

Ceiling Sensor

Ceiling CO₂ and Temperature Sensor

■ Overview

The ceiling CO₂ and temperature sensor (Model CY7102) detects CO₂ concentration and temperature in a room.

This sensor is suitable for monitoring CO₂ concentration and temperature in a room.

This sensor is suitable for a column free space/room, a stylish space/room, and other spaces where installation location of the sensor is restricted in a building.

■ Features

- (1) Wide CO₂ concentration and/or temperature sensing range with high accuracy
- (2) CO₂ concentration is sensed by the non-dispersive infrared absorption method.
Pt100 RTD*, conforming to JIS* C 1604 Class A, is used for sensing temperature.
- (3) CO₂ concentration sensing, linear output signal in 1–5 V DC range for CO₂ concentration
- (4) Excellent long-term stability
- (5) High environmental resistance
- (6) Minimizes impact on interior design and maximizes interior space.
- (7) Fits well on a ceiling with the thin, square, and stylish body.
- (8) Mountable on various types of ceilings such as steel ceiling panel and acoustic ceiling board.
- (9) Ensures flexibility of interior layout compared to wall-mount type sensor.
- (10) Installation and maintenance can be done indoors.
- (11) CE marking certified product

This product conforms to the standards for CE marking.

* RTD: resistance temperature detector
* JIS: Japanese Industrial Standards



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.
- The main unit is packaged for shipment after inspection and calibration.
To minimize the output drift that may occur after its installation, it should be unpacked and mounted just before the power is supplied (approximately within 48 hours). If the main unit has been continuously non-energized (since it is unpacked till it is activated, or since it is shut down) for 48 hours or over, be sure to conduct the CO₂ zero gas calibration (refer to ■ Maintenance) after the power is supplied.
- This product detects CO₂ concentration by the NDIR method, so it periodically emits light.
Avoid using it in a room where should be kept dark.

Safety Precautions

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 was developed, designed, and manufactured for general air conditioning use.

Do not use the product in a situation where human life may be at risk or for nuclear applications in radiation-controlled areas. If you wish to use the product in a radiation-controlled area, please contact Azbil Corporation.

Particularly when the product is used in applications like the following where safety is especially required, implementation of fail-safe design, redundant design, regular maintenance, etc., should receive appropriate consideration so that the product can be used safely and reliably.

- Safety devices for protecting the human body
- Start/stop control devices for transportation machines
- Aeronautical/aerospace machines

For system design, application design, instructions for use, or product applications, please contact Azbil Corporation. Azbil Corporation bears no responsibility for any result, or lack of result, deriving from the customer's use of the product.

Recommended Design Life (Recommended Period of Use)

It is recommended that this product be used within its design life. The design life is the period during which you can use the product safely and reliably based on the design specifications. If the product is used beyond this period, its failure ratio may increase due to time-related deterioration of parts, etc.

The design life during which the product can operate reliably with the lowest failure ratio and least deterioration over time is estimated scientifically based on acceleration tests, endurance tests, etc., taking into consideration the operating environment, conditions, and frequency of use as basic parameters.

The design life of this product is 10 years.

The design life specified for this product assumes that maintenance, such as replacement of the limited-life parts, is carried out properly. Refer to the section on maintenance in this manual.

■ Cautions




CAUTION


Alerts users that improper handling may cause minor injury or material loss.

■ Symbols



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 means 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



Take anti-lightning surge measures based on regional and building characteristics. Lightning may cause fire or critical damage to this product if protective measures are not taken.



Provide a circuit protector (e.g., a fuse or circuit breaker) for the power source. Failure to do so may cause a short circuit leading to fire or device failure.



Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.



Installation, wiring, and maintenance must be performed by personnel qualified to do instrumentation and electrical work. Otherwise there is a danger of fire or electric shock.



Before wiring or maintenance, turn off the power to this product. Failure to do so may result in electric shock or device failure.



All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.



