PT3E-0513

RIKEN KEIKI

Explosion-Proof Calorimeter OHC-800

Sampling Device

RS-400 Series

Operating Manual

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Preface

Thank you for choosing our explosion-proof calorimeter OHC-800-RS-400.
This product is an explosion-proof calorimeter in a flame-proof enclosure (explosion-proof class: Ex dIIB+H2 T4) consisting of a gas measuring part "OHC-800" and a sampling device "RS-400-□□□□," which is designed for continuous, fast-response measurement of the "Calorific value," "Density," and "WOBBE index" of various fuel gases such as natural gas, coke oven gas, blast furnace gas, converter gas, biomass gas and biogas.
This manual describes how to use the calorimeter. Not only the first-time users but also the user who have already used the calorimeter must read and understand the operating manual before using this product.
This manual mainly provides descriptions on the sampling device. Read also the separate volume "OHC-800 Operating Manual" for the operation of measuring part OHC-800.
Throughout this manual, the following indications are used to ensure safe and effective work.

⚠ **DANGER**	This message indicates that improper handling may cause death or serious damage on life, health or assets.
⚠ **WARNING**	This message indicates that improper handling may cause serious damage on health or assets.
⚠ **CAUTION**	This message indicates that improper handling may cause minor damage on health or assets.
NOTE	This message indicates advice on handling.

<Contents>

1

Product Overview

1-1. Product components and accessories

- Gas measuring part "OHC-800": 1 set
- Sampling device "RS-400-□□□□": any set
  * See the following classification of sampling device models.
- Operating manuals (this manual and the operating manual for measuring part)

NOTE

This product is designed to have a measuring part "OHC-800" incorporated in the sampling device. The tubing required for "OHC-800" has been arranged inside the main unit prior to shipment.

[Sampling Device Classification]

RS-400-□□□□

Storage box
- **0: No storage box**
- **1: Outdoor box (SUS) with shading plate**
- **2: Indoor box (SPCC) with window**

Use of pressure reducing valve for measuring gas
- **0: Pressure reducing valve not used**
- **1: Pressure reducing valve used**

Bypass flow rate of measuring gas
- **0: Not bypassed**
- **1: 0.5 - 5 L/min**
- **2: 1 - 10 L/min**
- **3: 2 - 20 L/min**

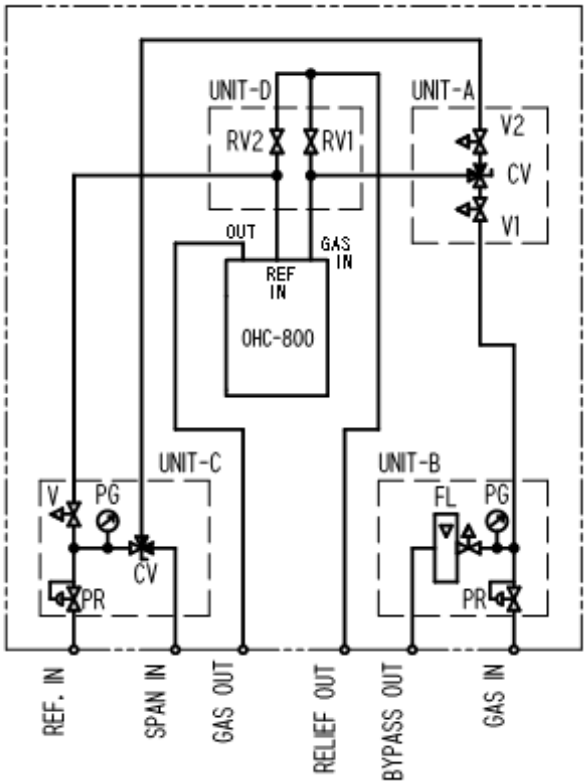
  * "0: Selection unavailable" is applied for the case without pressure reducing valve.

Pressure gauge unit
- **1: MPa**
- **2: MPa/PSI double units**

  * "1: MPa" is selected for the use in Japan because of the Measurement Act.

1-2. Names and functions for each part

The following figure shows a typical internal tubing system of the sampling device RS-400 series.



Unit names and functions

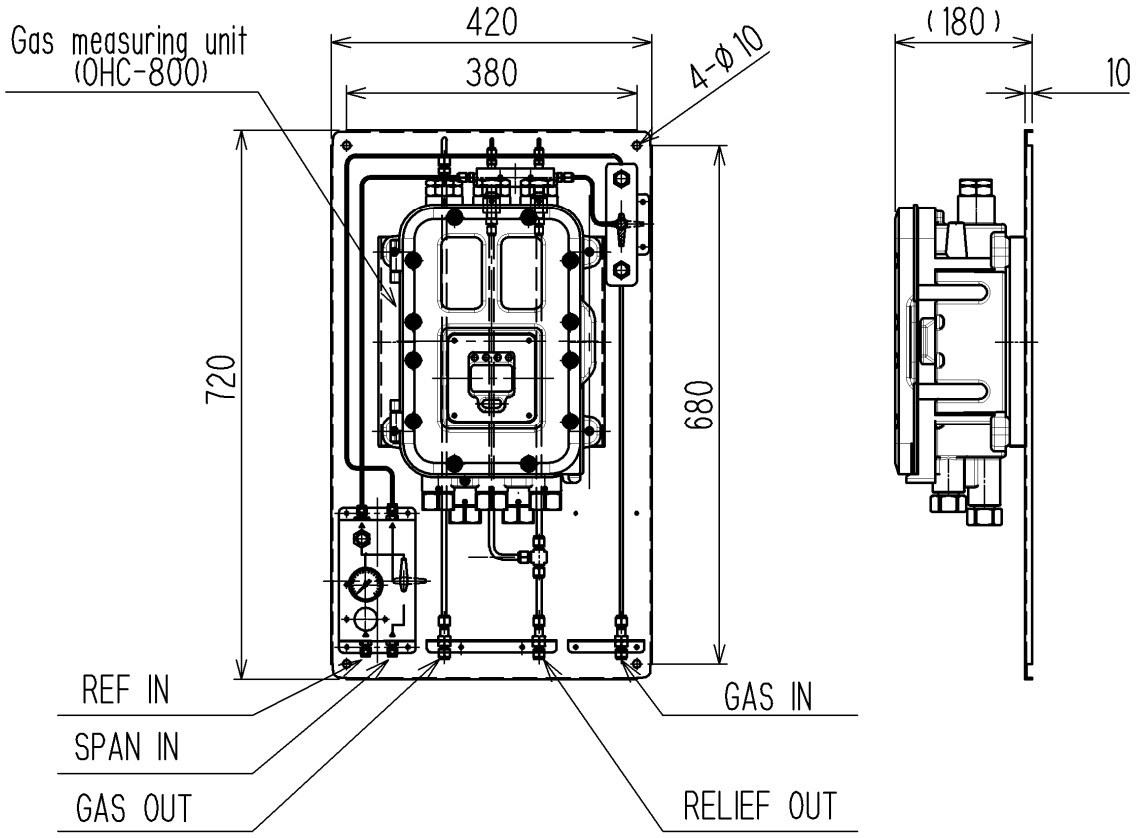
Unit	Symbol	Part	Functions
UNIT-A	V1	Needle valve	Adjusts the flow rate of the measuring gas supplied from UNIT-B.
	V2	Needle valve	Adjusts the flow rate of the reference gas or calibration gas supplied from UNIT-C.
	CV	Switching valve	Selects a gas to be supplied to the OHC-800.
UNIT-B	PR	Pressure reducing valve	Adjusts the measuring gas supplied from GAS IN to a constant pressure.
	PG	Pressure gauge	Indicates the pressure of the measuring gas after pressure adjustment. (Display scale: 0 - 0.2 MPa)
	FL	Flow meter with needle valve	Adjusts and indicates the bypass flow rate of the gas discharged from BYPASS OUT. (Display scale: 0.5 - 5 L/min, 1 - 10 L/min, 2 - 20 L/min * Varies by the specification.)
UNIT-C	PR	Pressure reducing valve	Adjusts the reference gas supplied from REF IN to a constant pressure.
	PG	Pressure gauge	Indicates the pressure of the reference gas after pressure adjustment. (Display scale: 0 - 0.2 MPa)
	V	Needle valve	Adjusts the flow rate of the reference gas to be supplied to the OHC-800. (Display scale: 0.5 - 5 L/min, 1 - 10 L/min, 2 - 20 L/min * Varies by the specification.)
	CV	Switching valve	Switches the gas to be supplied to UNIT-A between the reference gas and calibration gas.
UNIT-D	RV1	Relief valve	When the sampling system malfunctions, lets out an excessive pressure from RELIEF OUT to prevent breakage of the OHC-800.
	RV2	Relief valve	

* The UNIT-B specification without pressure reducing valve and bypass line is also available.

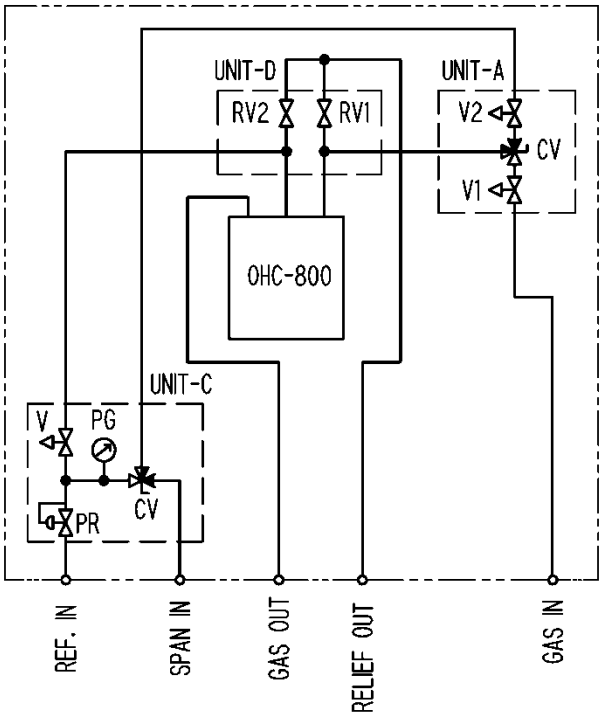
1-3. Outline drawing and tubing diagram for each specification

<RS-400-000□>

No storage box



Tubing diagram



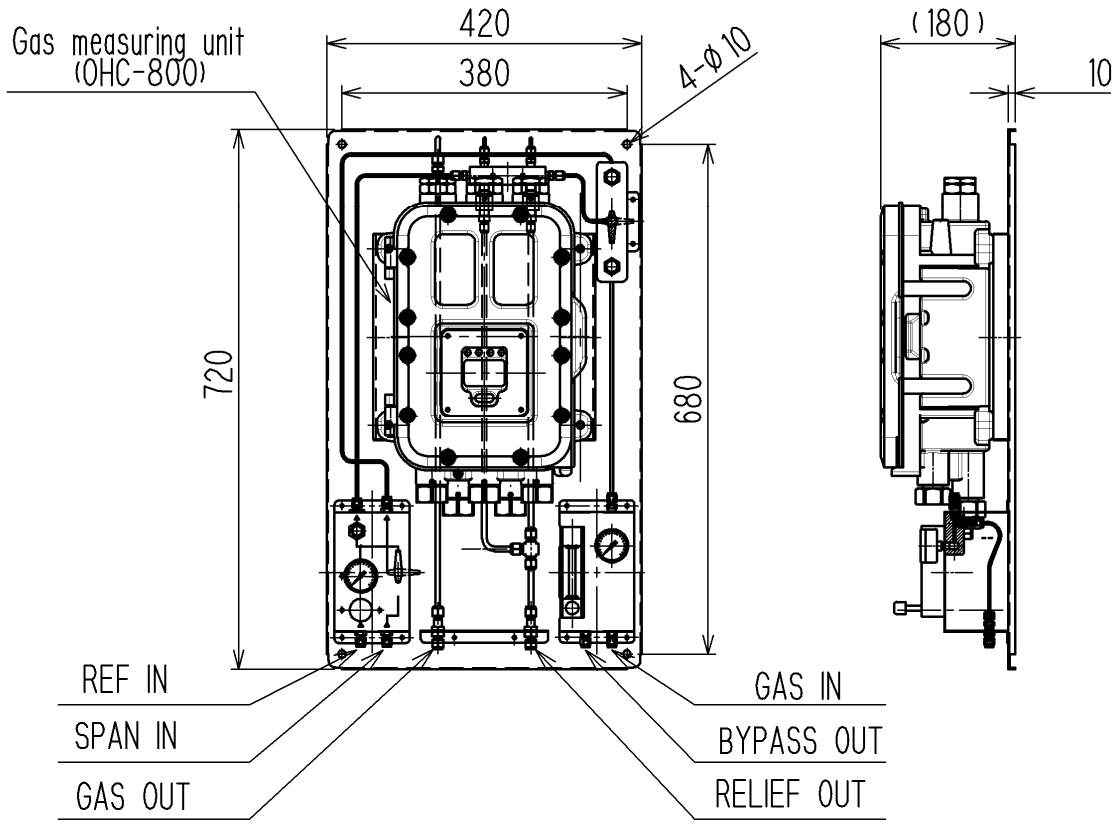
GAS IN
REF IN
SPAN IN
} Swagelok fitting for 1/8" tube

GAS OUT
RELIEF OUT
} Swagelok fitting for 1/4" tube

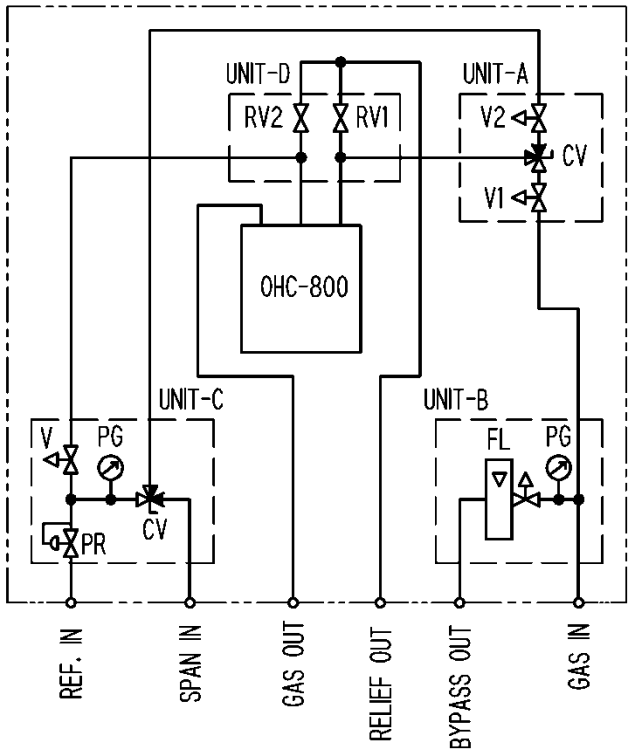
UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

