Gas Detector Head

SD-1

Operating Manual

Request for the Customers

- Read and understand this operating manual before using the detector.
- You must operate the detector in accordance with the operating manual.
- Regardless of warranty period, we shall not make any compensation for accidents and damage caused by using this product.

  The compensation shall be made only under the warranty policy of products or parts replacement.
- Because this is a safety unit, a regular maintenance for every six months and daily maintenance must be performed.
- If you find abnormalities in the detector, please notify them to our local representative immediately.

1. Outline of the Product

1-1. Before you begin

Thank you for choosing our detector head SD-1 with the signal converter. Please check that the model number of the product you purchased is included in the specifications on this manual.

This manual explains how to use the detector and its specifications. It contains information required for using the detector properly. Not only the first-time users but also the users who have already used the product must read and understand the operating manual to enhance the knowledge and experience before using the detector.

1-2. Purpose of use

- This detector is a fixed type gas detector head which detects leak of common combustible gases. This detector is a safety unit, not an analyzer or densitometer which performs quantitative/qualitative analysis/measurement for gases. You must understand the features of the detector before using it, so that you can use it properly.
- The detector detects abnormalities in the air caused by presence of gases or other reasons (leak) with the built-in gas sensor unit. The concentrations of detected gases are shown on the seven-segment LED.
- The detector has built-in alarm contact and can be used either as a gas alarm or fault alarm.
- The detector outputs a gas concentration in 4 – 20 mA.

1-3. Definition of DANGER, WARNING, CAUTION, and NOTE

DANGER	This message indicates that improper handling may cause 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.

2. Important Notices on Safety

2-1. Warning cases

WARNING

Power Supply
Before turning on the detector, always check that the voltage is properly applied. Do not use an unstable power supply because it may cause malfunctions.

Need of grounding circuit
Do not cut the grounding circuit or disconnect the wire from the grounding terminal.

Defects in protective functions
Before starting the detector, check the protective functions for defects. When seeming defects are found in the protective functions, such as protective grounding, do not start the detector.

External connection
Before connecting the detector to external control circuit, securely connect it to a protective grounding circuit.

Zero adjustment (AIR Adjustment) in the atmosphere
When the zero adjustment is performed in the atmosphere, check the atmosphere for freshness before beginning the adjustment. If other gases exist, the adjustment cannot be performed properly, thus leading to dangers when the gas leaks.

Response to a gas alarm
Issuance of a gas alarm indicates that there are extreme dangers. Take proper actions based on your judgment.

2-2. Precautions

CAUTION

Do not use a transceiver near the detector.

To restart the detector, you must wait for five seconds or more before doing it.

Do not use the external output of the detector to control other units.

Do not disassemble/modify the detector, or change the settings if not necessary.

Avoid applying organic solvent and others to the window board for a long time.

Do not forget to perform a regular maintenance.

