

Duct CO₂ Sensor

General

Duct CO₂ sensor Model CY8100C1001 in combination with Part No. 83165722-002 is a duct-mount CO₂ sensor used for detecting carbon dioxide (CO₂) concentration in a duct. This product is used in a wide range of applications such as monitoring of CO₂ concentration in a return duct, control of outdoor air intake, and so on.

Features

- Non-dispersive infrared (NDIR) sensor
- Linear output signal in 1 V DC to 5 V DC range
- Long-term stability
- CE Marking certified product:
Model CY8100C1001 conforms to all the applicable standards of CE Marking.



Model Number

Model number	Description
CY8100C1001	Duct CO ₂ sensor

Part Numbers of Items Sold Separately

Part number	Description
83165722-002	Assembly kit: - Sampling probe - Sealing gasket, two screws, two washers - Cable assembly
83104511-001	Zero calibration service bag (calibration gas (at 0 ppm CO ₂) generator)

IMPORTANT:

In a system where harmful chemical substances or viral pathogens, etc., are handled, do not limit outdoor air intake using this product or other CO₂ measuring instruments.

It is dangerous to limit fresh outdoor air intake in such systems where fresh air is continuously required.



Safety Instructions

Please read instructions carefully and use the product as specified in this manual. Be sure to keep this manual nearby for quick reference.



Restrictions on Use









This product is targeted for general air conditioning. Do not use this product in a situation where human life may be affected. If this product is used in a clean room or a place where reliability or control accuracy is particularly required, please contact our sales representative. Azbil Corporation will not bear any responsibility for the results produced by the operators.

Warnings and Cautions

	WARNING	Alerts users that improper handling may cause death or serious injury.
	CAUTION	Alerts users that improper handling may cause minor injury or material loss.

Signs

	Notifies users that specific actions are prohibited to prevent possible danger. The symbol inside ⊘ graphically indicates the prohibited action. (For example, the sign on the left notifies that disassembly is prohibited.)
	Instructs users to carry out a specific obligatory action to prevent possible danger. The symbol inside ● graphically indicates the actual action to be carried out. (For example, the sign on the left indicates general instructions.)

 CAUTION	
	Use the product under the operating conditions (temperature, humidity, power, vibration, shock, mounting direction, atmospheric condition, etc.) as listed in the specifications. Failure to do so might cause fire or device failure.
	Use the product within the rated operating ranges as listed in the specifications. Failure to do so might cause device failure.
	Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.
	All wiring must comply with applicable codes and ordinances.
	Before wiring, be sure to turn off the power to the product.
	Be sure to provide a circuit breaker for the power to the product as the product does not have a power switch.
	Do not disassemble the product. Doing so might cause device failure.

