PS-7 Series

Extractive Pump Gas Detector
(Detachable Sensor and Sampling Units)

Instruction Manual

- Keep this manual for easy reference.
- Carefully read this manual prior to use.
- This manual describes the standard model. If your unit has end-user-specific options, this manual will be superseded by your delivery specifications.

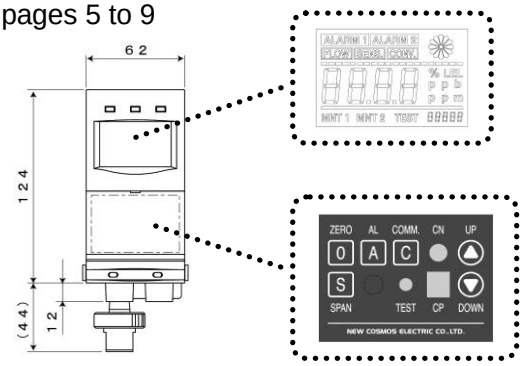
CE

NEW COSMOS ELECTRIC CO.,LTD.

Instruction Manual No.
GAE-018-02
Aug 2020

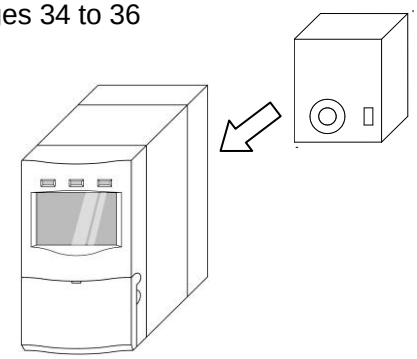
Unit Dimensions and Components

5. “Unit Dimensions and Components” on pages 5 to 9



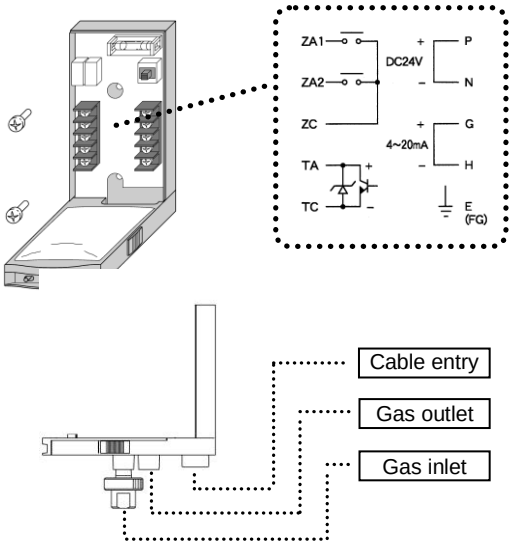
Sensor Unit Installation/Replacement

9-2. “Sensor Unit Installation /Replacement” on pages 34 to 36



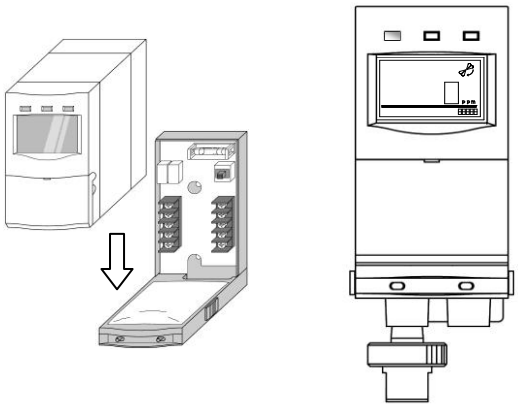
Base Unit installation/Wiring

6-1. “Installation and Wiring” on pages 11 and 12



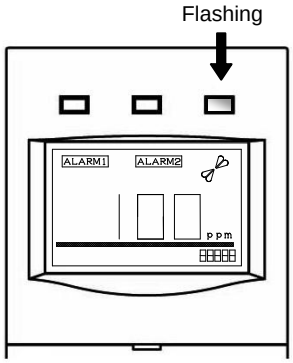
Operation

7-1. “Operation” on pages 15 to 24
Normal operation on page 24



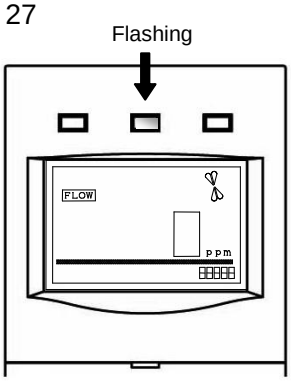
Gas Alarm

7-2. “Gas Alarm Operation” on page 25



Trouble Alarm

7-3. “Trouble Alarm Operation” on pages 26 and 27



Troubleshooting

10. “Troubleshooting” on pages 40 and 41.

Table of Contents

1. Introduction

- Thank you for purchasing the New Cosmos PS-7 series extractive pump gas detector. Before using it, please read this instruction manual carefully to ensure reliable and safe operation.
- This unit detects semiconductor process gas or combustible gas (e.g., hydrogen) that may be present in a cylinder cabinet, an exhaust duct, or an industrial facility work environment (e.g., semiconductor manufacturing plant) and transmits the gas concentration value as an analog signal to an external device while simultaneously showing the gas concentration value on its display.
- If the gas concentration reaches the preset level, the red ALARM LED will start flashing and activate the relay contacts, thus monitoring the concentration of the leaked target gas.
- Sensor and sampling units can be easily replaced without tools. After the replacement of a sensor/sampling unit, on-site calibration using a prepared gas is not necessary.
- Periodic maintenance is essential to maintain the reliability of the detector. Therefore, perform periodic maintenance in accordance with the instructions given in this manual.
- PS-7 series gas detectors are divided into the following six models according to the sensor unit type and with/without a pyrolyzer. For sensor selection, please contact New Cosmos or its authorized representative.

<table>
<tr><th>Sensor unit type</th><th>With
communication function</th><th>Without
communication function
(COMM-less model)*</th></tr>
<tr><td>Toxic gas sensor unit
CDS-7</td><td rowspan="2">PS-7-01</td><td rowspan="3">PS-7-04</td></tr>
<tr><td>Combustible gas sensor unit
CHS-7</td></tr>
<tr><td>Oxygen sensor unit
COS-7</td><td>PS-7-02</td></tr>
<tr><td>Toxic gas sensor unit and
pyrolyzer CDS-7+CDP-7</td><td>PS-7-03</td><td>—</td></tr>
<tr><td>Toxic gas sensor unit with built-in
pyrolyzer CDS-7</td><td>PS-7-05</td><td>PS-7-06</td></tr>
</table>

* COMM-less models are not equipped with Personal Digital Assistant (PDA) communication or DeviceNet communication function, and do not comply with CE marking.

* A DeviceNet unit (sold separately, specified during order placement) is required to use DeviceNet communication.

Symbols Used in this Instruction Manual

This manual uses Danger, Warning, Caution and Note symbols to draw attention to procedures, materials, methods, and processes, which require particular attention.

⚠ **DANGER**	Indicates an imminently hazardous situation that can result in death or serious injury.
⚠ **WARNING**	Indicates a potentially hazardous situation that may result in death or serious injury.
⚠ **CAUTION**	Indicates a hazardous situation that may result in minor injury or property damage.
NOTE	Provides information on product handling.

2. General Precautions

- To ensure safe operation, follow the precautions given below.
- Only use this product in accordance with the applicable laws and regulations.
- Wiring and installation should only be performed by a qualified electrician with knowledge of wiring/installation procedures.

⚠ DANGER

- This product is not explosion-proof and thus should not be installed in a hazardous area.

⚠ WARNING

- In the event of a gas leak alarm, follow safety procedures in accordance with your company's regulations.
- Ground the detector to prevent electric shocks.

⚠ CAUTION

- Do not disassemble, modify, or alter the structure of this unit or its electrical circuits. Doing so may compromise the performance of the product.
- This product is not drip-proof and thus should be kept away from water.
- Only use this product in accordance with the applicable laws and regulations.
- Set the main unit’s power switch (located on the front of the base unit) to the OFF position before installing/removing the main unit. Installation/removal while the main unit’s power switch is in the ON position may cause a false alarm or device failure.

3. Package Contents

The following items are included in a standard package. If any items are missing or damaged, please contact New Cosmos or its authorized representative for replacement.

Standard contents

Item	Quantity
Gas detector (PS-7)	1
Half union (R1/4-ø6mm or R1/4-ø1/4 in. selectable)*1	2
Replacement filter elements (FE-1, 12 pcs.) for MF-50 filter unit	1
Replacement fuse (125 V, 1.0 A), normal blow or time lag*2	1
Mounting screws (M4×8)	2
Outlet spacer	1
Test stick	2 *3
Instruction manual (this document)	1 *4
PS-7 gas detector's operation manual for administrators (Doc. No.GAE-019-xx)	1 *4
Activated charcoal filter's outer sleeve (KF-6S-6Z or KF-6S-6ZH)	1 *5

*1. Specified during order placement. R1/4- ø6 mm is shipped for unspecified orders.
*2. Normal blow type fuse is provided for COMM-less model.
*3. Two pcs. are provided per system.
*4. One pc. is provided per system.
*5. One pc. is provided with a PS-7-05 or PS-7-06 unit. An activated charcoal filter's inner sleeve (KF-6S-Y1) is provided with a separately sold sensor unit and not included in "standard contents". Fittings will be provided as per the delivery specifications.

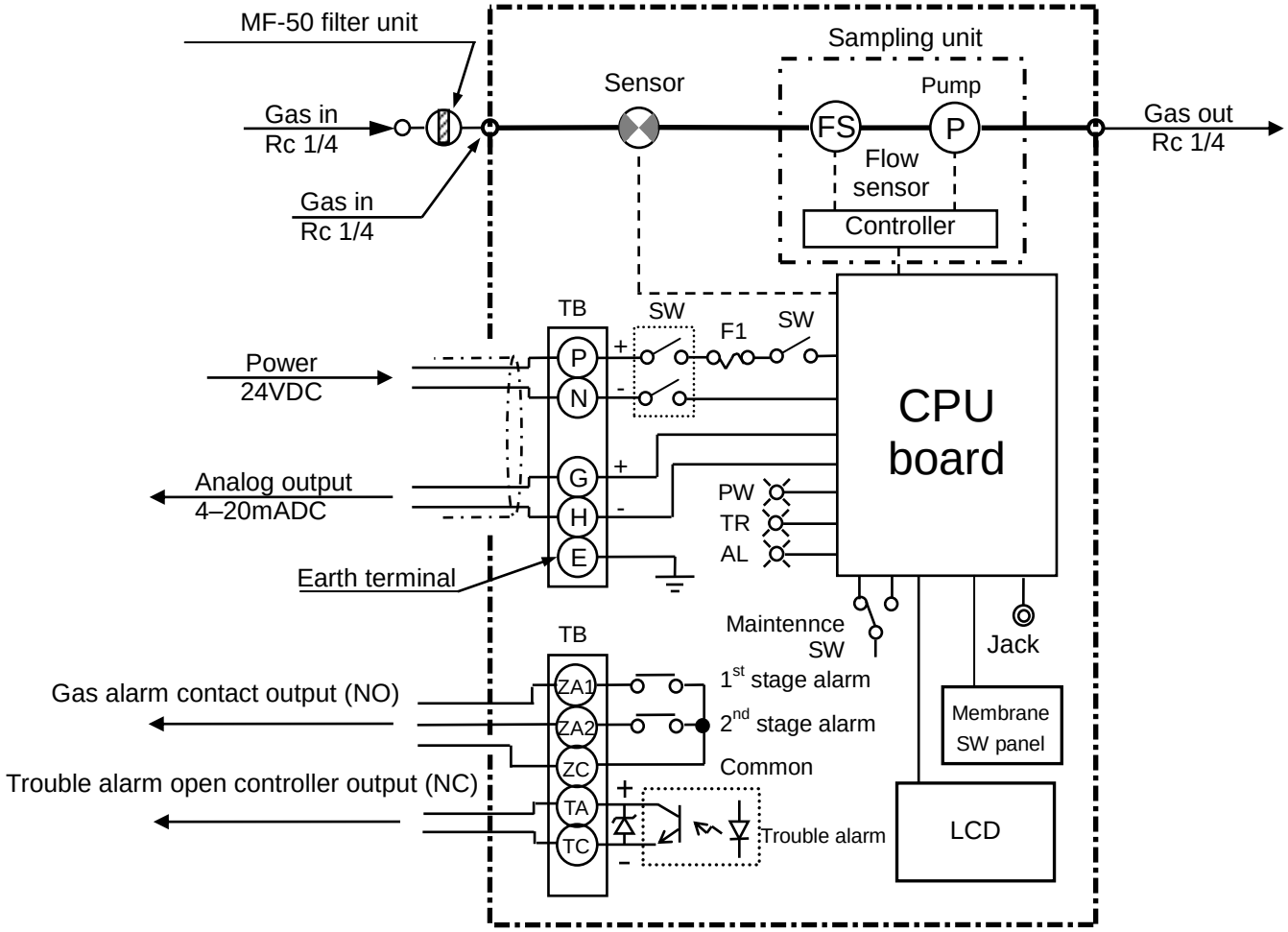
Note 1: Sensor units are sold separately and not included in the standard contents.
Note 2: For the package contents of the models with a DeviceNet unit, refer to the DeviceNet unit's instruction manual.

Optional items (sold separately)

Item	Quantity
Filter unit (MF-51)*6	As ordered
Gas collector (PF-D1)	As ordered
Loop checker (LC-7)*7	As ordered

*6. Recommended in the case of monitoring highly adsorptive gas (e.g., HCl, Cl2, NH3) other than HF and F2.
*7. Only for COMM-less models use.