3. Product Components

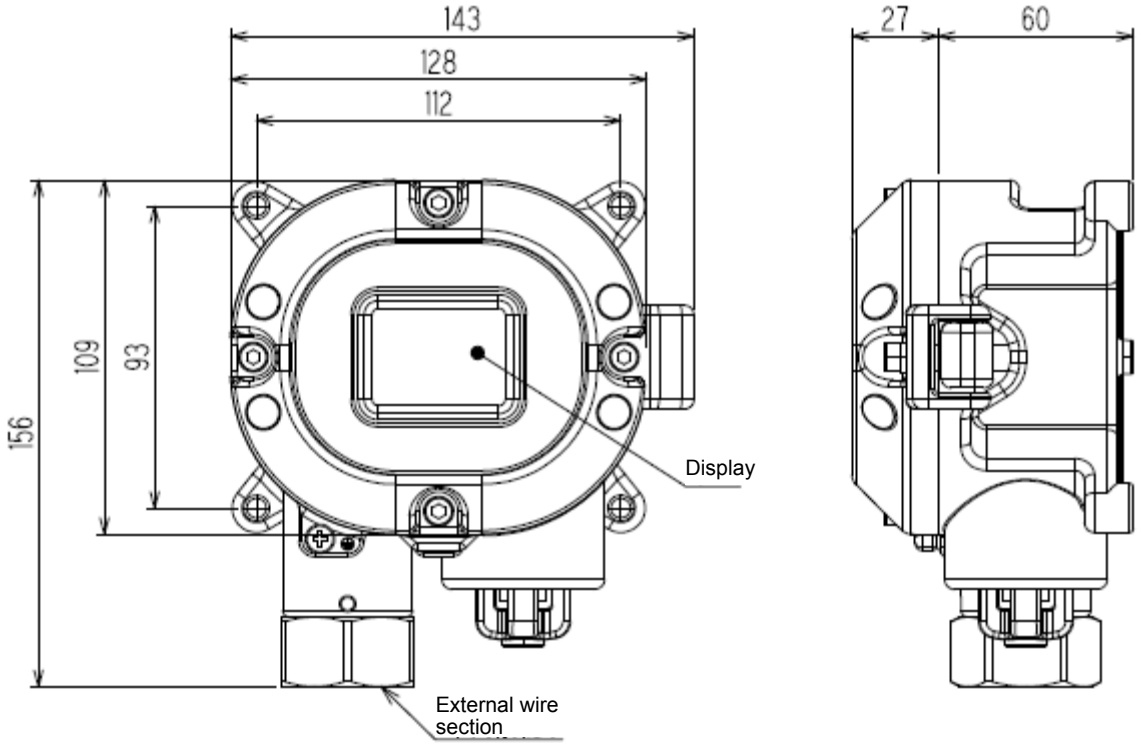
3-1. Gas detector and standard accessories

<Standard Accessories>

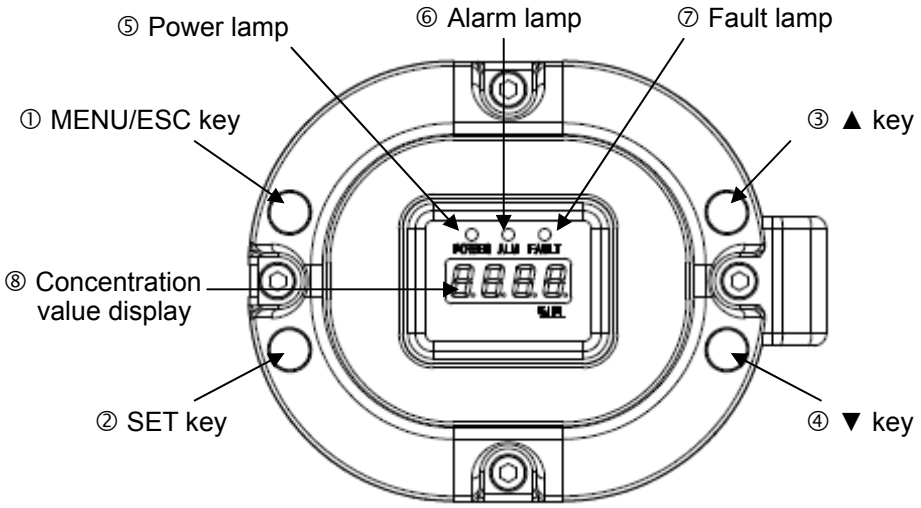
- Operating manual
- Dedicated handling lever
- Dedicated control key

> **CAUTION**
>
> Use the supplied dedicated control key to operate the detector.
> If products other than these accessories are used, key operations cannot be accepted properly.