To connect the wires to the product, use crimp terminal lugs with insulation. Failure to do so may cause short circuit leading to fire or device failure.



After wiring or maintenance work, reattach the cover. Failure to do so may result in electric shock.

■ Model Numbers

Basic model number	Power supply	CO ₂ concentration output	Temp. output	Fixed	Output wiring	Company logo	Description
CY7102							Ceiling Mount CO ₂ Concentration Sensor
	T						24 V DC, 24 V AC
		1					CO ₂ concentration output 1–5 V
			P				RTD (Pt100)
				0			_____
					1		Modular jack connection
							With company logo
						-1	Without company logo

● Parts ordered separately

Description	Model number	Note
Mounting bracket (for acoustic ceiling board)	Model HKC1	Negurosu Denko Co., Ltd. Mountable on the 12–19 mm thick acoustic ceiling board.
Ceiling sensor mounting bracket (for a steel ceiling panel)	83153520-001	It is for a steel ceiling panel. Do not use it for an acoustic ceiling board.
Modular cable	DY7227A0020	Standard model
	DY7227C0020	Ecological model
CO ₂ service bug (CO ₂ zero gas supply kit)	83104511-001	Used for zero gas calibration

■ Specifications

Item		Specification	
Measuring range	Temperature	0–50 °C	
	CO ₂ concentration	0–2000 ppm	
Measuring method	CO ₂ concentration	Non-dispersive infrared absorption method (NDIR)	
Output signal	Temperature	100 Ω / 0 °C RTD (Pt100), conforming to JIS C 1604 Class A)	
	CO ₂ concentration	1–5 V DC - Linearly detectable in 0–2000 ppm range - Input impedance of connected controller: min. 50 kΩ	
Accuracy	Temperature	0.1 °C ± 0.4 °C (in 0–50 °C environment) - Including heat generated by the circuit: 0.1 °C, sensor element error: ± 0.3 °C, air speed influence: ± 0.1 °C	
	CO ₂ concentration	CO ₂ concentration measurement	± (50 ppm + 5 % of measured value)
		Output resolution	10 mV
Drift in CO ₂ concentration measurement		Continuously ON operation: ± 150 ppm/year (@ 1000 ppm) Continuously OFF (ref. value): ± 15 ppm/48-hour in 50 % RH environment	
Initial stabilizing time for CO ₂ concentration measurement		After continuously OFF for 48 hours or more, approx. 10 days (excluding just after the product is unpacked) Other than above, approx. 3 days	
Time constant (ref. value)	Temperature	3 min or less (environment air velocity 0.5 m/s)	
	CO ₂ concentration	3 min or less (in diffused conditions)	
Power voltage		24 V AC - 15 % to + 10 % (50/60 Hz) 24 V DC ± 10 %	
Power consumption	24 V AC	Max. 3.0 VA	
	24 V DC	Max. 2.0 W	
Insulation resistance		500 V DC, 20 MΩ or more	
Withstand voltage	500 V AC	Voltage applied for 1 min, max. 1 mA leakage current (between housing and terminals)	
Environment conditions		Rated operating conditions	
		Transportation/storage conditions (in packaged state)	
		Ambient temperature	0–50 °C
Environment humidity	10–85 % RH (without condensation)	5–95 % RH	
Color		Light gray	
Major materials		Flame retardant ABS*	
Weight		Approx. 75 g	
Installation		With the mounting kit (sold separately)	
Connection		Modular jack	
Accessory		Main unit mounting screws (M4 x 12 mm 2 pcs, M4 x 35 mm 2 pcs), protective sheet	