4. Block Diagram



Max. load: 125 VAC or 30 VDC 0.5 A (resistive load) for gas alarm contact output (ZA1/ZA2-ZC)
Max. load: 30 VDC 30mA (resistive load) for trouble alarm open collector output (TA-TC)

⚠ WARNING

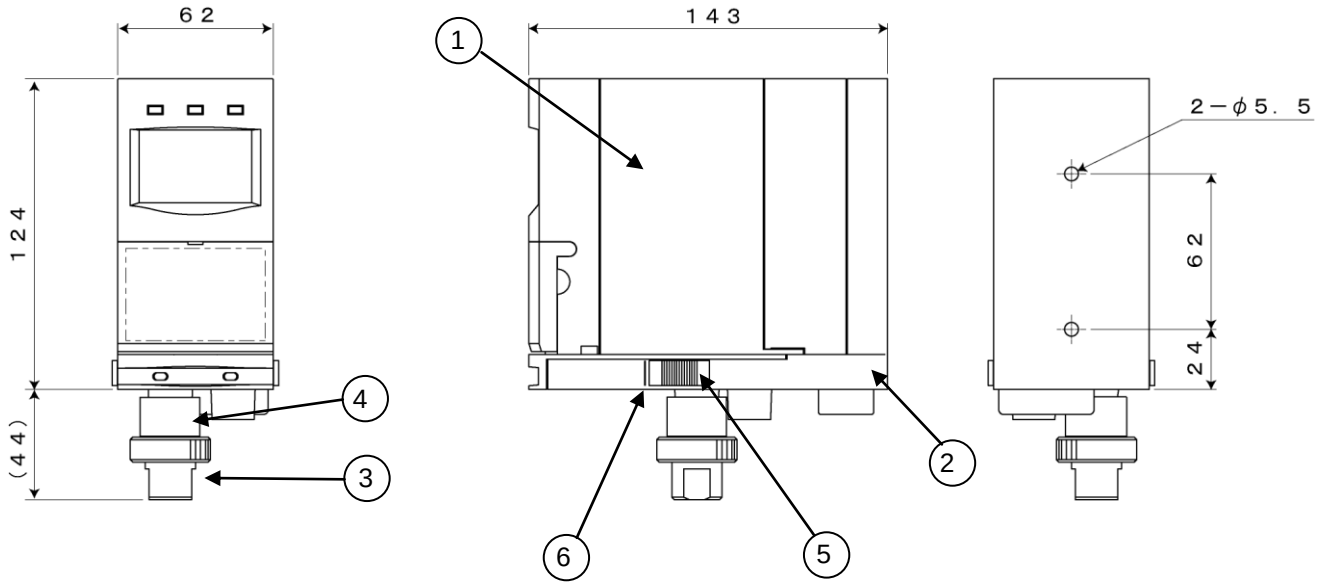
- Turn off the gas detector before wiring to prevent electric shocks.
- Ground the gas detector to prevent electric shocks.
- Ensure correct polarity when connecting the trouble alarm open collector (TA: + / TC: -). Due to the built-in protection diode, incorrect polarities will cancel an active trouble alarm output.

⚠ CAUTION

- The analog output line and power line of the gas detector are not isolated from each other. When using with external devices, provide isolation to prevent noise from other power lines from interfering with the analog output of the detector.
- When wiring, place wires to avoid potential noise sources (e.g., large power transformers, motors, and powers supply units).
- Ensure cables between the gas detector and external devices are connected correctly.

5. Unit Dimensions and Components

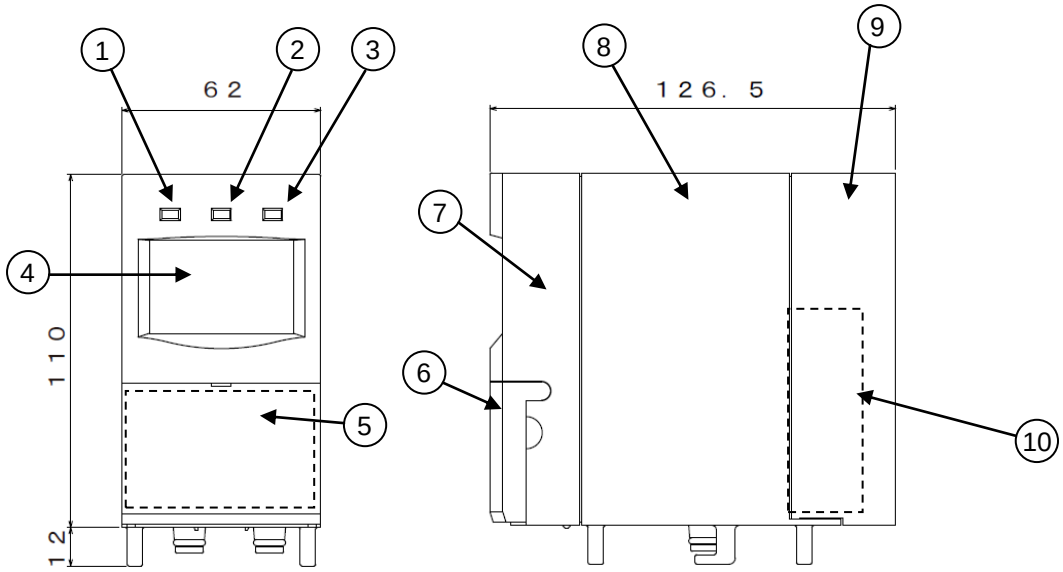
5-1. Exterior Appearance



(Dimensions are in mm)

Item	Component	Description/Function
1	Main unit	Includes a display, a pump and a sensor
2	Base unit	Thread cables through the cable entry hole at the bottom of the base unit
3	Filter unit (MF-50)	Incorporates a filter element (FE-1) that prevents dust from entering the gas inlet and the sensor
4	Inlet spacer	Prevents the filter unit from being over-tightened
5	Latch (2 places)	Secures the main unit to the base unit
6	White line (2 places)	Indicates that the latch is in the lock position

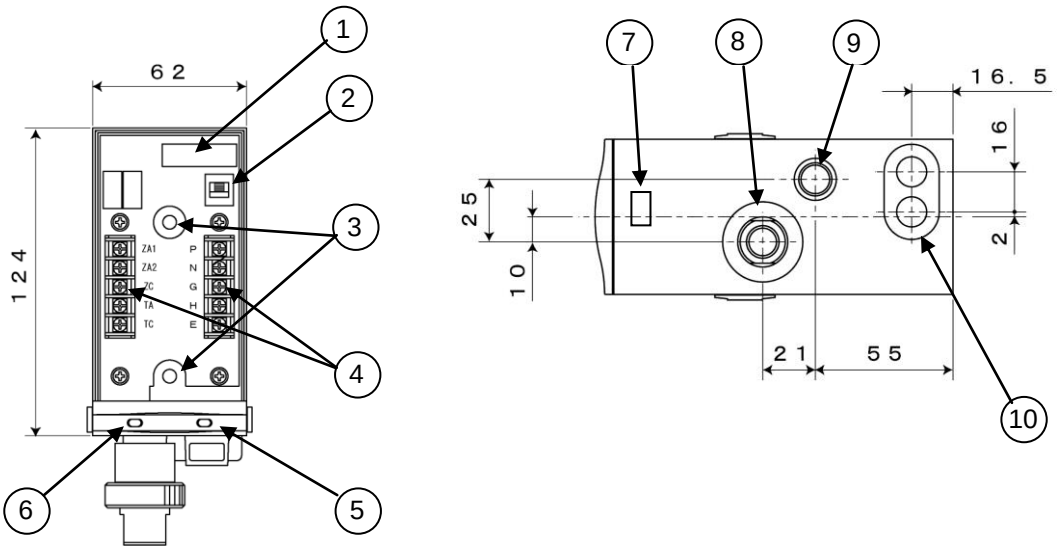
5-2. Main Unit



(Dimensions are in mm)

Item	Component	Description/Function
1	Green POWER LED	When lit, it indicates that the unit is in normal operation mode (gas-monitoring mode)
2	Amber TROUBLE LED	Flashing indicates the presence of an internal failure
3	Red ALARM LED	Flashing indicates the presence of a gas alarm
4	LCD	Displays alarm notification, numeric gas concentration value, gas concentration on a bar graph, trouble status, maintenance/test mode, and flow-rate status
5	Operation buttons (covered)	Include the setting/adjustment buttons and the TEST switch
6	Front cover	Gently pull out and slide it down to access the operation buttons
7	Front panel	Incorporates a built-in main board
8	Sampling unit	Incorporates a built-in pump unit
9	Rear cover	Protects a built-in sensor unit
10	Sensor unit	Can be removed/installed by removing the rear cover

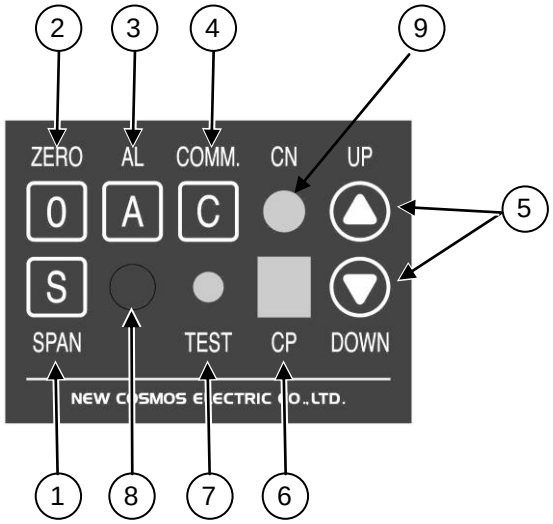
5-3. Base Unit



(Dimensions are in mm)

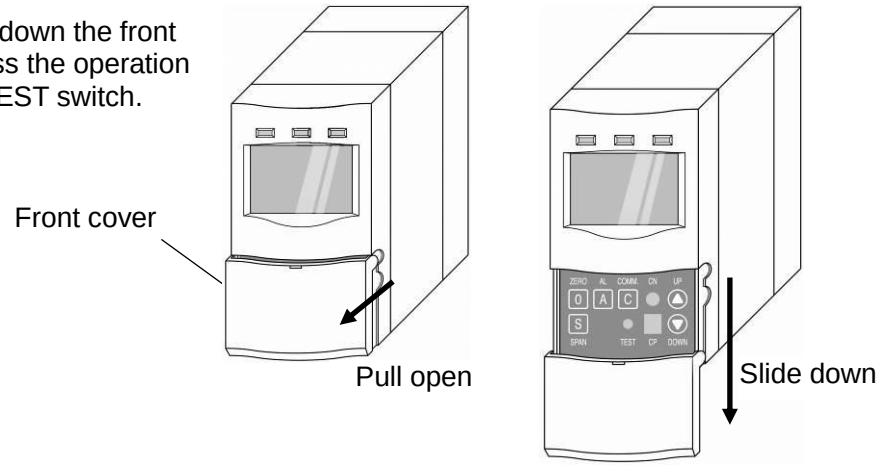
Item	Component	Description/Function
1	Fuse	Internal circuit protection in the event of a current surge
2	Base unit's power switch	Turns the base unit on/off
3	Mounting hole (2 places)	Dia. 5.5 mm
4	Terminal block (2 places)	Used for external wiring
5	Main unit's power switch	Turns the main unit on/off *If the base unit's power switch is off, no power is supplied to the main unit
6	MNT switch (maintenance switch)	Switches between the maintenance mode 1 (MNT1), maintenance mode 2 (MNT2), and normal operation mode (center position)
7	Pyrolyzer connector	Supplies power to a connected pyrolyzer (CDP-7) *Not provided for COMM-less models
8	Gas inlet	Thread size: Rc1/4 Filter unit (MF-50) is attached to this inlet
9	Gas outlet	Thread size: Rc1/4
10	Grommet	Holds signal and power cables

5-4. Operation Buttons



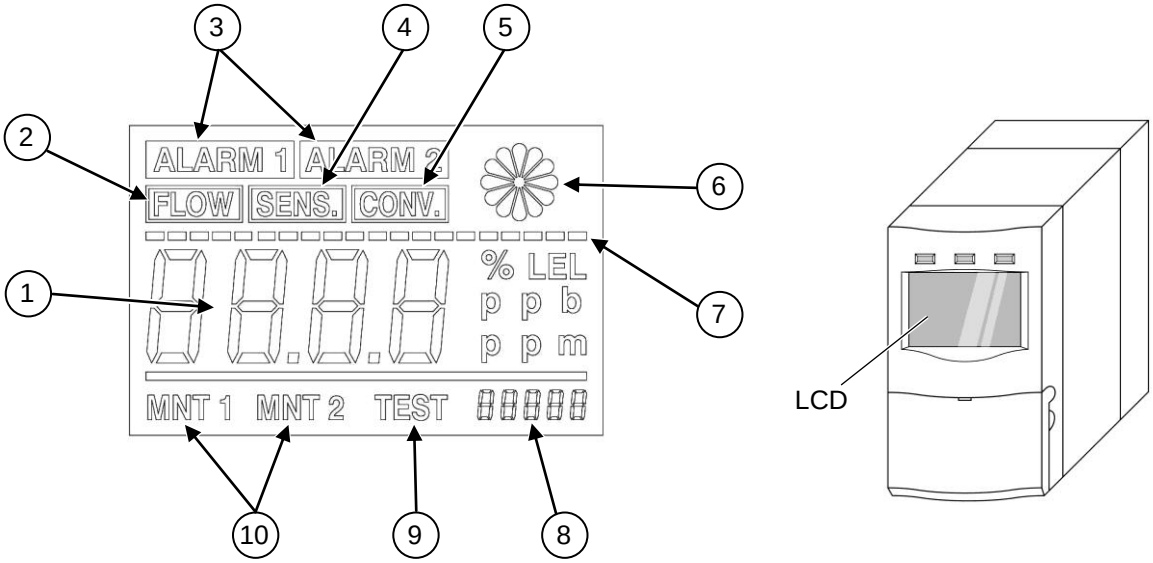
Opening front cover

Pull and slide down the front cover to access the operation buttons and TEST switch.



Item	Component	Panel marking	Description/Function
1	SPAN button (Span adj. button)	SPAN	Performs span adjustment. For O_2 sensor unit (COS-7), 21%vol adjustment will be performed
2	ZERO button (Zero adj. button)	ZERO	Performs zero adjustment for toxic/combustible gas sensor unit (CDS-7/CHS-7)
3	AL button (Alarm setting check button)	AL	Used to check the alarm set values
4	COMM. button	COMM.	Imports data from a currently inserted sensor at the initial startup, etc.
5	UP and DOWN buttons	UP DOWN	Used to increase/decrease the parameter value
6	Analog output check connector	CP	Dedicated connector to check the unit's 4–20 mA analog output
7	TEST switch (recessed)	TEST	Turns the test mode on/off
8	Button for administrator use		(Administrator use)
9	Communication connector	CN	Used for PDA communication *Not provided for COMM-less models

5-5. LCD Indicator Icons



Item	Icon/Display	Description/Function
1	Numeric display	Displays gas concentration and the unit of measurement (e.g., %LEL, ppb, ppm)
2	FLOW	Lit when the flow rate is low. Linked with item 6
3	ALARM1 ALARM2	Lit when the 1st or 2nd stage gas alarm is on
4	SENS.	Lit when there is a sensor fault (e.g., broken wire) or an incorrect sensor unit has been inserted
5	CONV.	Lit when a broken pyrolyzer wire is detected *Not used for COMM-less models
6	Flow-rate icon	Represents the flow rate status of sampled gas Spinning quickly: The flow rate is normal. “FL500” indicated on the sub-display Spinning slowly: The flow rate is reduced. Possible filter/tube clogging. “FL400 or less” indicated on the sub-display Stopped: The flow rate is too low. Low flow rate alarm. “FL300 or less” indicated on the sub-display
7	Gas concentration on the bar graph	One bar represents 5% of the full scale value. The bar graph value increases from left to right, with the far-right being the full scale value
8	Sub-display	Displays information related to setting, flow rate, etc., at the bottom-right corner (Administrator use)
9	TEST mode	Lit when the unit is in test mode
10	MNT1 / MNT2 mode	Lit when the unit is in maintenance mode 1 or 2

6. Installation and Wiring

⚠ DANGER

- This product is not explosion-proof and thus should not be installed in a hazardous area.