3-2. Outline drawing



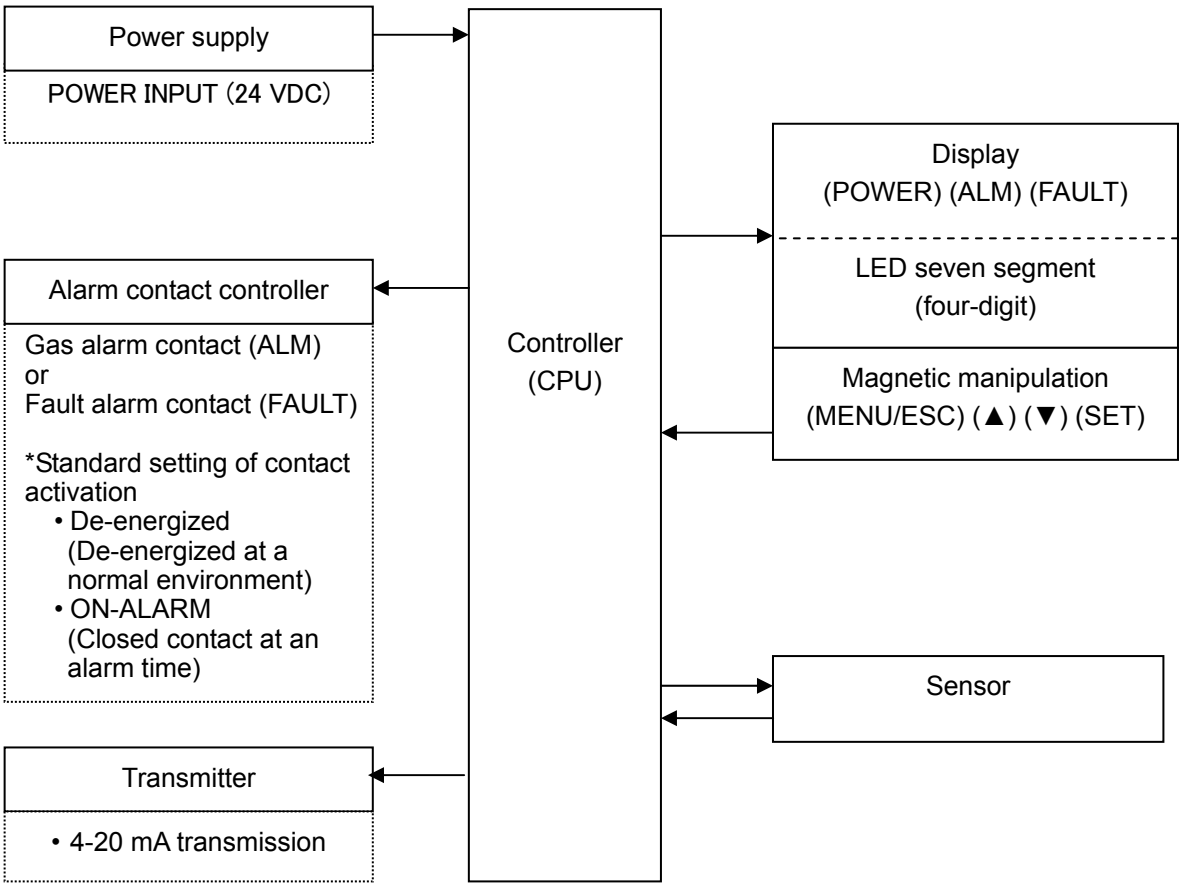
3-3. Names and functions for each part



①	MENU/ESC key	Used to enter the maintenance mode. It is also used to cancel in a specific mode.
②	SET key	It is used for value confirmation and so on in a specific mode.
③	▲ key	Used to switch menus or change a value (UP).
④	▼ key	Used to switch menus or change a value (DOWN).
⑤	Power lamp	Power lamp. Detection mode: it lights up in green. Maintenance mode: it blinks in green.
⑥	Alarm lamp	Alarm lamp. It lights up in red when the alarm setpoint value is reached.
⑦	Fault lamp	Fault lamp. It lights up in yellow when an abnormality is detected in the detector.
⑧	Concentration value display	Displays the gas concentration and so on.

3-4. Block diagram

<Electric Diagram>



4. How to Use

4-1. Before using the detector

Not only the first-time users but also the users who have already used the product must follow the operating precautions.
Ignoring the precautions may damage the detector, resulting in inaccurate gas detection.

4-2. Precautions for installation sites

CAUTION

This is a precision device. Because the detector may not provide the specified performance in some places (environments), check the environment in the installation site, and then take appropriate actions if necessary.
Because the detector plays an important role for safety and disaster prevention, you must install as many units of the detector as needed in appropriate points.
Because points where gases leak and remain easily are different depending on the types of gases and the working areas, please decide carefully installation sites and the number of units to be installed.

Do not install the detector in a place with vibrations or shocks.

Do not install the detector in a place exposed to water, oil or chemicals.

Do not install the detector in a place where the temperature drops below -20°C or rises over 60°C.

Do not install the detector in a place exposed to direct sunlight or sudden changes in the temperature.

Keep the detector (and its cables) away from noise source devices.