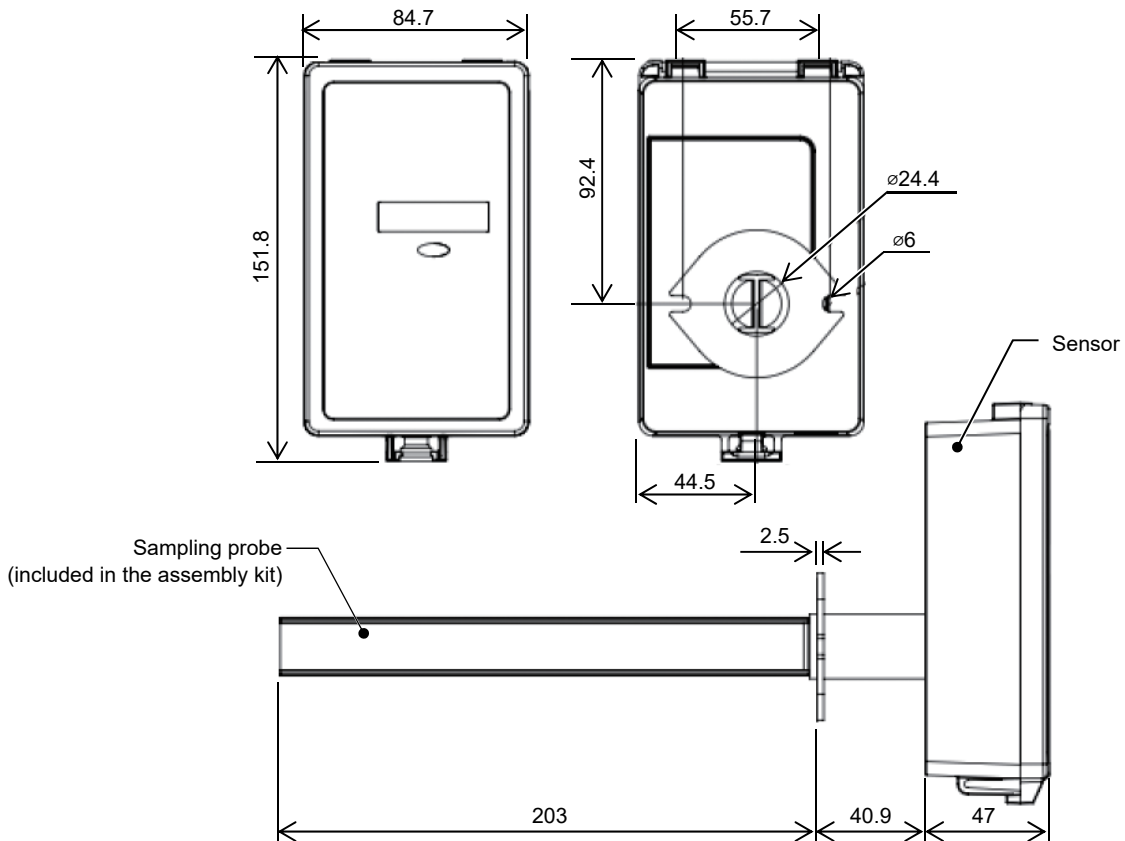
Specifications

Item		Specification
Power		24 V AC +10 %, -15 % (at 50 Hz to 60 Hz)
Consumption power		Max. 3 VA
Output signal		1 V DC to 5 V DC (Linear to 0–2000 ppm CO ₂ concentration)
Allowable load resistance		Min. 5 kΩ
Measuring range		0 ppm to 2000 ppm CO ₂ concentration
Operating principle		Non-dispersive infrared (NDIR)
Accuracy		± 50 ppm ± 5 % of reading D/A conversion accuracy: ± 2 % of reading ± 20 mV D/A resolution: 10 mV
Drift	Continuous ON	± 150 ppm/year (at 1000 ppm)
	Continuous OFF (reference)	± 15 ppm/48 hours for 50 %RH
Time constant	0.6 m/s air velocity	Max. 3 min
Environmental conditions	Operating conditions	CO ₂ concentration: 0 ppm to 2000 ppm
		Temperature: 0 °C to 50 °C
		Humidity: 0 %RH to 85 %RH (non-condensing)
	Wind velocity	More than 0.6 m/s
Transport/storage conditions	Temperature: -20 °C to 50 °C	
	Humidity: 0 %RH to 95 %RH (in unopened package)	
Vibration resistance		4.9 m/s ² (at 10 Hz to 150 Hz)
Insulation resistance		Min. 100 MΩ at 500 V DC (between case and each lead wire)
Dielectric strength		Max 1 mA leakage current at 500 V AC for 1 minute (between bobbin and each lead wire)
Protection class		IP65 (dust-proof and splash-proof) for the sensor
Materials		Sensor and sampling probe: PC-ABS plastic
		Lid: PC plastic
Color		Sensor and sampling probe: Black
		Lid: Transparent
Weight		Approximately 0.35 kg
Installation		Indoor duct, chamber
Initial warm-up time		Continuously unpowered sensor for 48 hours or over: Approximately 10 days (Product which has just been unpacked is exceptional.) Other than the above: Approximately 3 days
Wiring	Power	Two-wire
	CO ₂ concentration output	Two-wire

ABS: Acrylonitrile butadiene styrene

Dimensions

Sensor and sampling probe assembled



Note: Total length of the cable, attached to the printed circuit board in the product, is 1 m.

