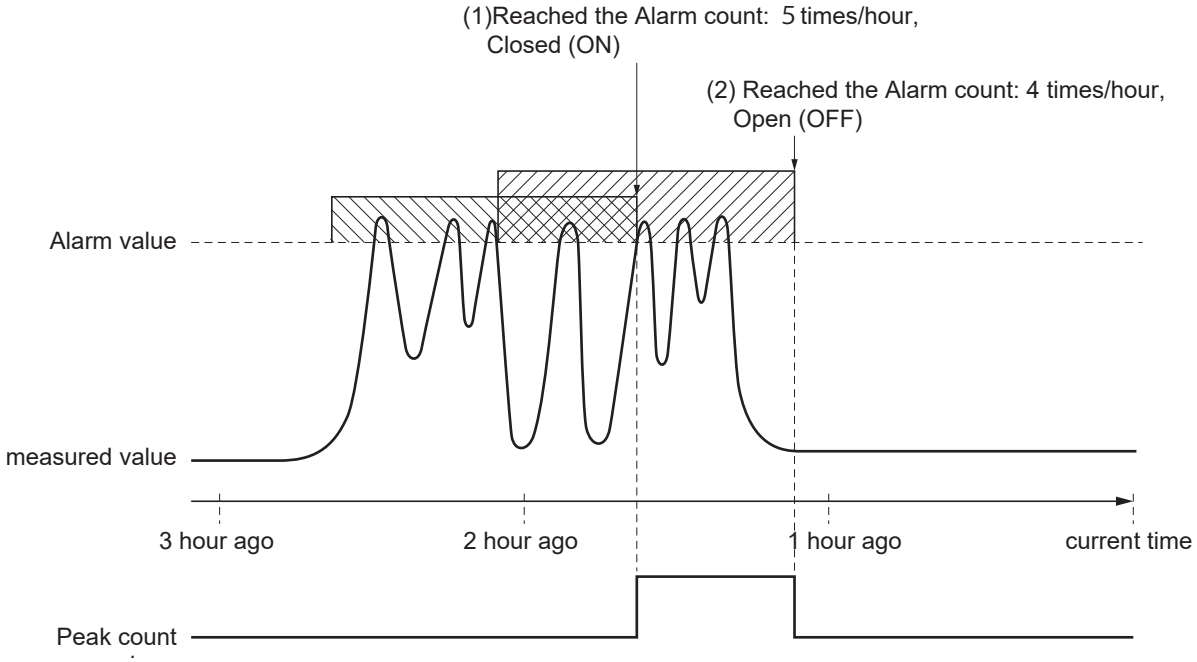


Figure 5.7

Counts up when the CO instantaneous value exceeds the peak concentration. If that peak count appears more than the set number of times per hour, the peak count alarm is turned "ON". When the number of peaks is less than the set number of times per hour, the alarm is turned "OFF".

In the above figure, the peak count alarm is turned "ON" in the ▨ because 5 peaks appeared in 1 hour. The time from (1) to(2) ▨ remains "ON" because the peak occurs more than 5 times per hour. The peak count alarm is turned "OFF" when 4 times per hour at (2). The hysteresis operation is similar to the hysteresis of the alarm setting and prevents chattering when the gas to be measured is unstable near the peak concentration.

* Peak counting is not performed for 10 minutes after power-on.

Forced cancellation of peak count alarms

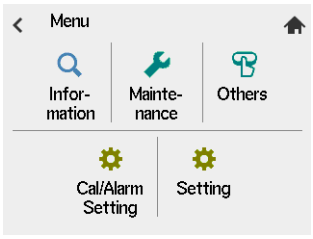
To forcibly cancel the peak count alarm, either display the CO Peak Count dialog from the measurement screen and press the Reset button to set the peak count to 0 (see "4.5 General operation of display/operation panel"), or turn the peak alarm setting to OFF". When the peak alarm is turned "ON", the peak count will start from zero.

5.1.8 Blowback setting

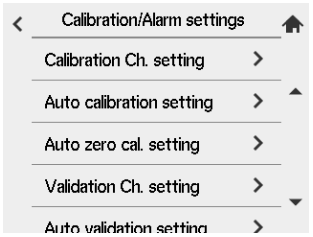
Setup for blowback.

(1) Tap MENU on the Home/Main screen > Menu

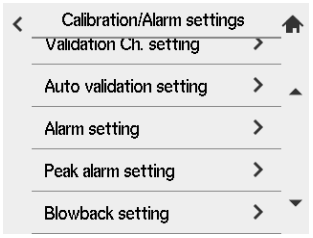
(2) Tap [Cal/Alarm Setting] > Cal/Alarm settings



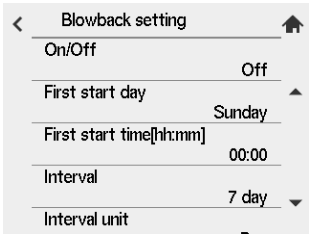
(3) Tap ▼ to go to Blowback setting.



(4) Tap [Blowback setting].



(5) Tap each item to set



● Items to set

On/Off	On/Off setting of the blowback	
First start day	Set the starting day of the week for the first blowback.	
First start time [hhmm]	Set what time and minute to start the first blowback.	
Interval	The time interval between the last blowback and the next one.	
Interval unit	Set the unit of cycle (hours/day).	
Gas Channel	Gas flow channel (analyzer/sampling system) setting for automatic validation	
Set time	Blowback time [min]:	time for blowback (minute)
	Blowback time [sec]:	time for blowback (second)
	Replacement time:	sample gas replacement time after blowback completion

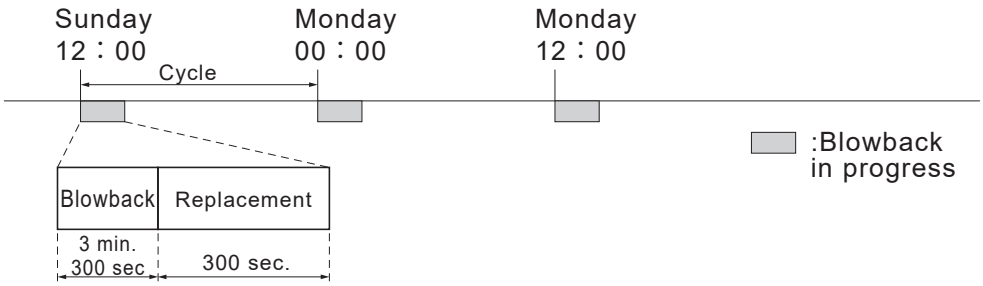
CAUTION

To perform blowback, assign "Blowback" to the contact output. For more information on contact outputs, see "5.2.4 Contact output setting"

Example

On/Off	On
First start day	Sun.
First start time	12:00
Interval	12
Interval unit	hour
Blowback time [min]	3
Blowback time [sec]	20
Replacement	300 sec.

When blowback is performed with the above settings:



Setting range

Interval: 1 to 99 hours, or 1 to 40 days (default 7 days)

Blowback time [min]: 0 to 15 minutes (default 10 minutes)

Hysteresis: 60 to 900 seconds (default 180 seconds)

CAUTION

- After the power is turned off (including power failure, etc.) and then turned on again, the next automatic validation is executed at the time set for the start time, and then at intervals of cycles.
- Regardless of whether the Blowback is On or Off, the Blowback can be performed from the screen or by remote start.

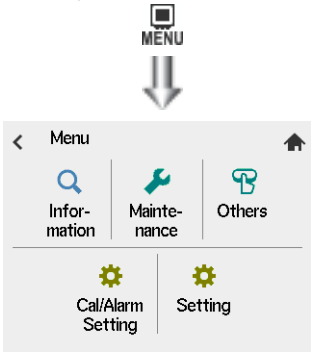
5.2 Settings

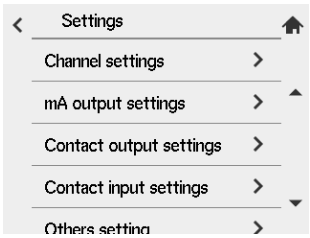
5.2.1 Channel settings

In the Channel settings, settings related to the range of each Ch (component) are made.

(1) Tap MENU on the Home/Main screen > Menu

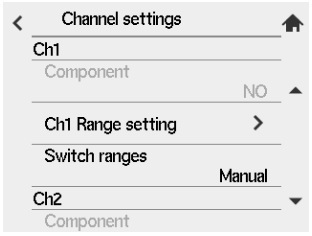
(2) Tap [Setting] > Settings



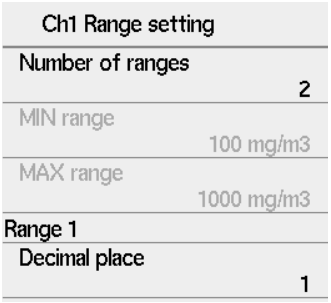


(3) Tap [Channel setting]

(4) Tap each item to set.



When you touch "Ch1 Range Setting", the screen shown on the right is displayed.



- **Items to set**

Component Channel component, you cannot change.

Chx range setting Set the number of ranges, the upper limit, and the number of decimal places for Range 1, and the upper limit and the number of decimal places for Range 2 for each channel. (When the option "/U" is specified and the upper range is 10000 mg/m^3 or more for NO (NOx), SO_2, or CO components, the unit item is displayed. Select from mg/m^3 or g/m^3.)

Range switchover How to switch ranges (manual/remote/auto)

Average time Time average time
Unit unit of average time

(The average time setting is displayed when Ch (component) is O_2-correction average or O_2 average.)

Setting range

Average time: 1 to 99 hours, or 1 to 40 days (default 7 days)

1 to 4 h (when the unit is hour) or 1 to 59 min (when the unit is minute) (default 1 h)

Range setting

(1) Tap the ▲ ▼ on the channel setting screen to display the range setting item for the channel you wish to change, and then tap that item.

(2) The range setting screen appears.

Tap the ▲ ▼ to display the item whose settings you wish to change, then touch the item. Use the selection dialog that appears or the keyboard dialog to change the setting. (Lower and upper ranges cannot be changed.)

CAUTION

- Ch x Range setting is displayed only when no verification option is specified for that Ch.
- If the range is changed, the upper and lower limits of the alarm may exceed the range, but this does not result in a setting error. In such cases, check the upper and lower alarm limits. (See "5.1.6 Alarm setting" for details on alarm settings.)

Range Setting Limits

(1) The relationship between Range 1 value, Range 2 value, lower limit value, and upper limit value shall be set to satisfy the following equation.

Lower limit range ≤ Range 1< Range 2 ≤ Upper limit range

(2) The maximum number of digits that can be entered in the range is 4. Decide the number of decimal places considering that the maximum value varies depending on the number of decimal places.

Example Number of decimal places = 2: Maximum value = 99.99

(3) The number of ranges can be 1 or 2; if 1, the Range 2 setting is invalid.

CAUTION

- Lower and upper limits are specified by the model and suffix code at the time of purchase and cannot be changed.
- Perform zero and span calibration for each range setting change.

Range Switchover

Manual Operate by switching on the measurement screen. (See "4.5 General operation of display/operation panel")

Remote Assign "Ch x Remote Range" of the target Ch (component) to the contact input. (x is 1 to 5) Assign Range 1 when there is an input to that contact and Range 2 when there is no input. (For contact input settings, refer to "5.2.5 Contact input setting")

Auto Automatically switches from Range 1 to Range 2 when the measured concentration value exceeds 90% of Range 1, and from Range 2 to Range 1 when the measured value is less than 80% of Range 1.

Example of average behavior

When the average time is set to 1 hour

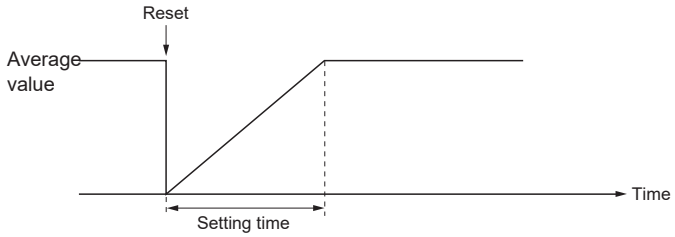


Figure 5.8

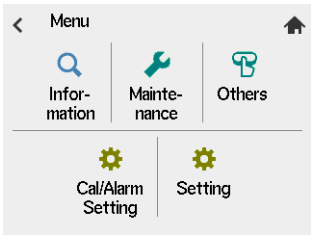
- Calculated by averaging the data acquired once every 30 seconds for 1 hour (set time). (Data acquired once every 30 seconds is a 30-second average of data acquired at 500 ms.)
- The average value is output every 30 seconds from the current time up to 1 hour (set time) ago.
- At the time of reset, all values prior to the current time are calculated as zero. Therefore, accurate average values will not be available until one hour after the reset.

5.2.2 mA output settings

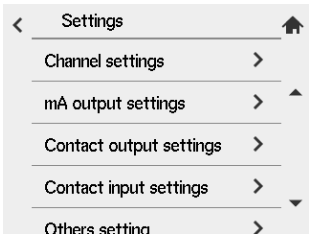
In the mA current output setting, set the current output pin assignment, hold, response time, output limit, and other settings related to current output.

(1) Tap MENU on the Home/Main screen > Menu

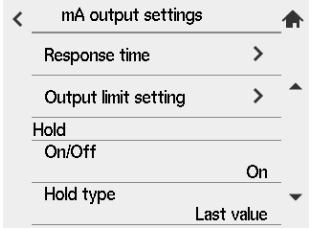
(2) Tap [Setting] > Settings



(3) Tap [mA output settings]



(4) Tap each item to set.



Items to set

Response time Response time setting. Set for each Ch (component).

Output limit setting Setting to limit current output

Hold Hold setting during maintenance, calibration, etc.

- On/Off On/Off setting of hold function
- Hold type Setting output value at hold
- Hold set value Set the output value when the hold type is "setpoint".

Hold (in case of failure) Failure hold setting. Set "On/Off", "Type of hold", and "Hold setting value" as well as the hold setting.

Current output x Ch setting assigned to current output pins

(x: 1 to 4)

Output hold

Output hold refers to holding the current output to the previous value or a preset value when the equipment is under maintenance, in calibration, or in the presence of an error. The equipment status and the hold types that can be selected at that time are shown in Table 5.1.