Do not install the detector in a place where maintenance of the detector cannot be performed or where handling the detector involves dangers.

Do not install the detector in equipment which is not properly grounded.

Do not install the detector in a place where other gases exist around it.

4-3. Precautions for system designing

> **CAUTION**
>
> An unstable power supply and noise may cause malfunctions or false alarms.
> The descriptions in this section must be reflected on the designing of a system using the detector.

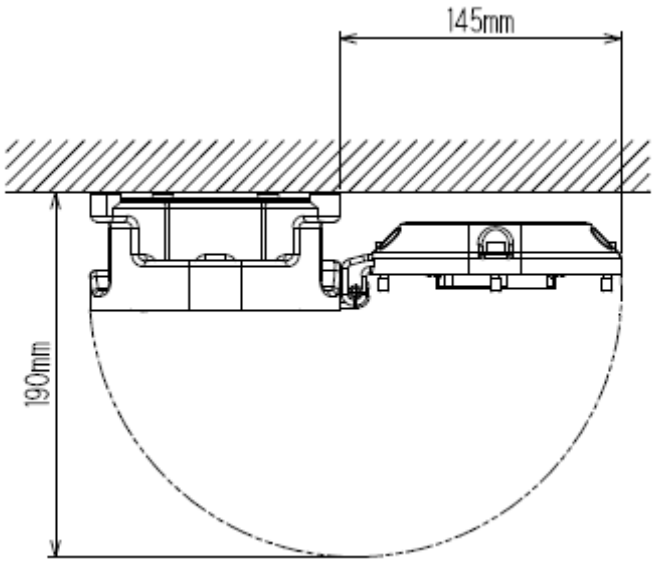
Using a stable power supply

The external output and alarm contact of the detector may be activated when the power is turned on, when momentary blackout occurs, or when the system is being stabilized. In such cases, use a safety power supply, or take appropriate actions on the receiving side.
The detector must be provided with the following power supply.

Power supply voltage	24 VDC (the terminal voltage of the detector)	
Allowed time of momentary blackout	Up to 10 millisecond (To recover from the momentary blackout for 10 millisecond or more, restart the detector.)	Example of actions To ensure continuous operation and activation, install a UPS outside the pyrolyzer unit.
Others	Do not use it with a power supply of large power load or high-frequency noise.	Example of actions Use a line filter to avoid the noise source if necessary.

4-4. How to install

<Install Dimensions and Maintenance Space>



4-5. How to wire

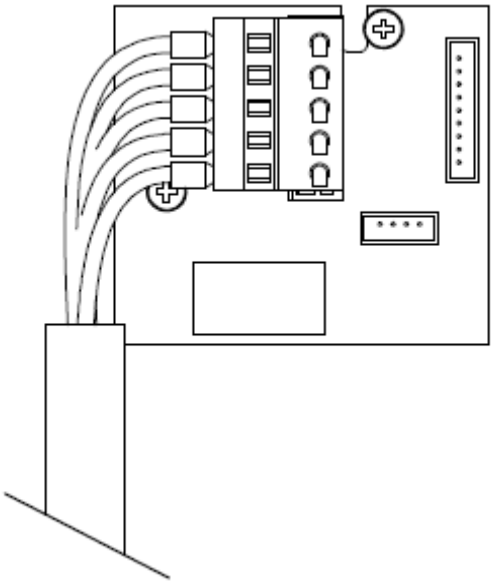
CAUTION

- Be careful not to damage the internal electronic circuit when wiring. In addition, be careful not to apply stresses on the detector when (overweight) cables are installed.
- The power cables and signal cables must not be installed together with the motor power cables, etc. When these cables must be installed together for unavoidable reasons, put the power cables and signal cables in a metal conduit. The conduit must be connected to a grounding circuit.
- When stranded wires are used, prevent wires from contacting each other.
- Use the dedicated handling lever to wire.

<Recommended Cable>

3-wire (when the contact is not used)	Shielded cable of CVVS, etc. (1.25 sq or 2.0 sq) - 3-core
3-wire (when the contact is used)	Shielded cable of CVVS, etc. (1.25 sq or 2.0 sq) - 5-core

<Figure of Terminal Plate>



24 VDC	DC+	1
4 - 20 mA	- (Common)	2
	Sig+	3
	Contact	4
	Contact	5

<Grounding>

Connect the detector to your grounding terminal with the external terminal ⏚ .