* ABS: acrylonitrile-butadiene-styrene resin

■ Dimensions

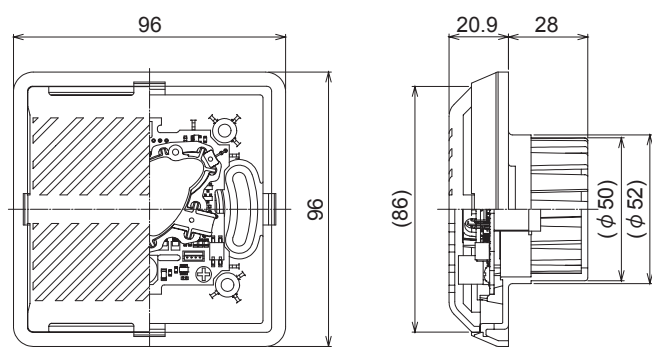


Figure 1 Dimensions (mm)

■ Installation

⚠ CAUTION	
!	Install and use this product according to the specifications stated in this manual. Failure to do so may cause fire or device failure.
!	Installation must be performed by personnel qualified to do instrumentation and electrical work. Otherwise there is a danger of fire or electric shock.

● Handling of the main unit

- The main unit is packaged in a tightly sealed aluminum moisture-proof bag for shipment. This prevents large output drift that may be caused by absorption of moisture into the main unit when it is continuously non-energized. Table 1 shows the output drift (reference value) after the main unit has been left without power supply. Note that output drift of the main unit continuously energized is ± 150 ppm/year.

Table 1. Output drift of the main unit continuously non-energized (reference value)

Humidity (% RH)	Non-energized period			
	to 6 hours	to 12 hours	to 24 hours	to 48 hours
30	< ± 10 ppm drift			
50	< ± 10 ppm drift			< ± 15 ppm drift
80	< ± 10 ppm drift	< ± 15 ppm drift		< ± 25 ppm drift

- The main unit is packaged for shipment after inspection and calibration.

To minimize the output drift that may occur after its installation, it should be unpacked and mounted just before the power is supplied (approximately within 48 hours).

If the main unit has been continuously non-energized (since it is unpacked till it is activated, or since it is shut down) for 48 hours or over, be sure to conduct the CO₂ zero gas calibration after the power is supplied.

Note: For the zero gas calibration, refer to ■ Maintenance.

● Installation location

IMPORTANT	<ul style="list-style-type: none"> Installation location of the sensor largely affects temperature/humidity control. Carefully select the location. Chemical (organic solvent) atmosphere may shift the output values. Corrosive gas, organic solvent, and other chemicals contained in the atmosphere can cause measuring error of the sensor, shorten the service life of the sensor, or damage it. <p>Ask our salesperson for use of the sensor in a special application, as mentioned above.</p>
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To install this product, follow the instructions bellow.

- Install the ceiling mount sensor on a ceiling.
 Note: This product is designed to install on a ceiling. Do not install on a wall.
- Check that the air conditioning system has return air chamber in the ceiling.
- To install the ceiling mount temperature sensor in an interior zone of a room:
 - Check that the room atmosphere passes through the sensing element inside this product.
 - Prevent short-circuit of this product.
 - Keep away from heat generated by lights and other devices.
- To install the ceiling mount temperature sensor in a perimeter zone of a room:
 - Check that the room atmosphere passes through the sensing element inside this product.
 - Prevent short-circuit of this product.
 - Keep away from supply air outlet on a ceiling.
 - Keep away from supply air outlet on a ceiling along with windows, and install on a inner side of the ceiling.
 - Keep away from the radiation heat of the sun.

● **Preparations**

- (1) Open a mounting hole, $\phi 82 \pm 1$ mm, on an acoustic ceiling board or a steel ceiling panel.

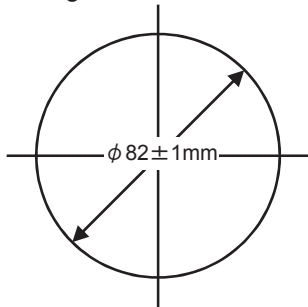


Figure 2. Mounting hole size (mm)

- (2) There are two methods to install the ceiling mount sensor depending on the material of ceiling.

For details, refer to ● *Installation method (on acoustic ceiling board)* and ● *Installation method (on steel ceiling board)*

● **Cover removal**

IMPORTANT • When removing the cover carefully handle the sensor so as not to damage the temperature sensing element.