Table 5.1

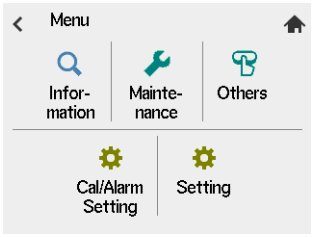
Equipment Status / Selectable Type of hold	Under maintenance Under calibration (*1) During validation During blowback	An error has occurred.
Off	✓	
last value	✓	✓
set value (0% FS to 100% FS)	✓	
set value (2.4 mA to 21.6 mA)		✓

*1: During calibration, manual calibration, automatic calibration, and auto zero calibration are included.

When you enter the respective screen by pressing "Maintenance," "Others" "Cal/Alarm Setting" or "Setting" on the Menu screen, you see the maintenance in progress.

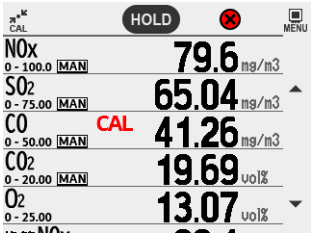
During calibration, validation, and blowback, the following icons are displayed at the top of the measurement screen.

under calibration : CAL
during validation : VAL
during blowback : BLOW



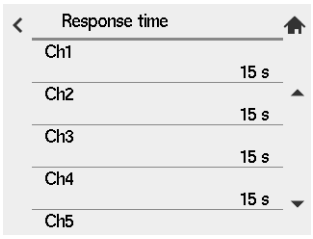
When an error is detected, the ⊗ is displayed at the top of the screen due to some abnormality or calibration-related error.

Hold follows the Hold setting for maintenance, calibration, validation, and blowback, and follows the Hold (in case of failure) setting when an error occurs.



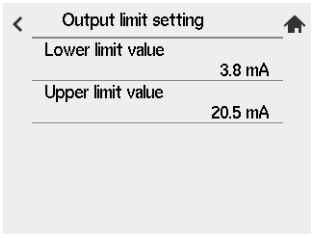
Response time setting

(1) Tap [Response Time]
The response time setting screen appears.
(2) Tap the Ch for which you want to change the setting.
Enter the numerical values when the keyboard dialog appears.



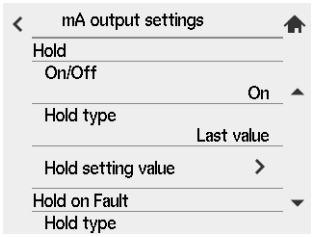
Output limit setting

(1) Tap [Output limit setting].
Output limit setting screen appears.
(2) Tap the item for which you want to change the setting.
Enter the numerical values when the keyboard dialog appears.

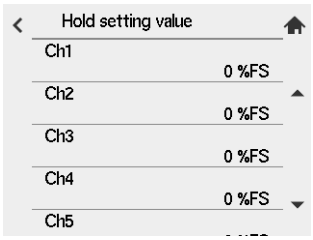


Setting of Hold setting value

(1)Tap ▼ on the mA output settings screen/
Tap [Hold setting value].



(2)Tap the item for which you want to change the setting.
Enter the numerical values when the keyboard dialog appears.



● Setting range

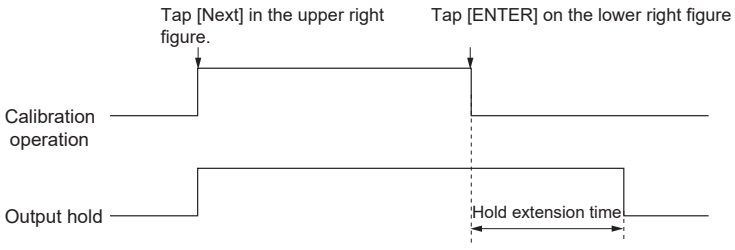
Response Time	0 to 60 s (default 15 s)
Lower limit value	2.4 to 21.6 mA (default 3.8 mA)
Upper limit value	2.4 to 21.6 mA (default 20.5 mA)
Hold setting value (*1)	0 to 100% FS (default 0% FS)
Hold on Fault	2.4 to 21.6 mA (default 3.4 mA)

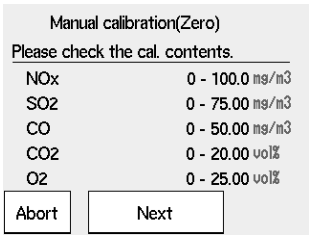
*1: The % FS setting is a percentage of the range, and is common to both ranges. For example, if the range is 0-1000ppm and the hold setting value is set to 10% FS, the output equivalent to 100 ppm is output and held, regardless of the measured value at that time.

Hold

When "On/Off" of Hold, Hold on Fault is set to "On", the output signal of each channel (component) is held during the state of each instrument (during calibration validation and blowback, even during the replacement time after the end of each state). The hold is also turned On/Off. It is also possible to hold (remote hold) the output signal by external input regardless of the hold On/Off setting. (See "5.2.5 Contact input setting" for details on remote hold.

(1)Operation at manual calibration
When the "Next" button is touched on the calibration content confirmation screen, gas flows and calibration starts. After that, when the "Enter" button is tapped on the calibration execution screen, calibration starts and after the calibration is completed, the replacement time starts.

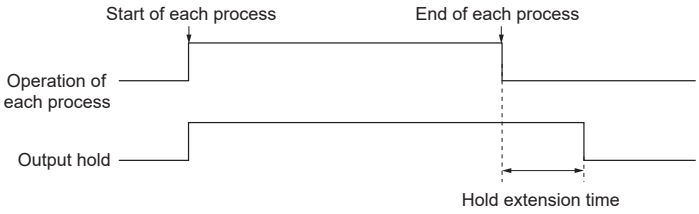


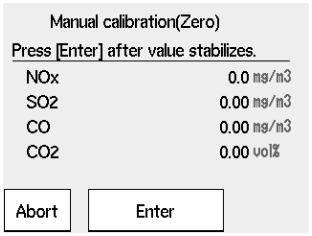


calibration content confirmation

The time set in the " Replacement time " in the flow time setting is extended.
(See "5.1.2 Auto Calibration Setting")

(2) Automatic calibration, auto zero calibration, during automatic validation, and blowback operation

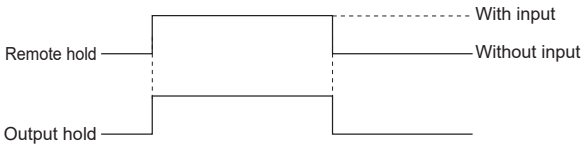




Calibration execution

The time set in the " Replacement time " in the flow time setting is extended. See "5.1.2 Auto Calibration Setting", "5.1.3 Auto zero calibration setting", "5.1.5 Setting Automatic Validation", "5.1.8 Blowback setting", for each process.

(3) Operation at remote hold



(4) Screen display during hold

The HOLD lights up at the top of the screen on the measurement screen.

(5) After the start of each process of various calibrations, automatic validation, and hold operation when blowback is interrupted, output hold for extended hold time is performed even when the process is interrupted. See "5.4.3 Automatic calibration", "5.4.4 Auto Zero Calibration", "5.4.5 Automatic Validation", "5.6.1 Blowback" for each process.)

(6) Other operations at hold

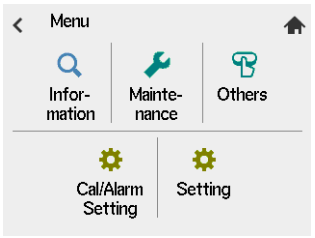
- Instantaneous measurement value display is not held (only output is held)
- When the hold is set to hold setpoint, the O_2-correction instantaneous value is calculated and held at the setpoint.
- The range identification contact output does not switch even if range switching is performed while the unit is on hold.

5.2.3 mA intput settings

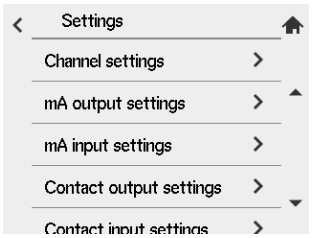
In the mA input setting, set the range setting for the 20 mA output of the external oxygen analyzer. This setting is displayed when using an external oxygen analyzer as O_2 detector.

(1) Tap MENU on the Home/Main screen > Menu

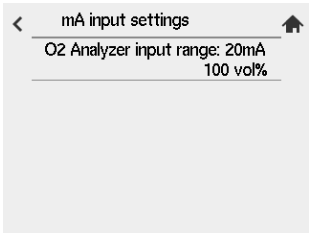
(2) Tap [Setting] > Settings



(3) Tap [mA input settings]



(4) Tap each item to set.



- **Items to set**

  O_2 Analyzer input range: 20mA

  Setting the oxygen concentration when the current input from the external oxygen analyzer is 20 mA.

- **Setting range**

  O_2 Analyzer input range: 20mA 5 to 100 vol% (default 100 vol%)

NOTE

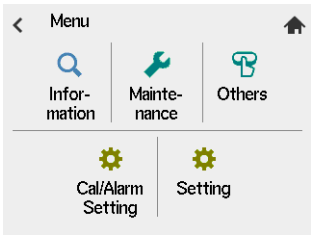
This feature has been added to Software Revision 1.02.01 or later. For older devices, please update the firmware to the latest version.

5.2.4 Contact output setting

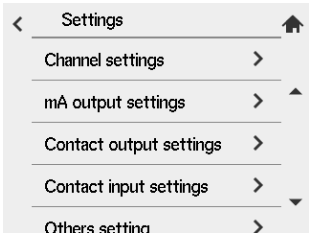
The contact output setting is used to assign functions to the contact output terminals.

(1) Tap MENU on the Home/Main screen > Menu

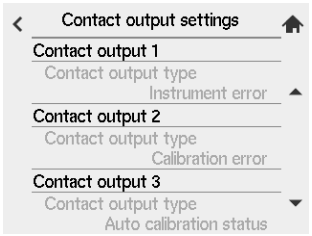
(2) Tap [Setting] > Settings



(3) Tap [Contact output settings].



(4) Tap each item to set.



Items to set

Contact output x (x: 1 to 17) — Settings for functions to be assigned to contact output terminals

Functions that can be assigned to contact outputs

See "Table 5.2" for the functions that can be assigned to the contact outputs. Multiple functions can be assigned to a single contact, or a single function can be assigned to multiple contacts.

To assign multiple functions to a single contact, select multiple functions in the function selection dialog. When multiple functions are assigned, if any one of the functions is closed, that output terminal will be closed. (OR Condition)

Limitations on contact output settings

For contact outputs 1 to 4, functions are fixedly assigned and cannot be changed by the user. The assignments are as follows

Contact output 1	Equipment abnormality
Contact output 2	Calibration abnormality
Contact output 3	During auto-calibration
Contact output 4	For zero calibration

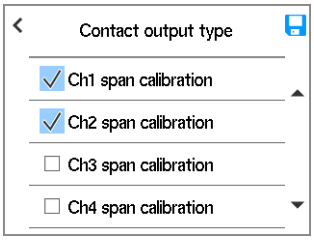


Table 5.2

Error	Function
Instrument error (Contact output "1" fixed)	Outputs when one of the following alarms occurs: "conversion unit failure," "output wiring error," "optical unit error," or "internal oxygen analyzer error".
Instrument error (Contact output "2" fixed)	Output when one of the following alarms occurs: "zero calibration alarm," "span calibration alarm," "calibration stability alarm," or "auto calibration alarm.
Auto calibration mode (Contact output "3" fixed)	Output when auto-calibration is running. When the hold setting is ON, outputs until the replacement time after calibration is completed. When the hold setting is OFF, the output is released when the replacement time after calibration is executed.
Auto validation mode	Output when automatic validation is running. If the hold setting is ON, outputs until the replacement time after validation is completed. If the hold setting is OFF, the output is released when the replacement time after the validation is executed.
Zero calibration (Contact output "4" fixed)	Output during zero point calibration.
Ch1 span calibration (*1)	Output during Ch1 span point calibration; must be assigned if Ch1 is subject to automatic calibration or automatic validation.
Chx span calibration (*1)	Ch x Output during span point calibration; must be assigned if Ch x is subject to automatic calibration or automatic validation; if Ch x is an external oxygen analyzer, the output is used as a calibration instruction to the external oxygen analyzer during automatic calibration. (x is 2 to 5)
Chx range identification	Used to identify the range of Ch x. Outputs when the range is Range 1, and cancels when the range is Range 2. Outputs when the range is Range 1, and cancels when the range is Range 2. When the component of Ch is an O_2-correction value, O_2-correction average value, or average value, the output is not output. During hold, the output maintains the status before hold even if range changeover occurs. This function is also used as a remote range answerback function. (x is 1 to 5)
Blowback	Output when blowback is running. Must be assigned when using the blowback function.
Alarm x	Outputs when the conditions for alarm x contact operation are met. The conditions are as follows. (x is 1 to 6) H-Limit/HH-Limit: When the measured value exceeds Range1 H-Limit/ Range2 H-Limit L-Limit/LL-Limit: When the measured value is below Range1 L-Limit/ Range2 L-Limit H-Limit or L-Limit: When the measured value exceeds Range1 H-Limit/ Range2 H-Limit, or when the measured value is below Range1 L-Limit/Range2L-Limit
Peak count alarm	Output during peak count alarms.
Sample switchover	Used to switch sample gases during calibration (automatic, auto zero, manual) or validation. When using automatic/auto zero calibration or automatic validation, be sure to assign this. Measuring Output During Calibration or Validation Output cancel (Analyzer) / Output (Sampling system)
Maintenance mode	Output during maintenance, calibration (automatic, auto zero, manual), validation, and blowback.
Power status	Always output when power is ON.
System validation	During automatic validation, if the gas flow channel setting is set to "sampling system", be sure to assign this function. Measuring Output cancel During Calibration Output
System calibration	Used when the gas flow channel is set to "sampling system" during calibration (manual calibration/automatic calibration/auto zero calibration), so be sure to assign this function. Measuring Output cancel During Calibration Output

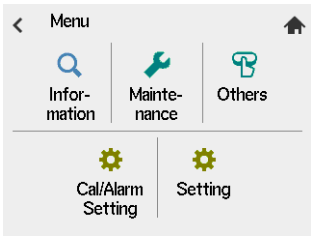
*1: If you use a mixed gas containing multiple components as the calibration gas, assign it to the same contact point.