⚠ WARNING

- For detection of highly adsorptive gas (e.g., HF and F_2), remove the filter element (FE-1) from the filter unit (MF-50). Correct detection is not possible if the filter element is present. Refer to 9-1. “Filter Element Replacement” for the removal procedure.

Typical gases for which FE-1 should be removed

Gas name	Chemical formula
Hydrogen fluoride*	HF
Tetrafluorosilane	SiF_4
Boron trifluoride	BF_3
Tungsten Hexafluoride	WF_6
Fluorine	F_2

*For detection of hydrolyzed HF, the filter element (FE-1) should be removed.

- Tubing should be Teflon, dia. 6/4, and less than 20 m in length. For detection of highly adsorptive gases (e.g., HF, F_2, HCl, Cl_2, NH_3), the tube length should be less than 5 m.

Typical gases for which the tube length should be less than 5 m

Gas name	Formula	Gas name	Formula	Gas name	Formula
Fluorine	F_2	Trichlorosilane	$SiHCl_3$	Ammonia	NH_3
Hydrogen fluoride*1	HF	Silicon tetrachlorid	$SiCl_4$	Hydrogen sulfide	H_2S
Chlorine	Cl_2	Chlorine trifluoride	ClF_3	Dimethylamine*1	$(CH_3)_2NH$
Ozone	O_3	Carbon tetrachloride	CCl_4	Tetrakis (dimethylamino) titanium	$Ti[N(CH_3)_2]_4$
Bromine	Br_2	Hydrogen bromide	HBr	Arsenic trichloride	$AsCl_3$
Hydrogen chloride*1	HCl	Boron trifluoride	BF_3	Phosphorus trichloride	PCl_3
Boron trichloride	BCl_3	Tungsten Hexafluoride	WF_6	Phosphoryl chloride	$POCl_3$
Dichlorosilane	SiH_2Cl_2	Tetrafluorosilane	SiF_4	Sulfur dioxide	SO_2

*1. For detection of hydrolyzed HF, F_2, HCl, or Cl_2/NH_3, the tube length should be less than 5 m.

*2. For detection of highly adsorptive gases other than those listed in the table above, the tube length should be less than 5 m.

⚠ CAUTION

- Install the gas detector in a place free from impact and vibration.
- Do not install in the vicinity of equipment that can generate high frequencies or a magnetic field.
- Do not use a gas collector in a confined space (e.g., inside a duct).
- Do not install the gas detector in a high temperature (higher than 40ºC) and condensation-prone area. Avoid sudden temperature changes.
- This product is not drip-proof and should be kept away from water.
- The pressure differential between the gas inlet/outlet and the outside air pressure (atmospheric pressure) should be within ± 1kPa. In addition, the pressure differential between the gas inlet and the gas outlet should be within 1kPa, with negative pressure applied to the gas inlet. Using the detector under overpressure will cause an excess flow, which may result in flow rate error or incorrect measurement.
- Install the gas detector vertically with its gas inlet and outlet facing down.
- Determine the height for the tip of the sampling tube by considering the specific gravity of the target gas and install the gas detector where gas is expected to accumulate.

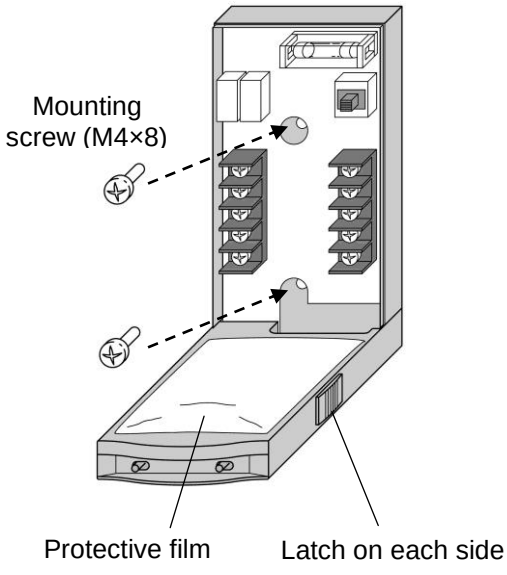
Gas type	Installing height
Gas heavier than air	Maximum of 30 cm above the floor
Gas near the specific gravity as air	75 to 150 cm above the floor
Gas lighter than air	Near the ceiling

- For the PS-7-05 or PS-7-06 unit, install the provided activated charcoal filter's outer sleeve (KF-6S-6Z or KF-6S-6ZH) to the gas inlet.

6-1. Unit Installation Procedure

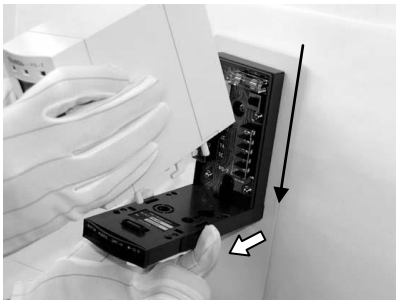
1. Determine where to place the base unit (positioning) and secure the base unit to the wall with the two mounting screws (M4x8).
2. Run the power and signal cables through the grommet (located at the bottom of the base) and connect the cable wires to the corresponding terminals (6-3. "Wiring Procedure").
3. To install the sensor unit at this stage, refer to 9-2. "Sensor Unit Installation/Replacement."

   To install the sensor unit at a later stage, skip this step and move to Step 4.
4. Remove the protective film.
5. Ensure that the main unit's power switch is in the OFF position.

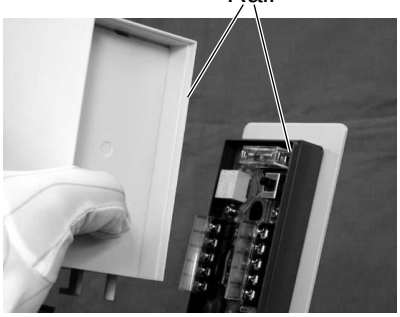


6. To install the main unit, pull forward and hold both the latches of the base unit. Connect the main unit by sliding it onto the rails of the base unit.

(2) Align with the rail and slide



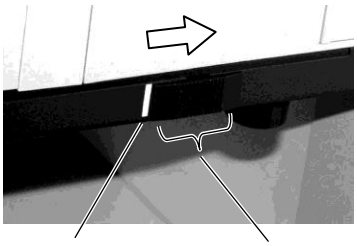
Rail



(1) Pull forward and hold the latches at both sides (unlock position)

7. Push the latches back into place such that the white lines are visible, indicating that the latches have been locked.

Fully push latch (lock position).



⚠ WARNING

- Ensure that the latches are in the fully locked position (white lines visible). Normal detection is not possible if the latches are not fully locked.

NOTE

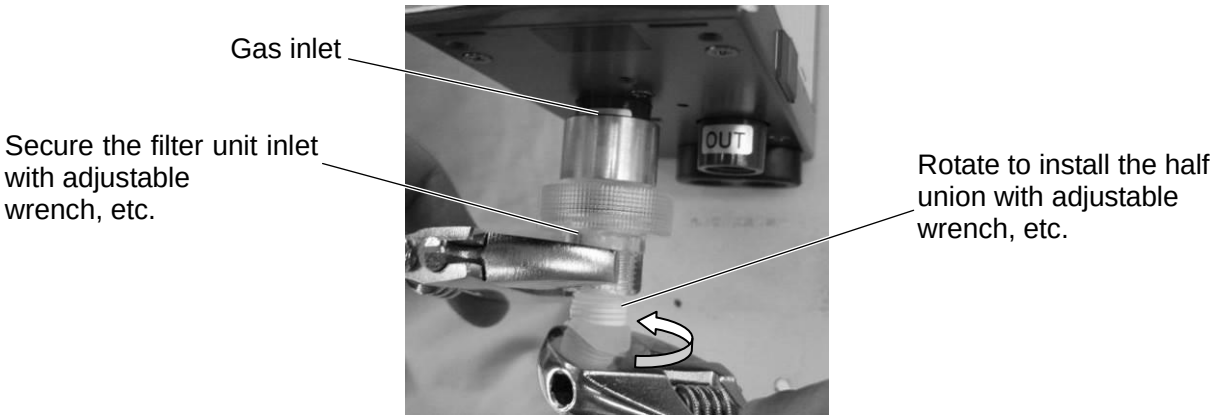
- The protective film is attached to protect the connectors and internal tubing of the base unit against possible damage while installing the base unit. Once the main unit has been installed onto the base unit, it is no longer necessary. Dispose of the used film in accordance with your company's rule and procedure.
- When installing multiple PS-7 units side by side, keep sufficient space (recommended: 30 mm or more) between each pair of the units for main unit installation/removal.

6-2. Tube Fitting Connection Procedure

Install the half unions (provided) into the gas inlet and outlet.

⚠ CAUTION

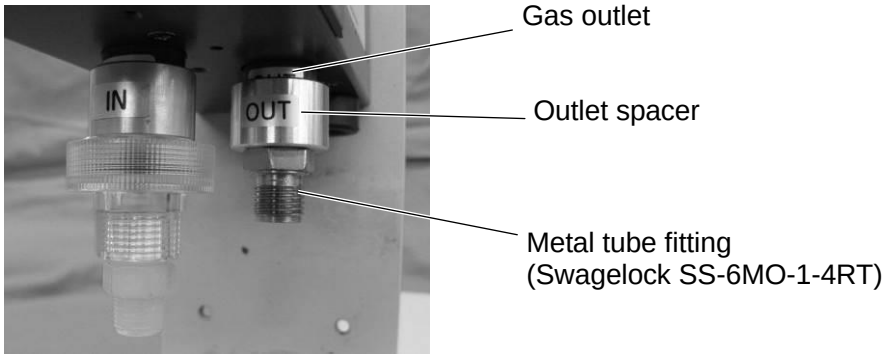
- Over-tightening the filter unit inlet may cause the gas inlet to break. When connecting the half union to the filter unit inlet, secure the filter unit inlet with one adjustable wrench or spanner, etc. to prevent the filter unit inlet from rotating and another to install to the half union.



Follow the precautions below when the metal tube fittings (not provided) need to be installed into the gas inlet and outlet:

⚠ CAUTION

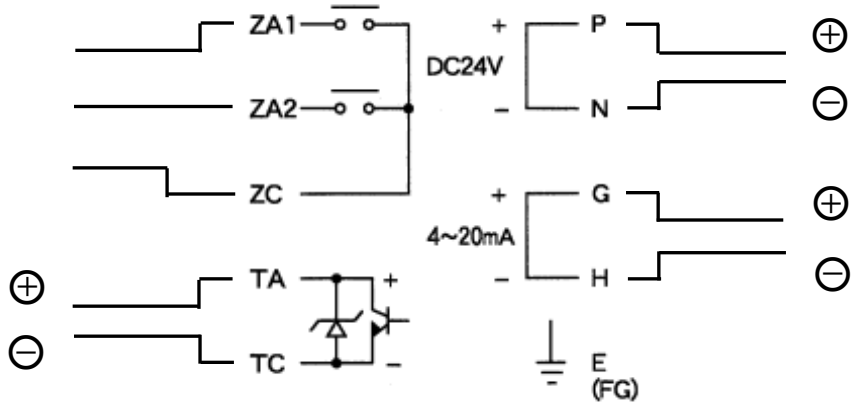
- Over-tightening the metal tube fitting may cause the gas outlet to break. To prevent this, install the outlet spacer (provided) to the gas outlet first and then connect the metal tube fitting over the spacer. Note: The inlet spacer is pre-installed when shipped.
- Use metal tube fittings, Swagelock SS-6MO-1-4RT or equivalent, for both the gas inlet and outlet.
- Wrap sealing tape tautly around the threads of each metal tube fitting to prevent slack (approx. 2.5 wraps).
  Tape size: 13 mm (width) x 100 ± 5mm (length) x 0.1 mm (thickness)
- Tighten the metal tube fitting until the spacer lightly touches the gas outlet and the metal tube fitting. Do not over-tighten the tube fitting or the gas outlet may break.



6-3. Wiring Procedure

Terminal block	Marking	Polarity	Function
TB1	P	+	Power input (24 VDC)
	N	−	
	G	+	Gas concentration output (4–20 mADC)
	H	−	
	E		Earth terminal
TB2	ZA1		1st stage gas alarm contact output (Dry NO contact) Max. load: 125 VAC or 30 VDC 0. 5 A (resistive load)
	ZA2		2nd stage gas alarm contact output (Dry NO contact) Max. load: 125 VAC or 30 VDC 0. 5 A (resistive load)
	ZC		Common for ZA1 and ZA2
	TA	+	Trouble alarm (NC open collector) Max. load: 30 VDC, 30mA resistive load
	TC	−	Trouble alarm common

(NO: Normally open; NC: Normally closed)



Terminal layout

⚠ WARNING

- Turn off the gas detector before wiring to prevent electric shocks.
- Ensure correct polarity when connecting the trouble alarm open collector (TA: + / TC: -). Due to the built-in protection diode, incorrect polarities will cancel an active trouble alarm output.
- Ground the detector to prevent electric shocks.