<RS-400-00□□>

No storage box



Tubing diagram



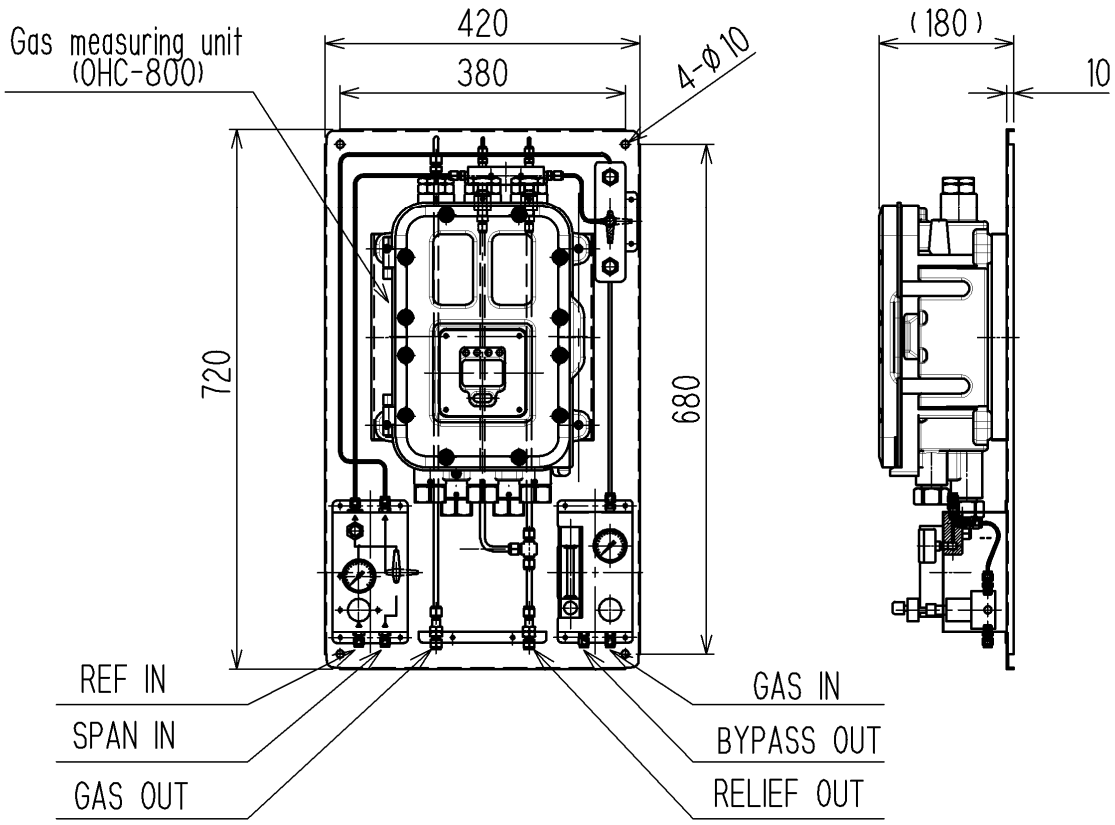
GAS IN
BYPASS OUT
REF IN
SPAN IN
} Swagelok fitting for 1/8" tube

GAS OUT
RELIEF OUT
} Swagelok fitting for 1/4" tube

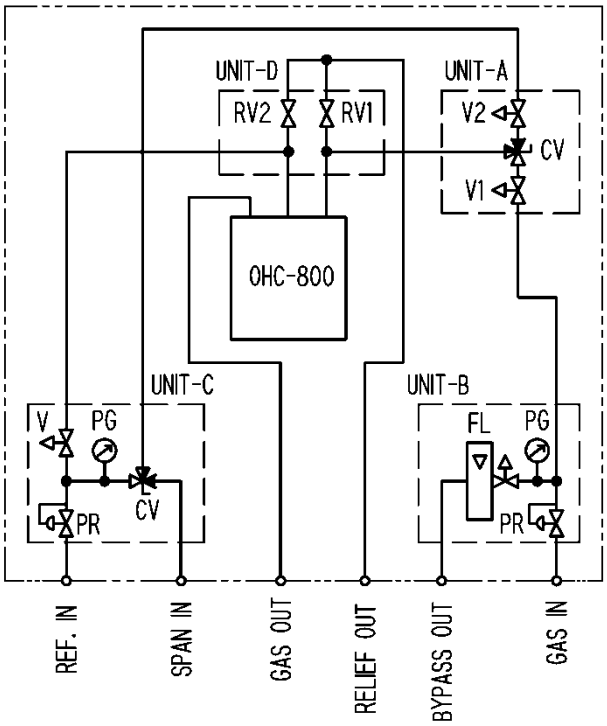
UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

<RS-400-01□□>

No storage box



Tubing diagram



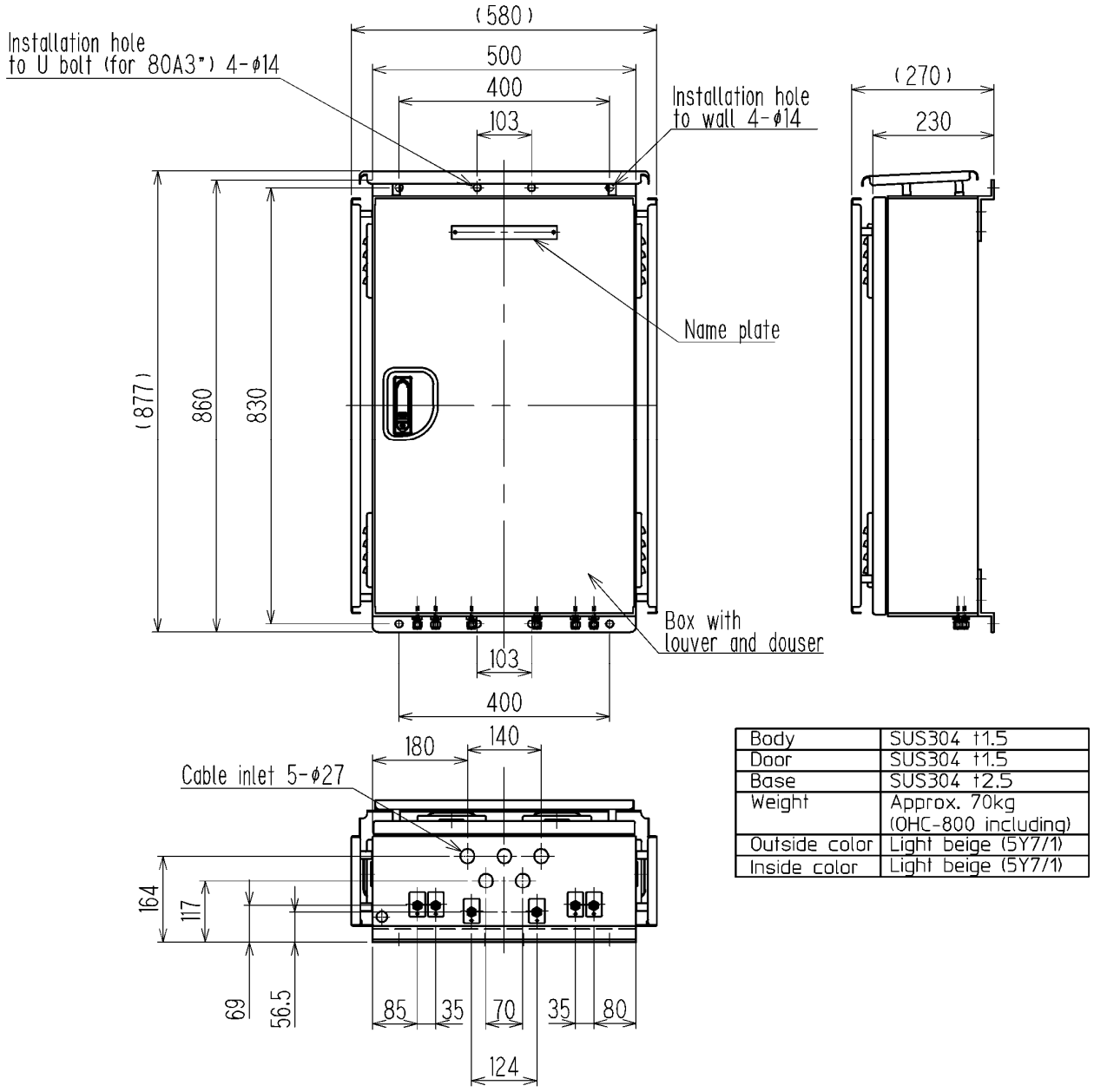
GAS IN
BYPASS OUT
REF IN
SPAN IN
} Swagelok fitting for 1/8" tube

GAS OUT
RELIEF OUT
} Swagelok fitting for 1/4" tube

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PR	Pressure reducing valve
	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

<Common between RS-400-100□, RS-400-10□□ and RS-400-11□□>

Outdoor box (SUS) with shading plate



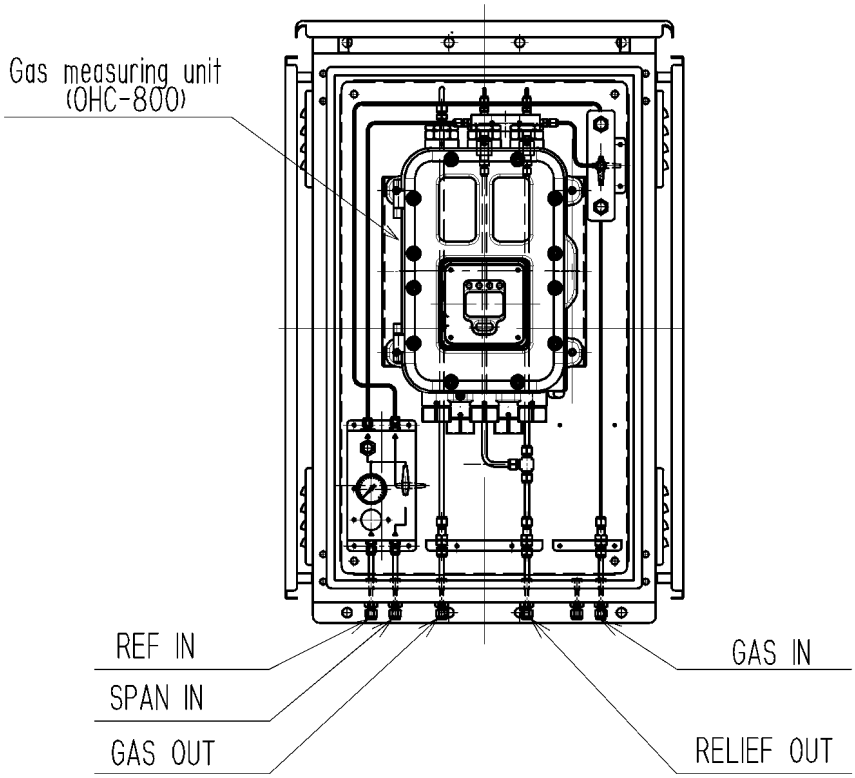
Body	SUS304 t1.5
Door	SUS304 t1.5
Base	SUS304 t2.5
Weight	Approx. 70kg (OHC-800 including)
Outside color	Light beige (5Y7/1)
Inside color	Light beige (5Y7/1)

* Swagelok fitting for 1/4" tube is used at all connections of tubing.

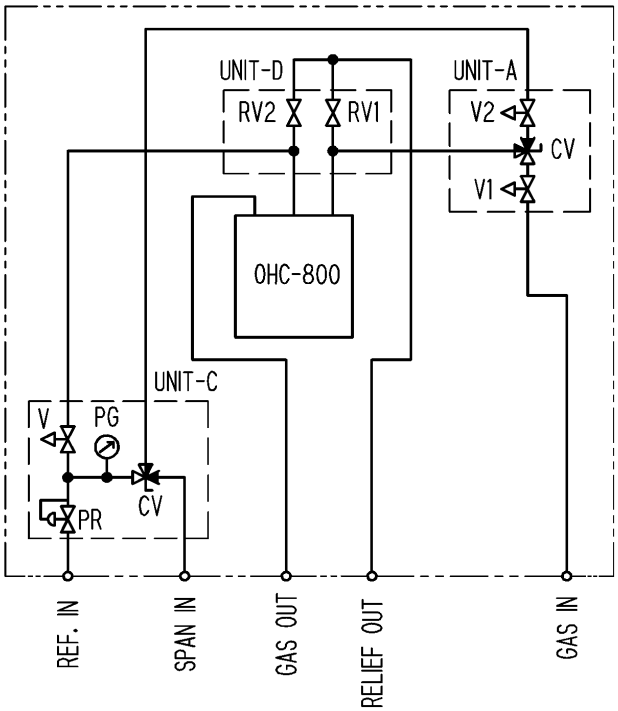
<RS-400-100□>

Box internal drawing

* See Page 7 for the outline drawing of outdoor box (SUS) with shading plate.



Tubing diagram



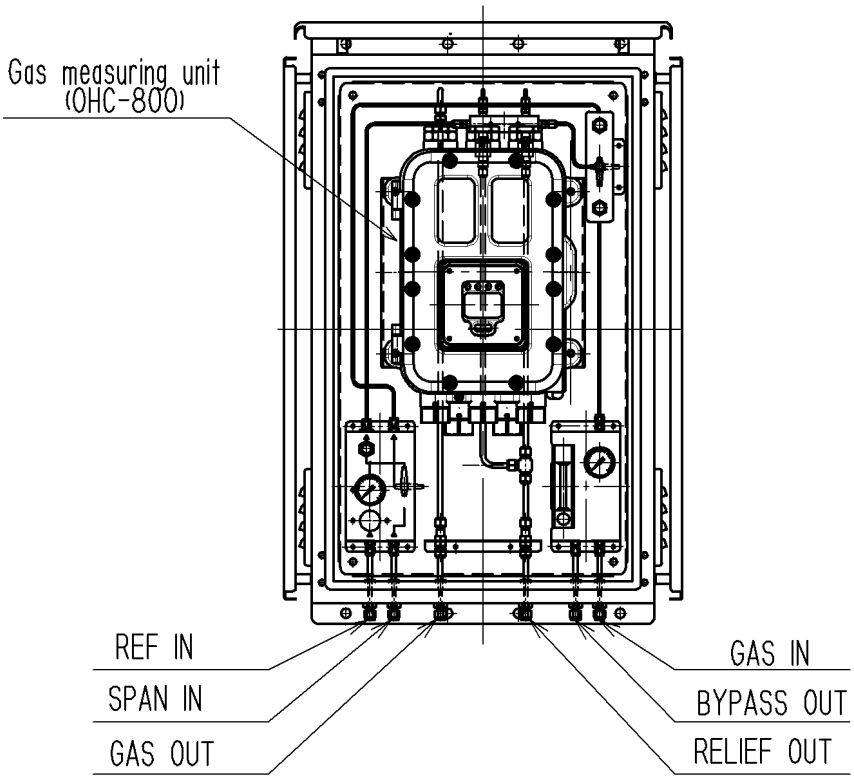
* Swagelok fitting for 1/4" tube is used at all connections of tubing.

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

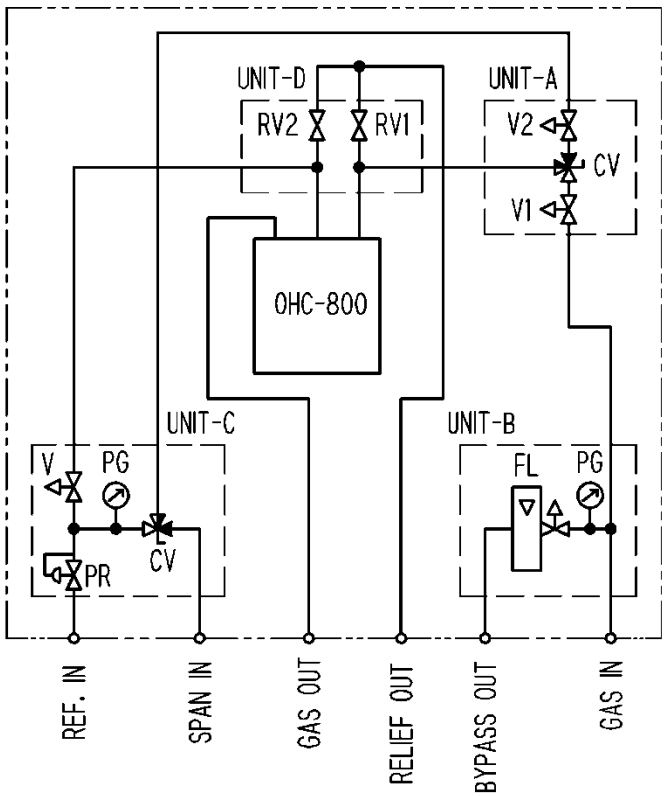
<RS-400-10□□>

Box internal drawing

* See Page 7 for the outline drawing of outdoor box (SUS) with shading plate.