5.2.5 Contact input setting

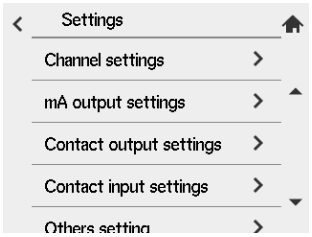
The contact input setting is used to assign functions to the contact input terminals

(1) Tap MENU on the Home/Main screen > Menu

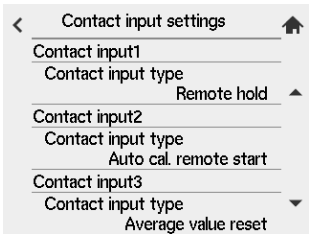
(2) Tap [Setting] > Settings



(3) Tap [Contact input settings]



(4) Tap each item to set.



- **Items to set**

  Contact input x: Setting the function assigned to the contact input terminal

  (x: 1 to 8)

Functions that can be assigned to contact inputs

See "Table 5.3" for the functions that can be assigned to the contact inputs.

A single function can be assigned to multiple contacts.

Table 5.3

Name	Detected	Function
Remote hold	level	Holds current output for as long as the contact is input.
Average value reset	pulse (1.5sec ≤)	O_2 correction average and average values are reset and recalculated from the initial state. All averages are reset simultaneously.
Auto calibration start	pulse (1.5sec ≤)	Automatic calibration starts when a contact is input. Even if the "On/Off" setting of the auto-calibration setting is Off, it will be executed according to the gas flow channel and flow time settings. (For more information on the automatic calibration setting, see ,"5.1.2 Auto Calibration Setting")
Auto zero calibration start	pulse (1.5sec ≤)	Automatic validation starts when the contact is input. Even if the "On/Off" setting of the automatic validation setting is Off, it will be executed according to the gas flow channel and flow time settings. (For details on automatic validation settings see "5.1.3 Auto zero calibration setting")
Auto validation start	pulse (1.5sec ≤)	Automatic validation starts when the contact is input. Even if the "On/Off" setting of the automatic validation setting is Off, it will be executed according to the gas flow channel and flow time settings. (See "5.1.5 Setting Automatic Validation" for more information on automatic validation settings)
Chx remote range	level	Switches the range of Ch x. When a contact is input, the range is set to Range 1; when no contact is input, the range is set to Range 2. (x is 1 to 5) The range switching setting for the target Ch must be set to "Remote". (See "5.2.1 Channel settings" for more information on the range switching setting)
Blowback	pulse (1.0sec≤, 11.0sec ≥)	Blowback is initiated when the contact is input. Even if the "On/Off" setting of the blowback setting is Off, it is executed according to the blowback time and replacement time settings. (For details on blowback settings, see "5.1.8 Blowback setting")
O_2 analyzer input	falling edge	When an external oxygen analyzer is used and Ch of the oxygen component is subject to automatic calibration, assign it to the contact input. Used to synchronize the completion of automatic calibration of the external oxygen analyzer. Without assignment, automatic calibration cannot be executed.
O_2 analyzer error	level	When an external oxygen analyzer is used and Ch of the oxygen component is subject to automatic calibration, assign it to the contact input. This is used to detect the presence or absence of an error upon completion of the automatic calibration of the external oxygen analyzer. Even without assignment, automatic calibration can be executed, but errors cannot be detected.

5.2.6 Other settings

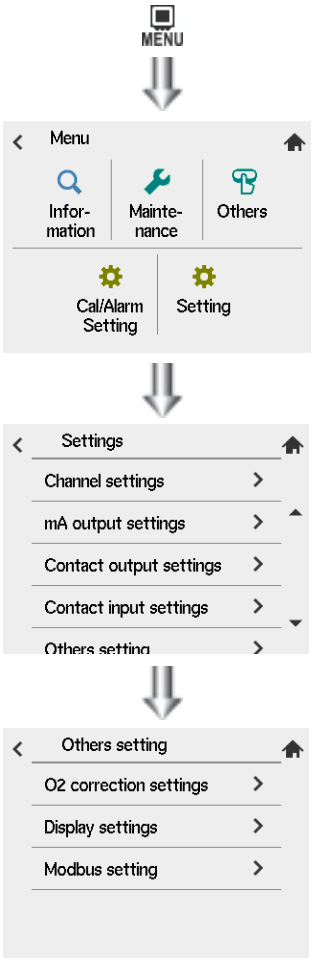
Other settings include O_2 correction settings, display settings, and Modbus setting

(1) Tap MENU on the Home/Main screen > Menu

(2) Tap [Setting] > Settings

(3) Tap [Other setting].

(4) Tap each item to set.



(1) O_2 correction settings

Configures settings related to O_2 correction or O_2 correction calculations. This setting item is displayed when this analyzer is measuring oxygen.

- **Items to set**

Ref. O_2 concentration Setting reference values for calculating O_2-correction concentration

O_2 concentration limit: Limit setting for measured oxygen concentration when calculating O_2 correction concentration

Sample Gas Concentration: Setting correction values for gases other than the measured component when calculating O_2 concentration

- **Setting range**

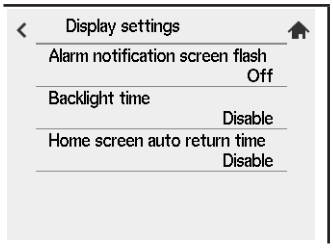
Ref. O_2 concentration: 0 to 19 vol% (default 12 vol%)

O_2 concentration limit: 1 to 20 vol% (default 20 vol%)

Sample Gas Concentration: None (0.000 vol% default)

(2)Display settings

Configure settings related to the screen display.



- **Items to set**

Alarm notification screen flash:

When set to On, the measurement screen will blink when an alarm occurs.

Backlight time:

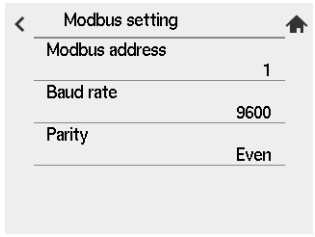
Backlight turns off after a certain period of inactivity and no alarms. 10/30/60 min selectable. Backlight will be turned on by touching the screen or by an alarm when the backlight is off.

Home screen auto return time

If there is no operation for a certain period of time and a screen other than the measurement screen is displayed, the display switches to the measurement screen. Select from 10/60 min. However, this function is not enabled in the calibration-related screen, automatic validation screen, blowback screen, loop check screen, valve check screen, touch panel adjustment screen, and alarm screen. This function is also disabled when the settings screen has not been saved (the save icon is displayed in the upper right corner).

(3)Modbus setting

Modbus is available in this product. Modbus communication using RS485 is available according to the model specification. Please make settings here according to your hardware configuration, and read the technical document (TI 11G06A01-01EN) for more information about Modbus communication.



- **Items to set**

Modbus address	Modbus slave address.
Baud rate	Data transmission speed; Select from 9600 bps/38400 bps/115200 bps.
Parity	Select even/odd/none

- **Setting range**

Converter address: 1 to 247 (default 1)

CAUTION

The stop bit is 1 bit when parity is even or odd, and 2 bits when parity is none. Setting parity to even or odd is recommended.

5.3 Other menu

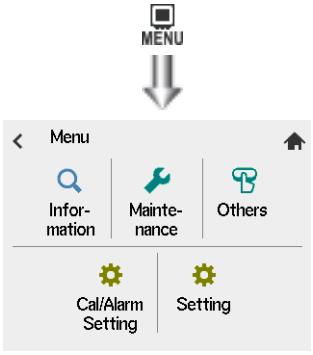
The Other menu allows you to set passwords to protect various operations and settings, set the product's date and time, and make adjustments related to the screen, such as the touch panel and brightness. (Service mode is for our service personnel only and cannot be used by customers.)

5.3.1 Password

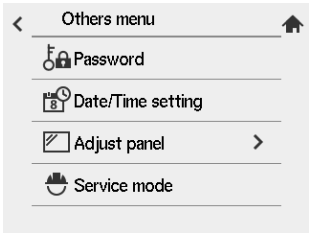
Various settings and operations of this product can be protected by passwords. You can set separate "Commissioning Pass" for changing various settings and " Execute Pass" for executing/ setting calibration and maintenance.

(1) Tap MENU on the Home/Main screen > Menu

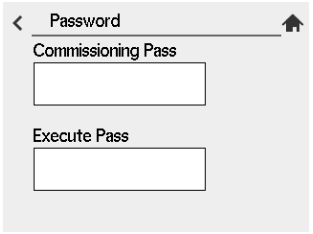
(2) Tap [Others].



(3) Tap [Password].



Tap the [Commissioning Pass] and [Execute Pass] text boxes to set them respectively.



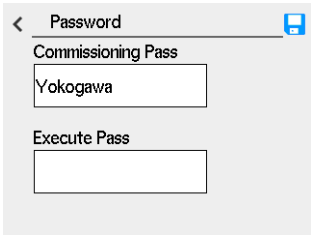
● Password screen / operation

See the table below for password-protected screens/operations and types.

Screen	Item	Types of password
Home/Main screen	Calibration menu icon	Execute Pass
	Suspend status icon processing Calibration CAL Validation VAL Blowback BLOW	Execute Pass
	CO peak count dialog reset	Execute Pass
Alarm detail	Alarm reset (when validation alarm is on)	Execute Pass
Menu	Maintenance	Execute Pass
	Other menu	Commissioning Pass
	Calibration/Alarm setting	Execute Pass
	Setting	Commissioning Pass

Password setting

(1) Tap the password you wish to set on the password setting screen and enter the password string in the keyboard dialog that appears.
You cannot set only the execution password.
The password can be up to 12 alphanumeric characters and symbols.
When you enter the password, the icon in the upper right corner will change to a save icon

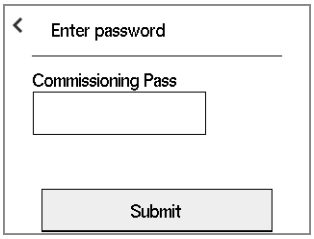


(2) Tap the save icon. The change is confirmed when it changes to the home icon.

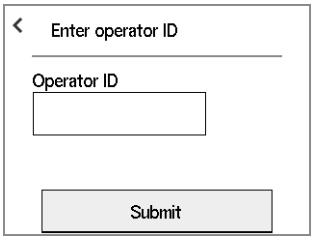
CAUTION

If you set a password, be sure to write it down.

If a password has been set, entering protected operations such as equipment setup or calibration will prompt you for the password.
If the correct password cannot be confirmed, a message stating that the password is wrong will be displayed.
After entering the correct password, the screen will change to the operator ID entry screen.



(3) Tap "Password" to display the password setting screen. Tap [Commissioning Pass], [Execute Pass] and the respective items to set them.
The operator ID is recorded in the event log information to identify the person who performed the operation. You can proceed without entering anything. The Operator ID can be up to 4 characters long.

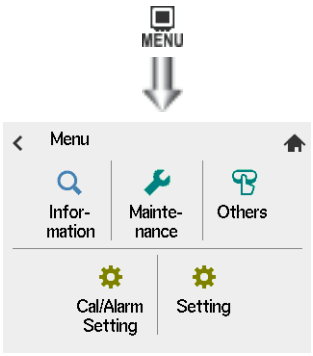


5.3.2 Date/Time Setting

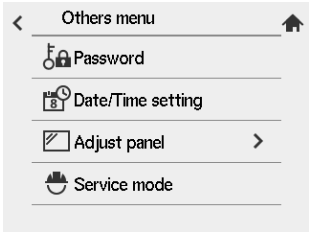
Set the date and time for this product.

(1) Tap MENU on the Home/Main screen > Menu

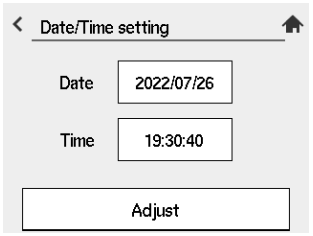
(2) Tap [Others]



(3) Tap [Date/Time setting]



(4) Tap the [Date], [Time] to set. Tap the [Adjust] to change the date and time to the set date and time.

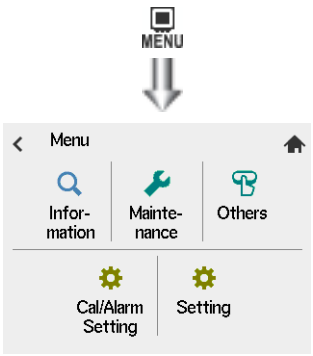


5.3.3 Adjust panel

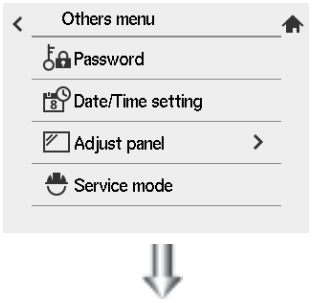
Adjust panel controls the touch panel and brightness.

(1) Tap MENU on the Home/Main screen > Menu

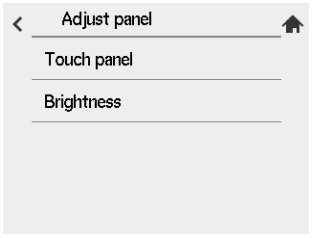
(2) Tap [Others].



(3) Tap [Adjust panel]



(4) Tap each item to set.

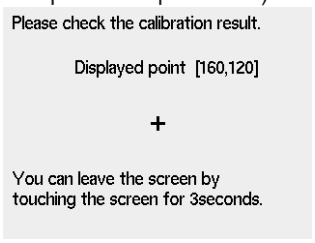


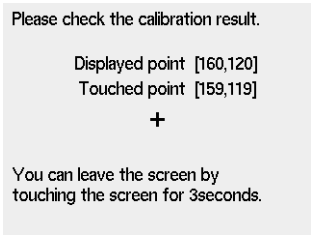
Touch panel

Calibrate or test the touchscreen

(1)Follow the on-screen instructions to touch the "+ " position. If you keep your finger on the screen for a while, the message will change as shown on the right. When the message changes, remove your finger.

(2)Repeat the same procedure four times in order: upper left, lower right, upper right, and lower left of the screen. A confirmation screen appears after the touch-adjustment. When the screen is touched, the touched coordinates are displayed as shown on the right. Touch the cross (+) position and confirm that the displayed coordinates are OK. (A few dots of misalignment in both the X and Y directions should cause no operational problems.)