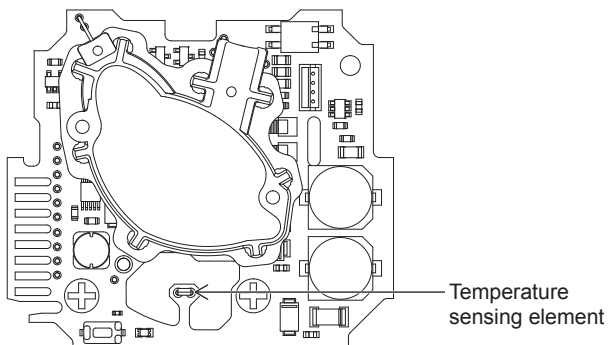


Figure 3.

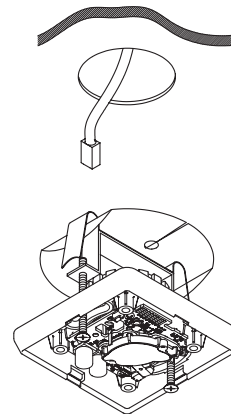
Loosen the screw on the surface of cover, and then pinch the latches inward to remove the cover.

● **Installation method (on acoustic ceiling board)**

Mount the sensor using the commercial part (Model HKC1 supplied by Negurosu Denko Co., Ltd.).

- (1) Remove the cover from the main unit.
- (2) Temporarily attach the mounting clamp to the main unit by tightening the two cross-recessed flat-head screws (M4 x 35, supplied with the product).
- (3) Splice the wires that run in the ceiling for sensor connection to the wires of the modular cable.

Figure 4.



- (4) Connect the modular cable to the main unit.

IMPORTANT • Plug in the modular jack into the modular connector until it clicks and lightly pull the cable to make sure perfect connection.

- (5) Press and hold the springs of the mounting clamp and attach to the ceiling.

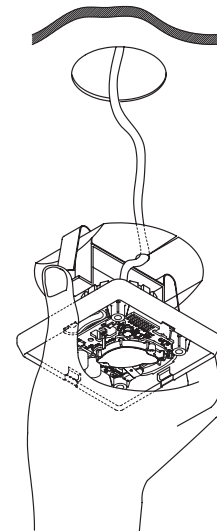


Figure 5.

- (6) Make sure that installation position is correct and completely tighten the screws to fix the main unit and mounting clamp on the ceiling.

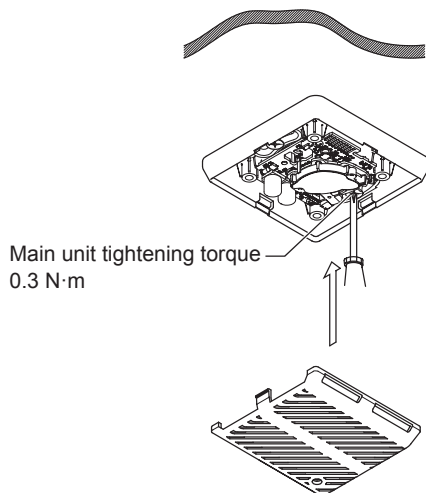


Figure 6. Mounting the main unit

IMPORTANT • Carefully tighten the screws using a tool so as not to damage the sensing element of the main unit.

- (7) Attach the cover to the main unit until the cover clicks. Then, lightly pull the cover to make sure that the cover is completely attached.
- (8) Fix the cover to the main unit with the screw (provided on the cover).

Note: Four screw holes are provided on each corner of the main unit. The cover is thus attachable in any of the four orientations with a screw.

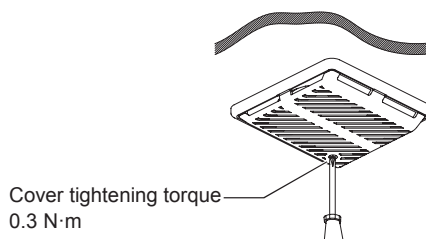


Figure 7. Attaching cover

● **Installation method (on steel ceiling board)**

Mount the sensor with the dedicated mounting bracket.