Tubing diagram



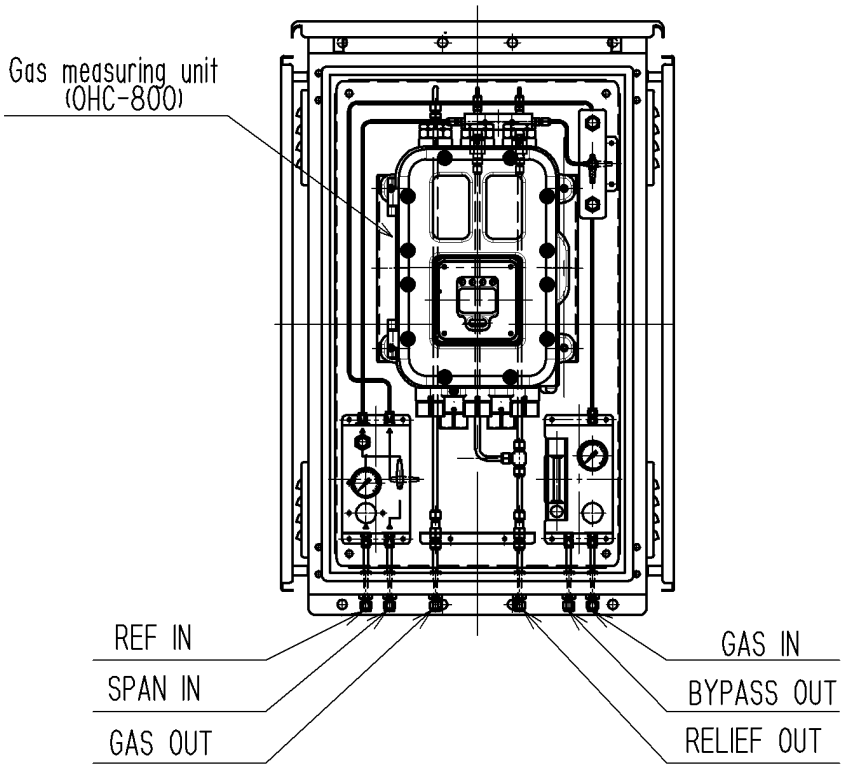
* Swagelok fitting for 1/4" tube is used at all connections of tubing.

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

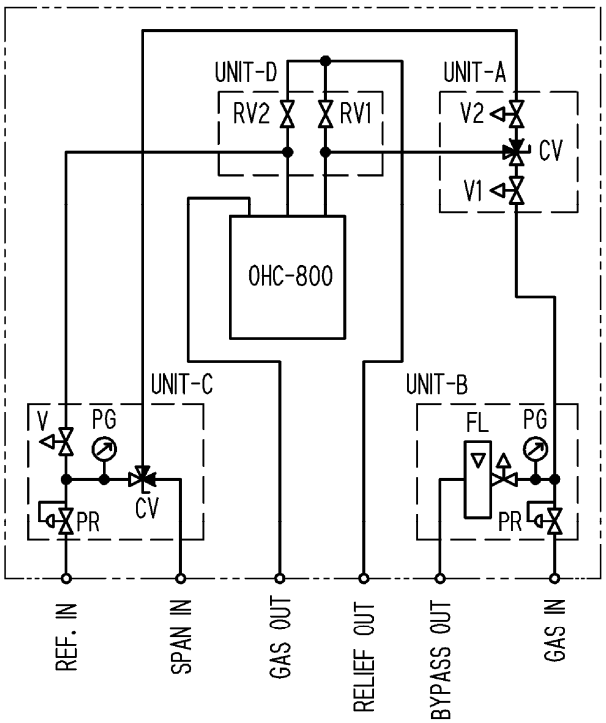
<RS-400-11□□>

Box internal drawing

* See Page 7 for the outline drawing of outdoor box (SUS) with shading plate.



Tubing diagram

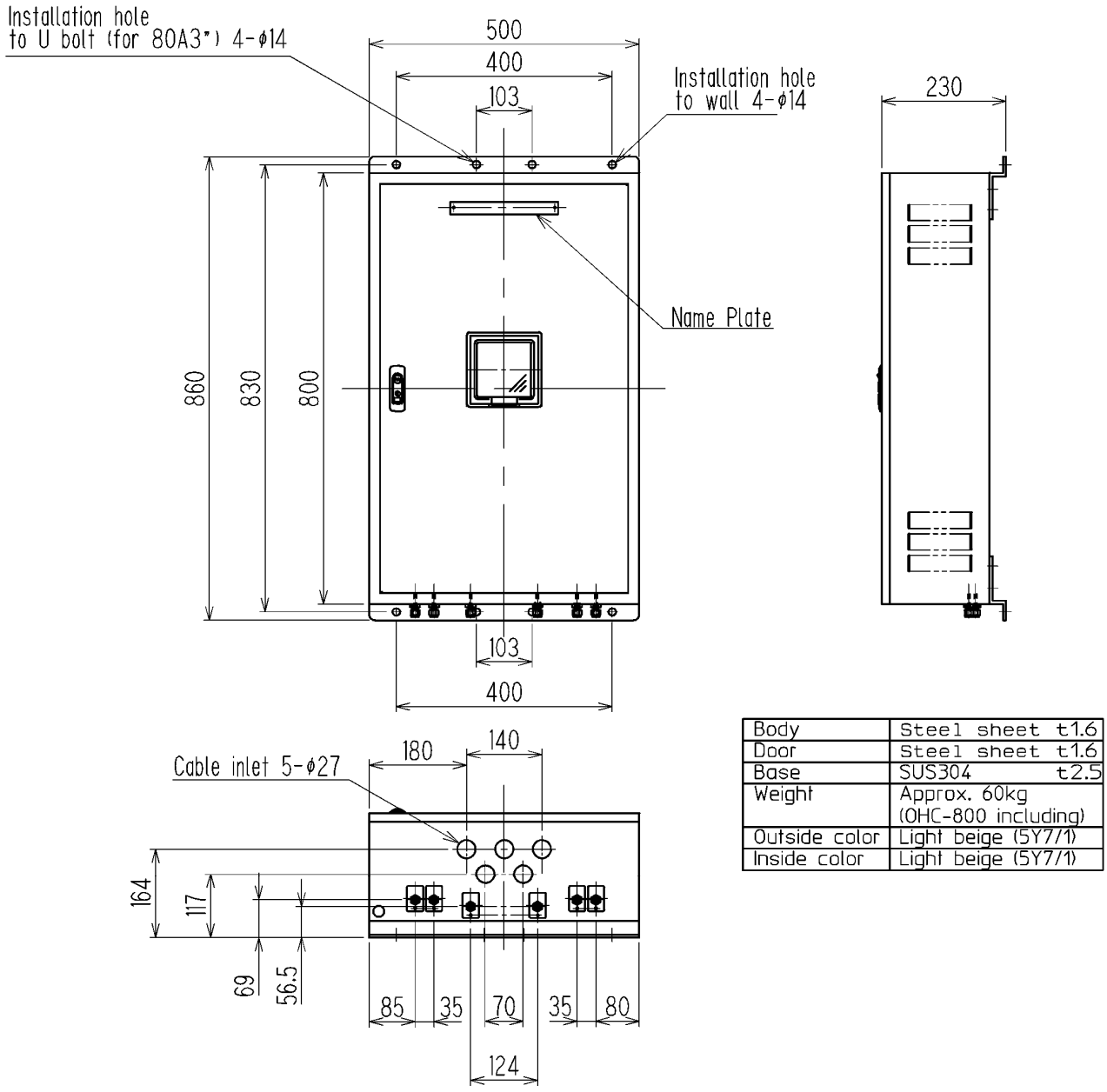


* Swagelok fitting for 1/4" tube is used at all connections of tubing.

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PR	Pressure reducing valve
	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

<Common between RS-400-200□, RS-400-20□□ and RS-400-21□□>

Indoor box (SPCC) with window



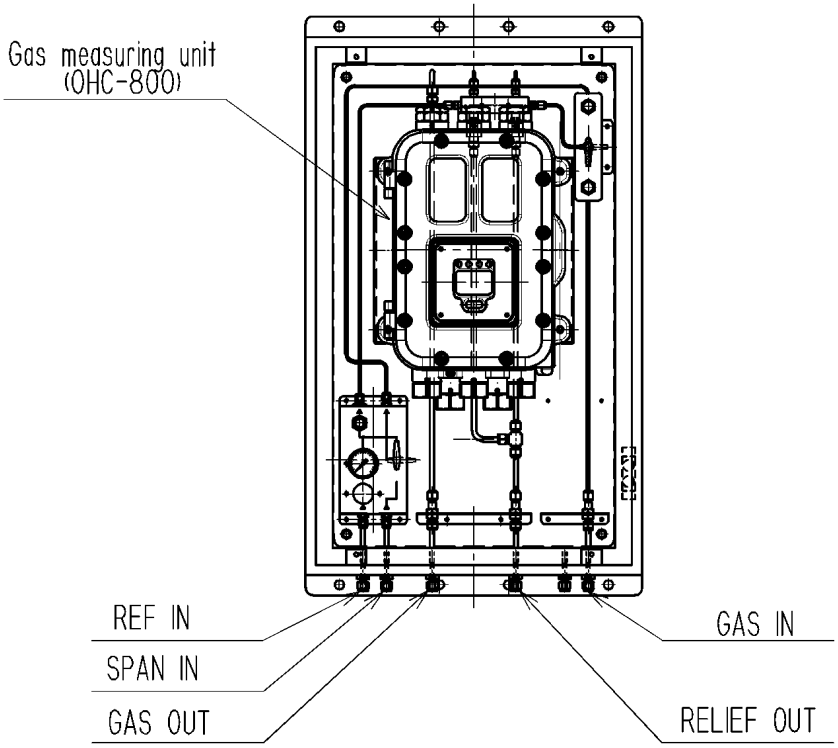
Body	Steel sheet t1.6
Door	Steel sheet t1.6
Base	SUS304 t2.5
Weight	Approx. 60kg (OHC-800 including)
Outside color	Light beige (5Y7/1)
Inside color	Light beige (5Y7/1)

* Swagelok fitting for 1/4" tube is used at all connections of tubing.

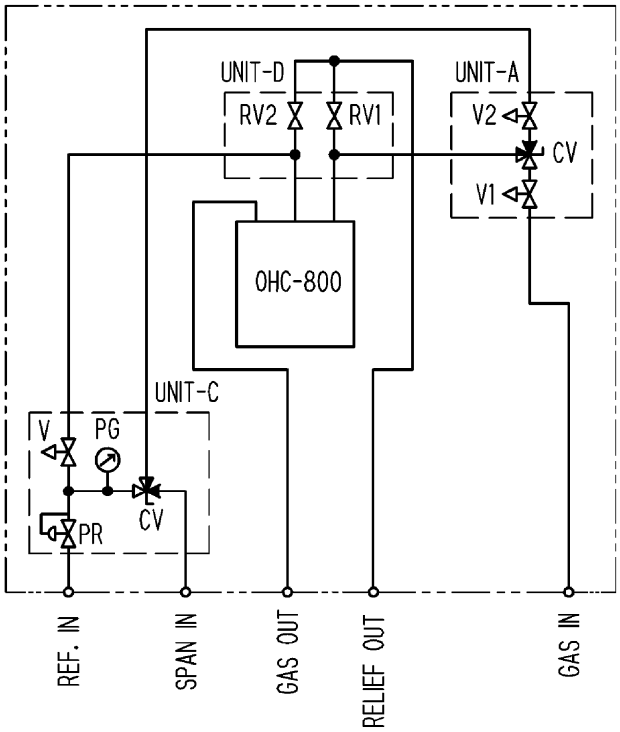
<RS-400-200□>

Box internal drawing

* See Page 11 for the outline drawing of indoor box (SPCC) with window.



Tubing diagram



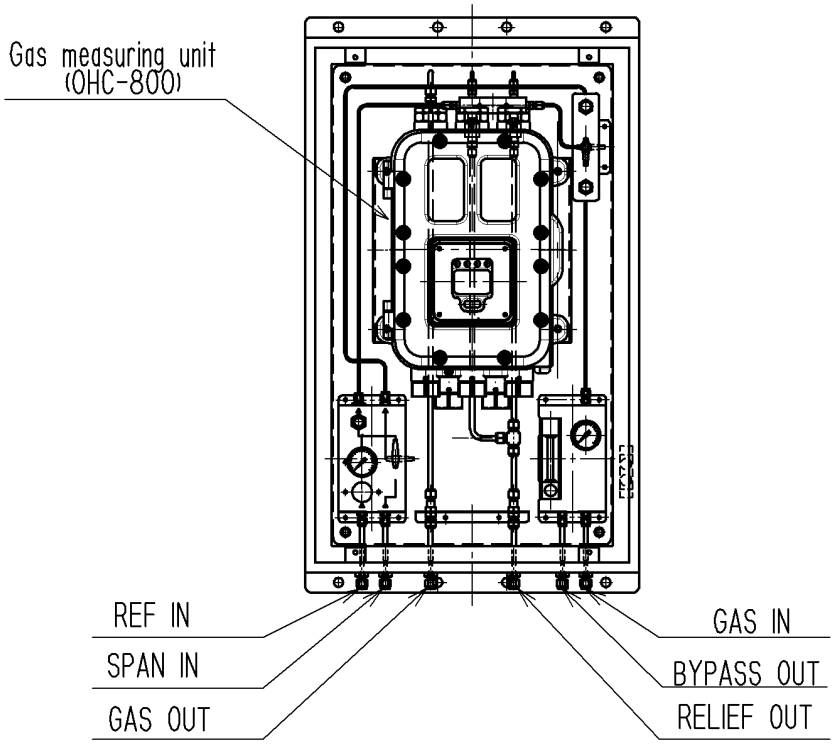
* Swagelok fitting for 1/4" tube is used at all connections of tubing.

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

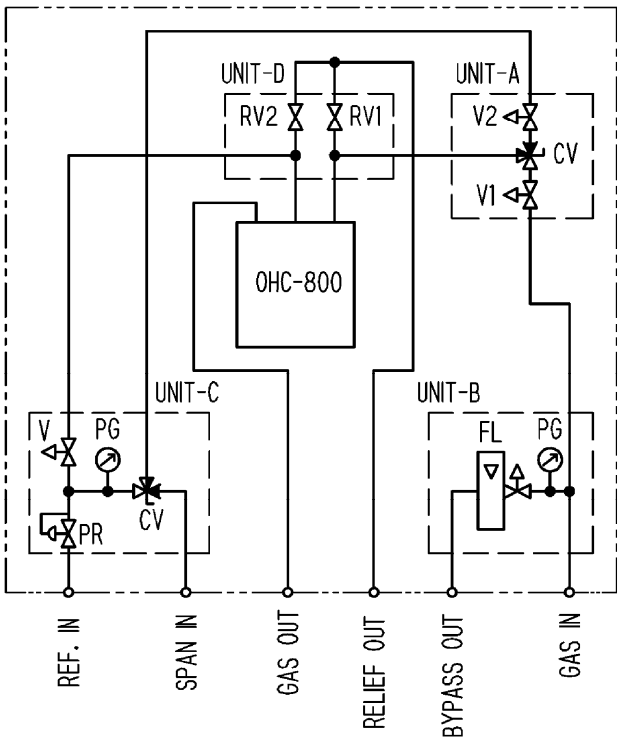
<RS-400-20□□>

Box internal drawing

* See Page 11 for the outline drawing of indoor box (SPCC) with window.



Tubing diagram



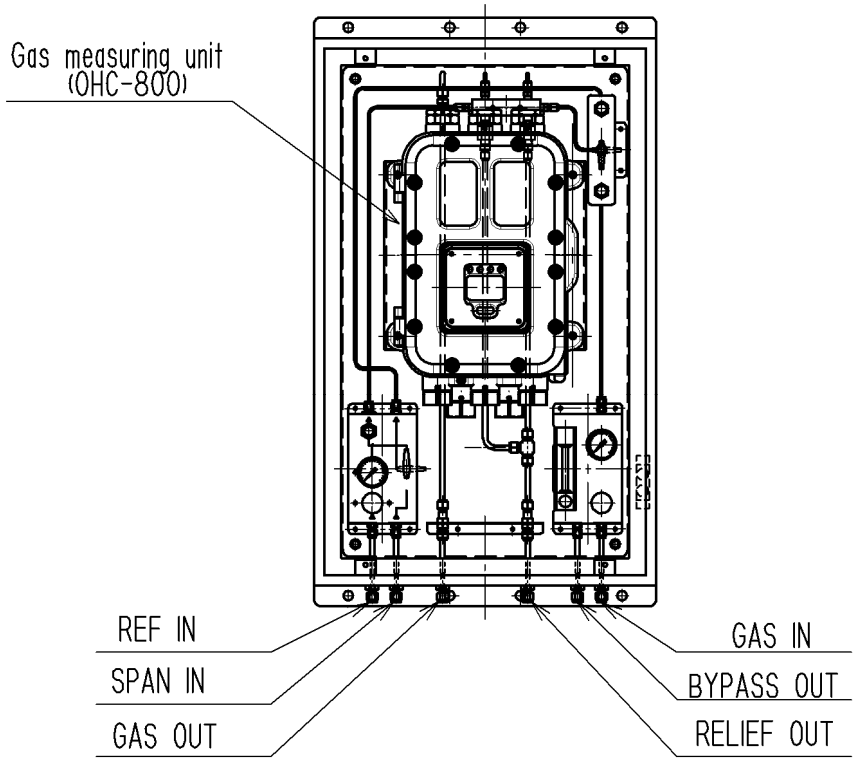
* Swagelok fitting for 1/4" tube is used at all connections of tubing.

UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

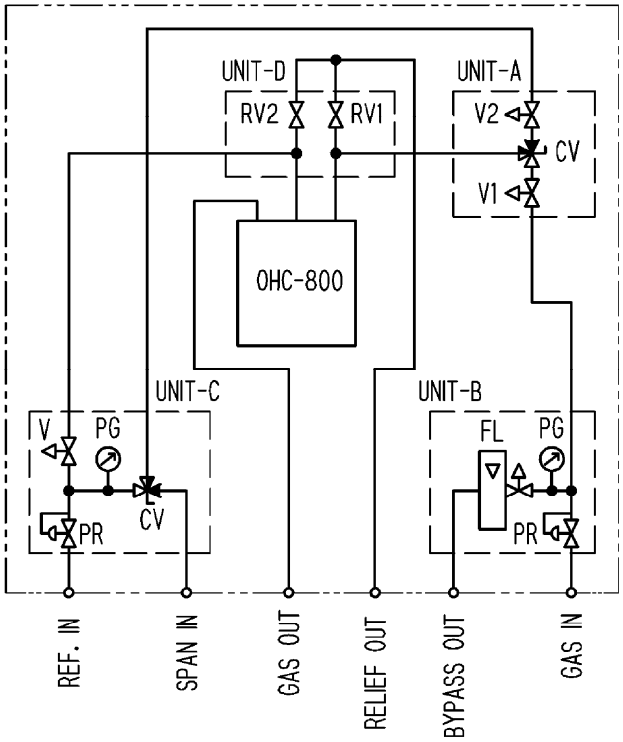
<RS-400-21□□>

Box internal drawing

* See Page 11 for the outline drawing of indoor box (SPCC) with window.



Tubing diagram



* Swagelok fitting for 1/4" tube is used at all connections of tubing.

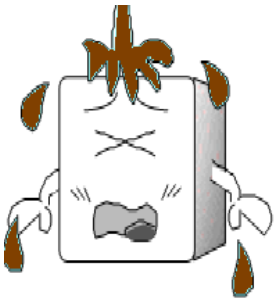
UNIT-A	V1	Needle valve
	V2	Needle valve
	CV	Switching valve
UNIT-B	PR	Pressure reducing valve
	PG	Pressure gauge
	FL	Flow meter with needle valve
UNIT-C	PR	Pressure reducing valve
	PG	Pressure gauge
	V	Needle valve
	CV	Switching valve
UNIT-D	RV1	Relief valve
	RV2	Relief valve

2

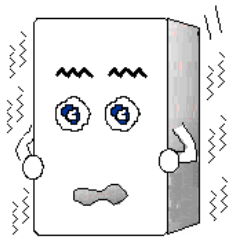
How to Install Calorimeter

2-1. Precautions on installation site

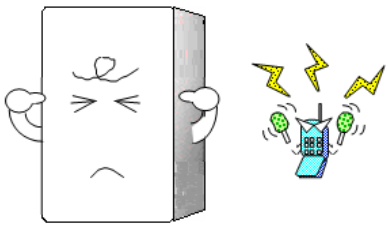
Do not install this product in any of the following locations.



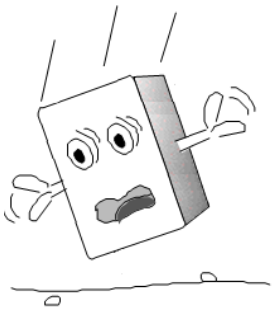
(1) Place where the calorimeter is exposed to oil, chemicals etc.



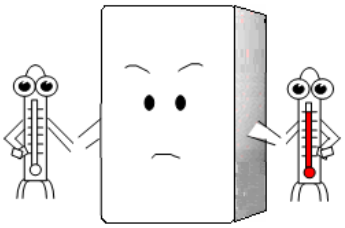
(2) Place with vibrations



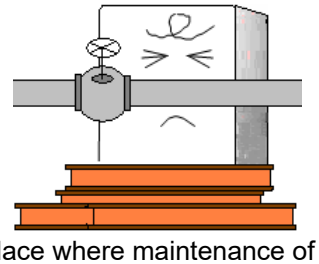
(3) Place where radio wave or noise is generated



(4) Place where the calorimeter may drop or receive strong shock



(5) Place exceeding the operating temperature range
Place where the calorimeter is exposed to direct sunlight or radiant heat



(6) Place where maintenance of the calorimeter cannot be performed
Place where handling of the calorimeter involves dangers

2-2. Precautions on installation

CAUTION

Do not drop or give strong shock to the calorimeter during installation.
Otherwise, the device may be damaged.

CAUTION

If the calorimeter is to be fixed on the wall, install it properly
where can hold its weight.

CAUTION

When installing the calorimeter on a freestanding rack (fixed type), fix the freestanding rack with anchor bolts.

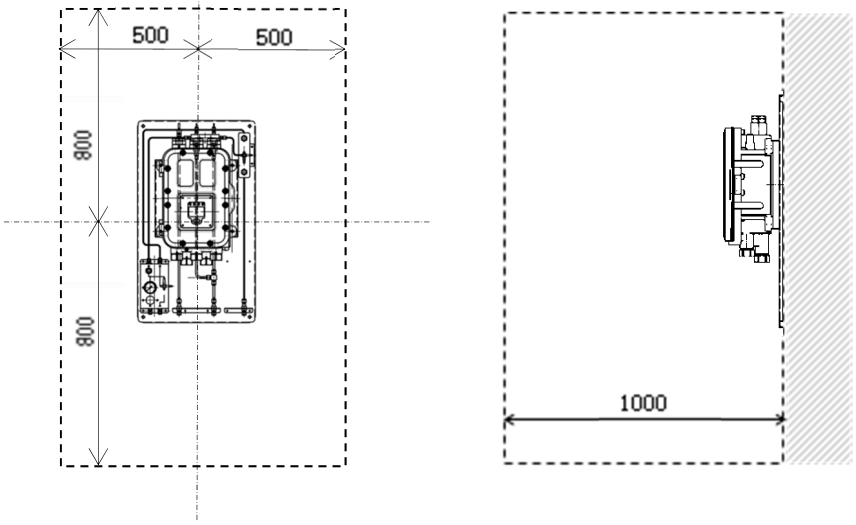
CAUTION

When performing construction work, prevent dust from entering the inside of the calorimeter.

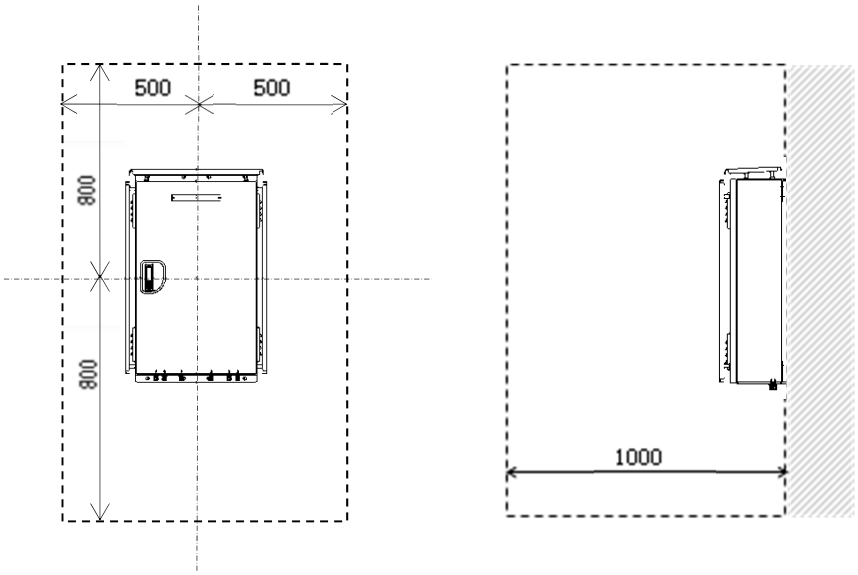
2-3. Maintenance space

Before installation, a maintenance space shown in the figure on the right must be secured. Be sure to secure this space during construction planning or installation.

Without storage box



With storage box



Maintenance space (Unit: mm)

CAUTION

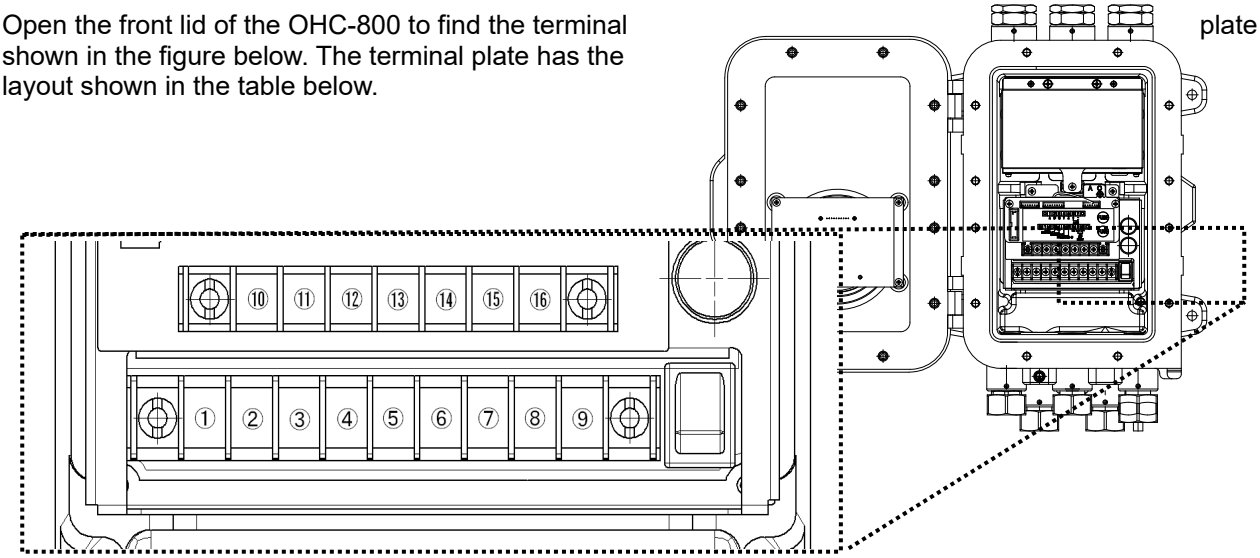
- Do not drop or give strong shock to the calorimeter during transportation or installation. Otherwise, the calorimeter may be damaged, or the explosion-proof performance may be lost.
- When installing the calorimeter on a freestanding rack (fixed type), fix the freestanding rack with anchor bolts.
- If the calorimeter is to be fixed on the wall, install it properly where can hold its weight.
- When performing construction work, prevent dust from entering the inside of the calorimeter.

3

How to Connect Wire

3-1. Description of terminal plate

Open the front lid of the OHC-800 to find the terminal plate shown in the figure below. The terminal plate has the layout shown in the table below.



(1) (2)	Contact output 1	CONTACT 1	Activates if the FUNCTION CHECK condition is met or the OUT OF SPECIFICATION condition is met. [No-voltage contact, contact capacity of 2 A, 30 VDC (resistance load)]
(3) (4)	Contact output 2	CONTACT 2	Activates if the FAILURE condition is met. [No-voltage contact, contact capacity of 2 A, 30 VDC (resistance load)]
(5) (6)	Contact output 3	CONTACT 3	Activates if the MAINTENANCE REQUIRED condition is met. [SSR contact, contact capacity of 20 W, 240 VAC (resistance load)]
(7)	Power	FG	Functional Grounding (EARTH)
(8)		L / +	100 - 240 VAC ±10%, 50/60 Hz, max. 18 VA or 24 VDC ± 10%, max. 5 W
(9)		N / -	

(10)	RS-485 communication	A	Input-output terminals for communication via RS-485
(11)		B	
(12)		G	
(13)		Y	
(14)		Z	
(15)	4 - 20 mA external output	(+)	4 - 20 mA DC (insulated, source current type) maximum load resistance of 300 Ω Minimum resolution of 0.01 mA or less
(16)		(-)	

M4 is used as the terminal screws for the terminal plate. Attach an insulated ring terminal with insulating coating for M4 to the tip of a cable for wiring.

NOTE

If you are considering the use of the RS-485 communication function, contact RIKEN KEIKI.

NOTE

Contact output 3 (SSR)

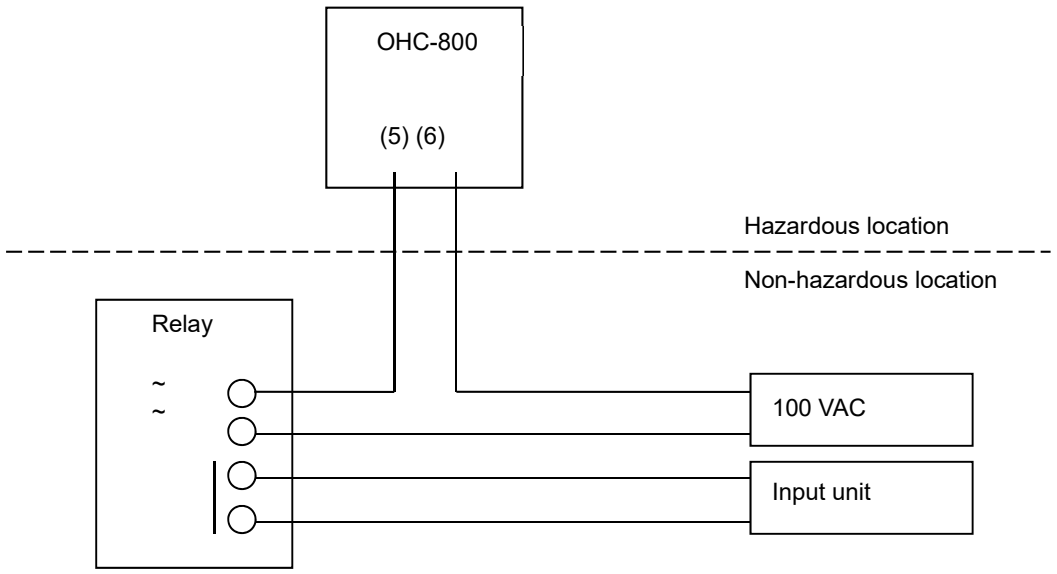
- Contact output 3 of the calorimeter makes SSR output.
- AC power supply is required to drive the contact output.

Converting SSR contact into dry contact

Add an external relay.

Contact output 3 of the calorimeter makes SSR output. (Load specification: 75 - 264 VAC, 20 mA - 1 A)
It is not possible for a DC input unit to obtain SSR output.
In this case, add an external AC relay to convert SSR contact output into dry contact output.