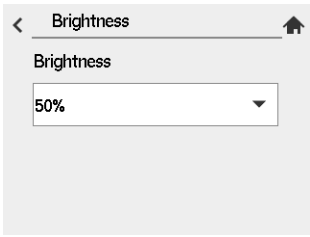
(3)Touch and hold the screen for 3 seconds as instructed on the screen to complete the confirmation and the screen adjustment screen appears.

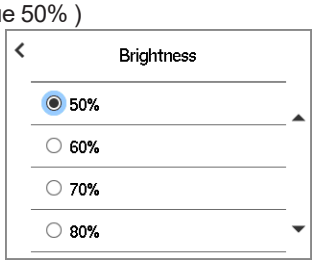
Brightness

Adjust the screen brightness.

Tap the combo box (

) to display the Brightness selection dialog box. Scroll through the screen with the ▲ ▼ and select the brightness you wish to set. Once selected, the dialog will be cleared and the screen will immediately display the selected brightness.
(Selectable from 10% to 100% in 10% increments. Default value 50%)





5.4 Calibration and Validation

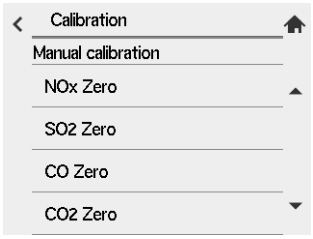
5.4.1 Manual Zero Calibration

Used for manual adjustment of the zero point. Normally, see "" and use the appropriate gas for your application as the zero calibration gas.

(1) Tap CAL on the Home/Main screen > Calibration

Calibration menu

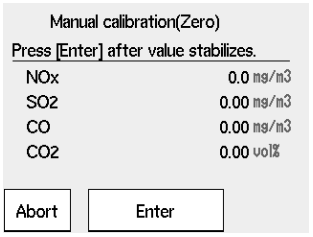
(2) Tap the ▼ ▲ to select the zero calibration of the Ch (component) to be calibrated. The calibration confirmation screen will be displayed.



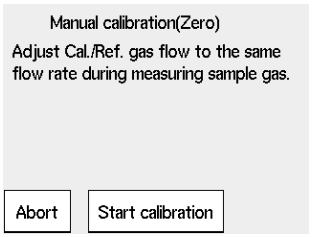
CAUTION

- Ch (component) that is set to "Simultaneous" in "Manual Zero Calibration" in the calibration channel setting will be zero-calibrated at the same time.
- In the Calibration screen, except for the replacement time in progress screen, the range, measured value, and units are always displayed in the calibration range, regardless of the range that was displayed in the measurement screen.

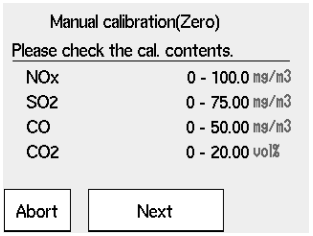
(3) Confirm the calibration contents on the screen that appears. If there are no problems, tap the "Next" button.
For the operation of the contact output when the solenoid valve is operated with the contact output for automatic calibration, see "● Contact output during manual zero calibration" The Calibration Start screen appears



(4) If you operate the valve manually, open the valve here to allow the proper flow rate to apply.
For the valve to be operated, see "● Contact output during manual zero calibration" and operate the same valve that is operated by the contact output.
Then touch the [Start Calibration].
The Calibration execution screen appears.



(5) Wait for the indicated value to stabilize with the zero gas flowing. After it stabilizes, touch the "Enter" button to perform zero calibration. After calibration is executed, if the solenoid valve of zero gas is operated by contact output 4 (for zero calibration) for automatic calibration, zero gas stops here. The calibration end screen is displayed.

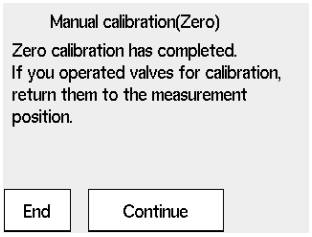


Calibration exit screen

(6) If you operated the valve manually, restore the valve status here.

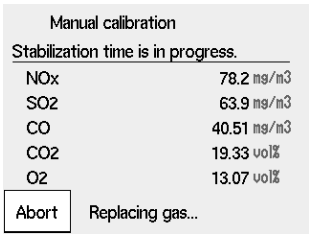
• To continue calibration, tap the [Continue]. The Calibration menu screen appears.
• To exit, touch the [End] button.

The replacement time in progress screen will be displayed. (The replacement time is the same as the replacement time for automatic calibration. See "5.1.2 Auto Calibration Setting")
If the replacement time has elapsed when the "End" button is touched, the measurement screen will be displayed.



[Continue] ⇒ "Calibration menu"
[End] ⇓

(7) In the Replace time in progress screen, all Ch (components), as well as the calibration target, are displayed. The display range is shown according to the range-switching setting.
Make sure that the influence of the calibration gas no longer exists.
After the replacement time has elapsed, the measurement screen is automatically displayed. Touching the [Abort] immediately terminates the replacement time and displays the measurement screen.



● Contact output during manual zero calibration

If "for sample switching" or "system calibration" is assigned to the contact output in addition to "for zero calibration," the contact output changes as shown in "Figure 5.9 Gas flow channel setting: analyzer" and "Figure 5.10 Gas glow channel setting: Sampling system" according to the gas flow channel setting in the auto-calibration setup. (See "5.2.4 Contact output setting" for the function assigned to the contact output and "5.1.2 Auto Calibration Setting" for the gas flow channel.)

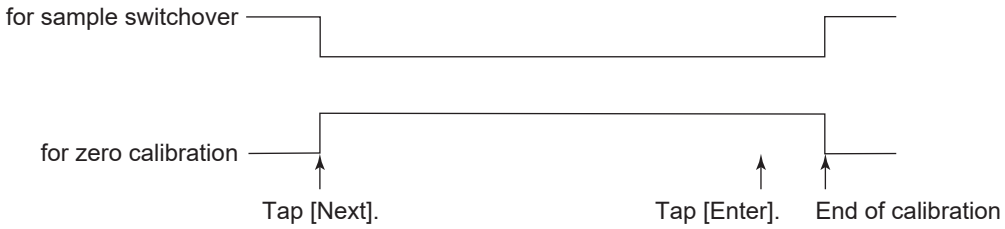
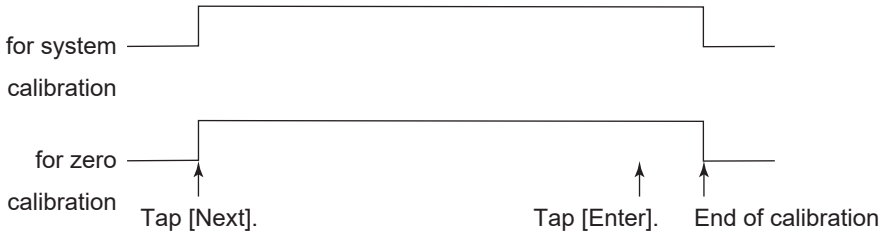


Figure 5.9 Gas flow channel setting: analyzer



The contact output for "sample switching" remains ON

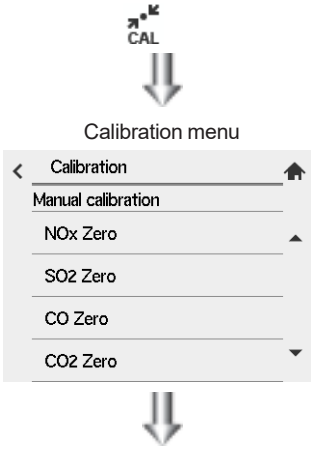
Figure 5.10 Gas glow channel setting: Sampling system

5.4.2 Manual span calibration

Used to manually adjust the span point. Perform span calibration by flowing the calibration gas of the concentration set as the span gas concentration; for NOx, SO_2, CO_2, and CO meters, use a standard gas with a concentration of 90% or more of the range value as the span calibration gas. For O_2 analyzers, use a standard gas with a concentration of 90% or more of the range value for built-in magnetic O_2 analyzers, and a standard gas with a concentration of around 1 to 2 vol% for zirconia O_2 analyzers.

(1) Tap CAL on the Home/Main screen > Calibration

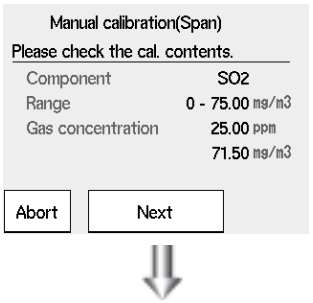
(2) Tap the ▼ ▲ to select the span calibration of the Ch (component) to be calibrated. The calibration confirmation screen will be displayed.



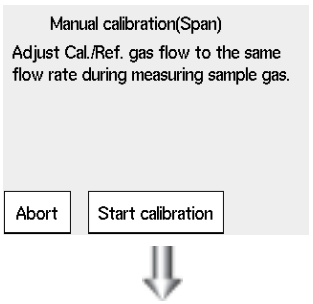
CAUTION

- In the Calibration screen, except for the replacement time in progress screen, the range, measured value, and units are always displayed in the calibration range, regardless of the range that was displayed in the measurement screen.
- When the unit of Ch (component) is mg/m^3 or g/m^3 , the unit of gas concentration is displayed together with ppm.

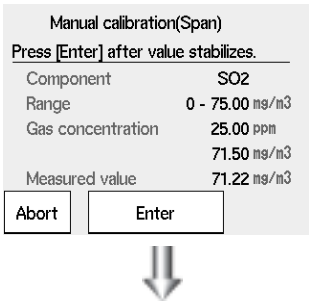
(3) Confirm the calibration contents on the screen that appears. After verifying that there are no problems, tap the "Next" button. For the operation of the contact output when the solenoid valve is operated with the contact output for automatic calibration, see "● Contact output during manual span calibration" The Calibration start screen appears.



(4) If you operate the valve manually, open the valve here to allow the proper flow rate to apply. For the valve to be operated, see "● Contact output during manual span calibration" and operate the same valve that is operated by the contact output. Then tap the [Start calibration]. The calibration execution screen will be displayed.

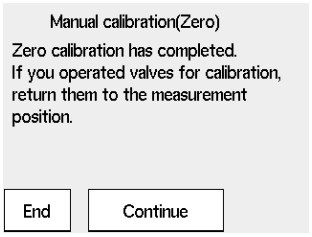


(5) Wait for the indicated value to stabilize with the span gas flowing. After stabilization, tap the "Enter" to perform span calibration. After calibration is performed, if the solenoid valve of the span gas is operated by contact output for automatic calibration, the span gas stops here. The calibration end screen is displayed.



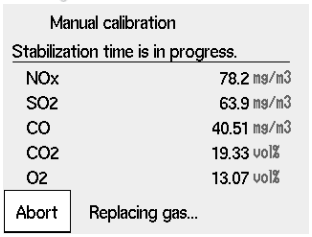
(6) If you operated the valve yourself, return it to its original condition here.
- To continue calibration, touch the [Continue]. The Calibration menu screen will be displayed.
- To exit, tap [End].

The replacement time screen will appear. (The replacement time is the same as the replacement time for auto-calibration. See "5.1.2 Auto Calibration Setting")
If the replacement time has elapsed when the "End" button is touched, the measurement screen will be displayed.



[Continue] ⇒ "Calibration menu"
[End] ⇓

- In the replacement time in progress screen, all Ch (components) as well as the calibration target are displayed. The display range is shown according to the range-switching setting.
Make sure that the influence of the calibration gas no longer exists.
After the replacement time has elapsed, the measurement screen is automatically displayed.
Tapping the " Abort" immediately terminates the replacement time and displays the measurement screen.



● Contact output during manual span calibration

When "Chx for span calibration" (x: 1 to 5), "for sample switching" or "system calibration" is assigned to the contact output, the contact output changes as shown in "Figure 5.11 Gas flow channel setting: Analyzer" and "Figure 5.12 Gas flow channel setting: Sampling system" according to the gas flow channel setting in the auto-calibration setting.(See "5.2.4 Contact output setting" for the function assigned to the contact output and "5.1.2 Auto Calibration Setting" for the gas flow channel.)

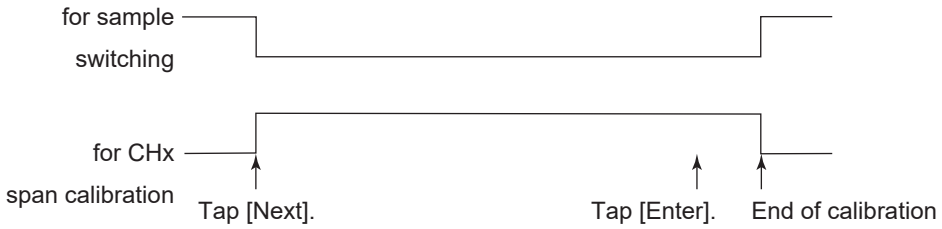
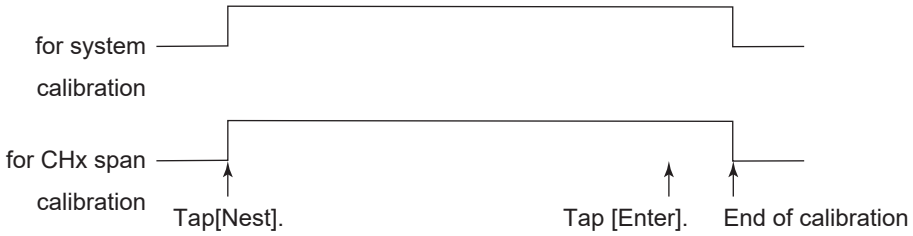


Figure 5.11 Gas flow channel setting: Analyzer



The contact output for "sample switching" remains ON.

Figure 5.12 Gas flow channel setting: Sampling system

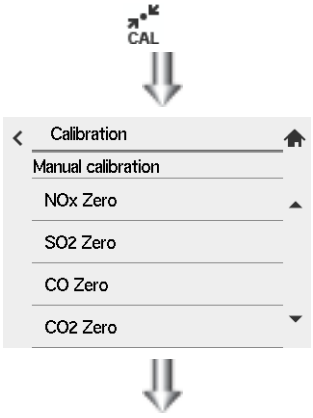
5.4.3 Automatic calibration

Use this item when you want to execute automatic calibration immediately, regardless of the initial start or cycle of the auto-calibration setting. Even if the "On/Off" setting of the auto-calibration setting is "Off", it will be executed according to the contents of the auto-calibration setting. (See "5.1.2 Auto Calibration Setting" for details on the automatic calibration setting.)