Figure 1. Dimensions (mm): Sensor and sampling probe assembled

Assembly kit

Sampling probe

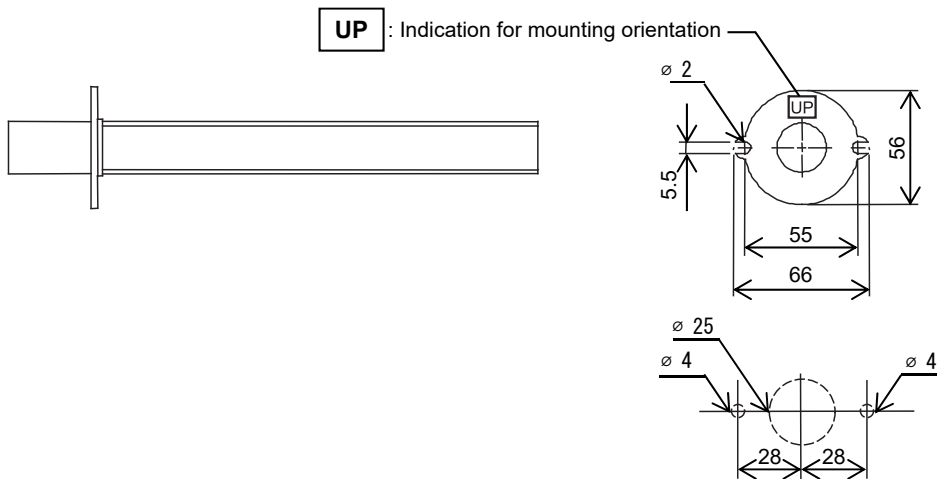


Figure 2. Dimensions (mm): Sampling probe

Cable assembly

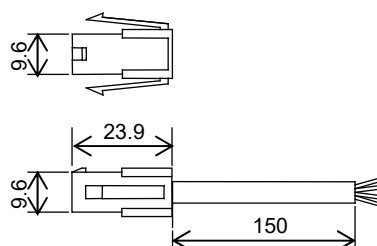


Figure 3. Dimensions (mm): Cable assembly

Installation

Precautions for installation

- Installation environment
Although the sensor’s enclosure conforms to IEC IP65 for dust-proof and splash-proof, avoid installing in locations exposed to corrosive atmosphere or direct sunlight.
IEC: International Electrotechnical Commission
- Handling of the sensor
Annual drift of the continuously powered sensor is ± 150 ppm.
The sensor is packaged in a tightly sealed aluminum moisture-proof bag for shipment. This prevents large output drift that may be caused from moisture absorption of the unpowered sensor. Table 1 shows the output drift (reference) of the unpowered sensor.

Table 1. Output drift of sensor unit without power supply





Hours without power supply	Humidity		
	30 %RH	50 %RH	80 %RH
To 6 hours	< ± 10 ppm	< ± 10 ppm	< ± 10 ppm
To 12 hours			< ± 15 ppm
To 24 hours			
To 48 hours		< ± 15 ppm	< ± 25 ppm

IMPORTANT:

The sensor is packaged for shipment after inspection and calibration. To minimize the output drift after the installation, unpack and install the sensor just before turning on the power (approximately 48 hours or shorter time before the power is turned on).

If the sensor continuously unpowered (for 48 hours or over) since it is unpacked or since it is turned off, be sure to execute the zero calibration (explained later) after the power is turned on.

CAUTION

-  Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.
-  All wiring must comply with applicable codes and ordinances.
-  Before wiring, be sure to turn off the power to the product.
-  Be sure to provide a circuit breaker for the power to the product as the product does not have a power switch.

Precautions for assembling the sensor with the assembly kit

The assembly kit (sampling probe and cable assembly) and the sensor must be ordered and mounted separately to minimize the drift (shown in the above **Precautions for installation** section.) caused by the unpackaged sensor being left without power.