- (1) Remove the cover from the main unit.
- (2) Put the dedicated mounting bracket, rubber magnet (Model 83153520-001) ordered separately, on the inside surface of the steel ceiling panel.
- (3) Center the $\phi 56$ mm hole of the mounting bracket on the cutting hole of a steel ceiling panel.
- (4) Splice the wires that run in the ceiling for sensor connection to the wires of the modular cable.
- (5) Insert the protective sheet (included part) to the modular cable.
- (6) Connect the modular cable to the main unit and place the protective sheet over the sensor.

IMPORTANT • Plug in the modular jack into the modular connector until it clicks and lightly pull the cable to make sure perfect connection.

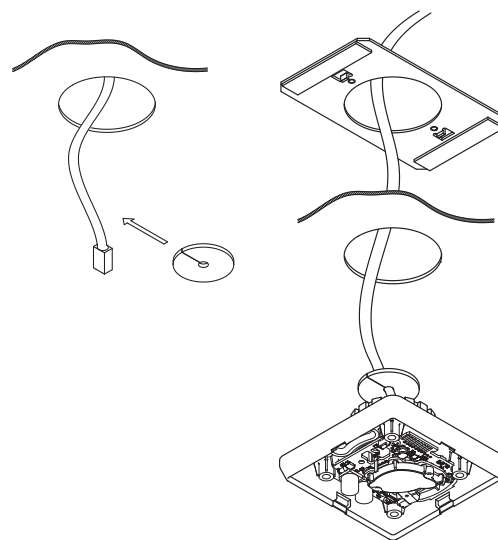


Figure 8.

- (7) Make sure that installation position is correct, and attach the main unit to the mounting bracket tightening the two cross-recessed flat-head screws (M4 x 12, included with the product).

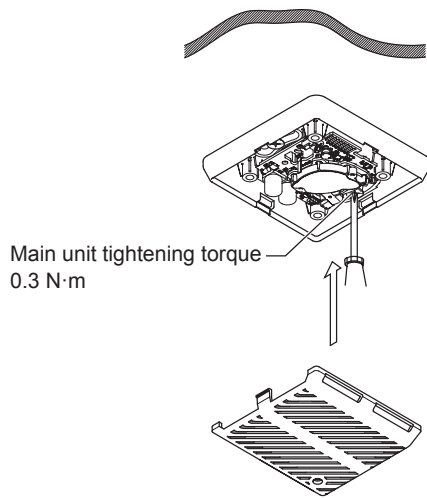


Figure 9. Mounting the main unit

IMPORTANT • Separate cables must be used for signal transmission of this sensor and for power supply of another device.

- (8) Attach the cover to the main unit until the cover clicks.
Then, lightly pull the cover to make sure that the cover is completely attached.
- (9) Fix the cover to the main unit with the screw (provided on the cover).

Note: Four screw holes are provided on each corner of the main unit. The cover is thus attachable in any of the four orientations with a screw.

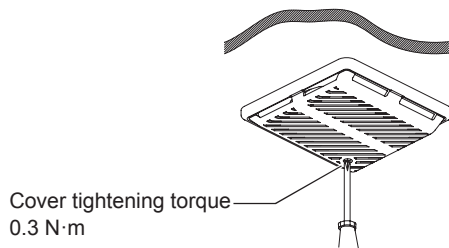


Figure 10. Attaching cover

■ Wiring

⚠ CAUTION

- ❗ Wire and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure.
- ❗ Wiring must be performed by personnel qualified to do instrumentation and electrical work. Otherwise there is a danger of fire or electric shock.
- ❗ Before wiring, turn off the power to this product. Failure to do so may result in electric shock or device failure.
- ❗ All wiring must comply with applicable codes and ordinances. Otherwise there is a danger of fire.