<Wiring Diagram>



- Install an AC relay in the non-hazardous area.
- Use a coil with specified voltage of 75 - 264 VAC and current of 20 mA - 1 A for the relay.
  E.g.) MK3ZP (OMRON): Rated current 23.1 mA (100 VAC, 60 Hz)

3-2. Recommended cable

Connected to	Recommended cable	Cable overall outer diameter
Power (AC) line	CVV 1.25 sq/3-core	Ø10.0
	CVV 2 sq/3-core	Ø11.0
Power (DC) line	CVVS 1.25 sq/2-core	Ø10.0
	CVVS 2 sq/2-core	Ø11.0
4 - 20 mA line	CVVS 1.25 sq/2-core	Ø10.0
	CVVS 2 sq/2-core	Ø11.0
Contact x 1 lines	CVVS 1.25 sq/2-core	Ø10.0
	CVVS 2 sq/2-core	Ø11.0
Contact x 2 lines	CVVS 1.25 sq/4-core	Ø11.0
	CVVS 2 sq/4-core	Ø12.0
Contact x 3 lines	CVVS 1.25 sq/6-core	Ø13.0
	CVVS 2 sq/6-core	Ø14.0
RS485 line	Shielded cable of KPEVS etc. 0.75 sq/2P	Ø11.0

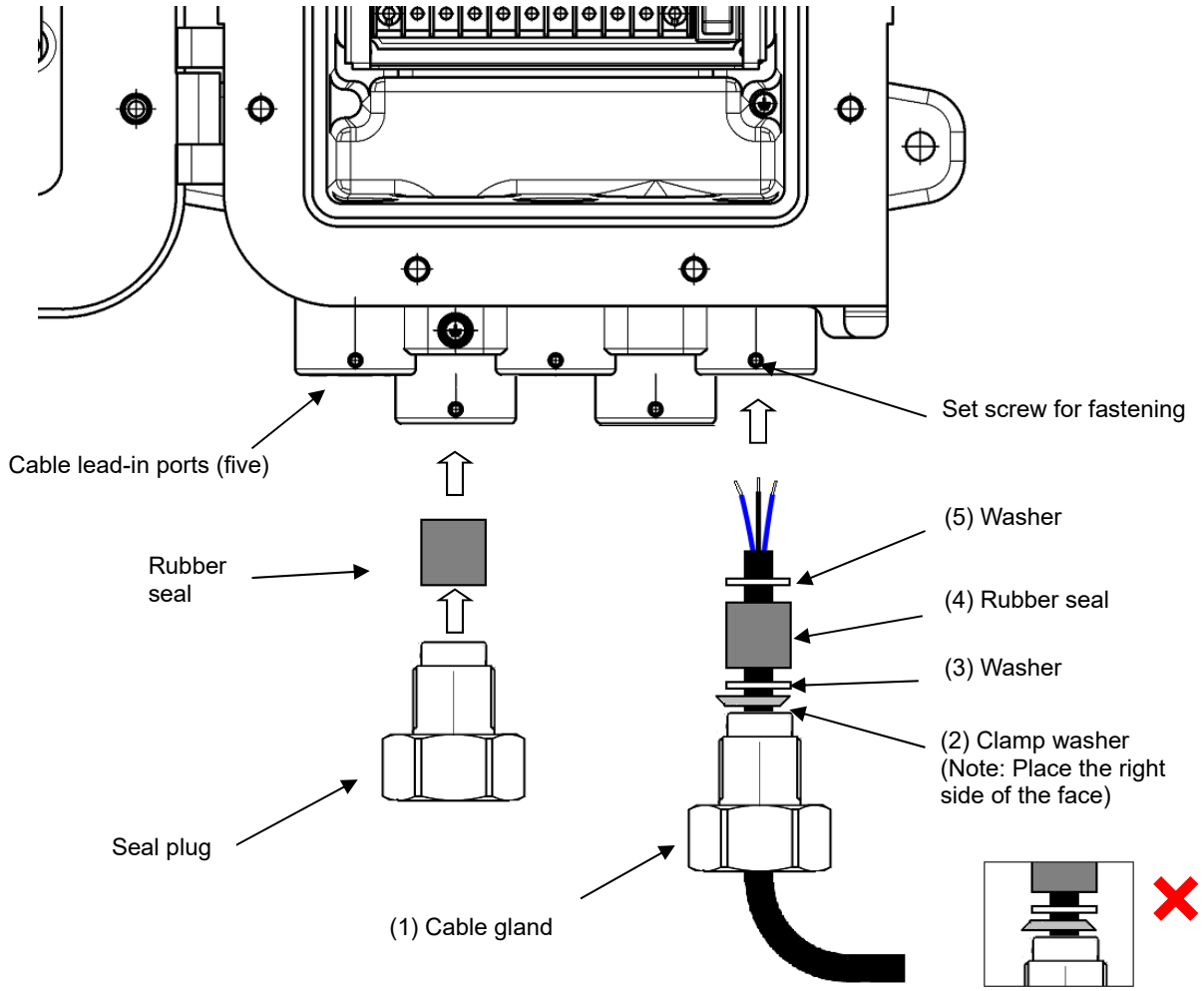
NOTE

The overall outer diameters must be checked because they may slightly vary between manufacturers.

3-3. Cable connection

As shown on the right side of the figure below, attach the parts in the following order: (1) cable gland, (2) clamp washer, (3) washer, (4) rubber seal and (5) washer to the cable, then connect the cable into lead-in port through the enclosure by attaching an insulated ring terminal to the tip in order to complete the connection to the terminal plate.

An unused cable lead-in port must be closed with a rubber seal and a seal plug as shown on the left of the figure below.

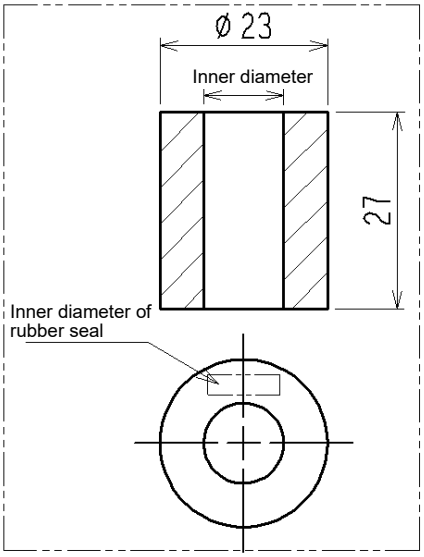


CAUTION

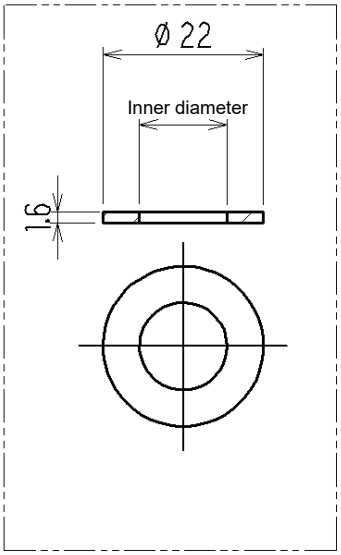
- Ensure the tightening torque for the cable gland and seal plug to be 40 Nm or larger.
- If it is difficult to tighten the cable gland and seal plug, grease its screw part and then tighten them with the tool.
- After completing tightening the cable gland and seal plug, use a set screw for fastening to prevent it from loosening.
- To improve noise immunity, connect the shield of the CVVS cable inside the enclosure.

The rubber seals, washers and clamp washers to be needed for cable connection vary depending on the overall outer diameter of a cable to be used. The table below shows the relationships between the overall outer diameters of cables and inner diameters of parts. Please specify parts needed for cables to be used.

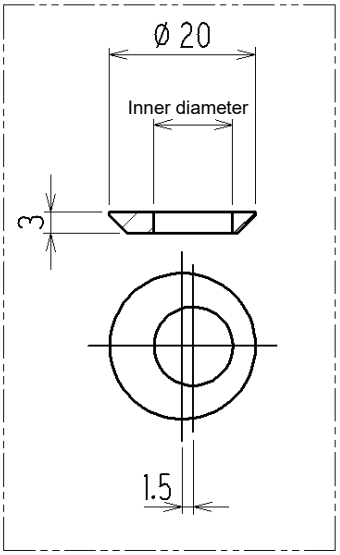
Cable overall outer diameter (mm)	Rubber seal Inner diameter (mm)	Washer Inner diameter (mm)	Clamp washer Inner diameter (mm)
Ø10, Ø10.5	Ø11	Ø12	Ø10.8
Ø11, Ø11.5	Ø12	Ø14	Ø11.8
Ø12, Ø12.5	Ø13	Ø14	Ø12.8
Ø13, Ø13.5	Ø14	Ø14	Ø13.8



Rubber seal



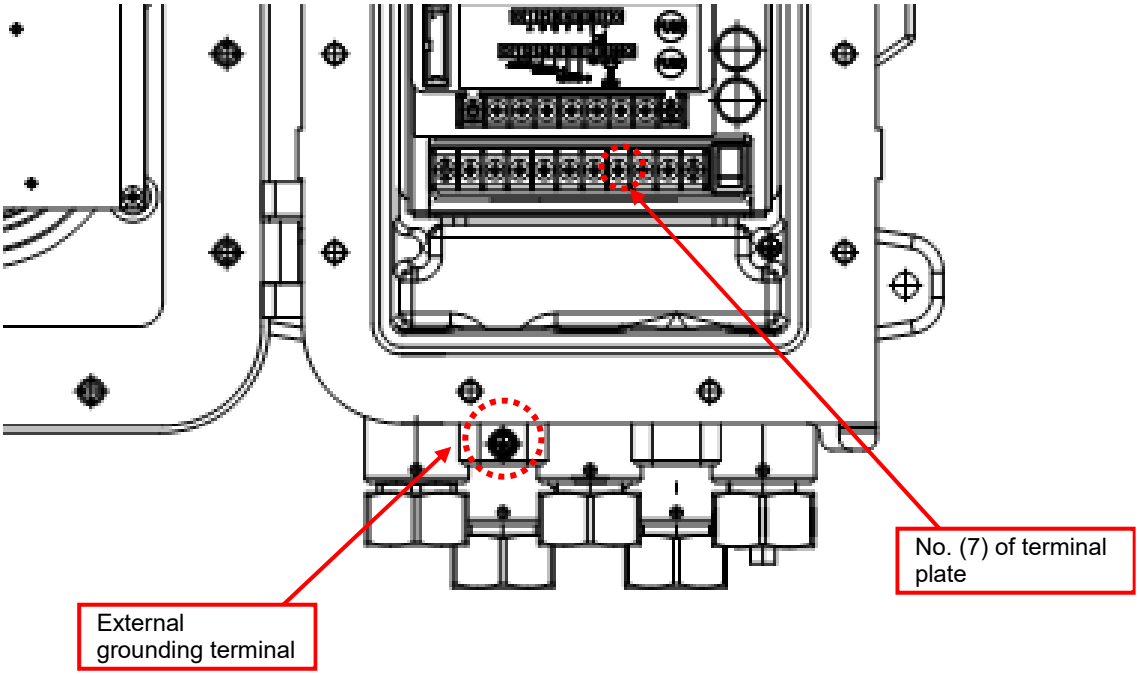
Washer



Clamp washer

3-4. Protective grounding

Connect the calorimeter to the ground using the "external grounding terminal" or "No. (7) of the terminal plate" shown in the figure below.



WARNING

- Before turning on the calorimeter, never fail to connect it to the ground.
- Ensure to connect the calorimeter to the ground for stable operation and safety. Do not connect the grounding wire to a gas pipe.
- Ensure the grounding to be D type grounding or equivalent (less than 100 Ω of the grounding resistance).
- Use cable lugs for the grounding wire without any slack or tangle for safe connection.

3-5. Precautions on electrical work

CAUTION

- Be careful not to damage the internal electronic circuit when wiring. In addition, be careful not to apply stresses on the calorimeter due to load or installation of cables.
- Do not install the power cables and signal cables in parallel with motor power cables, etc. When these cables must be installed in parallel for unavoidable reasons, put the power cables and signal cables in a metal conduit and connect the conduit to the ground.
- Use ring terminals.
- Use appropriate cables to wire.

Using a stable power supply

Not only when the power is turned on but also when the calorimeter is restarted due to momentary blackout, note that OHC-800 is switched to a warm-up status for 15 minutes and stops measurement for function check status (see Sections 4.1, "From display just after power-on to measurement start" and 4.4, "Self-diagnostic and monitoring function").
To reduce risk of momentary blackout, use a UPS (uninterruptible power supply) or take other appropriate action.

The calorimeter must be provided with the following power supply.

Power supply voltage (Terminal voltage of the calorimeter)	100 VAC ± 10% - 240 VAC ± 10% [AC specification] 24 VDC ± 10% [DC specification]	
Allowed time of momentary blackout	Up to 40 milliseconds (The calorimeter recovers from momentary blackouts that last 40 milliseconds or longer by restarting itself.)	Example of actions Install a UPS etc. on the outside of the calorimeter to ensure continuous operation and activation.
Others	Do not use it with a power supply of large power load or high-frequency noise.	Example of actions Use a line filter etc. to avoid the noise source if necessary.

Introducing protective measures against lightning

If cables are installed outside the factory/plant, or if internal cables are installed in the same duct as the cables coming from outside the factory/plant, "inductive lightning surge" may be caused by lightning. Because lightning acts as a large emission source while cables act as a receiving antenna, devices connected to the cables may be damaged.
The occurrence of lightning cannot be prevented, and even cables installed in a metal conduit or under the ground cannot be completely protected from inductive lightning surge caused by lightning.

Although complete elimination of damages caused by lightning is impossible, the following protective measures can be taken.

Protection against lightning	Take appropriate measures in accordance with the importance of the facilities and the environment. Provide protection by a lightning arrester (cable arrester). Install a lightning arrester before the field devices and central processing equipment to mitigate any risk due to inductive lightning surge transmitted through the cable. For information on how to use a lightning arrester, please contact the manufacturer.
Grounding	In addition to lightning, there are more sources of surge noise. To protect devices from these noise sources, the devices must be grounded.

* The lightning arrester has a circuit to remove a surge voltage which damages field devices. Therefore, signals may be attenuated by installing the arrester. Before installing a lightning arrester, verify that it works properly.

Proper use of contact

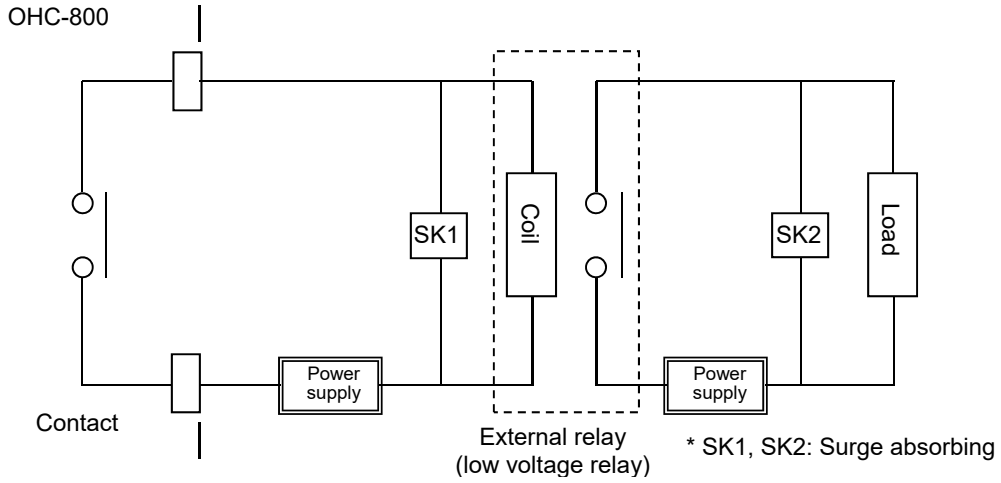
If the contact output of this product is used on a line where large inductive load occurs, the following errors may occur due to counter electromotive force generated at the contact.

- Deposition, defective insulation or defective contact at the relay contact
- Damage of any electric parts due to high-voltage generation
- Abnormal operations by an out-of-control CPU

CAUTION

- Do not use the contacts of the calorimeter directly for drive control over external devices that generate large inductive load, such as a fluorescent lamp or large-scale motor.
- To control a line where large inductive load occurs, provide an external relay for contact amplification. However, because the coil of an external relay also involves inductive load, select a relay at a lower voltage, and then protect the contact of the calorimeter with an appropriate surge absorbing part, such as a CR circuit.

To control a line where large inductive load occurs, protect the contacts of this product as shown in the figure below.