If it takes more than 48 hours for the sensor to be installed before being powered, mount the sampling probe and connect the cable assembly first, and then unpack, install, and wire the sensor just before supplying the power.

Installation of the assembly kit

Sampling probe: Mount the sampling probe before assembling the sensor with the sampling probe.

- 1) Select a the probe mounting position where the typical CO₂ concentration of process fluid can be measured and where the specified air velocity can be acquired.
- 2) Drill a \varnothing 25 mm hole for mounting the sampling probe and two \varnothing 4 mm holes for the screws, as shown in Fig. 2.
- 3) Provide the sealing gasket between the probe and the duct/chamber surface, and insert the probe so that the whole probe is inserted inside the duct/chamber and is exposed to the process fluid.
- 4) Set the sampling probe so that the process fluid flows perpendicularly to the probe, as shown in Fig. 4. (There is no requirement for flow direction.)
- 5) Check the mounting orientation. 'UP' mark on the sampling probe (shown in Fig. 2) must be positioned on the upper side. Then, fix the sampling probe with M4 screws and washers (two for each) on the both bilateral sides.

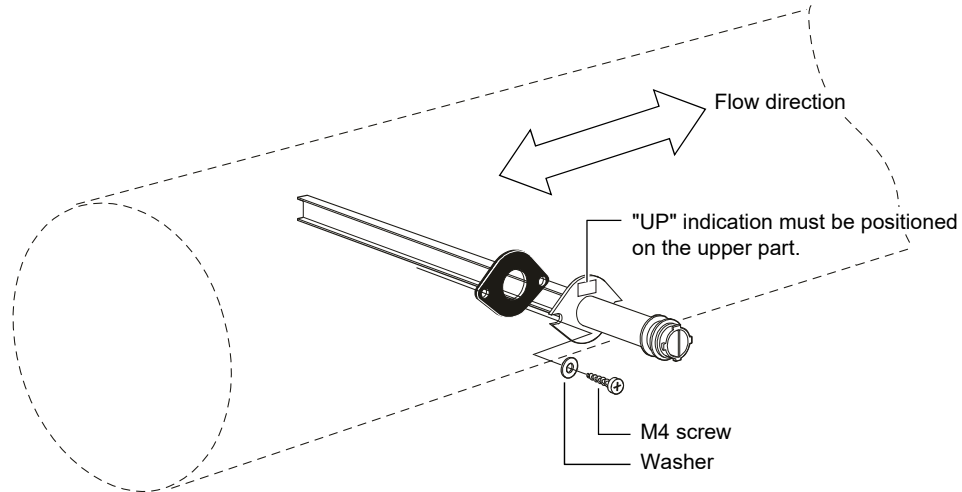


Figure 4. Mounting the sampling probe

Cable assembly: Following is an example of the cable assembly connection in a round outlet box (conforming to JIS C8340). JIS: Japanese Industrial Standard

- 1) Select an outlet box with entries large enough (\varnothing 25 mm or larger) for the connector of the sensor cable.
 - 2) Lead the cable from the controller into the outlet box through an entry.
 - 3) Splice the cable with the cable assembly, as shown in Fig. 5.
- Note that the sensor cable will be connected to the cable assembly just before the power to the sensor is turned on.

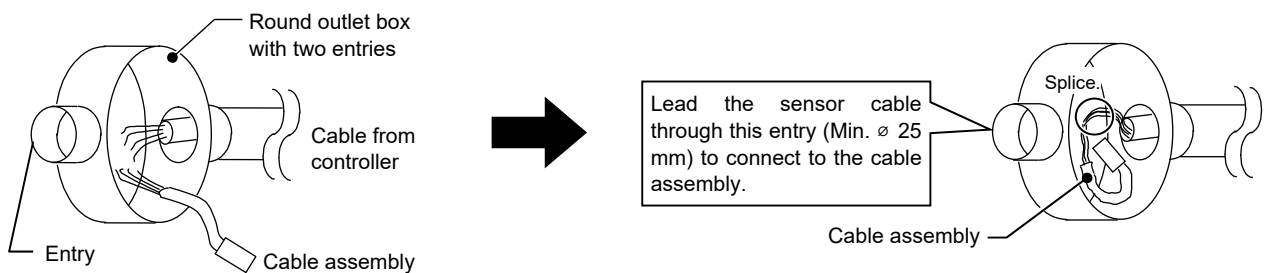


Figure 5. Cable connection example: Splicing the cable assembly

Installation of the sensor

The sensor is easily assembled with the sampling probe by snap-in bayonet mount. Refer to the following steps.