WARNING

Before turning on the detector, do not forget to connect it to a grounding terminal.
For stable operation of the detector and safety, it must be connected to a grounding terminal. Do not connect the grounding wire to a gas pipe.
The grounding must be made as D type grounding (below 100 Ω of grounding resistance).

5. How to Operate

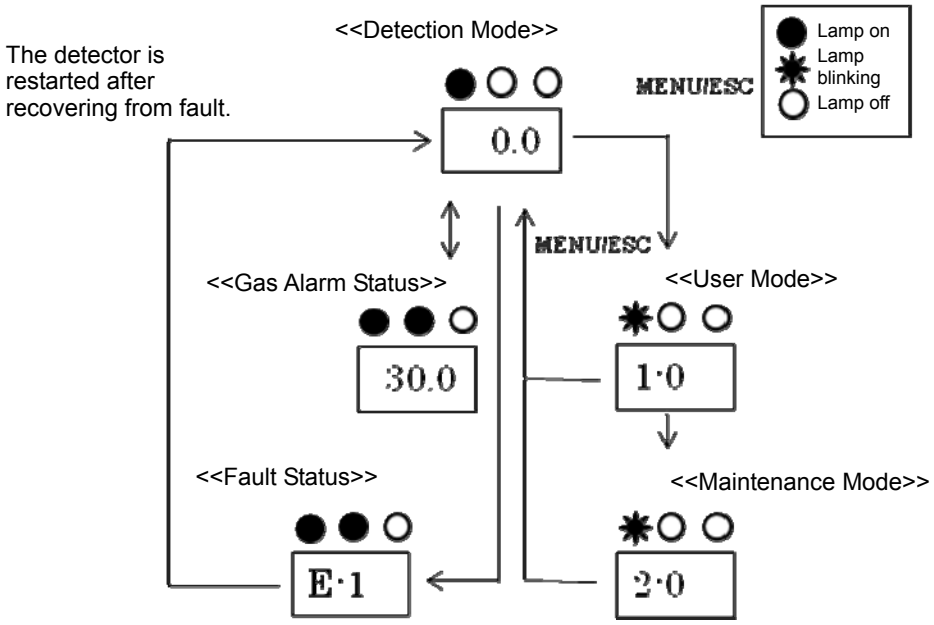
5-1. Preparation for start-up

Before connecting a power supply, read and understand the following precautions. Ignoring these precautions may cause an electric shock or damage the detector.

- Connect the detector to a grounding circuit.
- Check that the wiring is connected to external circuit properly.
- Check that the power supply voltage is compliant with the specification.
- Because the external contact may be activated during the adjustment, take measures to prevent an activated contact from having influences on external circuits.

5-2. Basic operating procedures

Normally, the detection mode is activated after the power is turned on.



WARNING

When the detector enters each mode from the detection mode while an alarm is activated, the alarm is released.

5-3. How to start the detector

- Before supplying power (24 VDC) to the detector, check that the detector is installed properly.
- Supply power (24 VDC) to the detector (turn on the detector).
- After the detector completes the start-up, it enters the detection mode.

CAUTION

- Do not turn off the detector during the initial clear. The detector is reading the internal memory during the initial clear.
- If a new sensor unit is installed or the sensor unit is replaced after the detector is started, the sensor unit must be warmed up for a specified period which is determined depending on the type of the sensor unit.
- After the warm-up is completed, perform a gas calibration.

5-4. Modes

Mode	Item	LED display	Details
Detection Mode		Gas concen-tration	Normal state
Gas Alarm Test Mode		Gas concen-tration	Perform the alarm test.
User Mode	ROM/SUM display	1-0	Not used
	Zero Adjustment	1-1	Perform the zero adjustment.
	Setting Display	1-2	Show the setting of the typical menu.
	Switch to maintenance mode	1-3	Switch to the maintenance mode.
Maintenance Mode	Test Mode	2-0	Perform various tests in the maintenance mode. • Gas test • Alarm test • Fault test • LED test • Memory test
	Zero Adjustment	2-1	Perform the zero adjustment.
	Span Adjustment	2-2	Perform the span adjustment.
	Zero/span initialization	2-3	Initialize zero/span values.
	Environmental setting	2-4	Used for various environmental settings. • Sensor replacement • INHIBIT setting • Alarm point setting • Alarm delay time setting • Zero suppression system setting • Zero suppression value setting • Used contact setting • Contact specification setting • Zero follower setting • Maintenance mode external output setting • External output adjustment • Alarm test external output setting etc.
	Display	2-5	Not used
	Switch to factory mode	2-6	Not used
	Switch to user mode	2-7	Returns to the user mode.