⚠ CAUTION

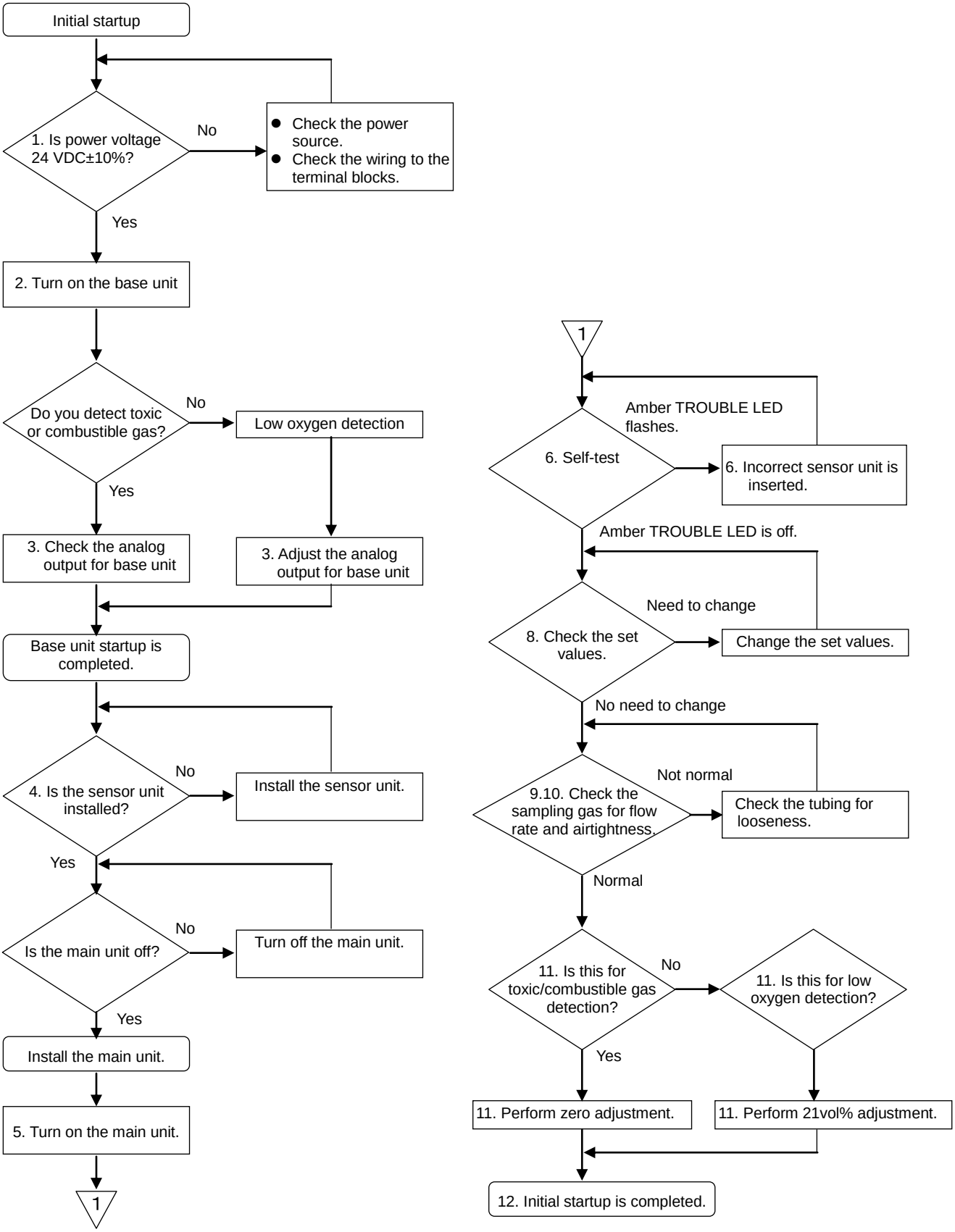
- The analog output line and power line of the gas detector are not isolated from each other. When using the detector with external devices, provide isolation to prevent noise from other power lines from interfering with the analog output of the detector.
- When wiring, place wires to avoid potential noise sources (e.g., large power transformers, motors, and powers supply units).
- Ensure cables between the gas detector and external devices are connected correctly.
- TB2's gas alarm contact output is intended to be used with resistive loads only. If used with inductive loads, back electromotive force will be generated, which may fail the operation of the device or relay contacts.

7. Operation

7-1. Operation Procedure

Operation Flow

The corresponding numbered steps are given for items 1–12 on the following pages.



⚠ WARNING

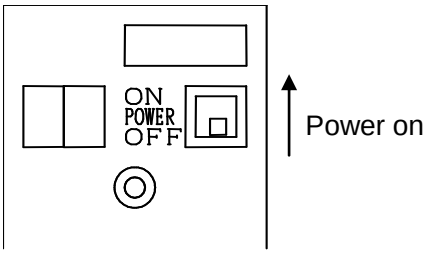
- When using the 24 VDC power supply, ensure that the power is 24 VDC ± 10%.
- Check that the target gas type and full scale value are correct before using a new sensor unit. Also, check that the sensor unit expiration date has not been reached.

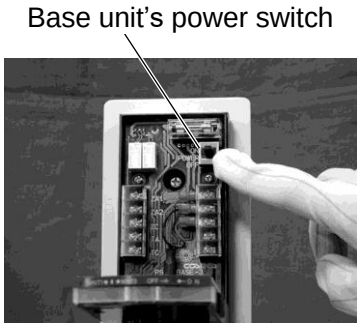
⚠ CAUTION

- Before turning on the gas detector, check that all wiring is correct. Refer to 6-3. “Wiring Procedure” and your delivery specifications if your unit has end-user-specific options.

Operate the gas detector by using the following steps:

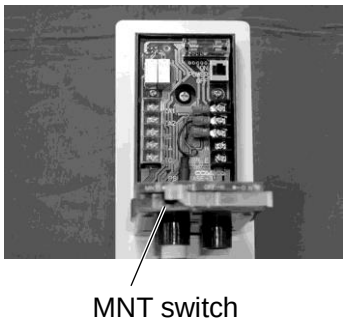
1. Ensure that the power voltage (between P and N on the terminal block) is 24 VDC ± 10%.
2. Set the base unit’s power switch to the ON position.

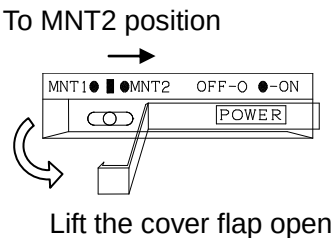




3. Adjust the analog output for maintenance mode 2 (MNT2).
   The MNT2 analog output varies with the sensor unit type. Therefore, the output needs to be adjusted by using the following steps. Refer to 7-5. “Maintenance Mode” for full information on the maintenance mode. For COMM-less models, a dedicated loop checker (LC-7) needs to be connected to the base unit for adjustment. Refer to (2) for details.

   (1) Lift the cover flap open. Set the MNT switch to the MNT2 position.



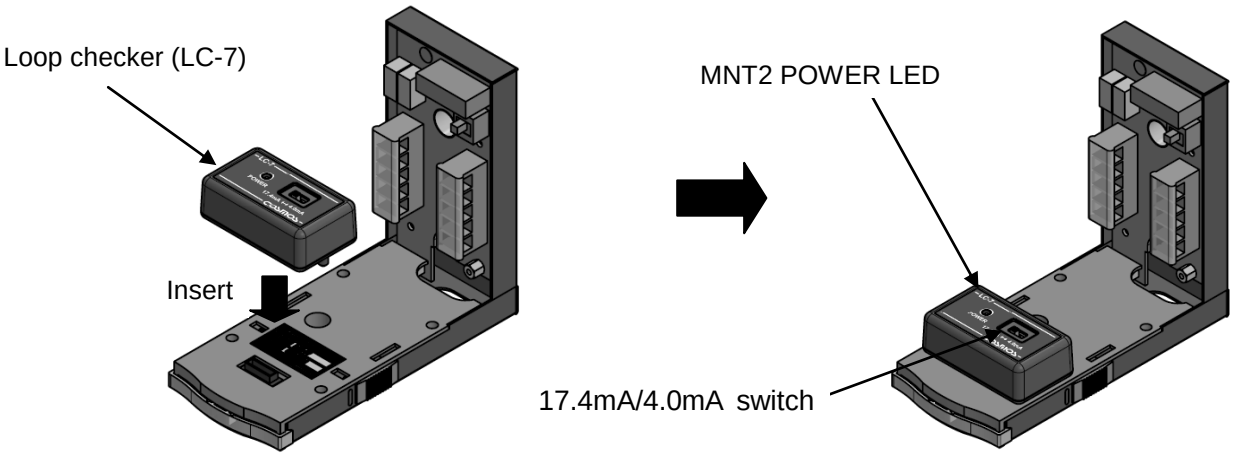


(2) For COMM-less models

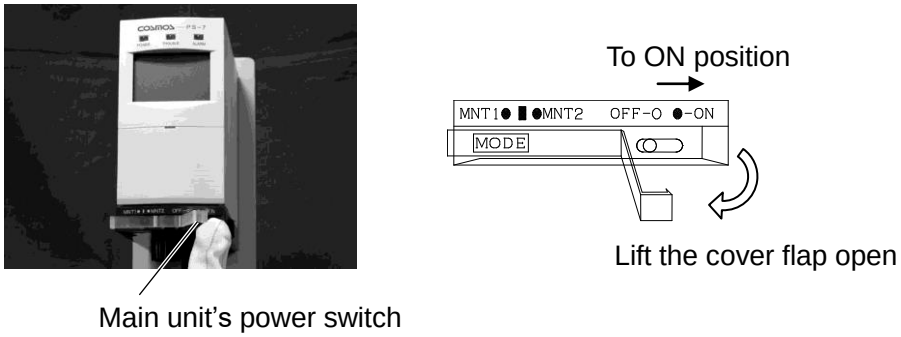
a. Connect the loop checker (LC-7) to the base unit.

b. Set the MNT2 analog output level to 4.0 mA or 17.4 mA depending on the sensor unit type using the 17.4 mA/4.0mA switch.

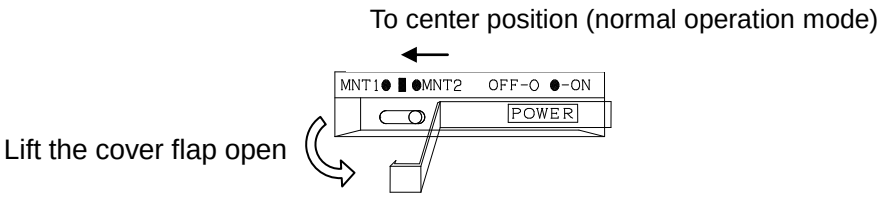
Sensor unit type	MNT2 analog level
CDS-7	4.0 mA
CHS-7	
COS-7 (FS: 25vol%)	17.4 mA
COS-7 (FS: 50vol%)	



c. Set the main unit's power switch to the ON position.



d. Set the MNT switch to the center position for normal operation mode.



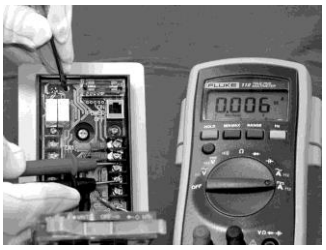
(3) For models other than COMM-less models

Toxic gas sensor: CDS-7
Combustible gas sensor: CHS-7
Oxygen sensor: COS-7 (FS: 25vol%)

a. Measure the analog output (current) between the “G” and “H” terminals with a multimeter, etc. If the output level is within the range below, go to Step (4). If not, adjust it using the trimmer.

Sensor unit type	Adjustable range
CDS-7	3.92-4.08mA
CHS-7	3.92-4.08mA
COS-7	17.32-17.48mA

*For COMM-less models, no need to adjust with the trimmer, and the output is fixed at 4.0 mA or 17.4 mA with the LC-7 loop checker.



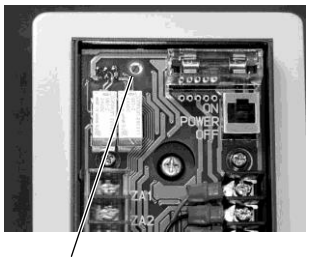
Multimeter G: +
H: -

Oxygen sensor: COS-7 (FS: 50vol%)

a. Measure the analog output (current) between the “G” and “H” terminals with a multimeter, etc. If the output level is within the range below, go to Step (4). If not, adjust it using the trimmer.

Sensor unit type	Adjustable range
COS-7 (FS: 50%)	10.64-10.80mA

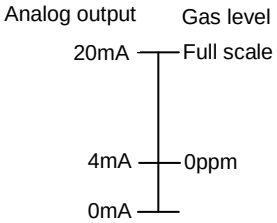
*For COMM-less models, no need to adjust with the trimmer, and the output is fixed at 17.4 mA with the LC-7 loop checker.



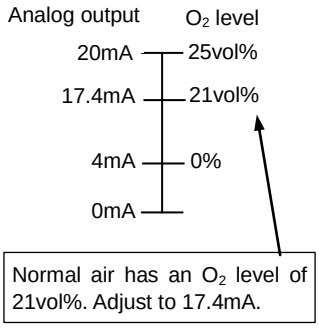
Trimmer (adjustment screw)
Rotate the trimmer with a slotted screwdriver to adjust the MNT2 output level.

NOTE

Toxic gas sensor CDS-7
Combustible gas sensor: CHS-7

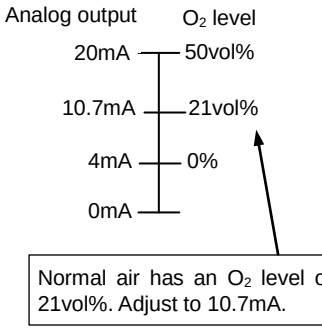


Oxygen sensor COS-7 (FS: 25vol%)



Normal air has an O_2 level of 21vol%. Adjust to 17.4mA.

Oxygen sensor COS-7 (FS: 50vol%)

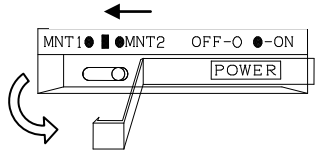


Normal air has an O_2 level of 21vol%. Adjust to 10.7mA.

b. Set the MNT switch to the center position for normal operation mode.

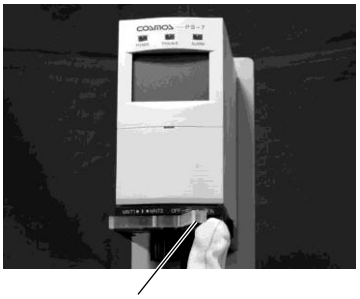
To center position (normal operation mode)

Lift the cover flap open

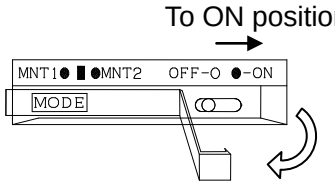


4. Install the sensor unit into the main unit if not installed yet. For the installation procedure, refer to 9-2. “Sensor Unit Installation/Replacement.” Ensure the main unit’s power switch is in the OFF position before the sensor unit/main unit installation. Install the main unit into the base unit by referring to 6-1. “Unit Installation Procedure.” For NF3 detection, install the activated charcoal filter into the unit by referring to 9-4 “Activated Charcoal Filter Installation/Replacement.”

5. Set the main unit’s power switch to the ON position.



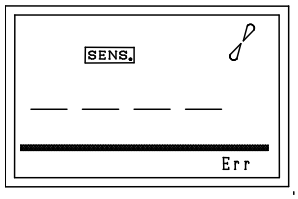
Main unit’s power switch

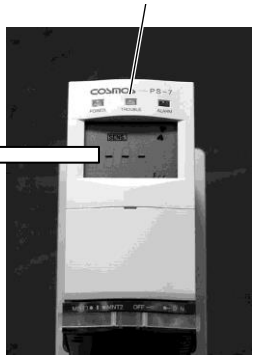


Lift the cover flap open

6. All the LEDs on the front and the LCD turn on for one second and then the gas detector starts a self-test.

   ■ When this product is used for the first time or a different gas type/sensor unit setting is installed (e.g., target gas or full scale value is different), the TROUBLE LED will flash, SENS. will appear, and “Err” will be shown at the bottom-right corner. After this, open the front cover and press the COMM. button for more than one second to clear the error.





   ■ When the same type/setting of the sensor unit is installed (e.g., target gas and full scale value are the same as the previous one), go to Step 7.