- 1) Engage the notches of the sensor with the locking knobs of the sampling probe, then lightly press the sensor.

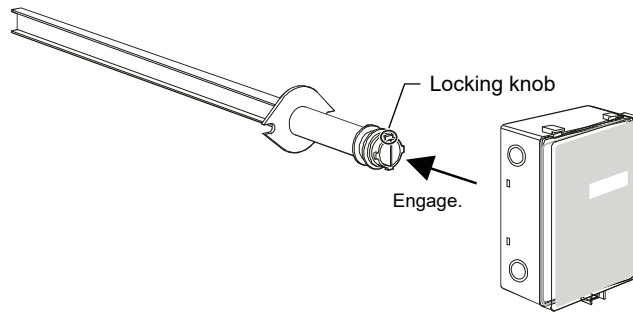


Figure 6. Assembling the sensor with the sampling probe (1)

- 2) Turn the sensor clockwise until it stops, as shown in Fig. 7.

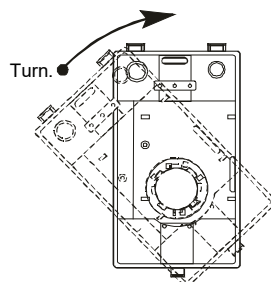


Figure 7. Assembling the sensor with the sampling probe (2)

- 3) Lead the sensor cable through the entry of the round outlet box, and connect the connector of the sensor cable to the connector of the cable assembly, which has been already connected to the cable from the controller.

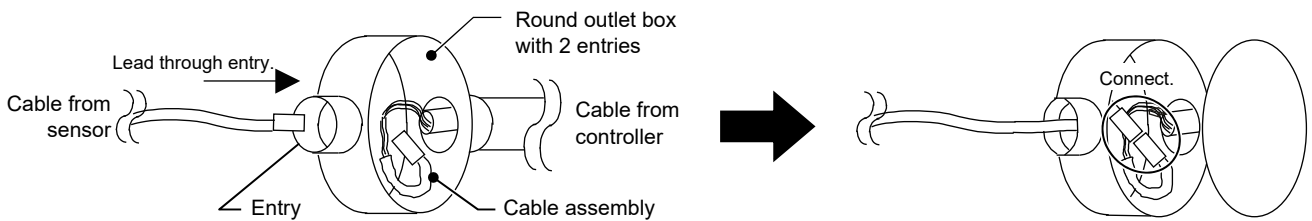


Figure 8. Cable connection example: Connecting the sensor cable

Wiring

⚠ CAUTION	
❗	Installation and wiring must be performed by qualified personnel in accordance with all applicable safety standards.
❗	All wiring must comply with applicable codes and ordinances.
❗	Before wiring, be sure to turn off the power to the product.
❗	Be sure to provide a circuit breaker for the power to the product as the product does not have a power switch.

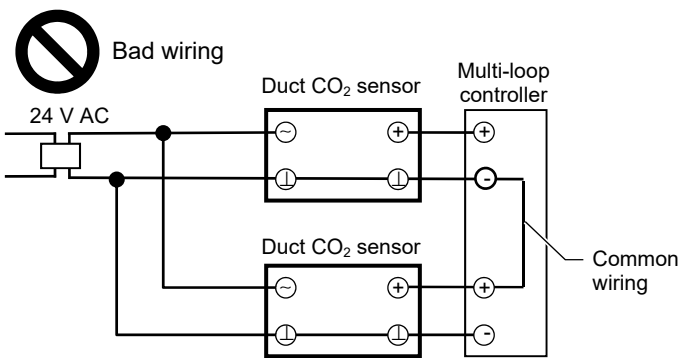
IMPORTANT:

- Do not supply the power other than 24 V AC to this product. Failure to do so might damage the product.
- Use isolated transformer to supply the power to this product.
Since the common wiring terminals (of green and white wire terminals) are internally connected, single product must be powered by a single 24 V AC transformer. If the multiple products or this product and a device in connection are powered by a single 24 V AC transformer, the common wiring will form a loop, and the product will get damaged.
- See Table 2 for correctly connecting the wires. Miss connection will cause short-circuit of the power supply and will damage the product.

Table 2. Lead wire description

Lead wire color	Description	Note
Brown	24 V AC power	—
White	24 V AC power (common)	Internally connected
Green	(-) output (common)	—
Yellow	(+) output	—

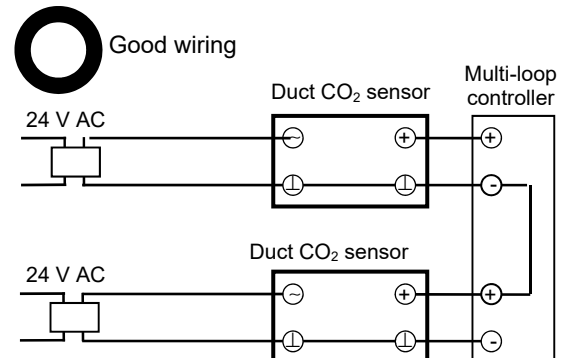
Wiring example:
Multiple products powered by a single transformer



Common wiring forms a loop.

Figure 9. Bad wiring example

Wiring example:
Multiple products powered by multiple transformers



Common wiring does not form a loop.

Figure 10. Good wiring example

Operation

Operation check

- 1) Remove the lid from the sensor and blow your breath on the sensor from approximately 10 cm away from the sensor.
- 2) Check that the CO₂ concentration displayed on the sensor LCD and the output voltage quickly rise.

LCD: Liquid crystal display

LCD indication

On the sensor LCD, CO₂ concentration is continuously displayed. When an error occurred in the product, the tool icon appears on the LCD, as shown in Fig. 13.

LED indication (yellow)

Table 3. LED indication

Operating status	LED operation
Normal	OFF
Initializing	Flashing
Zero calibration	
Error	ON

LED: Light-emitting diode

Maintenance

Cleaning

Since process fluid flows into the sensor, clean the circuit board inside the sensor approximately once a year.

Zero calibration

Annual drift of the continuously powered sensor is ±150 ppm. Be sure to execute the zero calibration once a year.

IMPORTANT:

- As mentioned in the **Installation** section, the long-term unpowered sensor may cause drift shown in Table 1. In such a case, the zero calibration must be executed after the sensor is powered again.
- Approximately 10 days are needed for the long-term unpowered sensor to stabilize its output. Calibrate the sensor in 10 days approximately after the sensor is turned on.

For the sensor calibration, zero calibration service bag (Part No. 83104511-001) is needed. Refer to the following and execute the zero calibration.

- 1) Remove the lid from the sensor.
- 2) Remove the plastic tube attached to the rear surface of the lid, and insert the tube into one of the calibration gas inlets of the sensor. Note that either of the inlets can be used for the zero calibration.

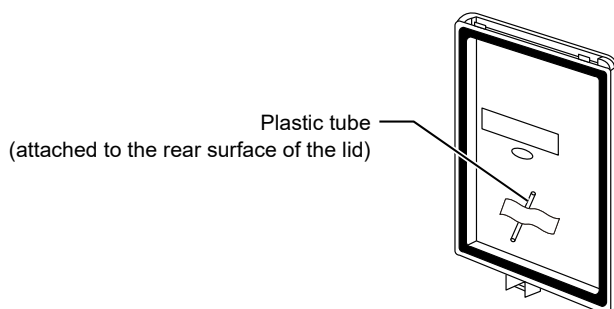


Figure 11. Rear surface of the lid

- 3) Connect the tubing of the zero calibration service bag to the plastic tube. Securely connect the tubing to prevent gas leakage.
- 4) Turn on the switch of the zero calibration service bag to purge the calibration gas (at 0 ppm CO₂) to the sensor.
- 5) Keep purging the gas until the measured values become stable (for approximately five minutes).