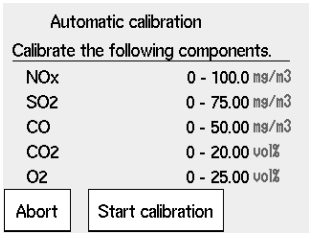
● Starting on screen

(1) Tap CAL on the Home/Main screen > Calibration

(2) Tap ▼ ▲ to select Automatic calibration.



(3) Confirm the calibration contents (channels to be automatically calibrated and calibration range) on the screen that appears. If there is no problem, tap the "Start calibration" button. The automatic calibration starts and the measurement screen is displayed.

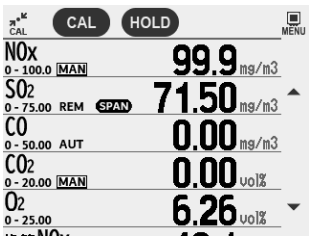


(4) The CAL indicating that calibration is in progress is displayed at the top of the screen in the measurement screen, and the Ch (component) to be automatically calibrated switches to the calibration range.

(5) During zero calibration, the ZERO is displayed on the target Ch (component), and zero calibration is executed at the same time. During span calibration, span calibration is performed one by one in the order of Ch (components). The SPAN is displayed on the Ch (component) during span calibration.

(6) If an external oxygen analyzer is used for the oxygen analyzer, a calibration command will be sent to the external oxygen analyzer after the zero/span calibration of the other components is completed. When the external O_2 analyzer is being calibrated, the CAL is displayed on the O_2 component.

(7) When all calibrations are completed, the unit is in the replacement time and the CAL icon blinks. The range returns to the previous range before calibration. After the replacement time has elapsed, the CAL will disappear and the instrument will return to the measurement state.



Remote start

To perform automatic calibration, close (short-circuit) the input terminal to which "Auto Calibration Start" is assigned in the contact input settings and open (open) it after at least 1.5 seconds. (For contact input settings, see "5.2.5 Contact input setting")

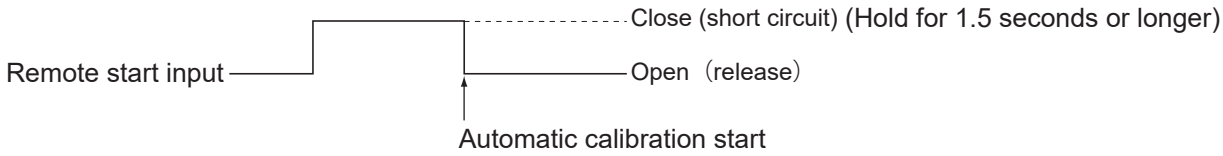


Figure 5.13

CAUTION

- If a dialog box appears at the start of auto-calibration and auto-calibration cannot start, the contact output and contact input settings are inadequate. See "5.2.4 Contact output setting" and "5.2.5 Contact input setting" to assign the necessary functions
- An automatic calibration error occurs when a zero calibration error or span calibration error occurs during the execution of automatic calibration. This auto-calibration error will be resolved after the next successful auto-calibration or manual calibration (regardless of success or failure).
- A calibration stability error may occur due to insufficient flow time when executing automatic calibration. To clear the error, perform manual calibration or adjust the flow time and perform automatic calibration again. (See "5.1.2 Auto Calibration Setting" for more information on flow time settings.

Cancel automatic calibration

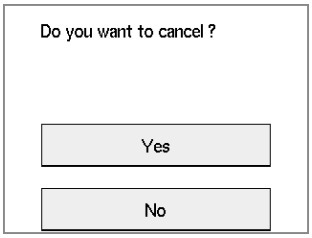
Calibration can be forcibly discontinued during auto-calibration.

(1) Tap the CAL on the measurement screen during auto-calibration, and the confirmation dialog box for cancellation will be displayed. (If an execution password has been set, you must enter the password before the dialog appears. For passwords, see "5.3.1 Password").

(2) In the dialog box to confirm discontinuation, tap the [Yes] to stop the calibration. The replacement time will begin, and the CAL will blink.

(3) If you tap the blinking CAL during the replacement time, you can also stop the process during the replacement time.

Confirm cancellation dialog



Contact output during automatic calibration

The contact output during automatic calibration varies as shown in "Figure 5.14 Gas flow channel setting: Analyzer" and "Figure 5.15 Gas flow channel setting: Sampling system" according to the gas flow channel setting in the automatic calibration setup. (See "5.2.4 Contact output setting" for the functions assigned to the contact outputs and "5.1.2 Auto Calibration Setting" for the gas flow channel.)

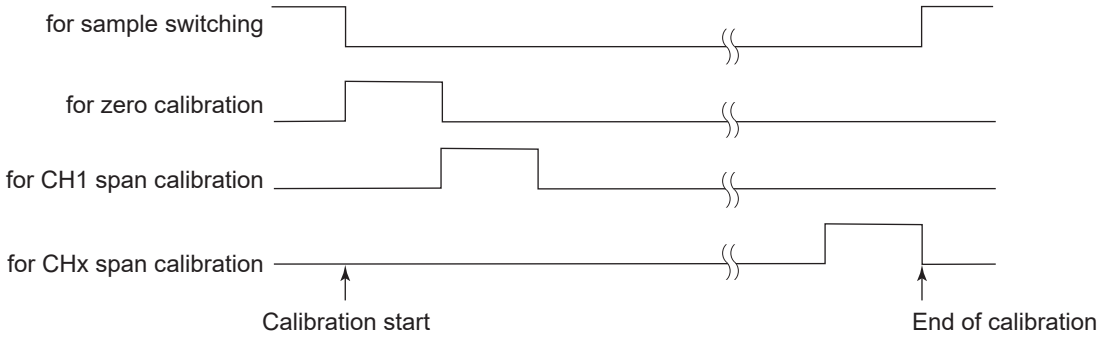
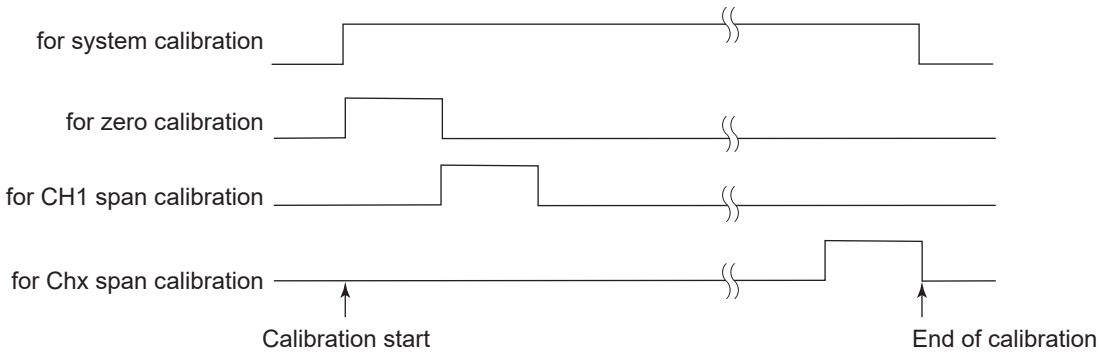


Figure 5.14 Gas flow channel setting: Analyzer



The contact output for "sample switching" remains ON.

Figure 5.15 Gas flow channel setting: Sampling system

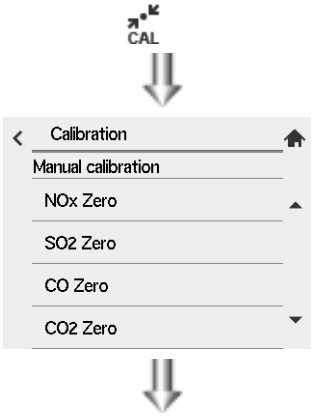
5.4.4 Auto Zero Calibration

This is used when you want to perform an auto zero calibration immediately, regardless of the initial start or cycle of the zero calibration setting. Even if the "On/Off" setting of the auto zero calibration setting is "Off", it will be executed according to the contents of the auto zero calibration setting. (See "5.1.3 Auto zero calibration setting" for details on the Auto Zero Calibration setting.)

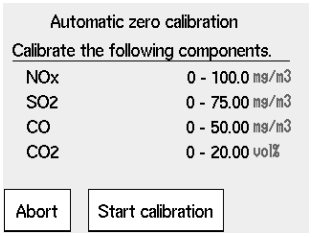
Starting on screen

(1) Tap CAL on the Home/Main screen > Calibration

(2) Tap ▼ ▲ to select Automatic zero calibration.



(3) Confirm the calibration contents (target channel for automatic zero calibration and calibration range) on the screen that appears. If there are no problems, tap [Start calibration]. Automatic zero calibration starts and the measurement screen appears.



- On the measurement screen, the CAL indicating that calibration is in progress is displayed at the top of the screen. Ch (component) subject to auto zero calibration switches to the calibration range. During zero calibration, ZERO appears on the Ch (component) subject to auto zero calibration, and zero calibration is performed at the same time.
- When the zero calibration is completed, replacement time starts and the CAL blinks. The range returns to the pre-calibration range. After the replacement time has elapsed, the CAL goes off and the system returns to the measurement state.

Remote start

To perform an automatic zero calibration, close (short-circuit) the input terminal to which "Automatic zero calibration start" is assigned in the contact input setting and open (release) it after at least 1.5 seconds. (For contact input settings, see "5.2.5 Contact input setting")

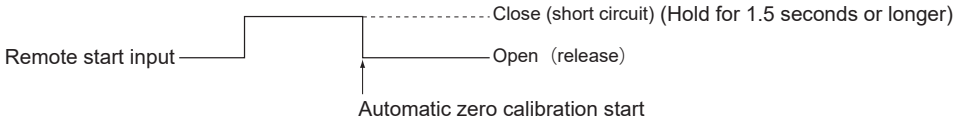


Figure 5.16

CAUTION

- If a setting confirmation dialog box appears when starting auto zero calibration and auto zero calibration cannot be started, the contact output setting is insufficient. See "5.2.4 Contact output setting" to assign the necessary functions.
- If a zero calibration error occurs during the execution of automatic zero calibration, an auto-calibration error occurs. This auto-calibration error will be resolved when the next automatic zero calibration is successfully performed or manual calibration is performed, regardless of success or failure.

- A calibration stability error may occur due to insufficient flow time when performing an automatic zero calibration. To cancel the error, perform manual calibration or adjust the flow time and perform the automatic zero calibration again. See "5.1.3 Auto zero calibration setting" for more information on flow time settings.

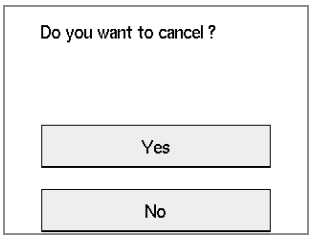
Cancel automatic zero calibration

Calibration can be forcibly discontinued during automatic zero calibration.

(1) Tap the CAL on the measurement screen during automatic zero calibration, and the confirmation dialog box for cancellation will be displayed. (If an execution password has been set, you must enter the password before the dialog appears. For passwords, see "5.3.1 Password").

(2) In the dialog box to confirm discontinuation, tap the [Yes] to stop the calibration. The replacement time will begin, and the CAL will blink.

(3) If you tap the blinking CAL during the replacement time, you can also stop the process during the replacement time.



Contact output during automatic zero calibration

The contact output during auto zero calibration shifts as shown in "Figure 5.17 Gas flow channel setting: Analyzer" and "Figure 5.18 Gas flow channel setting: Sampling system" according to the gas flow channel setting in the Auto Zero Calibration Setup. (See "5.2.4 Contact output setting" for the function assigned to the contact output and "5.1.3 Auto zero calibration setting" for the gas flow channel.)

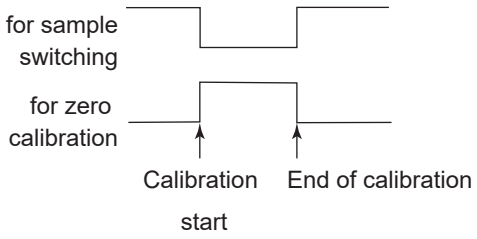
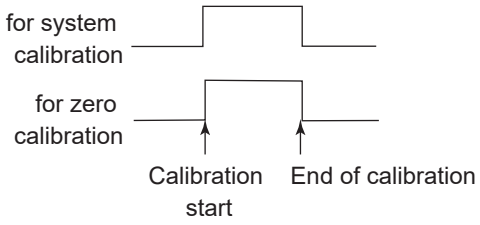


Figure 5.17 Gas flow channel setting: Analyzer



The contact output for "sample switching" remains ON.

Figure 5.18 Gas flow channel setting: Sampling system

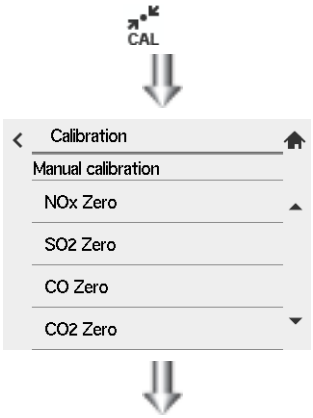
5.4.5 Automatic Validation

Use this option when you want to perform automatic validation immediately, regardless of the initial start or cycle of the automatic validation setting. Even if the "On/Off" setting of the automatic validation setting is "Off", the automatic validation will be executed according to the contents of the automatic validation setting. (See "5.1.5 Setting Automatic Validation" for details on automatic validation settings.)

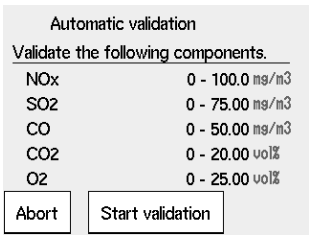
● Starting on screen

(1) Tap CAL on the Home/Main screen > Calibration

(2) Tap ▼ ▲ to select Automatic validation.



(3) Confirm the validation contents (channels to be automatically validated and calibration range) on the screen that appears. If there is no problem, tap the [Start validation]. The automatic validation starts and the measurement screen is displayed.