5-5. Alarm test mode

WARNING

- Before starting the alarm test (transmission test), provide a notification to the related sections so that they can prepare for false abnormalities (external output signals and alarm contact). After the test is completed, do not forget to press the MENU/ESC key to return to the detection mode. (If the detector remains in the alarm test mode, it automatically returns to the detection mode in ten hours.)

5-6. User mode

WARNING

After the adjustment is completed, do not forget to press the MENU/ESC key to return to the detection mode.
(If the detector remains in the user mode, it automatically returns to the detection mode in ten hours.)

5-7. How to exit

To turn off the detector, turn off the power supply (24 VDC) to the detector.

WARNING

- When the detector is turned off, an alarm may be activated on the upper (central) system. Before turning off the detector, the INHIBIT (point skip) on the upper (central) system must be activated.
  Decide whether the power can be turned off by checking the operation of the devices connected to the external output or external contact output terminal of the detector.
- If the alarm contact is energized (option), it is activated when the detector is turned “OFF”.

6. Operations and Functions

6-1. Gas alarm activation

Gas alarm: Activated when the concentration of detected gas reaches or exceeds the alarm setpoint value. <<Auto-Reset Operation>>

✱ NOTE

The alarm setpoint is factory-set. Although the alarm delay time (standard: 2 seconds) works in the detector to prevent a false activation, it can be cancelled if not needed.

<Display Operation>

Gas Concentration Display

In case of over the detection range (Over Scale), “∩ ∩ ∩ ∩” is displayed on the LCD.

Power Indicator Lamp (POWER: Green)

During operation, this lights up continuously.

Alarm Indicator Lamp (ALM: Red)

It lights up when the alarm setpoint value is reached to or exceeded.

<Contact Activation>

The contact is activated when the gas concentration reaches or exceeds the alarm setpoint value. (only when the alarm is used)
The contact activation is reset automatically when the gas concentration drops below the alarm setpoint value.

<Response to Gas Alarm>

In case of responding to a leaked gas

When a gas alarm is triggered, take actions in accordance with your management rules of gas alarm. Normally, take the following actions.

- Check the reading of the detector.

> ✱ NOTE
>
> If a gas leak is momentary, the reading may already have dropped when you check it. In addition, when the alarm is triggered by noise or other incidental conditions other than a gas, the reading may have already dropped.

- Based on your management rules of gas alarm, no one can be allowed to access the monitored zone to ensure safety.
- If the Gas Concentration Display continues to be shown, close the main valve of the gas, and then check that the gas concentration reading dropped.
- Equipped with a protective gear to avoid dangers caused by possibly remaining gases, before accessing the gas leak point, and then check that gases remain by using a portable gas detector.
- If you can determine that the point is free from dangers, take actions to fix the gas leak.

6-2. Fault alarm activation

A fault alarm is triggered when the detector detects abnormalities. After a fault alarm is triggered, the fault lamp (yellow) lights up and an error message is displayed on the LCD. Determine the causes and take appropriate actions.
After the detector is successfully returned from the fault, it restarts with the process normally performed right after it is turned on (initial clear).
If the detector has problems and is repeatedly malfunctioning, contact us immediately.