AB-7175

- 6) When the values become stable, press and hold the zero calibration button (shown in Fig. 12) of the sensor for approximately three seconds to activate the zero calibration.
- 7) Check that the yellow LED flashes. It flashes four times (approximately for ten seconds) when the calibration is executed, and turns off when the calibration is successfully finished.
- 8) Disconnect the tubing of the zero calibration service bag from the plastic tube.
- 9) Remove the plastic tube from the calibration gas inlet of the sensor and attach the plastic tube back to the rear surface of the lid in order not to lose the plastic tube. Then, attach the lid to the sensor.

Note:

- * Refer to **AB-5803 Specifications/Instructions: Zero Calibration Service Bag** for handling the zero calibration service bag.

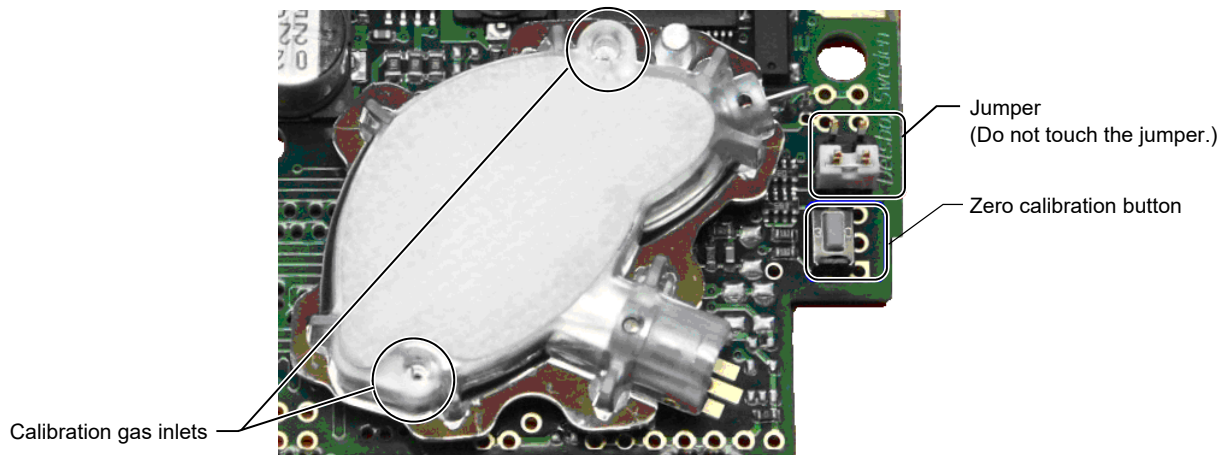


Figure 12. Layout of zero calibration button and the calibration gas inlets

Error indication

This product contains self-diagnostic function. Self-diagnosis is executed automatically every time the power is turned on and during normal operation. If an error is detected, the yellow LED is turned on, and the tool icon appears on the LCD to indicate the error. Contact our salesperson if an error is detected.

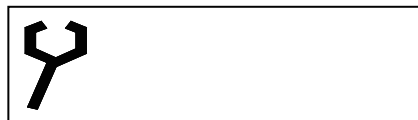


Figure 13. Tool icon on the LCD

Disposal

Dispose of this product as industrial waste in accordance with your local regulations.

Do not reuse all or a part of this product.

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This product complies with the essential requirements of the Electromagnetic Compatibility Directive (EMCD) and the Restriction of Hazardous Substances Directive (RoHSD).
EMCD: EN 61326-1 Class B, Table 1 (for use in a basic electromagnetic environment)

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Specifications are subject to change without notice.

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