(4) VAL indicating that validation is in progress is displayed at the top of the screen in the measurement screen, and the Ch (component) subject to automatic validation is switched to the calibration range.
During zero validation, the ZERO is displayed on the Ch (component) to be automatically validated, and zero validation is executed at the same time. During span validation, span validation is executed one by one in the order of Ch (components) SPAN is displayed on the Ch (component) under span validation.

(5) When all validations are completed, the VAL blinks during the substitution time. The range returns to the range before validation. When the displacement time has elapsed, the VAL goes off and the instrument returns to the measurement state.

Remote start

To perform an automatic validation, close (short-circuit) the input terminal to which "Automatic validation start" is assigned in the contact input setting and open (release) it after at least 1.5 seconds. (For contact input settings, see "5.2.5 Contact input setting")

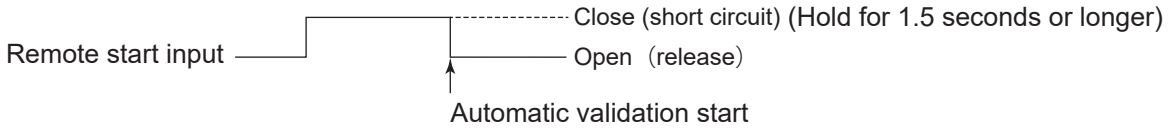


Figure 5.19

CAUTION

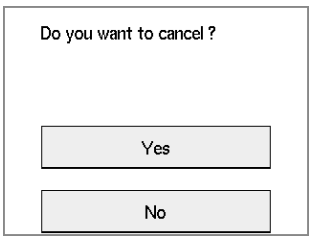
- If a setting confirmation dialog box appears at the start of automatic validation and automatic validation cannot be started, the contact output settings are insufficient. See "5.2.4 Contact output setting" to assign the necessary functions
- Validation of the external oxygen analyzer is performed at the time of zero validation. Since the solenoid valve operation of the oxygen component is not performed from this product, span validation is not performed.

Cancel automatic validation

Validation can be forcibly discontinued during automatic validation.

(1) Tap VAL on the measurement screen during automatic validation, and the cancellation confirmation dialog box appears.(If an execution password has been set, you must enter the password before the dialog appears. For passwords, see "5.3.1 Password")

(2) When you tap the [Yes] in the dialog box to confirm the discontinuation, the validation is canceled, the replacement time begins, and the VAL blinks.



(3) Tap the blinking VAL during the replacement time to stop the process during the replacement time.

Contact output during automatic validation

The contact output during automatic validation changes as shown in "Figure 5.20 Gas flow channel setting: Analyzer" and "Figure 5.21 Gas flow channel setting: Sampling system" according to the gas flow channel setting in the automatic validation setup. (See "5.2.4 Contact output setting" for the functions assigned to contact outputs and "5.1.5 Setting Automatic Validation")

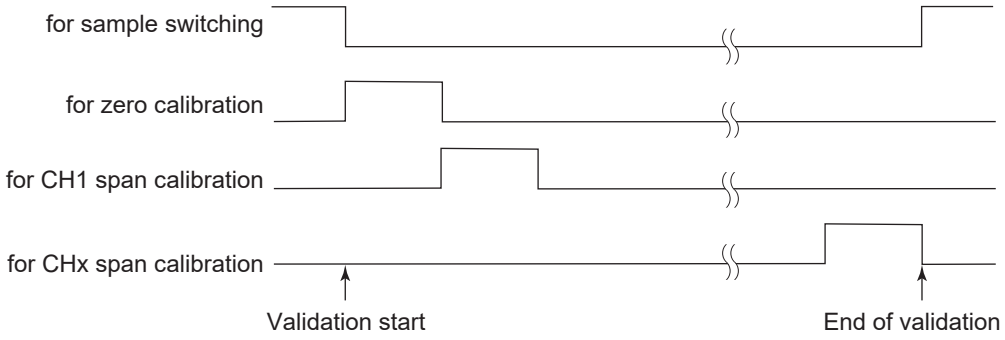
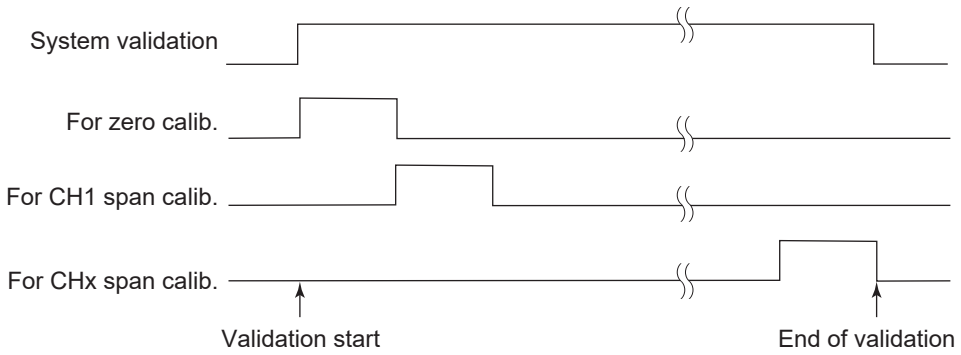


Figure 5.20 Gas flow channel setting: Analyzer



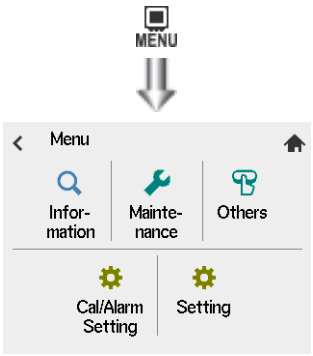
The contact output for "sample switching" remains ON.

Figure 5.21 Gas flow channel setting: Sampling system

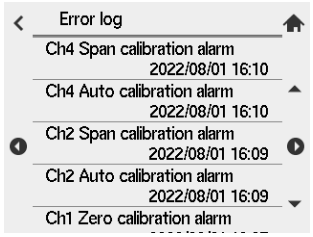
5.5 Information

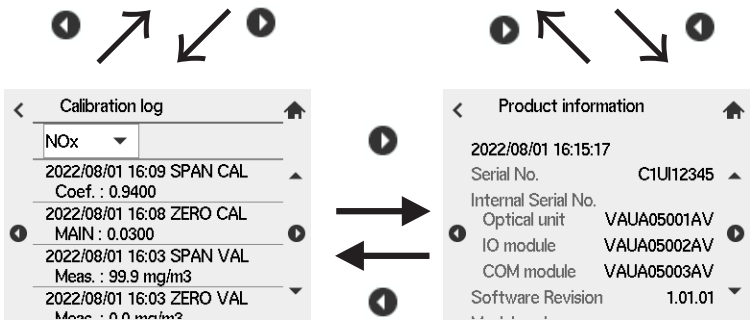
Error log, Calibration log, Product information are displayed.

1 Tap the icon MENU on the measurement screen.
The menu screen appears.
2 Touch "Maintenance".
The maintenance menu will appear.



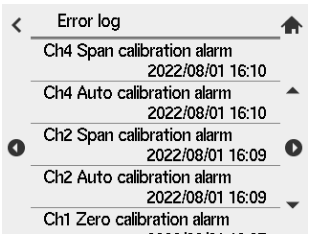
3 Touch the ◀ ▶ to switch sequentially between the error log screen, calibration log screen, and product information screen.





● Description of Error log screen

This screen shows a history of error occurrences. When more than 5 errors have occurred, touch ▲ ▼ to scroll through them. The latest 14 errors are displayed. An event consists of an error name, and the date and time it occurred (year, month, day, hour, minute). See "7.2 Error log" for a description of the errors.

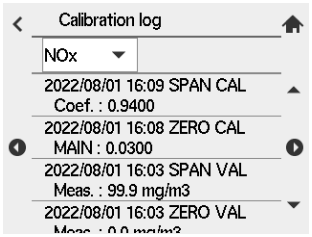


● Description of Calibration log screen

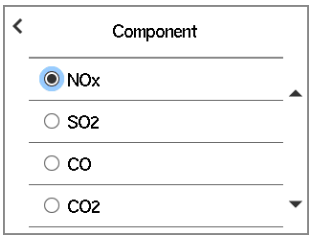
This screen shows a history of calibration and validation (*1). When more than 4 events are recorded, tap the ▼ ▲ to scroll through. Displays the latest 50 events for each component. The events when zero/span calibration ("zero CAL" / "span CAL" on the screen) was performed are displayed with the date and time, calibration factor, and zero/span validation ("zero VAL" / "span VAL" on the screen). Zero/Span Validation ("ZeroVAL"/"SpanVAL" on the screen) consists of the date, time, and measured value.

*1: Validation is available function when a suffix code "-V" for auto validation is specified.

Touch the combo box NOx to select component.



The component selection dialog appears, and the component is newly displayed on the Calibration Log screen.



Select CO.

See the table below for the coefficient name, number of decimal places of the coefficient, and calibration alarm threshold for each component displayed in the calibration log. (For component NOx, the coefficient name for zero calibration is "MAIN," the number of decimal places is 4, and a calibration alarm occurs if the coefficient is outside the range of -1.0000 to 1.0000). Measured values in the validation log are displayed with the number of decimal places and units of the calibration range.

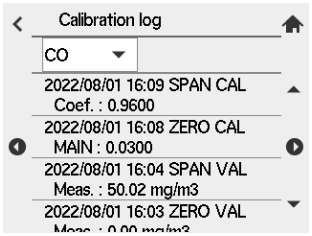


Table 5.4 Each component displayed in the calibration log

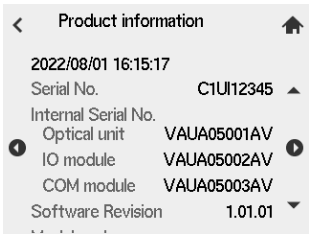
Cal.type	Coefficient name Number of decimal places	NOx	SO_2	CO	CO_2	CH4	O_2 (built-in)
Zero	MAIN 4	1.0000 -1.0000	1.0000 -1.0000	1.0000 -1.0000	1.0000 -1.0000	1.0000 -1.0000	
	Coefficient 4						1.0000 0.0000
Span	Coefficient 4	1.666 0.769	1.666 0.769	1.666 0.769	1.666 0.769	1.666 0.769	1.0000 0.0000

For external oxygen analyzers, only the date, time, and calibration type are recorded, not the coefficient information.
Oxygen analyzers do not have calibration alarms due to out of coefficient range.

Product information

Displays the date and time, Serial No., Software revision, model name and code, etc. set for this product.

Touch ▼ ▲ to scroll through and display all items.



5.6 Maintenance

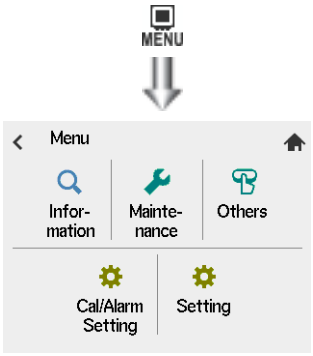
This is used during maintenance, including the blowback screen to prevent probe clogging, the loop check screen for current output testing, and the valve check screen for valve open/close testing.

5.6.1 Blowback

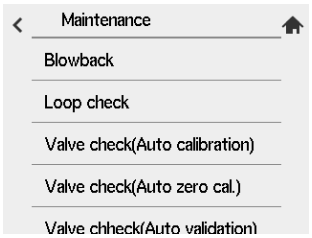
Use this function when you want to execute blowback immediately, regardless of the initial start or cycle of the blowback setting. Even if the "On/Off" setting of the blowback setting is "Off", the blowback will be executed according to the blowback setting. (See "5.1.8 Blowback setting" for more information on blowback setting.)

● Starting from the screen

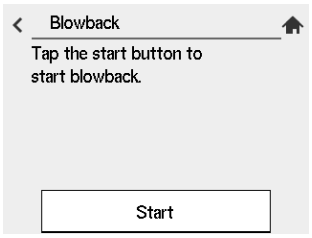
1 Tap the icon MENU on the measurement screen.
The menu screen appears.
2 Touch "Maintenance".
The maintenance menu will appear.



3 Select "Blowback".
The Blowback screen will appear.



4 Tap the "Start" button.
Blowback starts and the measurement screen appears.



● Remote start

To perform blowback, short (short-circuit) the input terminals to which "Blowback" is assigned in the contact input setting and open them after at least 1 second but not more than 11 seconds have elapsed. (For contact input setting, see "5.2.5 Contact input setting".)

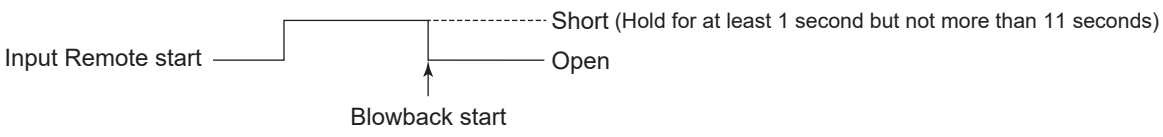


Figure 5.22

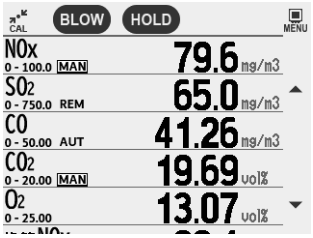
CAUTION

If a setting confirmation dialog box appears and blowback cannot be started, you have insufficient contact output setting. See "5.2.4 Contact output setting" to assign the necessary functions.

Forced abort

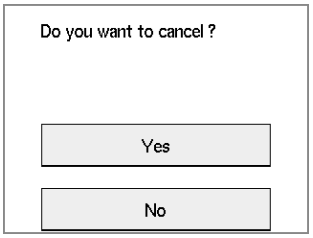
"You can forcibly interrupt the blowback during blowback."

1 Tap the BLOW on the measurement screen during blowback, and the abort confirmation dialog box will appear. (If an execution password has been set, the password must be entered before the dialog appears. For passwords, see "5.3.1 Password".)