6-3. External output operation

Signal Transmission System		Electric current transmission (non-isolated) 4 – 20 mA
Transmission Path		CVVS
Transmission Distance		CVVS 1.25 sq: maximum 1.25 km CVVS 2.0 sq: maximum 2.0 km
Connection Load Resistance		Below 300 Ω
1	Detection Mode (No Alarm)	4 - 20 mA (concentration output)
2	Detection Mode (Gas Alarm)	4 - 20 mA (concentration output)
3	Initial Clear	Depending on the setting of the section 4. 2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA
4	Maintenance Mode	2.5 mA setting: 2.5 mA 4 mA setting: 4 mA HOLD Setting: the previous value retained 4-20 mA setting: 4 - 20 mA (concentration output)
5	Alarm Test	Output ON setting: 4 - 20 mA (concentration output) Output OFF setting: In accordance with setting of the section 4.
6	Fault Alarm	0.5 mA (Fixed)
7	INHIBIT	Depending on the setting of the section 4. 2.5 mA setting: 2.5 mA 4 mA, HOLD, 4 - 20 mA setting: 4 mA*
8	Power Off	0 mA

7. Maintenance

This is an important instrument for the purpose of safety.
To maintain the performance of the detector and improve the reliability of safety, perform a regular maintenance.
We provide services on regular maintenance, adjustment and maintenance including span adjustment.
To make the calibration gas, dedicated tools, such as a gas cylinder of the specified concentration and gas sampling bag must be used.
Our qualified service engineers have expertise and knowledge on the dedicated tools used for services, along with other products. To maintain the safety operation of the detector, please use our maintenance service.

8. Storage, Relocation and Disposal

8-1. Procedures to store the detector or leave it for a long time

The detector must be stored under the following environmental conditions.

- In a dark place under the normal temperature and humidity away from direct sunlight
- In a place where gases, solvents or vapors are not present

8-2. Procedures to relocate the detector or use it again

When the detector is relocated, select a new place in accordance with “4-2. Precautions for installation sites” and “4-4. How to install”.
For information on wiring, see “4-5. How to wire". The unpowered time must be minimized when the detector is relocated.

CAUTION

- When you use a relocated or stopped/stored detector again, do not forget to perform a gas calibration. For information on readjustment including gas calibration, please contact our sales department.

8-3. Disposal of products

- When the detector head is disposed of, it must be treated properly as an industrial waste in accordance with the local regulations.

10. Product Specifications

10-1. List of specifications

Model	SD-1
Detection principle	Catalytic combustion type
Gas to be detected	Combustible gas
Detection system	Diffusion type
Detection range	(Depending on specifications): 0 – 100% LEL (standard)
Alarm point setting	(Depending on specifications): 1/4 F.S. (standard)
Alarm accuracy	±25% of the alarm setpoint under the same condition
Alarm delay time	Within 30 seconds by providing the gas 1.6 times the alarm setpoint
Transmission Distance	CVVS (1.25 sq) cable within 1.25 km
	CVVS (2.0 sq) cable within 2.0 km
External output	Analog transmission system (4 -20 mA) maximum load 300 Ω
	Gas alarm contact (standard) or trouble contact 1a de-energized (standard) Rated load 30 VDC 0.5 A or 250 VAC 0.5 A (resistant load)
Display function	Seven-segment LED (four-digit) display, LED lamp
Self diagnosis function	System error (memory trouble), breaking or short-circuit of sensor
	LED lamp (yellow) on message “E-XX”
Power supply voltage	24 VDC (17 – 26.4 VDC)
Power consumption	Approx. 3 W (MAX)
Operating temperature/humidity	[Overseas] -20 - 60°C/Below 95% RH (non-condensing)
External dimensions/Weight	Approx. 130 (W) x 110 (H) x 87 (D) mm/ Approx. 3.5 kg
Explosion protection	ExdIICT5 (waiting for a license to use it)

10-2. List of accessories

- Operating manual
- Dedicated handling lever
- Dedicated control key

11. Definition of Terms

Catalytic Combustion type	This is a principle of the sensor installed in the detector head. See “10-3. Detection principle” for details.
Initial Clear	Output from the detector head fluctuates for a while after turning on the power. This is a function to prevent triggering alarm during that time.
Full Scale	Maximum value of the detection range.
%LEL	A unit where the lower explosive limit (LEL) of the combustible gas to be detected is set to 100.
ppm	A concentration unit that means part per million of the combustible gas to be detected.
Calibration	Adjusts the readings to the calibration gas concentration value by using the calibration gas.
Zero Suppression	A function to cut off the specific drifting that the sensor has.
Alarm Delay Time	A function which temporarily suspends activation to prevent a false alarm caused by noise from its outside.
INHIBIT	The gas detection function is temporarily suspended during maintenance, etc. of the detector. This is also called “point skip”, which has the same function.