7. “Good” is displayed at the bottom-right corner. The unit will begin the 30-second initialization mode (POWER LED flashes). After this, the normal operation mode (POWER LED is steady lit) will start as the gas concentration is displayed on the LCD.

POWER LED
30 sec flashing -> steady lit

8. Check the set values. Note: To change the set values, refer to “PS-7 gas detector’s operation manual for administrators” (a separate document).

■ To view the set values shown in the table below, press the UP/DOWN button.

Press the UP/DOWN button to cycle through the items in the sequence as shown in the table. The set value for the selected item is displayed at the bottom-right corner (sub-display).

On sub-display	Function to set	Remarks	Default setting	
			Toxic: CDS-7 Combustible: CHS-7	O_2: COS-7
d1 ＊＊	Delay time 1	Delay time for 1st stage gas alarm contact (sec)	d1 0	d1 0
d2 ＊＊	Delay time 2	Delay time for 2nd stage gas alarm contact (sec)	d2 0	d2 0
az	Analog output (zero)	*1	-	-
as	Analog output (span)	*1	-	-
zs ＊	Zero or 21vol% suppression	Suppression percentage against the full scale value (with 1% increments)	zs 5	zs 2
H - H	Gas alarm mode	High-High limit	H - H	L - L
L - L		Low-Low limit		
H - L		High-Low limit		
Con ＊	Broken pyrolyzer wire detection	0: Not detected 1: Detected	Con 0	Con 0
CG ＊＊	Calibration gas concentration	*1	CG 40	CG 84
nEt ＊	DeviceNet on or off *2	0: Off 1: On	nEt 0	nEt 0
F ＊＊＊	F value	*1	-	
FL＊＊＊	Flow rate	The current flow rate is displayed (mL/min)	-	
P ＊＊＊	Sensor unit output	*1	-	
At ＊	Automatic 21vol% adjustment	0: Disabled 1: Enabled	-	At 1

*1. For New Cosmos service engineer use
*2. Not provided in COMM-less models

■ To view each gas alarm set value, press the AL button.
Press the AL button to cycle through the items in the sequence shown below:

A1 ＊＊ → A2 ＊＊→ gas concentration (normal operation mode) → A1 ＊＊ → A2 ＊＊→

The percentage in the full-scale% is shown at the bottom-right corner.

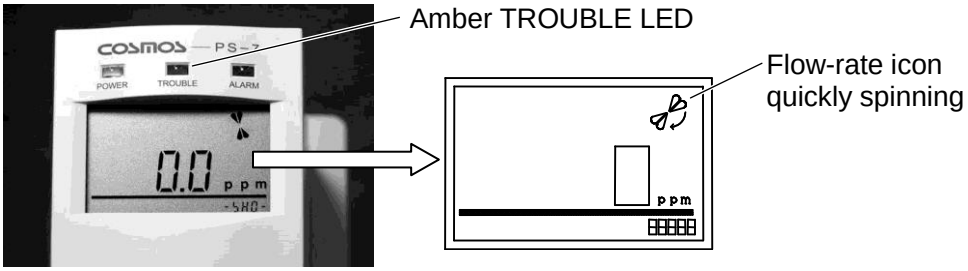
E.g., “A1 10” represents that the 1st alarm set value is 10% of the full scale value.

The actual alarm set concentration value is shown on the LCD.

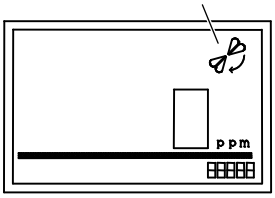
E.g., 0.10 ppm

On sub-display	Default set value		Description
A1 ＊＊	Toxic: CDS-7 Combustible: CHS-7	A1 10	10% of full scale value
	O_2: COS-7	A1 72	72% of full scale value
A2 ＊＊	Toxic: CDS-7 Combustible: CHS-7	A2 20	20% of full scale value
	O_2: COS-7	A2 76	76% of full scale value

9. Check the flow rate of the sampled gas.
   Check that the flow-rate icon quickly spins and the amber TROUBLE LED is off.
   When the flow-rate icon is quickly spinning, the specified flow rate (500mL/min) is maintained.

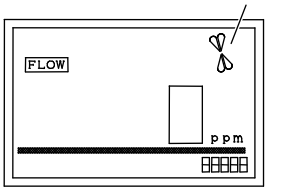


NOTE



Clogging notification
・Flow-rate icon spins slowly

Indicates a possible clogged tube/filter, or excessive negative pressure, etc. Gas detection and monitoring continue even when this notification is present.



Low flow rate alarm notification
・Flow-rate icon stops spinning
・FLOW appears on the LCD
・Amber TROUBLE LED flashes
・Trouble alarm is active

If the specified flow rate cannot be detected, a low flow rate alarm will be activated.

10.Check for airtightness.

Disconnecting the tube from the gas inlet and fully blocking the inlet with a finger will change the flow-rate icon's spinning speed from quick to slow. Keep blocking it and check that the flow-rate icon stops spinning and the amber TROUBLE LED starts flashing. (The delay time for the low rate alarm is set to 10 seconds). FLOW appears on the LCD.

If the flow-rate icon does not stop spinning and the amber TROUBLE LED does not flash, check that the sensor unit is properly installed into the main unit. Refer to 9-2. "Sensor Unit Installation/Replacement." Check that the latches are in the fully locked position (white lines visible).Connect the tube back to the gas inlet and check that the flow-rate icon quickly spins.

11.One-touch zero/21vol% adjustment

(Zero adjustment for CDS-7/CHS-7 and 21vol% adjustment for COS-7)

Take the steps mentioned in the table below, to perform a one-touch zero/21vol% adjustment once the specified period of time passes after turning on the main unit. Repeat the one-touch zero/21vol% adjustment to increase accuracy.

Sensor unit type	Timing for 1st adjustment	Timing for 2nd adjustment	Steps
Toxic gas: CDS-7	30 minutes after powering up	24 hours after powering up	Set the MNT switch to MNT1 or MNT2. Press the ZERO button.
Oxygen gas: COS-7 (25 vol%)			Set the MNT switch to MNT1 or MNT2. Press the SPAN button.
Combustible gas: CHS-7	One day after powering up	7 days after powering up	Set the MNT switch to MNT1 or MNT2. Press the ZERO button.

NOTE

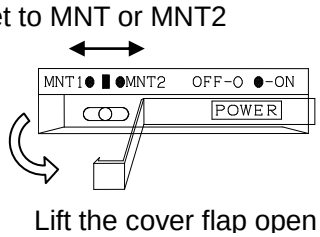
- Depending on the environment, it may take longer than the expected 24-hour/7-day period (see above) for the base line (zero or 21vol%) to be fully stabilized.
- For COS-7 oxygen sensor (FS: 50vol%), one-touch 21vol% adjustment is not possible. However, if 21vol% adjustment is needed, refer to "PS-7 gas detector's operation manual for administrators" for the procedure (separate document).

⚠ WARNING

- Perform zero/21vol% adjustment in clean air. Inaccurate gas concentrations will be indicated if the zero/21vol% adjustment has been performed in an atmosphere that may contain target or interfering gases.

Procedure

(1) Set the MNT switch to the MNT1 or MNT2 position. Refer to 7-5. "Maintenance Mode Setting/Operation" for more information.



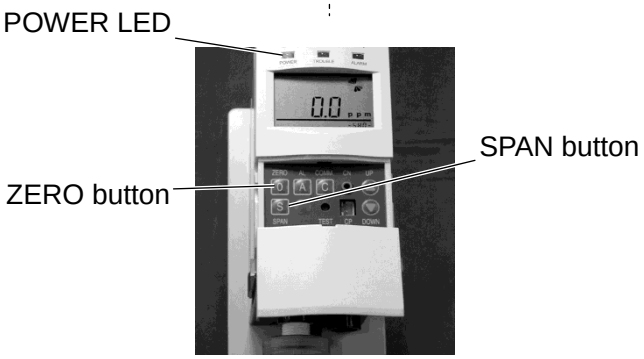
(2)

Toxic gas sensor: CDS-7 Combustible gas sensor: CHS-7

Press the ZERO button for more than two seconds. The green POWER LED will flash one time, indicating the zero adjustment is completed.

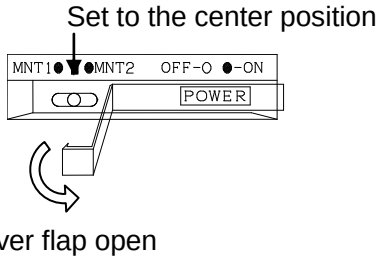
Oxygen sensor: COS-7

Press the SPAN button for more than four seconds. The green POWER LED will flash one time, indicating the zero adjustment is completed.

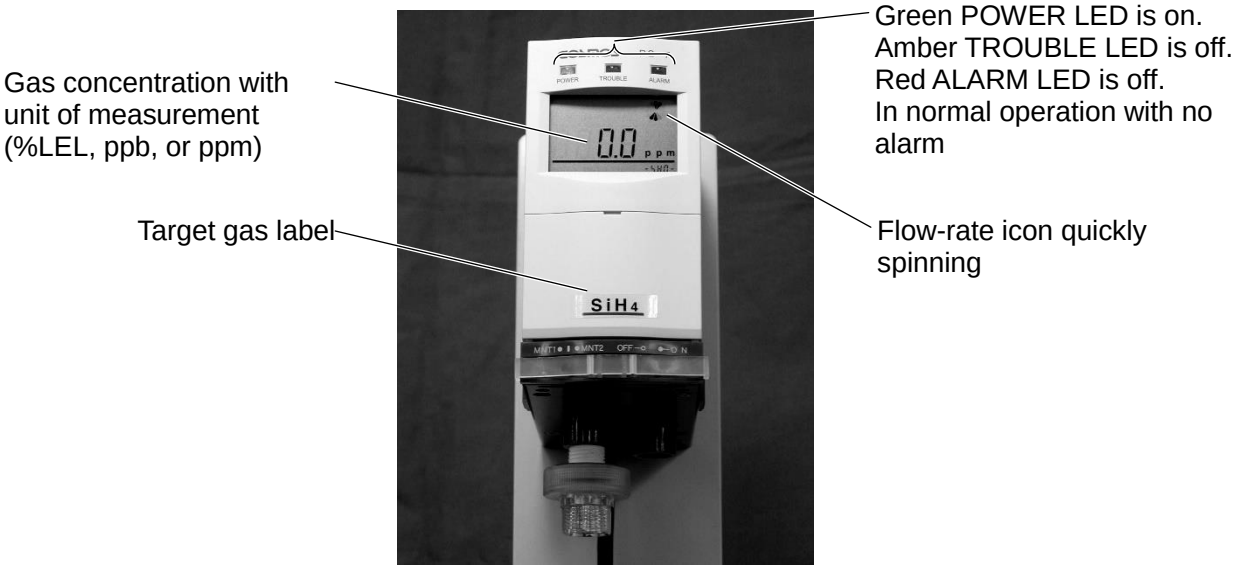


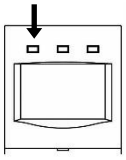
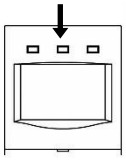
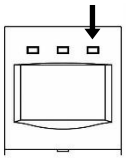
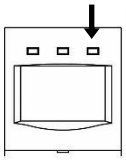
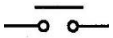
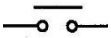
(3) Set the MNT switch to the center position for normal operation mode.

Perform zero/21% adjustment again by repeating the Steps (1) to (3) at the following timing:
24 hours after powering up for toxic gas and oxygen
7 days after powering up for combustible gas



12. Affix the target gas label to the front (visible location) of the detector.



	Normal operation (gas-monitoring)	Trouble alarm (internal failure)	1st stage gas alarm	2nd stage gas alarm
LED	Green lit 	Amber flash 	Red flash 	Red flash 
LCD		FLOW SENS. CONV.	ALARM1	ALARM1 ALARM2
Gas alarm contact (ZA1) 	OFF (open position)	OFF (open position)	ON (closed position)	ON (closed position)
Gas alarm contact (ZA2) 	OFF (open position)	OFF (open position)	OFF (open position)	ON (closed position)
Trouble alarm open collector (TA) 	ON (closed position)	OFF (open position)	ON (closed position)	ON (closed position)

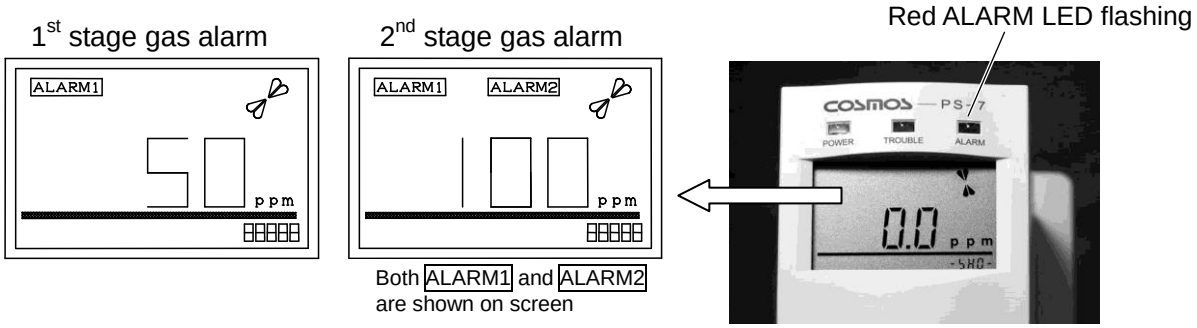
7-2. Gas Alarm Operation

If the gas concentration exceeds the gas alarm set value, the alarm contacts will activate after the alarm delay time, the red ALARM LED will start flashing, and ALARM1 or ALARM1+ALARM2 will be shown on the LCD.

Note: During the alarm delay time, ALARM1 or ALARM1+ALARM2 flash on the LCD, the alarm contact does not activate and the red ALARM LED does not flash.

Self-resetting: When the gas concentration falls below the gas alarm set value, the ALARM LED, ALARM1, ALARM2 and relevant gas alarm contacts will automatically return to their normal positions/status.

The table below lists the operation of each mode in the event of a gas alarm.



	On display	Green POWER LED	Amber TROUBLE LED	Red ALARM LED
1st stage gas alarm	ALARM 1	On	Off	Flashes
2nd stage gas alarm	ALARM 1 ALARM 2	On	Off	Flashes

NOTE

A1 and A2 relation in each gas alarm mode

- H - H mode (High-High limit alarm)

Full scale
- 2nd stage gas alarm: ALARM1 and ALARM2 are lit. Gas alarm contacts (ZA1, ZA2) activate. Alarm set value shown as "A2 ＊＊".
- 1st stage gas alarm: ALARM1 is lit. Gas alarm contact (ZA1) activates. Alarm set value shown as "A1 ＊＊".