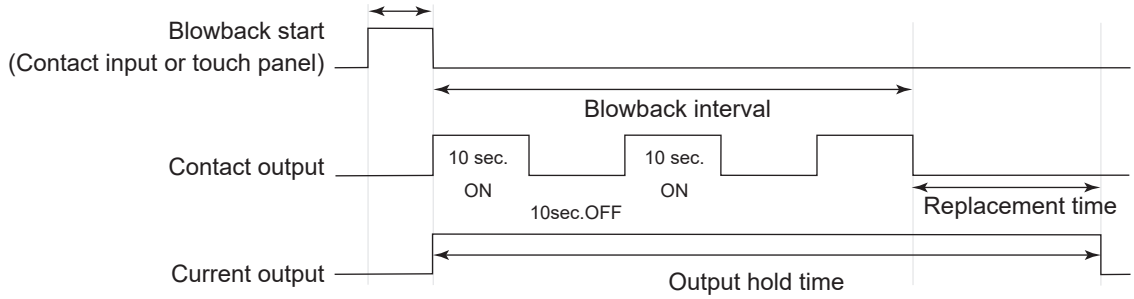
2 (When you tap the "Yes" button in the cancel confirmation dialog, the blowback is canceled, the replacement time is in progress, and BLOW icon blinks.

3 To stop processing during the replacement time, also touch the BLOW icon that is blinking during the replacement time.



Blowback operation

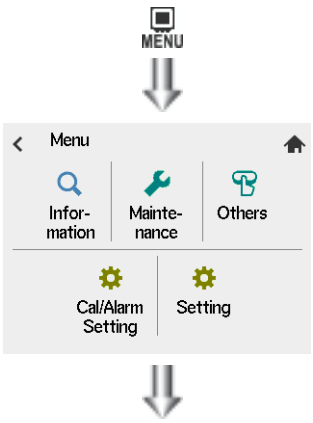
Once the blowback starts, the contact output opens and closes alternately about every 10 seconds for the preset blowback time. After the blowback time has elapsed, the current output is held in the state set by "hold" until the replacement time elapses.



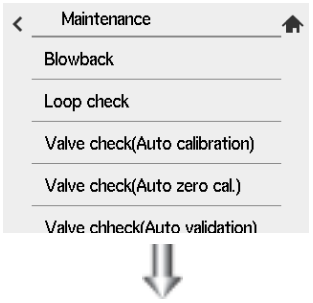
5.6.2 Loop check

Allows output of the value set at the current output terminal (AO).

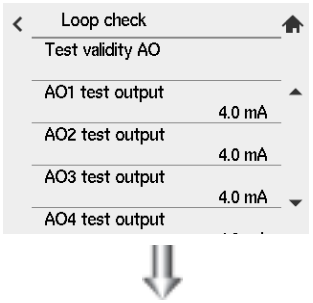
1 Tap the icon MENU on the measurement screen.
The menu screen appears.
2 Touch "Maintenance".
The maintenance menu will appear.



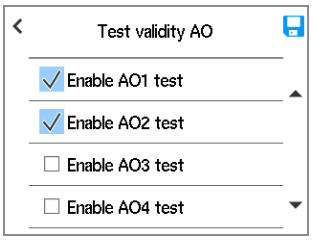
3 Select "Loop check".
The Loop check screen will appear.



4 Tap "Test validity AO".
A dialog box for multiple selections will appear.
Select the AOs you wish to test (multiple selections allowed).
5 Tap "AOx test output".
A keyboard dialog appears.
Enter the current value you wish to output. (x: 1 to 4)



6 If you change "Test validity AO" or "AOx Test Output", the background of the changed item will turn blue and the in the upper right corner of the screen will change to a .
7 Tap the to confirm the change and the set current value will be output from the enabled AO



● Description of valve selection

Test validity AO.	Setting the current output terminal to be output
AOx test output	Setting the value to be output to the current output terminal
(gas name) Span: (x: 1 to 4)	Valve status during span calibration of each component

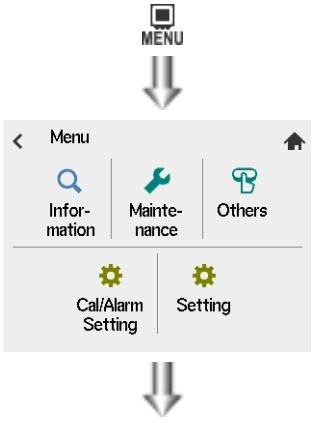
● Setting range

AOx test output	2.4 to 21.6 mA (default 4.0 mA)

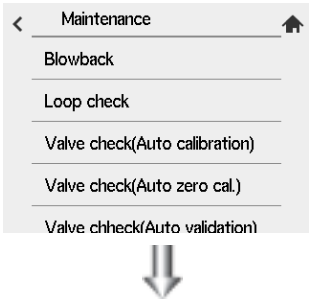
5.6.3 Valve check (Auto calibration)

Check the operation of the valve during automatic calibration. Switch the state of the valve and check the measured value at that time to confirm that there is no problem with the valve operation. Before checking, configure the contact output setting and assign the necessary functions to automatic calibration. (For contact output setting, see "5.2.4 Contact output setting".)

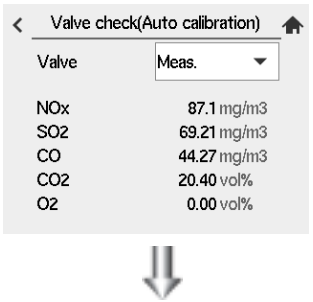
1 Tap the icon MENU on the measurement screen.
The menu screen appears.
2 Touch "Maintenance".
The maintenance menu will appear.



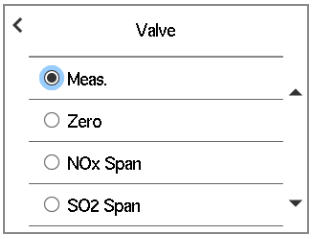
3 Select "Valve check (Automatic calibration)".
The Valve check (Automatic calibration) screen will appear.



4 The combo box Meas. shows the currently selected valve status.
Tap the combo box and select the valve status you wish to check.



The display switches to the selected valve state.



Description of valve selection

Meas. Valve status during measurement

Zero Valve status during zero calibration

(gas name) Span: Valve status during span calibration of each component

CAUTION

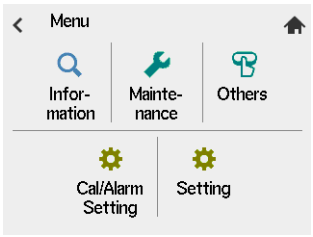
When an external oxygen analyzer is used as an oxygen analyzer, the contact output does not operate even if O_2 span is selected.

5.6.4 Valve check (Auto zero cal.)

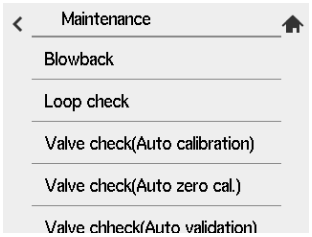
The operation of the valve at the time of auto zero calibration can be checked. Switch the state of the valve and check the measured value at that time to confirm that there is no problem with the valve operation. Before checking, configure the contact output setting and assign the necessary functions to auto zero calibration. (For contact output setting, refer to "5.2.3 Contact Output Setting.")

1 Tap MENU icon on the measurement screen.
The menu screen appears.

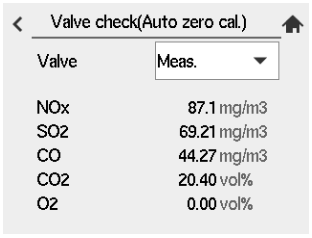
2 Touch "Maintenance".
The maintenance menu will appear.



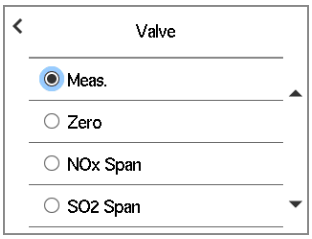
3 Select "Valve check (Auto zero cal.)".
The Valve check (Auto zero cal.) screen will appear



4 The combo box Meas. shows the currently selected valve status.
Tap the combo box and select the valve status you wish to check.



The display switches to the selected valve state.



● Description of valve selection

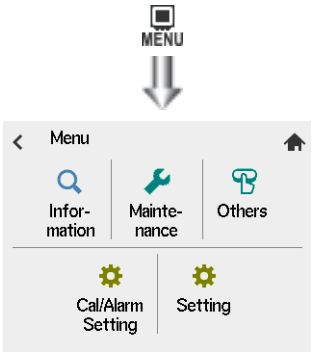
Meas. Valve status during measurement

Zero Valve status during zero validation

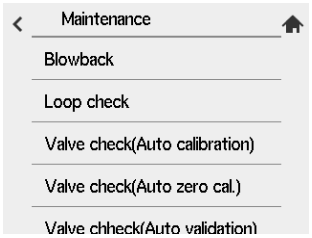
5.6.5 Valve check (Auto validation)

The operation of the valve can be checked during automatic validation. By switching the state of the valve and checking the measured value at that time, you can confirm that the valve is operating properly. Before checking, configure the contact output settings and assign the necessary functions to the automatic validation. (For details on contact output setting, see "5.2.4 Contact output setting".)

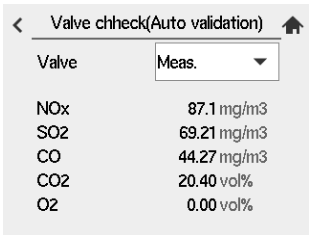
1 Tap the icon MENU on the measurement screen.
The menu screen appears.
2 Touch "Maintenance".
The maintenance menu will appear.



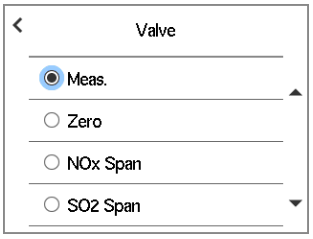
3 Select "Valve check (Automatic Validation)".
The Valve check (Automatic Validation) screen will appear.



4 The combo box Meas. shows the currently selected valve status.
Tap the combo box and select the valve status you wish to check.



The display switches to the selected valve state.



Description of valve selection

Meas. Valve status during measurement

Zero Valve status during zero validation

(gas name) Span: Valve status during span validation of each component

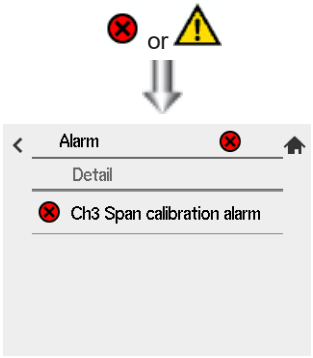
CAUTION

When an external oxygen analyzer is used as an oxygen analyzer, the contact output for O_2 span is used for the calibration command to the external O_2 analyzer. Therefore, the contact output for O_2 span does not turn On even if O_2 span is selected on the screen.

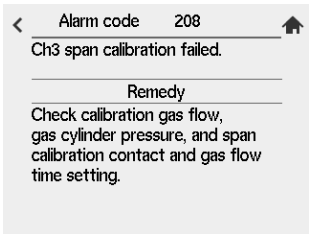
5.7 Alarm

This screen is used to check alarms that have occurred in the equipment. In the alarm list screen, all alarms that have occurred can be monitored. Tap the alarm name in the alarm list screen to display the "Alarm details screen" that shows the description and countermeasures for that alarm. See "7.1 Alarms" for more information on the alarms displayed..

1 On the screen, tap ⊗ or ⚠ to show the alarm list.



2 Touch the alarm name.
The alarm details are displayed.



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6. MAINTENANCE

WARNING

When performing maintenance, inspection, or other work with the top cover (or front door) of the product open, be sure to safely shut off the measuring gas line and provide sufficient ventilation inside and around the product to prevent poisoning, fire, or explosion due to gas leakage or other causes.

WARNING

Do not run the product for a long period of time with the front cover of the product open. Dust, dirt, etc. may adhere to the inside of the product, causing it to malfunction.

6.1 Daily check and maintenance procedures

Periodic maintenance

The front window should be kept clean to ensure clear visibility of the screen and proper operation of the touch panel. If dirty, wipe clean with a soft damp cloth or soft tissue. For more stubborn stains, use a neutral detergent.
Ensure that the case remains watertight against water and vapor. Make sure the sealing area is clean and properly fitted when opening the front door to remove the cable gland and put it back in place.

CAUTION

Never use strong chemicals or solvents. If the window is heavily soiled or scratched, parts may have to be replaced. Please consult Yokogawa for service.

Table 6.1 Maintenance and check list

Inspection cycle	Inspection point	Criteria	Remedy
Daily	Sample gas flow rate	0.5 to 0.8 L/min	If out of criterion, set the sample inlet pressure to 4.9 kPa to 9.8 kPa.

Inspection and maintenance should be performed once a day as needed.

Zero and span calibration

Perform zero calibration. See 5.4.1 Manual Zero Calibration for the calibration method.

After zero calibration is completed, perform span calibration. See 5.4.2 Manual span calibration.
Zero and span calibration should be performed once a week, or as needed.

Long-term maintenance parts

No periodic maintenance is required. However, replacement may be necessary depending on the site environment and the condition of the sample gas.

Please contact us for maintenance services.

6.2 How to replace a fuse

The converter has two fuses. If a fuse blows, replace it as follows.

CAUTION

Before replacing a fuse, be sure to fully investigate the cause of the blown fuse (short circuit, etc.) and repair it.

(1) Shut off the power supply to the converter to ensure safe replacement.

(2) Remove the fuse from the fuse holder. Using a flat-blade screwdriver that fits into the groove on the holder cap, rotate the cap 90 degrees counterclockwise. Once this is done, the fuse can be pulled out with the entire cap.

(3) Install a new fuse in the holder, making sure it has the given rating (5A). Insert the fuse into the holder with the cap in place, and rotate the cap 90 degrees clockwise while pressing down with a flat-blade screwdriver.

Fuse used with the product

Fuse point	Main unit	Pressurized enclosure
Maximum rated voltage:	250 V	250 V
Maximum rated current:	5 A	1.25 A
Type:	time-lag fuse	time-lag fuse
Standard:	UL, CSA, VDE certified, Electrical Appliance and Material Safety Law certified	UL, CSA, VDE certified, Electrical Appliance and Material Safety Law certified
Part Number	A1513EF	A1423EF

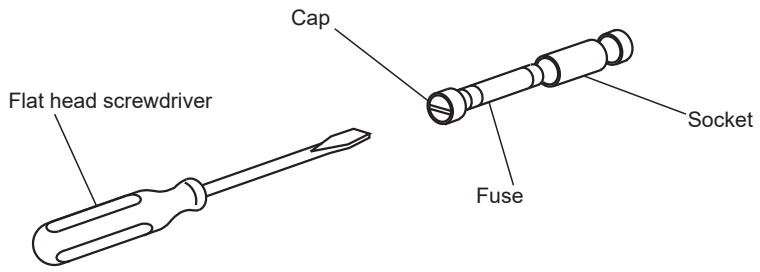


Figure 6.1 How to remove a fuse

6.3 How to replace line filter

The filter (line filter) is located in the sample gas inlet fitting. Viewed from the inlet side, it has three parts in alignment: C-shaped snap ring (Retainer), plate (sintered filter), and filter (felt). Follow the procedure below to replace the filter with a new one. You need a special tool (snap ring pliers) to remove the C-shaped snap ring when replacing it.