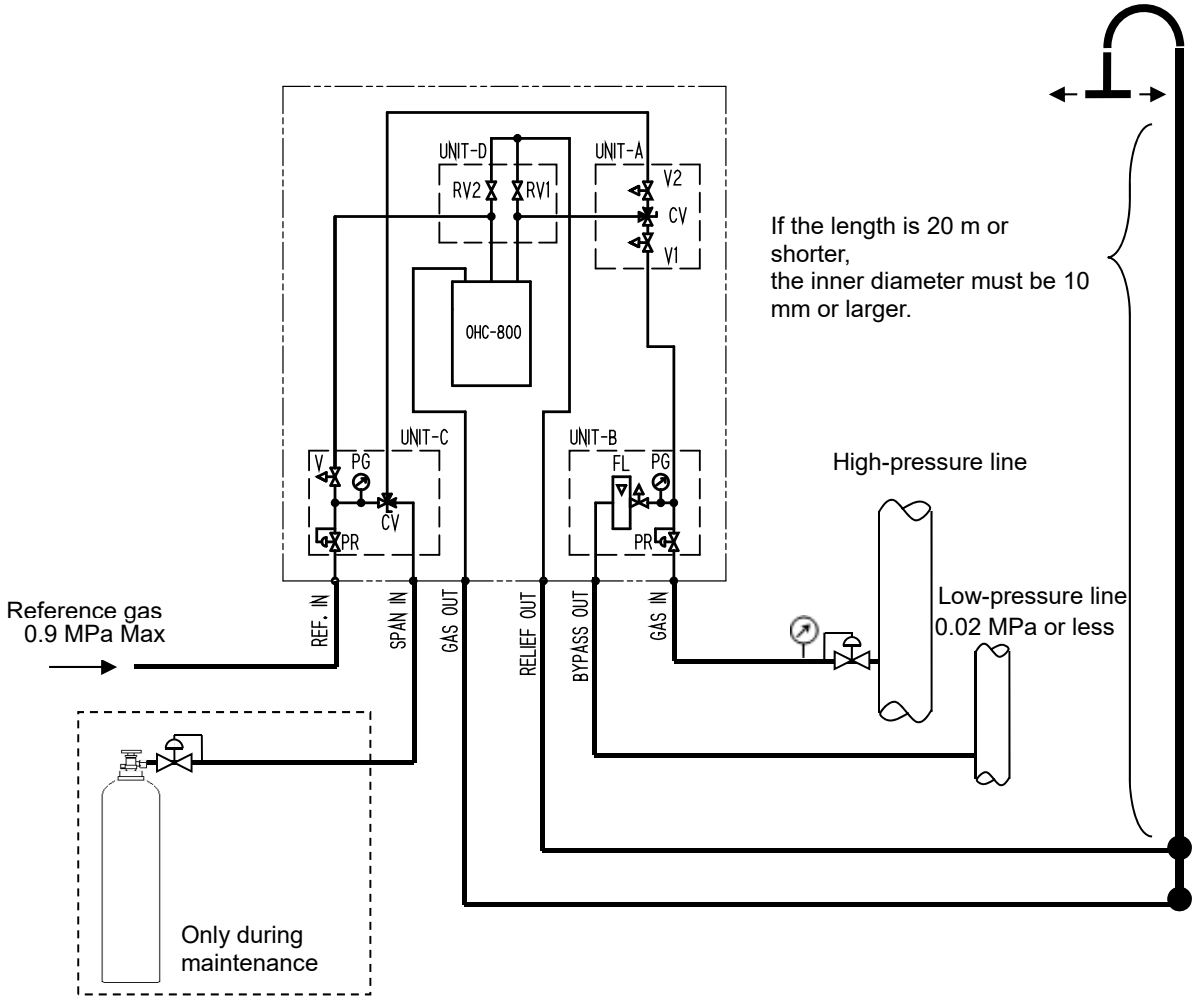
- Relay it with an external relay (contact amplification). At the same time, the surge absorbing part SK1 suitable for the specifications must be attached to the external relay.
- In addition, the surge absorbing part SK2 must be attached to the loaded side of the external relay if necessary.
- It may be recommended that the surge absorbing part should be attached to the contact for certain load conditions. It must be attached to an appropriate position by checking how the load is activated.

4

How to Tube

4-1. Recommended external tubing system

If the sampling point is on a high-pressure line over 0.9 MPa, decompression must be performed outside the sampling device. Decompression must be performed as close to the sampling point as possible to ensure the quickest possible arrival of the measuring gas at the OHC-800. (Use the direct-insertion type of pressure reducing valve if possible.)
Since the OHC-800 consumes approximately 300 mL/min of measuring gas, which is small, the bypass flow rate must be increased to ensure quicker arrival of the gas.
If there is a low-pressure line of about 20 kPa, BYPASS OUT can be connected. If there is no low-pressure line, release the gas from BYPASS OUT into the atmosphere.
Since there is no limit on the arrival time of the reference gas, there is no problem unless the pressure exceeds 0.9 MPa.
The gas from GAS OUT should be released into the atmosphere in principle, but it can be exhaust into an exhaust duct equivalent to the atmospheric pressure (atmospheric pressure ±3 kPa) if any.
If RELIEF OUT converges on GAS OUT, use tubing with inner diameter of 10 mm or more (3/8" or more) if the length of the tube is 20 m or shorter in order to decrease the load from the converging point to downstream.
The end point of a vent for atmosphere release should form an inverted "T" shape to prevent inflow of rainwater or variations of exhaust pressure due to wind inflow.



If there is any potential risk of drain or dust inflow, install a trap or filter to prevent inflow of those foreign substances.

Use of storage box	Connection of tubing
Storage box not used RS-400-0□□□	REF IN SPAN IN BYPASS OUT GAS IN } Swagelok fitting for 1/8" tube is used at all connections of tubing. GAS OUT RELIEF OUT } Swagelok fitting for 1/4" tube is used at all connections of tubing.
Storage box used RS-400-1□□□ (outdoor use) RS-400-2□□□ (indoor use)	Swagelok fitting for 1/4" tube is used at all connections of tubing.

The table below shows the guideline values for the "setting pressures of external pressure reducing valves" and "bypass flow rates" corresponding to the "tubing diameters" and "tubing lengths" from the external pressure reducing valve to GAS IN of the sampling device in the tubing system shown on the previous page.
Use this table only for your reference because it shows estimated values for assumed arrival time of six seconds or shorter, without any view for upstream tubing structure from external pressure reducing valve or filters installed at any point of the tubing.

Tubing length / Tubing diameter	10m	20 m
Ø3, 1/8"	Setting pressure: 0.04 MPa Bypass: Not required	Setting pressure: 0.2 - 3 MPa Bypass flow rate: 2 - 5 L/min
Ø6, 1/4"	Setting pressure: 0.1 MPa Bypass flow rate: 2.5 - 5 L/min	Setting pressure: 0.1 MPa Bypass flow rate: 5 L/min
Ø8, 5/16"	Setting pressure: 0.1 MPa Bypass flow rate: 5 - 10 L/min	Setting pressure: 0.1 MPa Bypass flow rate: 10 L/min
Ø10, 3/8"	Setting pressure: 0.1 MPa Bypass flow rate: 10 - 20 L/min	Setting pressure: 0.1 MPa Bypass flow rate: 20 L/min

Use tubing with a large inner diameter for GAS OUT and RELIEF OUT.

	Ø6 - 4	Ø8 - 6	Ø10 - 8
GAS OUT	5 m or shorter	25 m or shorter	-----
RELEF OUT	0.5 m or shorter	4 m or shorter	10 m or shorter

4-2. Precautions on tubing work

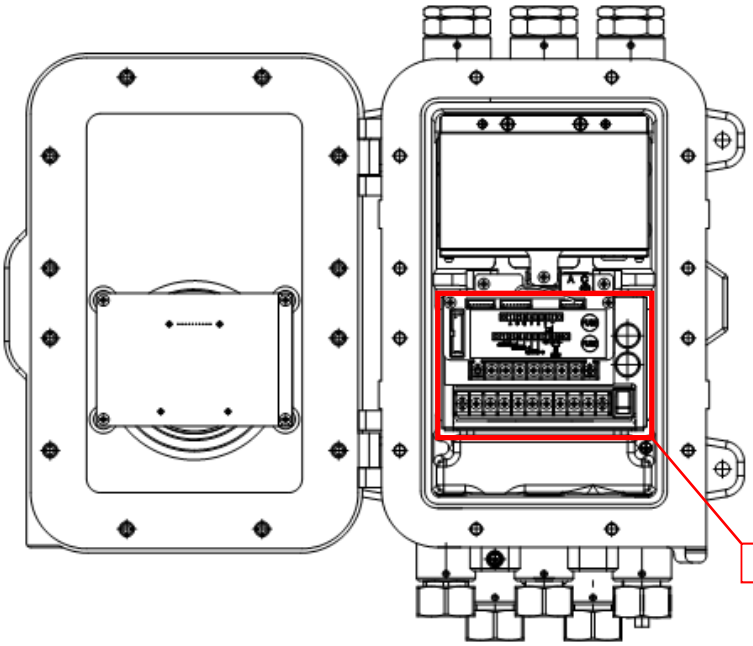
1) Use stainless tubing.
2) After the tube is cut, its cut point may have a smaller inner diameter.
   Use a file etc. to expand the inner diameter of the cut point.
3) Cut-dust of tubing may cause failures of the needle valve, flow rate detection mechanism, three-way switching valve etc.
   To remove cut-dust remaining inside of the tube, blow compressed air etc., into the tube before connecting it to the calorimeter.
4) Determine a sampling point inlet for the measuring gas, considering the airflow of the measuring gas line, unevenness in the manufacturing process of the fuel gas.
5) Adjust the measuring gas equivalent to the ambient temperature before supplying it to the sampling device.

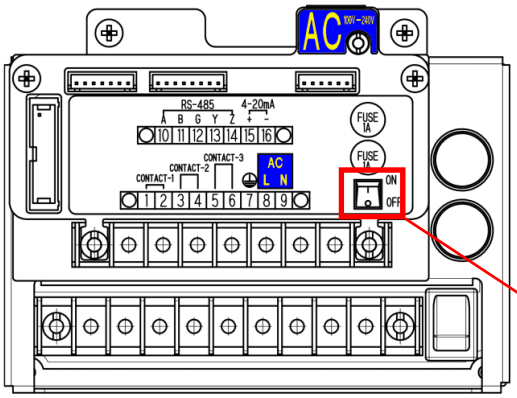
5

How to Adjust/Use Calorimeter

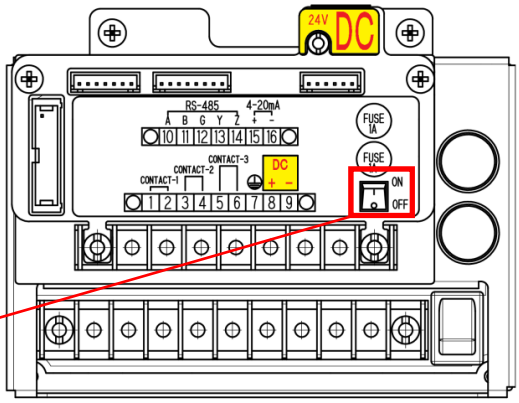
5-1. How to start the gas detector

1) Check that the external wiring has been done properly.
2) Check that the power supply voltage is compliant with the specification.
   Rating: 100 - 240 VAC ±10%, 50/60 Hz or 24 VDC ±10% (The setting can be changed to either the AC or DC specifications.)
3) Check that the external tubing has been connected properly.
4) Check that no leak occurs from a tube between the measurement location and gas inlet.
5) Turn on the measuring part "OHC-800" to start up the calorimeter.
   (The cover of OHC-800 cannot be opened/closed in an explosion-proof area. Therefore, the calorimeter needs to be installed with the internal power turned on, and it is started by turning on the main or external power switch.)
6) After turning on the power, wait until the 15-minute warm-up state is exited before use.



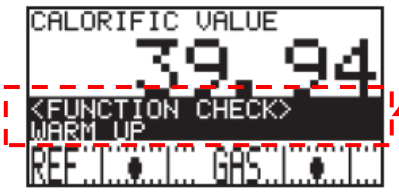


Power terminal unit with AC specifications



Power terminal unit with DC specifications

Power switch



Warm-up finishes 15 minutes after power-on.

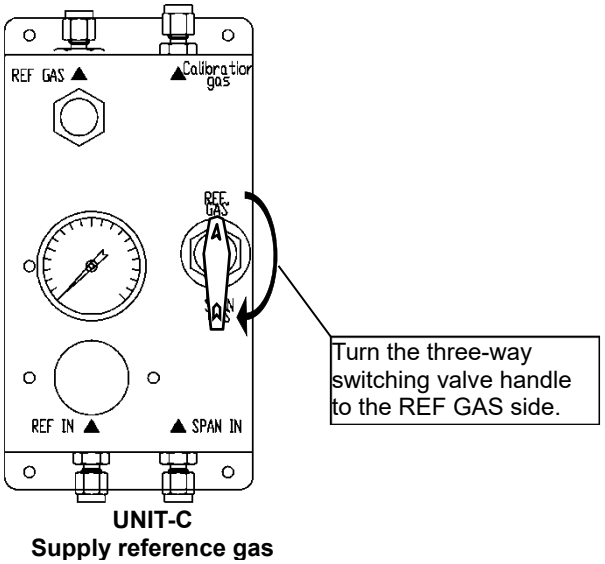
OHC-800 display

5-2. How to use three-way switching valve

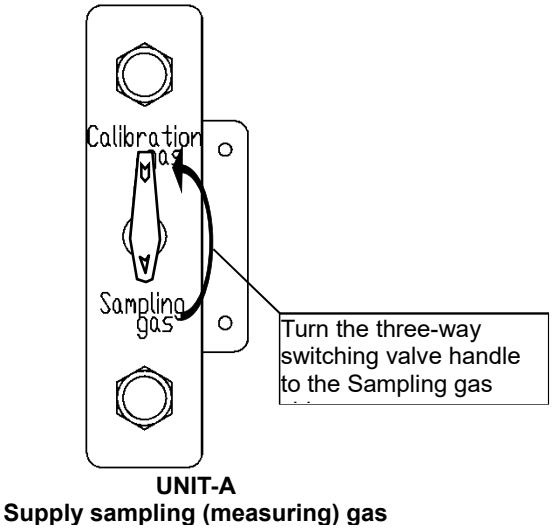
The three-way switching valves (CV) of UNIT-A and UNIT-C are used to switch the gas lines in the following cases (1) to (3).

(1) In measuring a gas, a reference gas is supplied from REF.IN to the reference gas line of the measuring part (OHC-800), and a measuring gas is supplied from GAS IN to the measuring gas line of the measuring part (OHC-800).
(2) In performing a reference gas calibration, a reference gas is supplied from REF.IN to the reference gas line and measuring gas line of the measuring part (OHC-800).
(3) In performing a span calibration, a reference gas is supplied from REF.IN to the reference gas line of the measuring part (OHC-800), and a calibration (span) gas is supplied from SPAN IN to the measuring gas line.