0ppm ← Reading in normal ambient air (no gas detected)

- L - L mode (Low-Low limit alarm)

25vol%

21vol% ← Reading in normal ambient air (no gas detected)
- 1st stage gas alarm: ALARM1 is lit. Gas alarm contact (ZA1) activates. Alarm set value shown as "A2 ＊＊".
- 2nd stage gas alarm: ALARM1 and ALARM2 are lit. Gas alarm contacts (ZA1, ZA2) activate. Alarm set value shown as "A1 ＊＊".

0vol%

- H - L mode (High-Low limit alarm)

50vol%
- High limit of gas alarm: ALARM2 is lit. Gas alarm contact (ZA2) activates. Alarm set value shown as "A2 ＊＊".

21vol% ← Reading in normal ambient air (no gas detected)
- Low limit of gas alarm: ALARM1 is lit. Gas alarm contact (ZA1) activates. Alarm set value shown as "A1 ＊＊".

0vol%

7-3. Trouble Alarm Operation

This unit can detect an internal failure. When an internal failure is detected, a trouble alarm will activate (open collector is normally ON (closed position) and in the event of a trouble alarm it switches to OFF (open position)). The amber TROUBLE LED will start flashing, and the analog output will fall to 0.6 mA or less.

Self-resetting: When a problem is removed, the TROUBLE LED, open collector, and analog output will automatically return to their normal positions/status.

Please refer to 10. “Troubleshooting.”

The internal failures include the following:

(1) Low flow rate

When a minimum flow rate is not present, the unit determines the flow rate to be too low. FLOW is shown on the LCD and the spinning flow-rate icon stops. The low flow rate is caused by: a clogged filter element, clogged tubing, excessive negative pressure, worn pump, etc.

(2) Sensor fault

SENS. appears on the LCD in the following situations:

- When the sensor’s zero-level output is extremely low.
- When a broken sensor wire is detected. This applies to a combustible gas sensor (CHS-7) only.

(3) Incorrect sensor installed

The data (e.g., target gas type, full scale value) from the last installed sensor is recorded by the gas detector. If a newly installed sensor unit does not match, the gas detector will detect that an incorrect sensor unit has been installed, and display SENS. And “ - - - -” on its LCD. To use a newly installed sensor unit that does not match the previous sensor type, press the COMM. button to renew the data.

(4) Broken pyrolyzer wire (when the detector uses a pyrolyzer)

If a broken wire is detected, CONV. will appear on the LCD.

(5) No power

If the gas detector is not powered, all the LEDs will turn off and the detector will stop operation.

(6) Blown fuse

If the fuse is blown due to which the unit loses power, then all the LEDs will turn off and the detector will stop operation.

(7) Memory read error

When the internal memory cannot be normally read after power-up, “nG” will be displayed on the LCD.

⚠ CAUTION

Oxygen sensor (COS-7): The analog output from this product falls to 0.6 mA or less in the event of a trouble alarm as listed above. When the host system (e.g., control room) is set to the low limit alarm (gas alarm activates when the gas concentration falls to the alarm set value or less) and if the product's analog output falls to 0.6 mA or less in under a second without a gas alarm, it means that a trouble alarm is present. Take measure to prevent the host system from activating a gas alarm, as needed.

	Trouble (internal failure)	On display	Green POWER LED	Amber TROUBLE LED	Red ALARM LED	Remarks
(1)	Low flow rate	FLOW	On	Flashing	Off	Flow-rate icon stops spinning.
(2)	Sensor fault	SENS.	On	Flashing	Off	
(3)	Incorrect sensor installed	SENS.	On	Flashing	Off	"- - - -" shown for the gas concentration on the LCD.
(4)	Broken pyrolyzer wire	CONV.	On	Flashing	Off	
(5)	No power		Off	Off	Off	
(6)	Blown fuse		Off	Off	Off	
(7)	Memory read error	nG	On	Flashing	Off	Error code shown at the bottom-right corner.

7-4. Test Mode

Setting

Use the test stick to press the TEST switch to enter the test mode. The TEST switch is pressed to turn the test mode on and off. The test mode will automatically end in 10 minutes.

Increase/decrease the analog output value using UP/DOWN button.

Turn on/off the recessed TEST switch with test stick.

Operation

"TEST" will be displayed on the LCD.

While in the test mode, it is possible to change the analog output (4–20mA) to the desired value with 0.16 mA increments (1% of the full scale value). Increase or decrease the analog output value by pressing the UP or DOWN button.

⚠ CAUTION

- While in the test mode (alarm test using the TEST switch), the gas alarm contacts activate. If the gas alarm contacts are used to operate the interlocks, etc. of the external devices, release the interlocks, etc. beforehand, as needed, to prevent a possible activation of the interlocks during the test mode, or
- Enter the maintenance mode before entering the test mode. Release the interlocks of the external devices beforehand, if needed (refer to 7-5. "Maintenance Mode").
- Notify those concerned before starting a gas alarm test.

7-5. Maintenance Mode

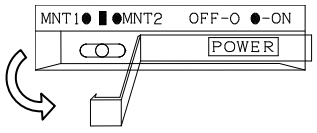
Setting

The MNT switch has three modes — maintenance mode 1 (MNT1), maintenance mode 2 (MNT2), and normal operation mode (gas-monitoring mode).

Set the MNT switch to MNT1 or MNT2 on the base unit's front, accordingly "MNT1" or "MNT2" will be shown on the LCD. To return to the normal operation mode, set the MNT switch to the center position.

MNT switch

MNT1 – normal operation – MNT2 (center)



Lift the cover flap open

Operation

During MNT1, gas alarm contacts and trouble alarm open collector are disabled.

During MNT2, gas alarm contacts and trouble alarm open collector are disabled, and the analog output is fixed at 4.0 mA (or 17.4 mA for oxygen).

In either maintenance mode, the amber TROUBLE LED flashes, and the detected gas concentration is shown on the LCD.

	Gas alarm contact	Trouble alarm open collector	Analog output	Amber TROUBLE LED	On display
MNT1 (host maintenance mode)	Disabled (fixed at OFF)	Disabled (fixed at ON)	Value corresponding to the detected gas concentration.	Flashes	Detected gas concentration value
MNT2	Disabled (fixed at OFF)	Disabled *1 (fixed at ON)	Fixed at 4.0 mA or 17.4 mA	Flashes	Detected gas concentration value

⚠ CAUTION

*1. Trouble alarm will activate if the main unit's power switch is set to the OFF position while in the MNT1 or MNT2 mode (OFF).

*2. The analog output may change when the main unit's power switch is set to the OFF position.

⚠ WARNING

During normal operation (gas-monitoring mode), ensure the MNT switch is set to the center position. Gas alarm contacts and trouble alarm open collector do not activate during MNT1/MNT2. When the MNT switch is set to MNT2, the analog output is fixed at 4.0 mA or 17.4 mA.

NOTE

MNT1 or MNT2 modes are enabled with the base unit and without the main unit. The base unit can produce a 4.0 mA or 17.4 mA analog output while in the MNT2 mode. This function is useful for loop check at startup, etc.

For COMM-less models, a 4.0 mA or 17.4 mA analog output can be produced only when a loop checker (LC-7) is attached.

8. Maintenance

This gas detector requires no on-site gas calibration. Each sensor unit is gas-calibrated when shipped. Replace the sensor unit with a new one every 6 months, except for combustible gas sensor units (CHS-7).

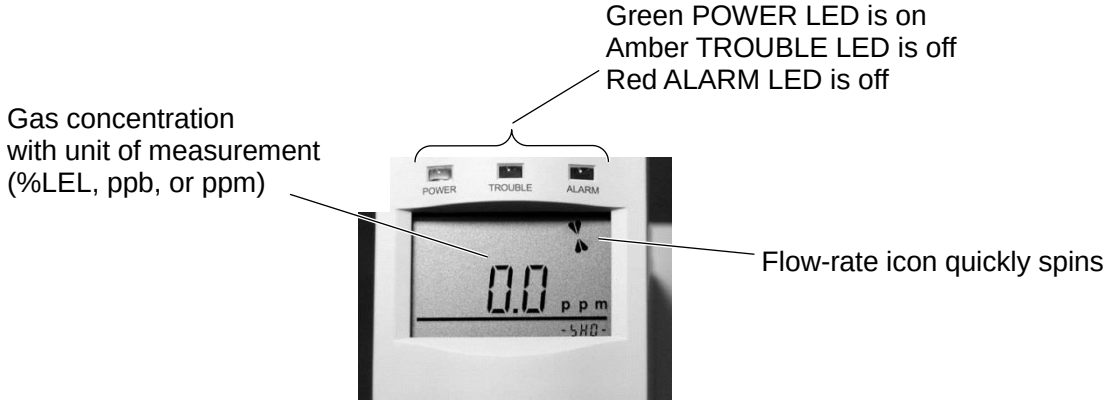
Routine checks are to be carried out by the user. 6-month and 3-year periodic inspections are to be performed by the user, New Cosmos or its authorized representative.
Record the check/inspection results, and save them for at least 3 years. An example of the check/inspection results is provided on page 32.

Important Maintenance Notice

In order to ensure the reliability of the gas detector, it is vital to perform periodic sensor unit replacement. The replacement can be done by the user, but it is highly recommended that a maintenance contract with a local New Cosmos representative be made for the performance of periodic sensor unit replacement and inspection.

Check item	Startup or relocation	Periodic Inspection		Routine check
		Every 6 months	Every 3 years	
(1) Concentration display	√	√		√
(2) Sampling gas flow rate	√	√		
(3) Airtightness	√	√		
(4) Filter element replacement		√		
(5) Check the tubing	√			
(6) Sensor unit installation/replacement	√	√		
(7) Sampling unit replacement			√	
(8) Loop check and alarm test using the TEST switch	√	√		

(1) Concentration display
Check that the gas concentration value is shown on the LCD and the detector is running.



(2) Sampling gas flow rate (flow-rate icon check)
Check that the flow-rate icon (at the top-right corner of the LCD) is quickly spinning. Refer to 7-1.9 “Check the flow rate of the sampled gas.”
If the flow-rate icon slowly spins or stops, check the filter element for contaminants. If the filter element (FE-1) is dirty, replace it with a new one. Refer to 9-1. “Filter Element Replacement” for the procedure. If the flow-rate icon does not return to normal operation (quickly spinning), check the tubing for clogging or excessive negative pressure.

(3) Airtightness
Check the airtightness of the unit by referring to 7-1.10. “Check for airtightness.”

(4) Filter element replacement
Check the filter element for contaminants at least once every 6 months and replace it if needed. The filter element is likely to clog faster in a severe environment. If the clogging notification (flow-rate icon slowly spins or stops) appears on the LCD, check the filter element. Replace it with a new one, if dirty. Refer to 9-1. “Filter Element Replacement” for the procedure.

(5) Check the tubing
Check that the tubing has been done correctly at startup or relocation. If the tubing is incorrect, gas sampling from the target place is not possible, and an appropriate flow rate cannot be maintained.

(6) Sensor unit installation/replacement
Install a new sensor unit into the gas detector at startup, and replace it with a new one every 6 months, except for combustible gas sensor units (CHS-7). Refer to 9-2. “Sensor Unit Installation/Replacement” for the procedure.

(7) Sampling unit replacement
Replace the sampling unit with a new one every 3 years. For the procedure, refer to 9-3. “Sampling Unit Replacement.”

(8) Loop check and alarm test using the TEST switch
Press the TEST switch with the test stick to send a pre-set analog output to the host system. Check the output at the host system. Press the TEST switch again to return the output to normal. For this, refer to 7-4. “Test Mode”.

⚠ CAUTION

- To maintain the reliability of the gas detector, perform a gas alarm test by using the TEST switch, etc. at least once a month.
- While in the test mode (alarm test using the TEST switch), the gas alarm contacts activate. If the gas alarm contacts are used to operate the interlocks, etc. of the external devices, release the interlocks, etc. beforehand, as needed, to prevent a possible activation of the interlocks during the test mode, or

  Enter the maintenance mode before entering the test mode. Release the interlocks of the external devices beforehand, if needed (refer to 7-5. “Maintenance Mode”).

  Notify those concerned before starting a gas alarm test.

Example of the check/inspection results

No.	Model	Target gas	Full scale value
1	PS-7	CO	250 ppm
2	PS-7	SiH_4	25 ppm
3			
4			
5			

Item	Location	Zero-level output		Alarm set value		Flow rate	Alarm test using the TEST switch	Airtight ness	Filter element	Tubing	Replacement sensor No.	Replace sampling unit
		Before adj.	After adj.	1st stage	2nd stage							
1	Cabinet	0	0	50	100	■	■	■	■	■	H1021943	———
2	Device A	0	0	5	10	■	■	■	■	■	H1021944	———
3						□	□	□	□	□		
4						□	□	□	□	□		
5						□	□	□	□	□		

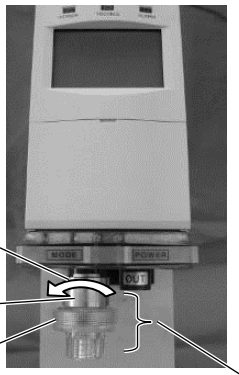
9. Consumable Replacement

This product has been designed such that its consumable parts can be easily replaced by the user.
To order, contact New Cosmos or its authorized representative.

9-1. Filter Element Replacement

If the filter element (FE-1) is dirty, replace it with a new one by using the following steps:

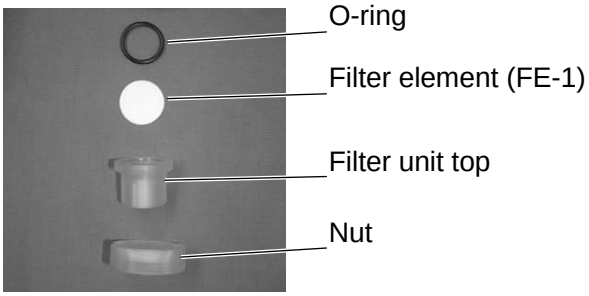
1. Rotate and loosen the nut which secures the filter unit (MF-50) and pull to separate the filter unit top from the inlet. The filter element is accessible now.



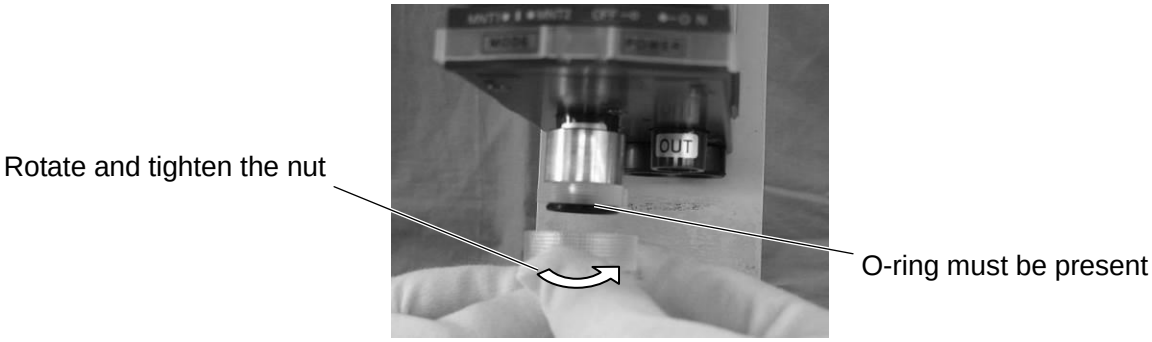
Precautions when replacing the entire filter unit or separating/reinstalling it from/into the inlet spacer:

Completely remove the old sealing tape (no residue). Wrap new sealing tape around the threads of the filter unit (approx. 2.5 wraps). Wrap the sealing tape tautly to prevent slack.
Tape size: 13 mm (width) x 100 ± 5 mm (length) x 0.1 mm (thickness)
Tighten the filter unit so that movement of the spacer is not possible. Do not over-tighten the filter unit to prevent a broken inlet.