(1) Using snap ring pliers (special tool), insert the tool into the two holes of the inner ring of the C-shaped snap ring to compress the snap ring and pull it out toward you.

(2) Remove the plate and filter with tweezers, etc.

(3) Install 1. a new filter, 2. a plate, and 3. a snap ring, in that order.

- The filter has two sides. Insert the filter into the fitting with the smooth, non-fluffy side facing to the front.
- Insert the plate. This also has a front and back. Insert the plate with the fine mesh side facing back.
- Compress and insert the snap ring with snap ring pliers. While pressing down on the filter and plate, fasten with the snap ring. At this point, be sure to press firmly on the snap ring to prevent the plate from moving even if you try to move it with tweezers or the like.

CAUTION

Press the snap ring firmly into place. If the pressing is loose, the filter and plate will not achieve the filtering function at all.

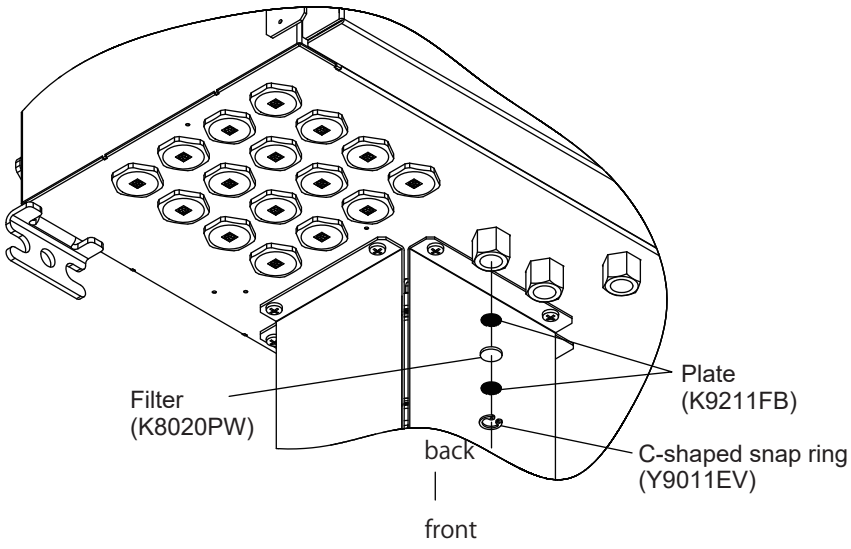


Figure 6.2 IR810S Filter replacement

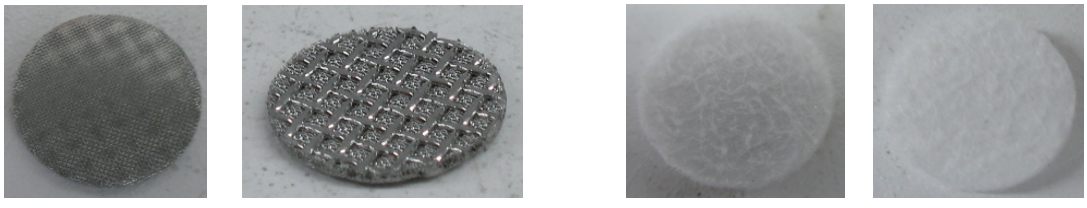


Figure 6.3 Plate and filter

6.4 Maintenance of optical unit

Maintenance and replacement of the optical unit is performed by our service. Please contact the sales office where you purchased the product.

See the page 2-10 Optical Unit Parts for the detailed and the replacement cycle.

7. TROUBLE SHOOTING

7.1 Alarms

Alarms are generated when there is a problem with the instrument. There are two types of alarms, “Fault” and “Warning”. If a “Fault” occurs, the event is recorded in the error log. For more information on the error log, see 5.5 Information. The following are lists of alarms.

Table 7.1 Fault

Alarm name	Description	Remedy
Converter unit failure	The converter unit has a fault.	Contact our service.
Output wiring is error	Input/output contact circuit or wiring is abnormal.	
Optical unit error	Optical unit measurement or communication is faulty.	
O_2 unit error	The built-in oxygen meter has a measurement error.	
Ch○ Zero calibration alarm	Ch○ Zero calibration failed	Check calibration gas flow rate, remaining cylinder pressure, zero calibration contact, and flow time settings
Ch○ Span calibration alarm	Ch○ Span calibration failed	Check the calibration gas flow rate, remaining cylinder pressure, and span calibration contact and flow time settings.
Ch○ Auto calibration alarm	Zero/span calibration of Ch○ failed during auto-calibration.	Check the calibration gas flow rate, remaining cylinder pressure, zero/ span calibration contact, and flow time settings
Ch○ Cal. stability alarm	Even after flow time has elapsed, the measured value of Ch○ is not stable.	Check the setting of the flow time.

○: 1 to 5

Table 7.2 Warning

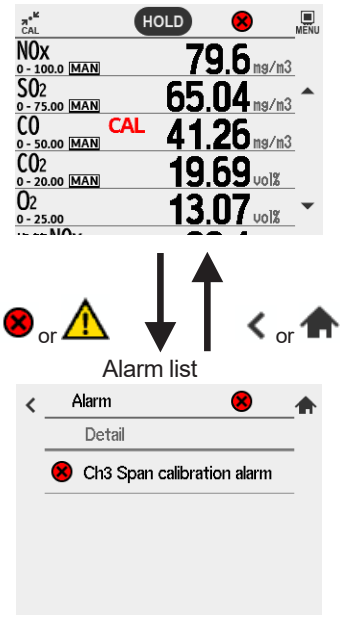
Alarm name	Description	Remedy
Date and time not set	The date and time have not been set	Set the date and time For date and time settings, refer to “5.3.2 Date and Time Settings”.
Override	The override function is enabled.	It becomes invalid when the cover of the internal pressure protection device is installed.
Ch○ HH alarm (*1)	Ch○ The concentration of the component exceeds the set value.	Check the measured values and alarm setpoints.
Ch○ L alarm (*1)		
Ch○ H alarm (*1)	Ch○ The concentration of the component falls below the set value.	
Ch○ LL alarm (*1)		
Peak count alarm	The number of times the CO concentration threshold is exceeded per hour has exceeded the set number of times.	Eliminate the cause of elevated CO concentrations
Ch○ Zero validation alarm (*2)	The measured value of Ch○ component exceeded the set value during zero validation.	Perform zero calibration.
Ch○ Span validation alarm (*2)	The measured value of Ch○ component exceeded the set value during span validation.	Perform span calibration.
Ch○ Zero cal. caution (*3)	The zero calibration factor of Ch○ is approaching outside the proper range.	Check the calibration gas flow rate, remaining cylinder pressure, zero calibration contact and flow time setting.
Ch○ Span cal. caution (*3)	The span calibration factor of Ch○ is approaching outside the proper range.	Check the calibration gas flow rate, remaining cylinder pressure, and span calibration contact and flow time settings.

*1: ○: 1 to 12
*2: ○: 1 to 5
*3: ○: 1 to 4 and the channel is other than O_2.

Screen display and operation when alarm occurs

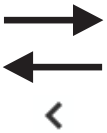
When an alarm occurs, the ⊗ or ⚠ icon appears at the top of the screen. If two alarms occur at the same time, the ⊗ icon appears as first priority.

Tap ⊗ or ⚠ to go to the alarm list screen.

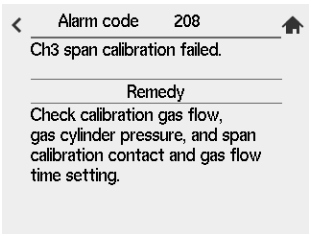


- Tap 🏠 to return to the measurement screen.
- Tap ‹ to return to the previously displayed screen. (In this case, the measurement screen).
- Tapping an error name displays the alarm details screen, which displays a description of the alarm and how to address it.

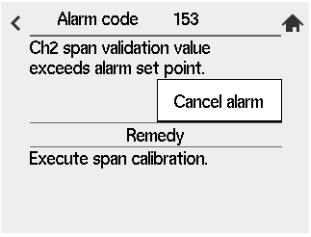
Tap an alarm to see.



Alarm list



- ‹ Tap the icon to return to the previously displayed screen. (Alarm list screen in this case)
- Tap 🏠 to return to the measurement screen.



In the alarm detail screen of “Ch0Zero Validation Alarm” and “Ch0Span Validation Alarm”, the “Alarm Cancel” button is displayed. Touch this button to clear the alarm. (When you touch the button, a confirmation dialog box appears. If an execution password has been set, the password must be entered. For passwords, see 5.3.1Password)

7.2 Error log

If a Fault alarm occurs, it is logged in the Error Log. The Error Log screen, which displays the error log, can be accessed from [Menu] > [Information]. For details, see 5.5 Information.

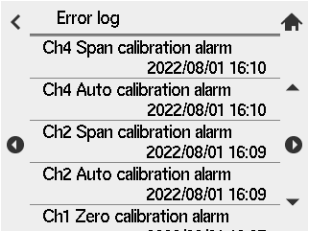


Figure 7.1 Error log

- A maximum of 14 errors can be saved in the error history. If more than 14, each time a new error occurs, the oldest error will be discarded.
- The contents of the error log are saved even when the power is turned off.

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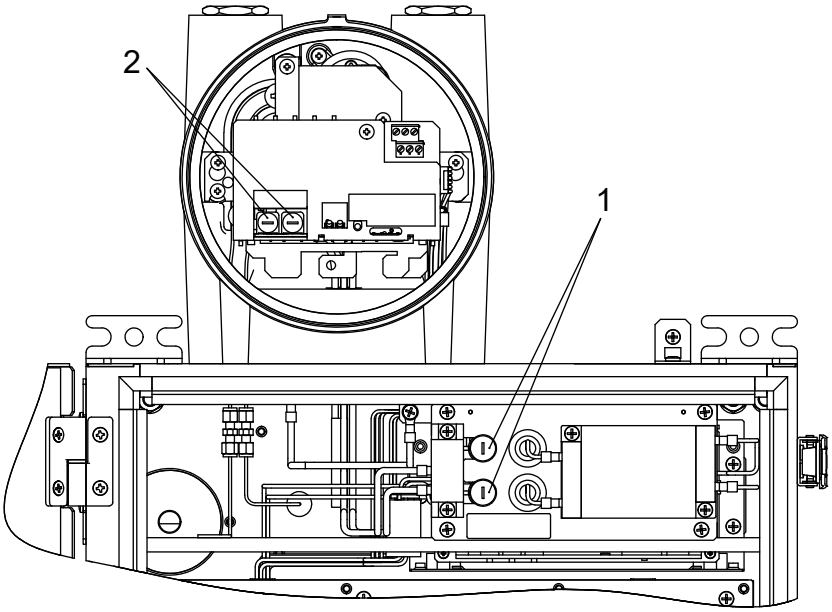
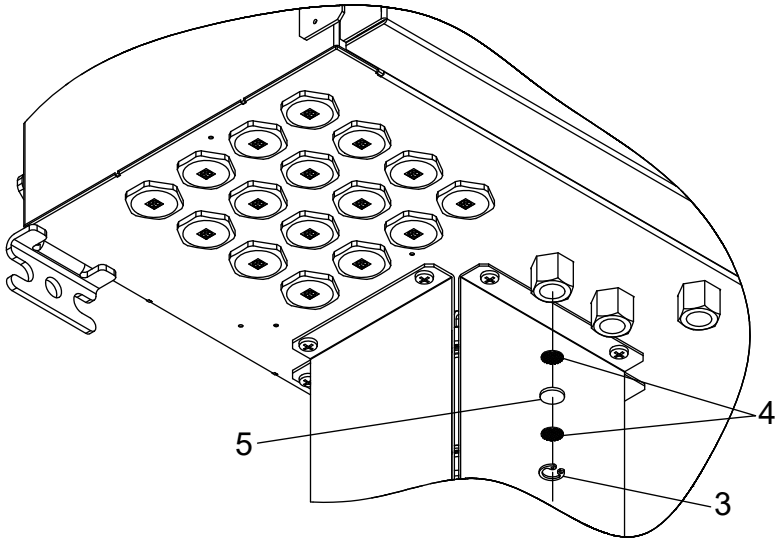
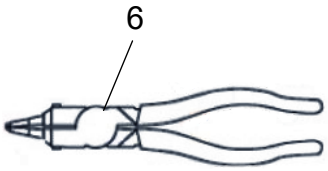
Customer Maintenance Parts List

IR810S
Explosion protected model
Infrared Gas Analyzer







Item	Part No.	Qty	Description
1	A1513EF	1	Fuse (5A)
2	A1423EF	1	Fuse (1.25A)
3	Y9011EV	1 (*1)	Snap Ring (Retainer)
4	K9213FB	1	Plate
5	K8020PW	1	Filter
6	K9643ZE	1	Snap Ring Plier (Tool to remove snap ring)

*1: Qt'y of 10 pieces or more can be purchased.

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1st Edition: Jan. 2024 (YK)

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- Manual No. : IM 11G06D01-02EN

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5th	**July 2025**	Revised notes. (pages 2-8, 2-9) Updated Accessories. (page 2-9) Additional changes. (pages 3-2, 3-7 through 3-12)
4th	**Dec 2024**	Revised material specification. (Page 2-3)
3rd	**June 2024**	Added explosion protection, NEPSI, local Ex approvals: India, Taiwan (pages x, xiv, 2-4, 2-8) Updated the regulation marking for -EC (IECEx) (page xiii) Overall reviewed
2nd	**Mar. 2024**	Corrected (Pages 1-4, 2-7, 2-8, 2-9, 2-10, 3-12, 3-17, 4-3, 4-4, 5-27, 6-4) Added Optical Unit Parts list. (Page 2-10)
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