<(1) Gas Measurement>

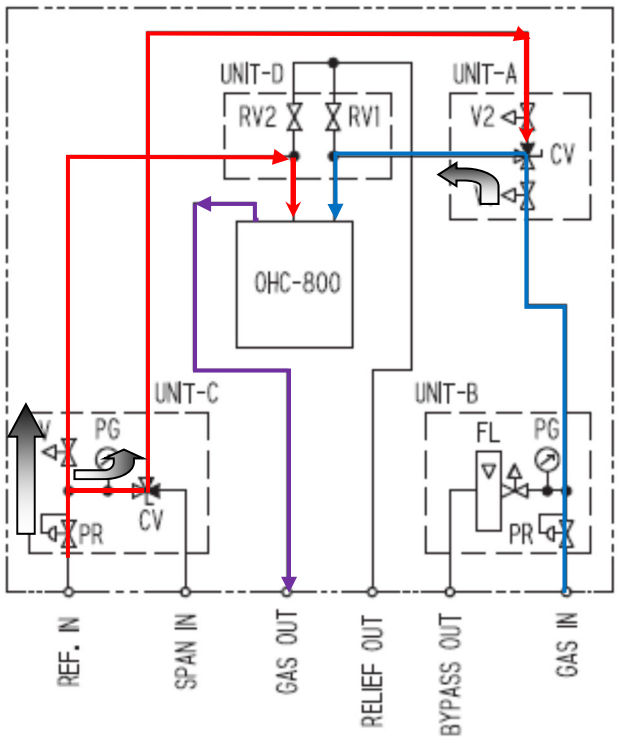


UNIT-C
Supply reference gas

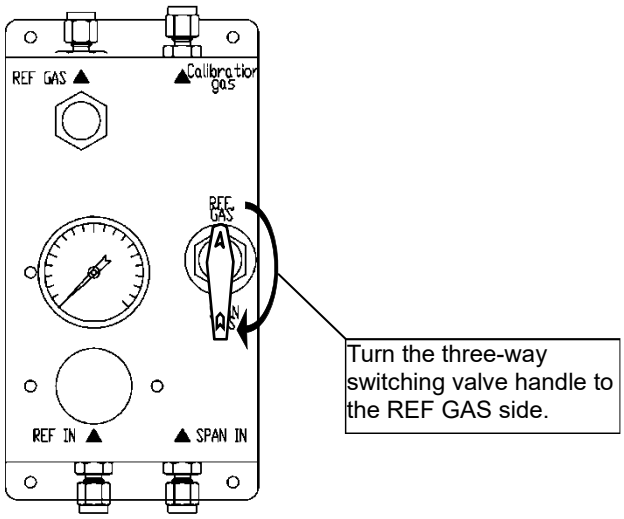


UNIT-A
Supply sampling (measuring) gas

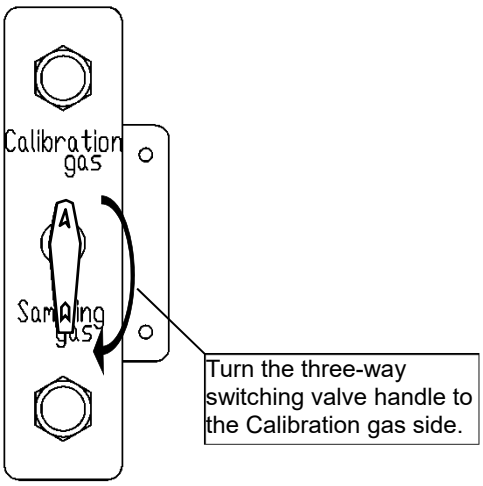
Tubing diagram



<(2) Reference Gas Calibration>

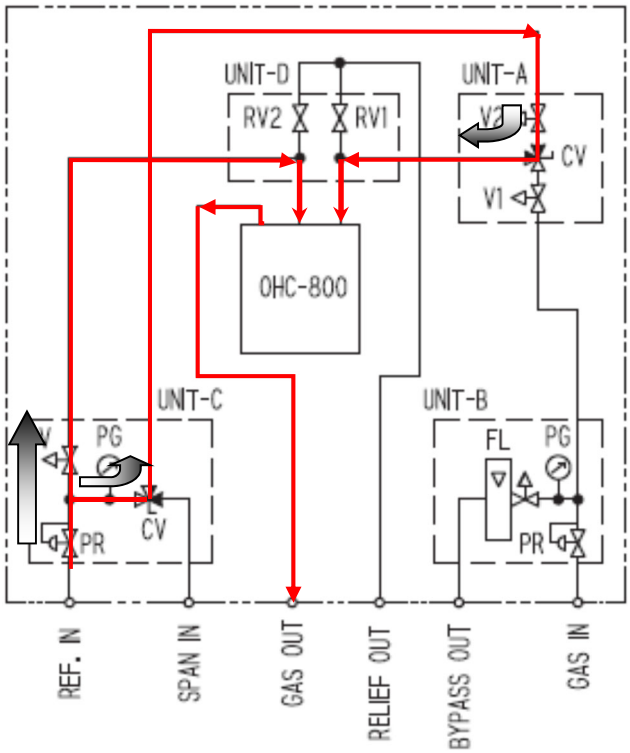


UNIT-C
Supply reference gas

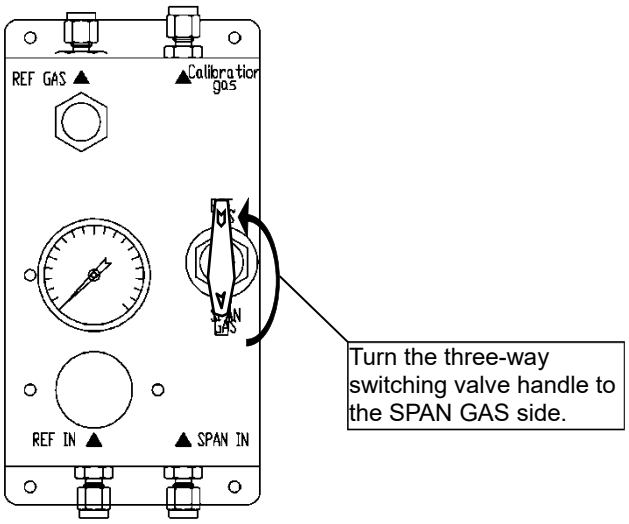


UNIT-A
Supply calibration (reference) gas

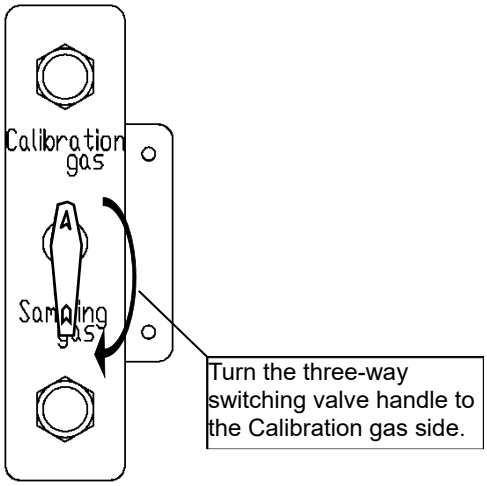
Tubing diagram



<(3) Span Calibration>

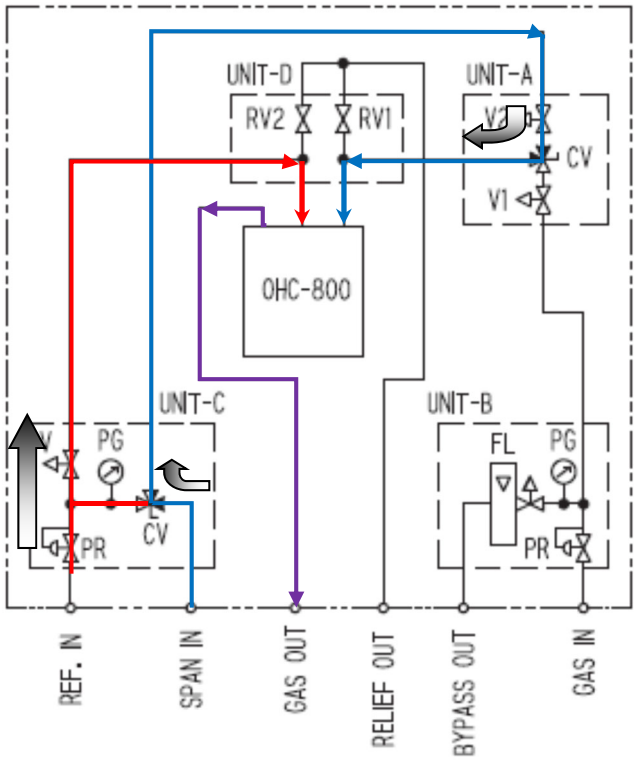


UNIT-C
Supply reference gas



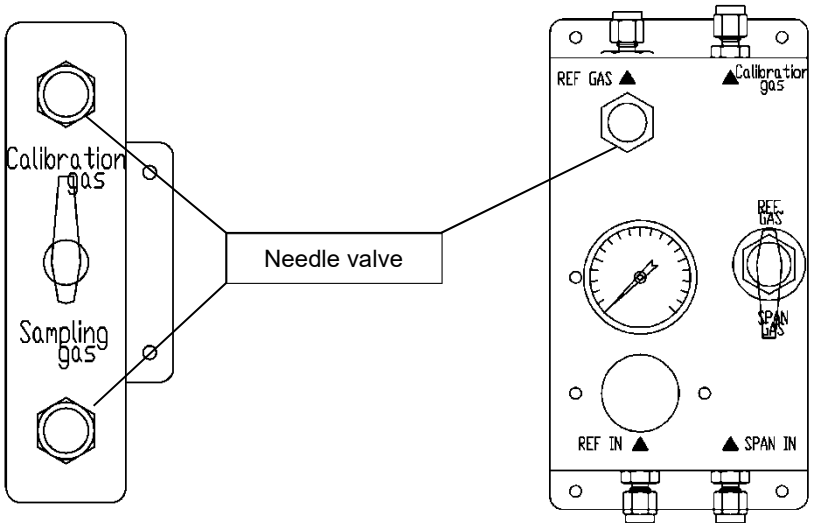
UNIT-A
Supply calibration (span) gas

Tubing diagram



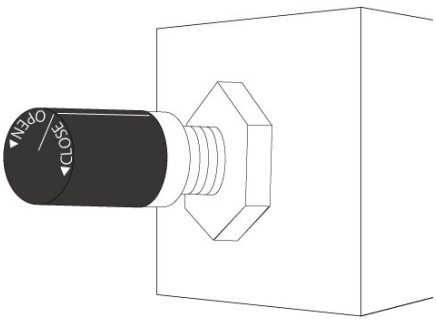
5-3. How to use sampling parts

5-3-1 Adjusting needle valve



UNIT-A **UNIT-C**

The needle valves of UNIT-A and UNIT-C are used to adjust the flow rate of gases (measuring gas, reference gas or calibration gas) supplied to the measuring gas or reference gas chamber of the measuring part OHC-800 to the specified value. Turn the needle valve to the right (clockwise) to decrease the flow rate or to the left (counterclockwise) to increase the flow rate.



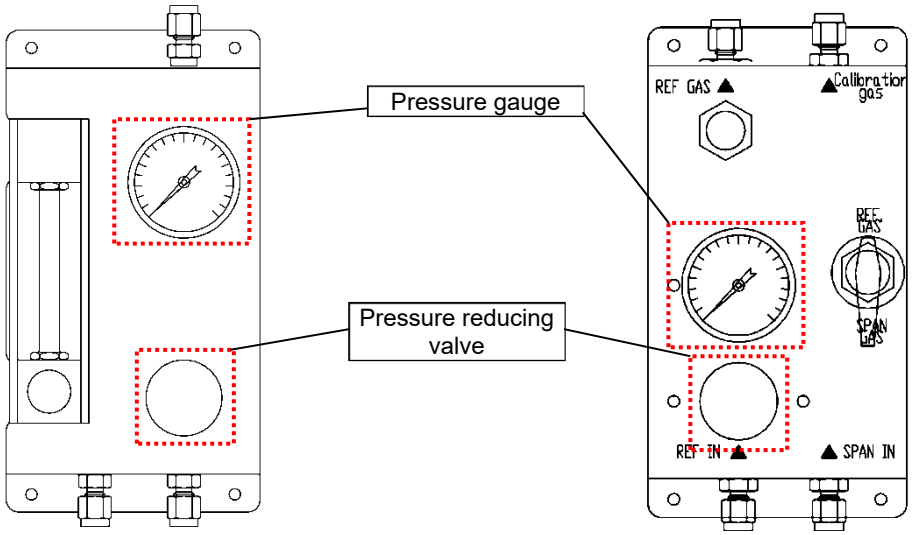
Needle valve

(1) UNIT-A needle valve V2: Adjusts the flow rate of sampling gas line.

(2) UNIT-A needle valve V: Adjusts the flow rate of calibration gas (span and reference calibration gases) line.

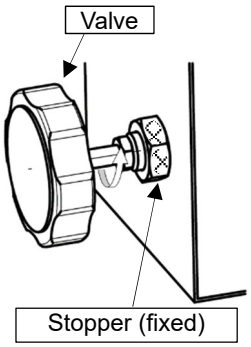
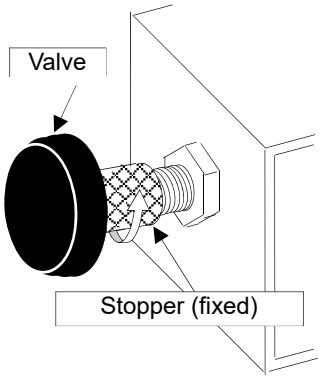
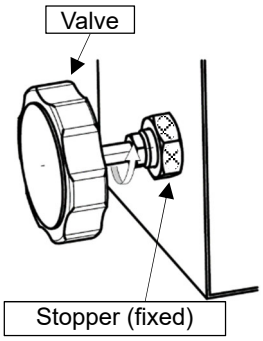
(3) UNIT-C needle valve V: Adjusts the flow rate of reference gas line.

5-3-2 Adjusting pressure reducing valve



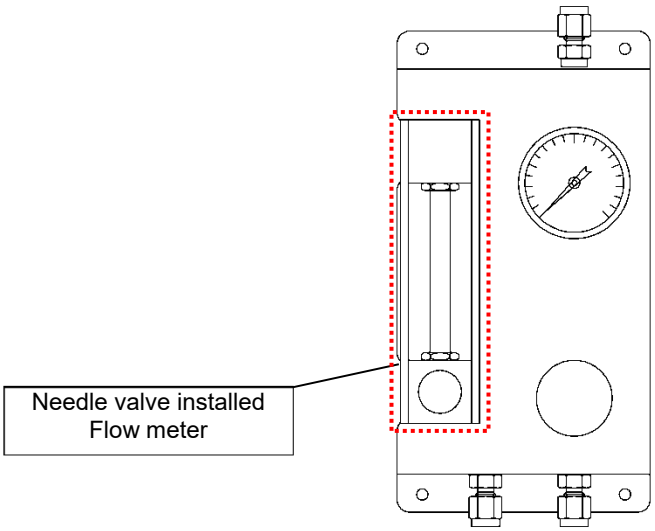
UNIT-B **UNIT-C**

The pressure reducing valves of UNIT-B and UNIT-C are used to adjust the pressure of gases (measuring gas, reference gas or calibration gas) supplied to the measuring gas or reference gas chamber of the measuring part OHC-800 to the specified value. Turn the needle valve to the right (clockwise) to increase the pressure or to the left (counterclockwise) to decrease the pressure. Check the pressure with the pressure gauge located above the valve.
After adjusting the pressure, turn the stopper to the left (counterclockwise) and fix the valve to avoid operational error.

UNIT	UNIT-B		UNIT-C
Model	RS-400-□11□ RS-400-□12□	RS-400-□13□	RS-400-□11□ RS-400-□12□ RS-400-□13□
Appearance			

5-3-3 Bypass line

Since the flow rate of measuring gas required for proper operation of OHC-800 is small (approx. 300 mL/min), sampling needs to be performed with a relatively large flow rate to the sampling device, and unused gas needs to be bypassed in order to shorten the delay time in the tube between a sampling point and the sampling device. A bypass flow rate can be set to an arbitrary value within the range specified by the selected flow meter.