2. Replace the filter element with a new one.



3. Install the filter unit top into the inlet. Rotate and tighten the nut to secure the filter unit. Ensure the O-ring is correctly seated.



9-2. Sensor Unit Installation/Replacement

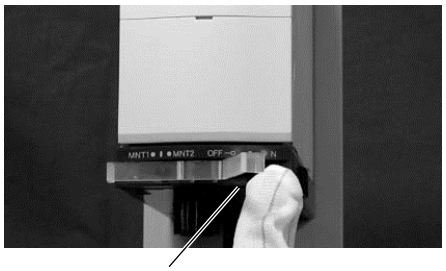
⚠ WARNING

- Check that the target gas type and full scale value are correct before using a sensor unit. Also, check that the sensor expiration date has not been reached.
- Note: The expiration year/month is not indicated on a combustible gas sensor (CHS-7).

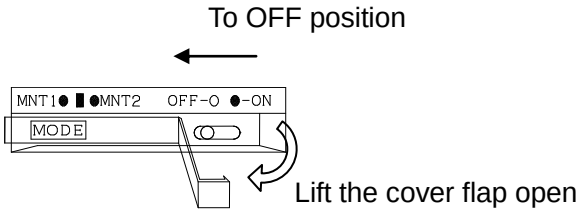
⚠ CAUTION

- Sensor unit replacement should be performed every 6 months, except for combustible gas sensors (CHS-7). Replace the expired sensor unit with a new one.
- The expiration year/month is written on each sensor unit's individual package. Replace the old one with a new one before the expiration date.
- Turn off the gas detector before sensor unit replacement. Setting the main unit's power switch to the OFF position will generate a trouble alarm output (open collector is opened (OFF)). If the trouble alarm output is used to operate the interlocks, etc. of the external devices, release the interlocks, etc. beforehand, as needed, to prevent a possible activation of the interlocks during replacement.

1. Set the main unit's power switch to the OFF position.

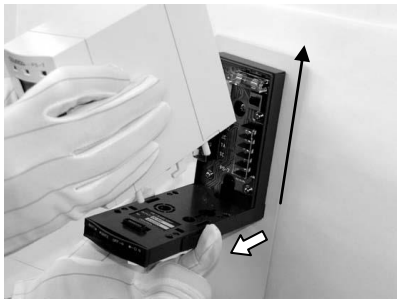


Main unit's power switch



2. Pull the latches on both sides of the base unit forward and lift the main unit to remove it from the base unit.

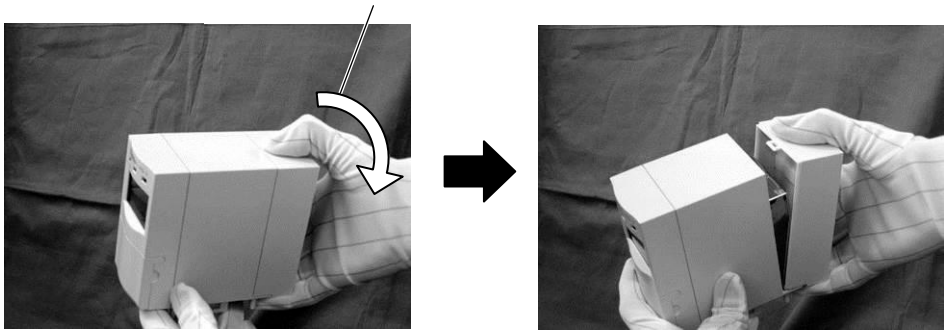
(2) Lift up the main unit



(1) Pull forward the latches on both sides

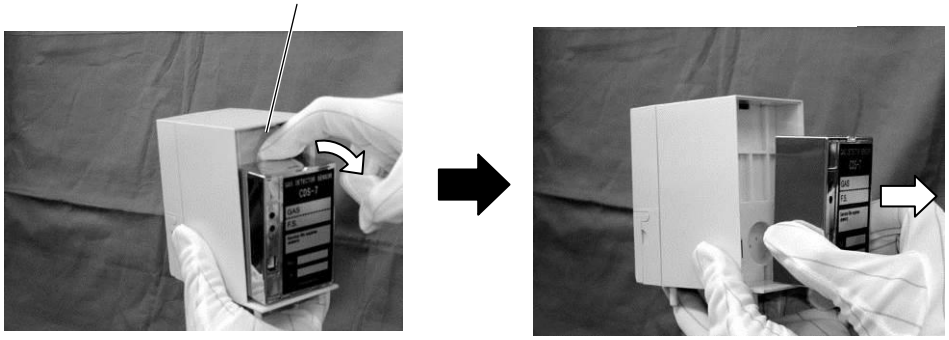
3. Press the top of the rear cover with thumb and pull back the rear cover to separate the rear cover from the main unit.

Press here then pull back the rear cover.

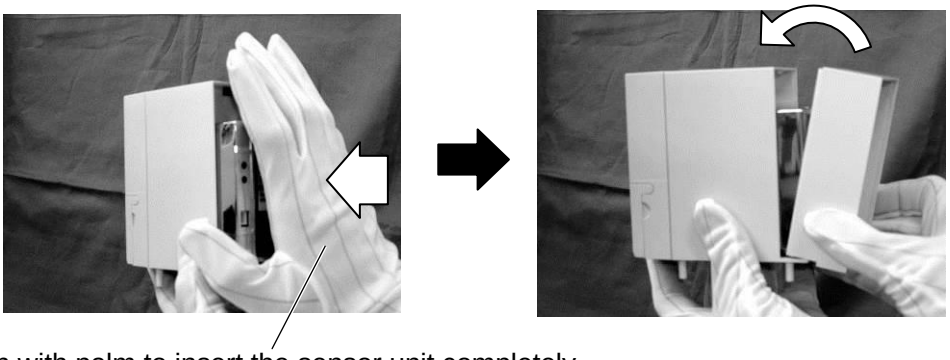


4. Insert a finger between the main unit and the sensor unit so that the sensor unit slightly tilts forward. Hold the sensor unit by its sides and then pull it out of the main unit.

Insert a finger so that the sensor unit will tilt forward



5. Insert a new sensor unit and place the rear cover back on.



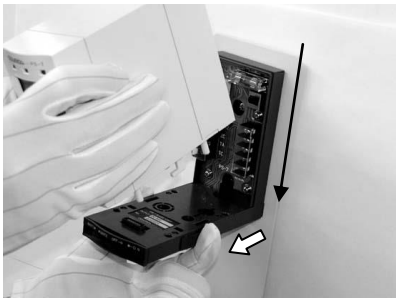
Push with palm to insert the sensor unit completely

⚠ WARNING

- If the sensor unit is not completely inserted, an airtight seal will not be created and correct gas detection will not be possible.

6. Pull forward and hold the latches at both sides and connect the main unit by sliding it onto the rails of the base unit.

(2) Align with the rail and slide on

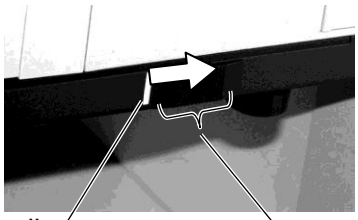


Rail

(1) Pull forward and hold the latches at both sides (unlock position)

7. Push the latches back into place such that the white lines are visible, indicating that the latches have been locked.

Push the latch (lock position).



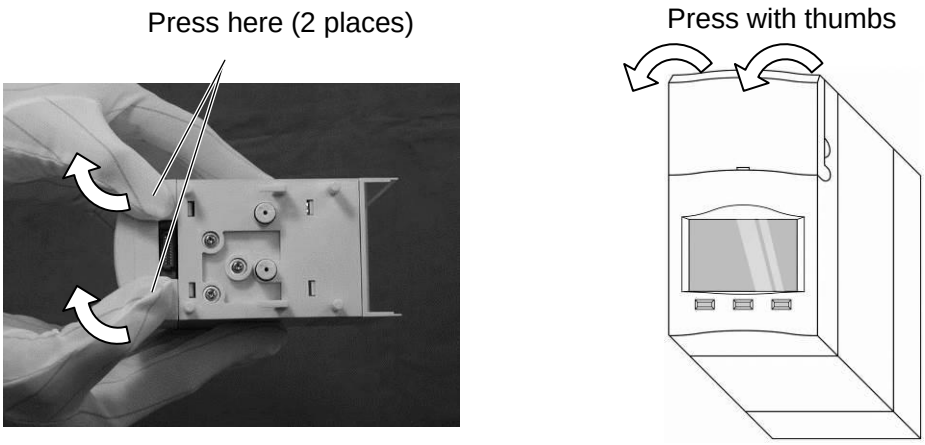
⚠ WARNING

- Ensure that the latches are in the fully locked position (white lines visible). Normal detection is not possible if the latches are not fully locked.

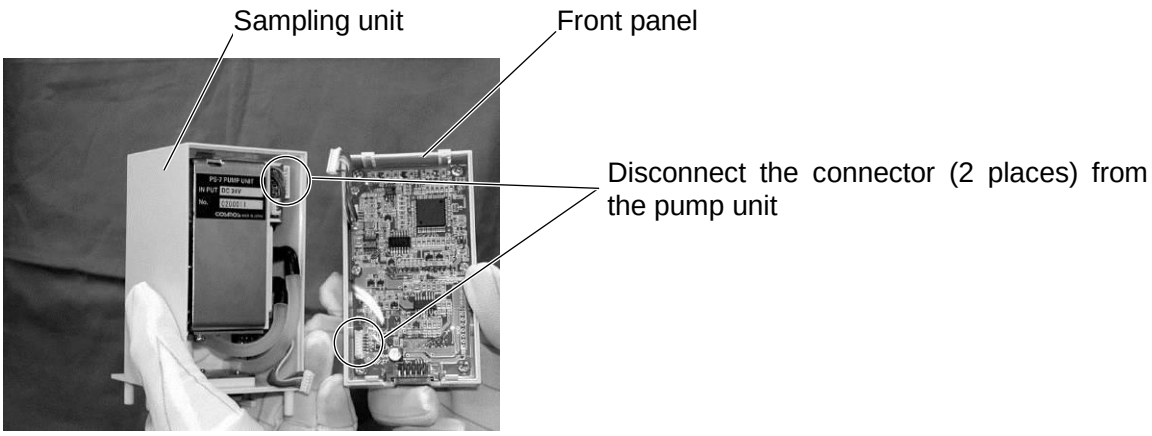
9-3. Sampling Unit Replacement

> **⚠ CAUTION**
>
> - Turn off the gas detector before sampling unit replacement. Setting the main unit's power switch to the OFF position will generate a trouble alarm output (open collector is opened (OFF)). If the trouble alarm output is used to operate the interlocks, etc. of the external devices, release the interlocks, etc. beforehand, as needed, to prevent a possible activation of the interlocks during replacement.

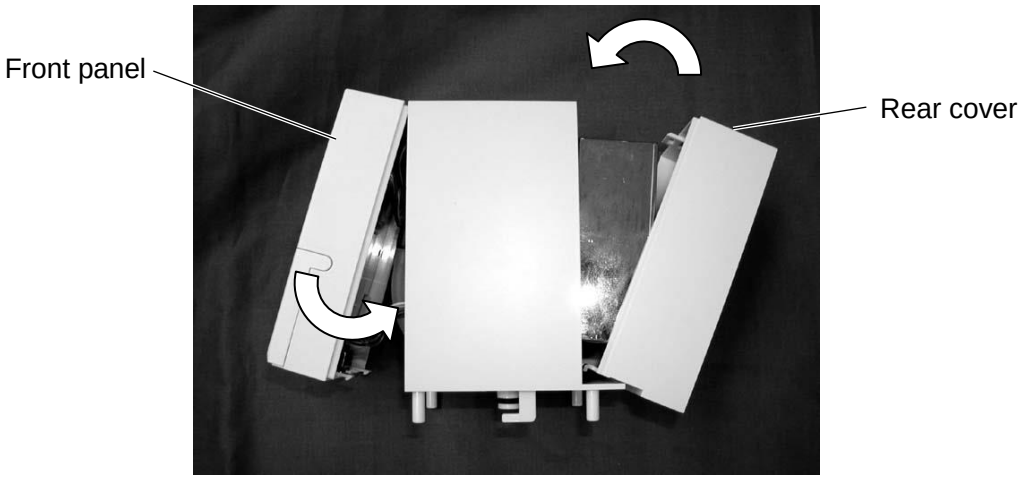
1. Remove the sensor unit by following Steps 1 to 4 of 9-2. "Sensor Unit Installation/Replacement."
2. While pressing the front panel's bottom with both thumbs, slowly press the panel forward to remove it from the main unit.



3. Disconnect the two connectors from the front panel.



4. Connect the two connectors. Mate the sampling unit and front panel. Insert the sensor unit and install the rear cover.



Ensure that cables are not caught

⚠ WARNING

- If the sensor unit is not completely inserted, an airtight seal will not be created, and correct gas detection will not be possible. Take care that the cables are not caught between the front panel and sampling unit.

5. Install the main unit by following Steps 6 and 7 of 9-2. “Sensor Unit installation/Replacement.”

NOTE Dispose of used sensor/sampling units in accordance with the applicable local laws and regulations.

9-4. Activated Chacoal Filter Installation/Replacement

⚠ WARNING

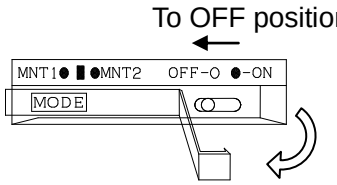
- Only use an activated charcoal filter when the target gas is NF_3.

⚠ CAUTION

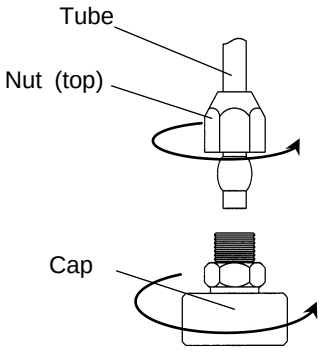
- Replace the activated charcoal filter's inner sleeve (KF-6S-Y1) at the time of replacing the sensor unit.
- Turn off the gas detector before filter installation/replacement. Setting the main unit's power switch to the OFF position will generate a trouble alarm output (open collector is opened (OFF)). If the trouble alarm output is used to operate the interlocks, etc. of the external devices, release the interlocks, etc. beforehand, as needed, to prevent a possible activation of the interlocks during replacement.