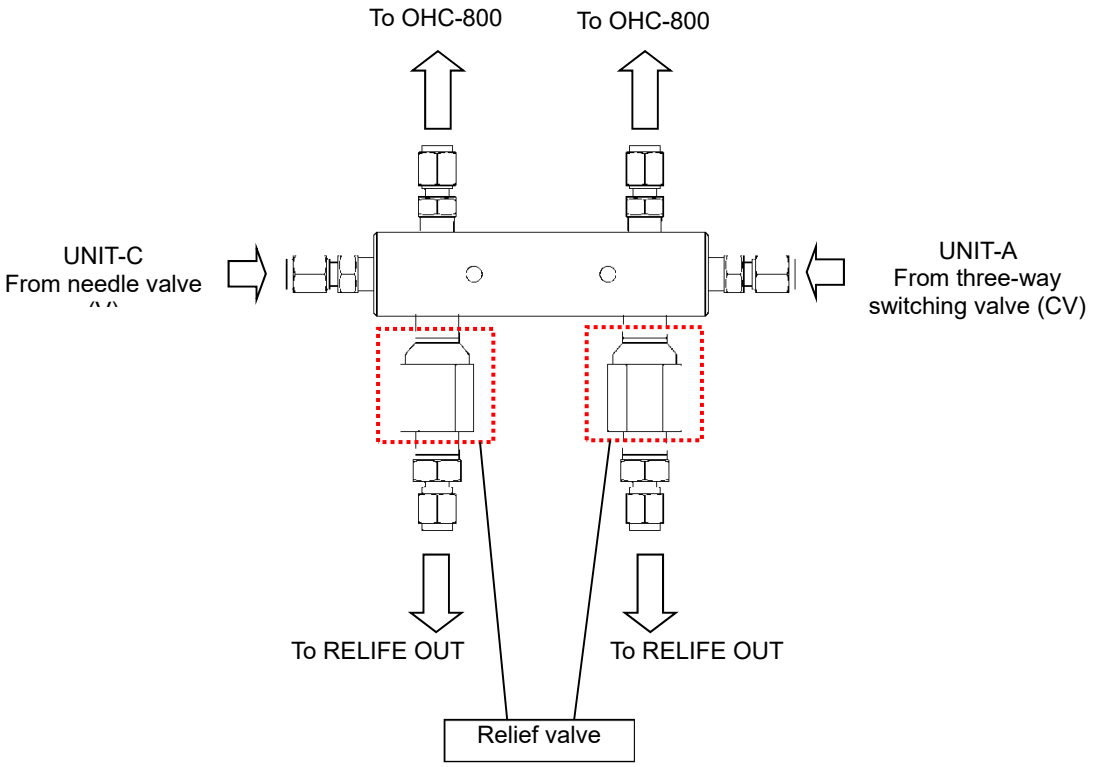
UNIT-B

Sampling device model and UNIT-B flow meter measuring range

RS-400-□11□	0.5 -5 L/min	0.03 MPa
RS-400-□12□	1 - 10 L/min	0.3 MPa
RS-400-□13□	2 - 20 L/min	0.1 MPa

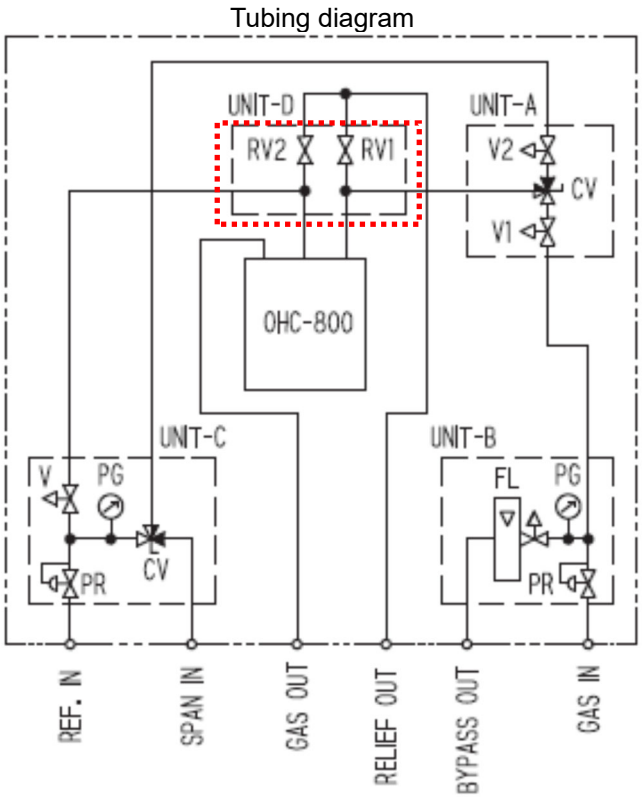
5-3-4 Relief valve

The relief valve of UNIT-D is used as a safety valve to prevent the measuring part OHC-800 from being damaged by excessive pressure.
The relief valve is released when the specified pressure (10 kPa) or more is applied to the valve, and the pressure is transferred to the RELEFE OUT gas line.



UNIT-D

Tubing diagram



5-4. How to adjust reference gas flow rate

1) Check that a reference gas is supplied from REF IN (0.05 - 0.9 MPa).

2) Adjust the pressure reducing valve PR so that the pressure gauge PG on UNIT-C reads 0.03 MPa, and then fix the valve.

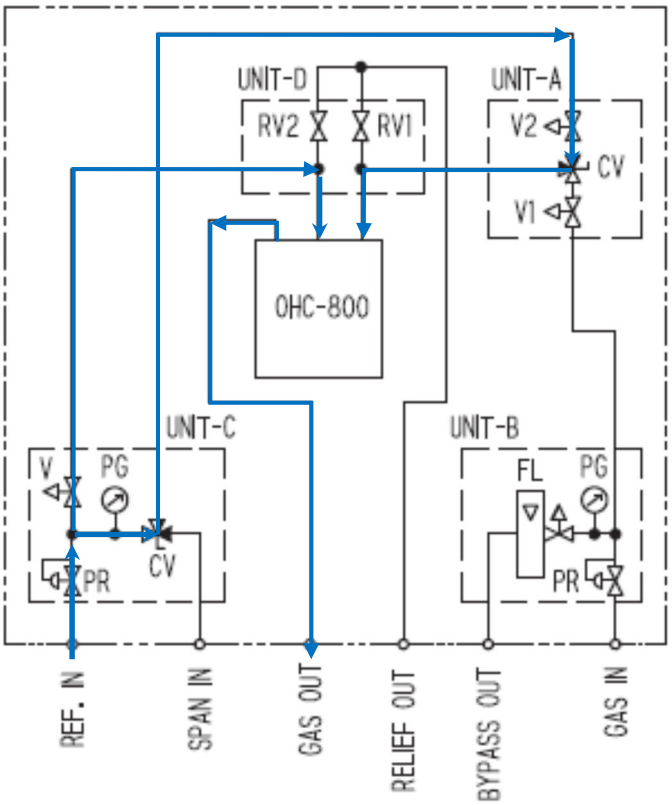
3) Turn the three-way switching valve (CV) on UNIT-C to the REF.GAS side.

4) Turn the three-way switching valve (CV) on UNIT-A to the Calibration gas side.

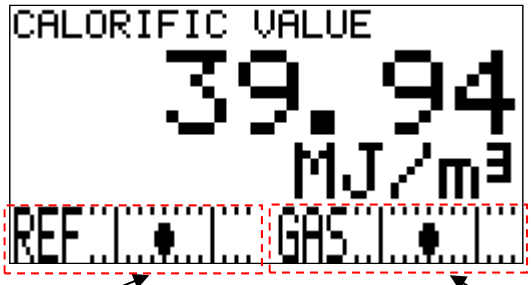
5) Adjust the needle valve V on UNIT-C so that the black circle that indicates REF flow rate comes to the middle of the scale.

6) Adjust the needle valve V2 on UNIT-A so that the black circle that indicates GAS flow rate comes to the middle of the scale.

Tubing diagram



OHC-800 display



Displays the flow rate of the reference gas (REF). Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 10 mL/min.

Displays the flow rate of the measuring gas (GAS).
Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 300 mL/min.

5-5. How to adjust measuring gas flow rate

1) Check that a measuring gas is supplied from GAS IN.

2) Adjust the pressure reducing valve PR so that the pressure gauge PG on UNIT-B reads the following specified value , and fix it with the stop valve.

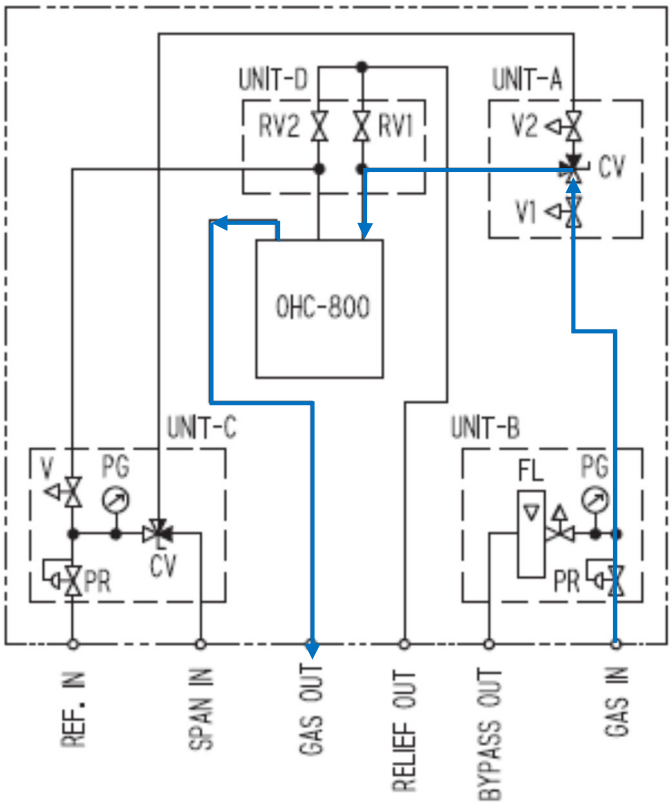
Sampling device model	the specified value
RS-400-□11□	0.03 MPa
RS-400-□12□	0.3 MPa
RS-400-□13□	0.1 MPa

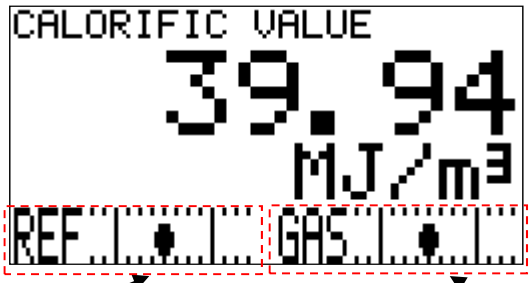
3) Adjust the needle valve installed flow meter FL on UNIT-B to determine the bypass flow rate (it can be set arbitrarily within the flow meter measuring range).

4) Turn the three-way switching valve on UNIT-A to the Sampling gas side.

5) Adjust the needle valve V1 on UNIT-A so that the black circle that indicates GAS flow rate comes to the middle of the scale.

Tubing diagram





Displays the flow rate of the reference gas (REF). Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 10 mL/min.

Displays the flow rate of the measuring gas (GAS).
Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 300 mL/min.

5-6. How to adjust calibration (standard) gas flow rate

1) Connect a standard gas cylinder to SPAN IN.

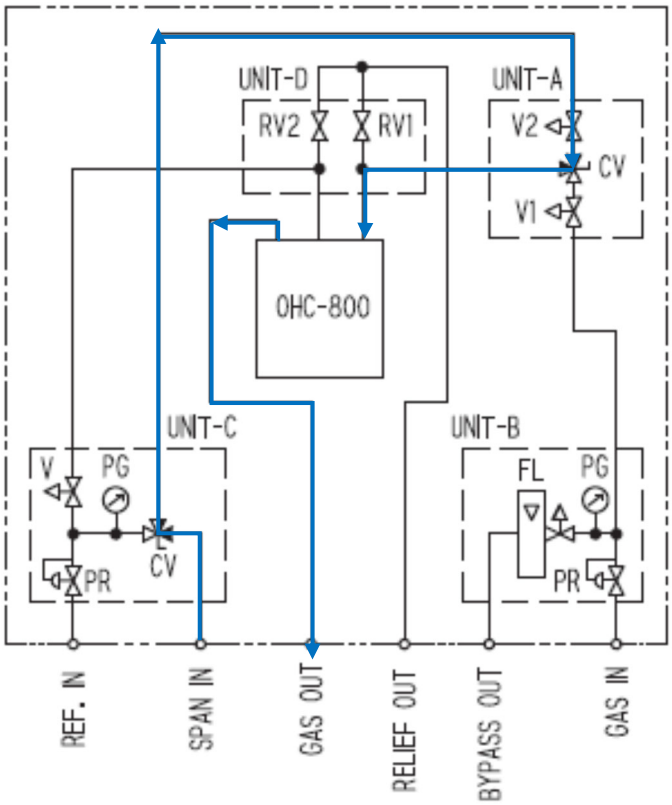
2) Adjust the secondary pressure of the cylinder to 0.03 MPa.

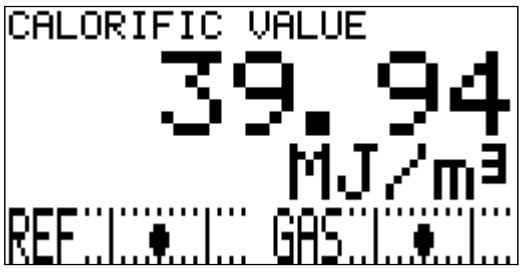
3) Turn the three-way switching valve on UNIT-A to the Calibration gas side.

4) Turn the three-way switching valve on UNIT-C to the SPAN GAS side.

5) Adjust the secondary pressure of the cylinder so that the black circle that indicates GAS flow rate comes to the middle of the scale.
(If it is difficult to fine-tune the flow rate, make adjustment using the needle valve V2 on UNIT-A.)

Tubing diagram





Displays the flow rate of the reference gas (REF). Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 10 mL/min.

Displays the flow rate of the measuring gas (GAS).
Make adjustment so that the black circle comes between the two solid lines that represent the upper (right) and lower (left) limits. *
When adjusted to the middle of the scale, the flow rate is about 300 mL/min.

6

Maintenance

This product is supposed to be operated continuously over a long period of time. Regular maintenance is necessary to maintain the appropriate performance during the period of use.

- Maintenance Contract -

We recommend you to conclude a maintenance contract with us for regular maintenance including span adjustment, adjustment, maintenance etc. to ensure stable operation and accuracy of the calorimeter.
Please contact RIKEN KEIKI for more information on a maintenance contract.

NOTE

See the separate volume "OHC-800 Operating Manual" for the maintenance of the measuring part (OHC-800).

6-1. Maintenance item

Maintenance area/item	Criteria	Actions
Reference gas (REF) and measuring gas (GAS) flow rates	Check that the black circles that indicate the reference gas (REF) and measuring gas (GAS) flow rates stay between the two solid lines that represent the upper and lower limits.	Adjust the flow rates using the respective needle valve.

6-2. Procedures to store the calorimeter or leave it for a long time

(1) If the calorimeter is to be left unused for a long time, expel the measuring gas from the tubing inside the device using fresh air, nitrogen etc.

(2) Storage conditions
The calorimeter must be stored under the following environmental conditions.
(1) In a dark place under the normal temperature and humidity away from direct sunlight
(2) In a place where gases, solvents or vapors are not present

7

Definition of Terms

The terms used in this manual are defined as follows.

Measuring gas	:	Gas used to measure calorific value, density and WOBBE index on this product.
Reference gas	:	Gas used on an optical sensor unit as a reference for measuring the refractive index of a measuring gas. The gas type varies depending on the product specifications.
Reference gas calibration (REF CAL.)	:	Operation for adjusting the reading when measuring the reference gas.

8

Product Specifications

This sampling device is used in combination with the measuring part OHC-800. Therefore, the product specifications include OHC-800.

8-1. Product Specifications

Model	OHC-800
Measuring principle	Opt-Sonic calculation through measurement of refractive index and sound speed
Measuring gas	See "Measuring gas specification sheet" attached.
Measuring targets	Calorific value, density (specific gravity) and WOBBE index
Measuring range	See "Measuring gas specification sheet" attached.
Sampling method	Constant-flow-rate gas introduction using external sampling devices
Self-monitoring/diagnostic function	Status monitoring using four classification categories • FAILURE • FUNCTION CHECK • MAINTENANCE REQUIRED • OUT OF SPECIFICATION
Display	Full-dot LCD (with backlight) EV lamps Green: Lights up at power-on. Orange: Lights up in conjunction with Contact Output 1. Red: Lights up in conjunction with Contact Output 2. Green: Lights up in conjunction with Contact Output 3.
External Output 1	4 - 20 mA DC (insulated, source current type) maximum load resistance of 300 Ω Minimum resolution of 0.01 mA or less
External Output 2	RS-485 communication function
External Output 3	IrDA communication output (for maintenance)
Contact output 1	Activated if the FUNCTION CHECK or OUT OF SPECIFICATION condition is met.* [No-voltage contact, contact capacity of 2 A, 30 VDC (resistance load)]
Contact output 2	Activated if the FAILURE condition is met.* [No-voltage contact, contact capacity of 2 A, 30 VDC (resistance load)]
Contact output 3	Activated if the MAINTENANCE REQUIRED condition is met.* [SSR contact, contact capacity of 20 W, 240 VAC (resistance load)]
How to Operate	Operation using a magnet control key (The calorimeter can be operated while maintaining the explosion-proof performance.)
Power supply	100 - 240 VAC ±10%, 50/60 Hz, max. 18 VA or 24 VDC ±10%, max. 5 W (The setting can be changed to either the AC or DC specifications.)
Protection class	Equivalent to IP66 or IP67
Ambient temperature	Japan EX : -20 to +57°C (no sudden changes) ATEX/IECEx : -20 to +60°C (no sudden changes)
Ambient humidity	95%RH or less (non-condensing)

Measuring gas temperature	Same as ambient temperature
Outer dimensions	Approx. 286 (W) x 453 (H) x 150 (D) mm
Weight	Approx. 23 kg
Explosion-proof structure	Flame-proof enclosures
Explosion-proof class	Japan EX : Ex d ⅡB + H_2 T4 ATEX : Ⅱ 2G Ex db ⅡB + H_2 T4 Gb IECEx : Ex db ⅡB + H_2 T4

* The operating conditions of contacts can be changed.
* Specifications subject to changes without notice.