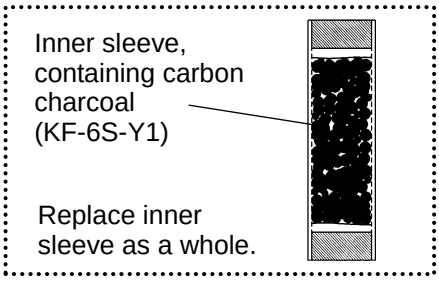
1. Set the main unit's power switch to the OFF position.

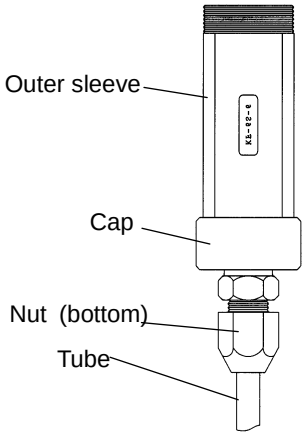
Main unit's power switch



Lift the cover flap open







2. Loosen the nut (on either end, top or bottom). Disconnect the tube from the activated charcoal filter.
3. Rotate the cap to remove it while holding the outer sleeve with the other hand.
4. Take the inner sleeve (KF-6S-Y1) that contains the carbon charcoal out of the outer sleeve.
5. Place a new inner sleeve (KF-6S-Y1) in the outer sleeve.
6. To install the cap to the sleeve, rotate it until firmly tightened to ensure that no movement is possible. Check that the cap on the other end is also filmy tightened.
7. Tighten the nut to connect the tube to the filter.
8. Set the main unit's power switch to the ON position. Check the sampling gas flow rate (refer to 9 of 7-1 "Operation Procedure").

NOTE Used activated charcoal filters must be disposed of as hazardous waste in accordance with the applicable local laws and regulations.

10. Troubleshooting

- Before requesting for repair, please refer to the table below. If the detector does not return to normal operation after performing the corresponding steps in the table, or if your issue is not found in the table, consult New Cosmos or its authorized representative.
- In the event of a device failure, refer to 7-3. “Trouble Alarm Operation.”
- In the case of a communication problem, refer to a separate PS-7 communication specifications guide.

Troubleshooting

Problem	Probable cause	Steps	Reference section
Green POWER LED does not turn on	Base unit’s power switch is in the OFF position	Set the switch to the ON position.	7-1.Operation Procedure
	Main unit’s power switch is in the OFF position	Set the switch to the ON position.	7-1.Operation Procedure
	Incorrect wiring	Check and rewire. Securely connect the wires to the terminals.	6-3. Wiring Procedure
	Connector to the front panel is loose	Check and rewire. Securely connect the wires to the terminals.	9-3. Sampling Unit Replacement
	Blown fuse	Replace the fuse. *Turn off the detector before replacement.	5-3. Base Unit
Amber TROUBLE LED flashes	Low flow rate due to clogged filter element	Replace the filter element.	9-1. Filter Element Replacement
	Low flow rate due to pump failure	Replace the sampling unit.	9-3. Sampling Unit Replacement
	Low flow rate due to clogged tubing	Remove clog from the tubing.	
	Connector to the pump unit is loose	Check and rewire. Securely connect the wires to the terminals.	9-3. Sampling Unit Replacement
	Incorrect sensor installed (data does not match the last installed sensor type)	Install the correct sensor type. To install a different sensor type, press COMM. button to renew the data.	7-1.Operation Procedure
	Sensor unit failure	Replace the sensor unit.	9-2. Sensor Unit Installation/Replacement
	Absent sensor unit	Install the sensor unit.	9-2. Sensor Unit Installation/Replacement
	Flow sensor output is unstable immediately after powering up	Leave the detector on for about 30 minutes.	
Gas concentration value and “_ _ _ _” flashing alternately	MNT switch is set to MNT1 or MNT2	Set the MNT switch to the center position for normal operation	7-5. Maintenance Mode

Problem	Probable cause	Steps	Reference section
		mode.	
No alarm contact output	MNT switch is set to MNT1 or MNT2	Set the MNT switch to the center position for normal operation mode.	7-5. Maintenance Mode
	Incorrect wiring	Check and rewire. Securely connect the wires to the terminals.	6-3. Wiring Procedure
Analog output is fixed at 4 mA or 17.4 mA	MNT switch is set to MNT2	Set the MNT switch to the center position for normal operation mode.	7-5. Maintenance Mode
Cannot change the test mode value (fixed at 0)	Test mode value is set within the zero suppression range	(1) Set the test mode value to the one greater than the zero suppression set value, or (2) Change the zero suppression set value.	(1) 7-4.Test Mode (2) PS-7 gas detector's operation manual for administrators
Flow-rate icon slowly spins	Low flow rate due to clogged filter element	Replace the filter element.	9-1. Filter Element Replacement
	Low flow rate due to pump failure	Replace the sampling unit.	9-3. Sampling Unit Replacement
	Low flow rate due to clogged tubing	Remove clog from tubing.	

11. Specifications

Model	PS-7 series
Detection principle	Electrochemical, hot-wire semiconductor, or galvanic cell
Sampling method	Extractive pump (500 mL/min. auto-controlled)
Sampling tube[*1]	PTFE, outside and inside dia.: 6mm and 4mm (or 1/4 in. and 11/64 in.) respectively[*2] Tube length: ≤ 20 m
Target gas	As per delivery specifications
Detection range	As per delivery specifications
Gas concentration display	Four-digit LEDs on LCD, with a unit of measurement 20-segment bar graph
Alarm set value	As per delivery specifications
Alarm accuracy	• Combustible gas: ± 25% of the alarm set value under identical conditions • Toxic gas: ± 30% of the alarm set value under identical conditions • Low oxygen: ± 1 vol% of the alarm set value under identical conditions
Alarm delay	• Combustible gas: ≤ 30 seconds for a gas concentration that is 1.6 times higher than the alarm set concentration • Toxic gas: ≤ 60 seconds for a gas concentration that is 1.6 times higher than the alarm set concentration • Low oxygen: ≤ 5 seconds until the reading reaches 18vol% with a 10vol% concentration at 20°C ± 2°C *Excludes delay time caused by the tube length and communication time.
Alarm indication	• Gas alarm (2 stages) Red LED flashes. ALARM1 and/or ALARM2 shown on display. • Low flow rate alarm (with a 10 second delay time) Amber LED flashes. FLOW shown on display. Flow-rate icon stops. • Sensor fault or incorrect sensor installed Amber LED flashes. SENS. shown on display. • Broken pyrolyzer wire Amber LED flashes. CONV. shown on display.[*3]
External output	• Gas concentration analog output 4–20mADC (common negative with power supply) *0.6 mA or less in the event of a trouble alarm *Current detection resistance should be 300 ohm or less,including wire resistance • Gas alarm contacts (1st and 2nd stages) Normally open dry contact, self-resetting Max. load: 125 VAC or 30 VDC, 0.5 A (resistive load) • Trouble alarm open collector Normally closed, self-resetting (Normally on, and off in the event of a trouble alarm or no power) Max. load: 30 VDC, 30 mA (resistive load) Trouble alarm activates in the events of low flow rate, sensor fault, incorrect sensor installed, or broken pyrolyzer wire, no power, or blown fuse. During trouble alarm, the analog output is 0.6 mA or less and no gas alarm activates.
Explosion-proof	This product is not explosion-proof
Compliance	CE (EMC: 2014/30/EU [*4] RoHS: 2011/65/EU)
Applicable cable	Shielded cable, dia. 8–11mm x 2 pcs
Cable length	≤ 500 m
Operating condition	Temperature: 0°C to 40°C (No sudden temperature change) Humidity: 30 to 85%RH (No condensation)

Power supply	24 VDC ± 10%				
Power consumption	Sensor unit	CDS-7	COS-7	CHS-7	CDS-7+CDP-7*3
	Typical	2.2 W	2.7 W	2.9 W	5.0 W
	Max.	4.2 W	4.2 W	5.0 W	7.8 W
Dimensions	W62 mm × H124 mm × D143 mm (excluding protrusions)				
Mass	Approx. 1.0 kg				
Mounting method	Wall mounting				

*1. Teflon is recommended. For highly adsorptive gas, consult New Cosmos or its authorized representative for the recommended material.
*2. Specify 1/4 in. and 11/64 in. for outside and inside diameter, respectively, during order placement, if the standard 6-mm outside and 4-mm inside diameter tubing is not used.
*3 Not provided for COMM-less models.
*4 COMM-less models do not comply with the EMC directive.

* The above specifications are subject to change without notice.
* If your specifications are non-standard, refer to the delivery specifications.

12. Warranty

The warranty period is one (1) year from the date of purchase.
You are entitled to the limited warranty, if the product malfunctions due to a manufacturing defect during normal use in accordance with the instruction manual, specifications and labels.

1. Warranty Scope

If the product fails or is found to be damaged due to a manufacturing defect during the warranty period, and used in accordance with the instruction manual and specifications, we will provide a free replacement and repair service. This warranty covers the New Cosmos product/parts only and not third party product/parts.

2. Warranty Exclusions

The following will be repaired at the cost of customer even during the warranty period.

(1) Failures and damages incurred by incorrect use, deliberate acts or negligence of the user.
(2) Failures and damages caused by disaster, earthquake, storm and flood, lightning, extreme climate, abnormal power supply voltage, excessive electromagnetic interferences, or other acts of God.
(3) Failures and damages resulting from repair and/or modification by non-New Cosmos certified technicians.
(4) Consumables and failures and damages resulting from improper consumable replacement.
(5) Other failures and damages not attributable to the manufacturer.

13. Disposal of Product

Dispose of a used gas detector, sensor unit, sampling unit, and activated charcoal filter in accordance with the applicable local laws and regulations.

Detection Principle

13-1. Electrochemical Sensor

This sensor consists of three electrodes and an electrolyte, and the method adopted here is to produce electrolytic oxidation with a potentiostat circuit while keeping the working electrode at a constant potential against the reference electrode. Measuring the current generated here allows determining the concentration of the gas (e.g., H_2S, CO).

The electrolytic reaction of H_2S is as follows:

Working electrode: $H_2S + 4H_2O \rightarrow H_2SO_4 + 8H+ + 8e^-$

Counter electrode: $2O_2 + 8H^+ + 8e^- \rightarrow 4H_2O$

13-2. Hot-wire Semiconductor Sensor

A small amount of metal oxide semiconductor is deposited on a platinum coil, then the platinum coil is heated to a high temperature. When reducing (electron donating) gases react with the surface of the metal oxide, electrons will be donated to the semiconductor in the course of the reaction. Consequentially, the resistance of the semiconductor decreases as more charge carriers (electrons) are available. The sensor element (semiconductor on the platinum coil) can be understood as two resistances in parallel, being part of a bridge circuit. The resistance change of the semiconductor is read as differential voltage using a bridge circuit. This type of sensor is very sensitive and can detect combustible or toxic gases at a low ppm or even a ppb level.

13-3. Galvanic Cell Sensor for Oxygen Detection

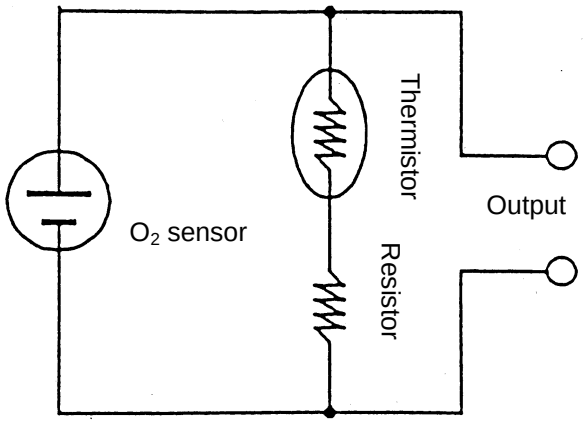
The sensor consists of two electrodes, a membrane and an electrolyte.

The electrodes are two different metals, noble metal (Pt, Ag) and base metal (Pb). The noble metal electrode has contact with air via a Teflon membrane. Connecting load resistance to both electrodes generates a potential difference, which promotes the following reactions:

Noble metal electrode: $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

Base metal electrode: $2Pb \rightarrow 2Pb^{2+} + 4e^-$

As a result, the current proportional to the oxygen concentration in the air flows from the noble metal electrode to the base metal electrode via the external circuit. Since the electromotive force changes depending on the temperature, a thermistor is added to compensate for the ambient temperature variations.



14. Glossary

Term	Definition
Gas detector	Device used to detect the presence of a target gas and to give its concentration in the form of an electrical signal.
Target gas	Specific gas to be detected, concentration displayed, and used to trigger alarms.
Alarm set value	A gas concentration value that is set on a gas detector for alarm activation.
Detection range	A range of target gas concentrations that can be displayed and trigger alarms.
Alarm delay	The length of time a gas detector takes to activate an alarm after it is exposed to a target gas concentration higher than the alarm set value or to some other specified conditions.
Calibration gas (test gas)	Gas specifically prepared to calibrate/adjust the gas detection and alarm system.
LEL (or LFL)	Lower Explosive Limit (or Lower Flammable Level). Lowest concentration (percentage) of a gas or vapor in air capable of producing a flash fire, or explosion in the presence of an ignition source like arc, flame or heat.
%LEL	Concentrations of combustible gas given in terms of percent of the lower explosion limit.
vol%	Gas concentrations given in terms of percent of cubic volume.
ppm	Gas concentrations given in terms of millionth part of cubic volume.
Maintenance and inspection	Tasks performed to ensure that equipment operates normally and correctly.
Flameproof enclosure (explosion-proof enclosure)	Enclosure in which the parts which can ignite an explosive atmosphere are placed. This enclosure can withstand the pressure created during an internal explosion of an explosive mixture, and prevent the ignition of an explosive atmosphere outside the enclosure.
Explosive atmosphere	Mixture of air and flammable substances in the form of dust or vapor which are within their explosive limits.
Hazardous area	An area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.

Revision History

Document No.	Date	Revision
GAE-018-00	Aug 2004	Initial issue
GAE-018-01	June 2009	01
GAE-018-02	Aug 2020	02

Additional copies of this instruction manual may be purchased.
Contact New Cosmos or its authorized representative for ordering.

Authorized representative:

Manufacturer:

NEW COSMOS ELECTRIC CO., LTD.
2-5-4 Mitsuya-naka, Yodogawa-ku,
Osaka 532-0036, Japan
www.newcosmos-global.com

NEW COSMOS ELECTRIC CO.,LTD.