IMPORTANT • Wire the signal wires of this sensor and the power wires of other device using different cables.

● Modular connection

Connect the modular cable to the modular jack on the main unit. Then connect the modular cable with the lead wires from the controller using the closed-end connectors (7 pcs).

Figure 11. Internal circuits

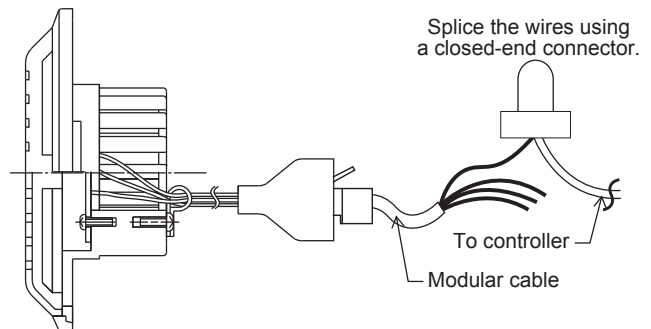


Figure 12. Modular jack connection

• Precautions for wiring

IMPORTANT

- If more than the rated voltage is accidentally applied to this product, replace the product with a new one for safety.
- Do not connect the temperature output wires to the power supply.
Doing so might generate smoke or cause burnout. Make sure all the wires are correctly connected before supplying power.
- Do not connect the 24 V AC transformer to any other device in addition to the sensor.
- To connect the sensor with a controller that has common mode analog inputs, separate 24 V AC power is required for the sensor from the controller.

- For wiring the temperature output and the CO₂ concentration output signal, 1.25 mm² or greater shielded multi-core cables (CVV-S) are recommended.
- For wiring the power supply and the temperature output signal, also 1.25 mm² or greater IV cables can be used.
- Be sure to ground the shielding on the controller side.
- The maximum cable length is 50 m.
- For the wiring, refer to the specifications and instructions of the controllers to which the sensor is connected.

• Power supply wiring

CAUTION



To connect the wires to the product, use crimp terminal lugs with insulation. Failure to do so may cause short circuit leading to fire or device failure.

Connect this product as described below.

- (1) Remove the cover.
- (2) Connect this product to the controller as shown in "Connection example."
- (3) Reattach the cover.

CAUTION



After wiring, reattach the cover. Failure to do so may result in electric shock.

• Wiring example

<< Connecting to controller >>

• DC power supply

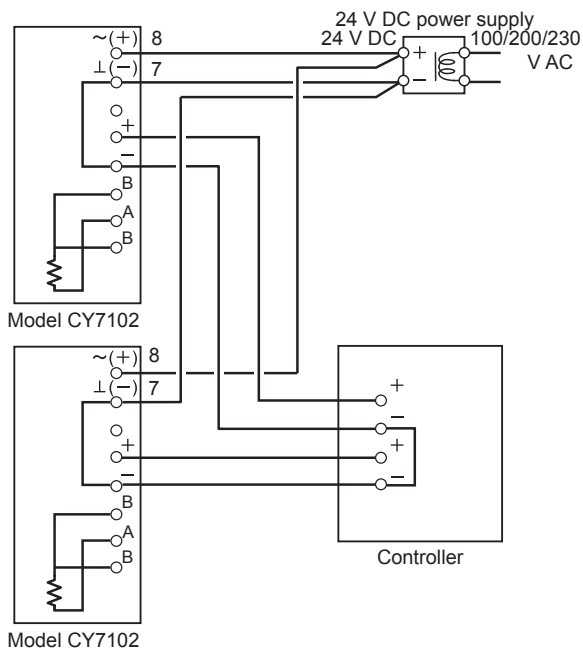


Figure 13.

IMPORTANT • 24 V DC power supply can be shared among multiple the sensors and controllers. Be sure to wire 24 V DC (+) to the terminal 8 of the sensors and 24 V DC (-) to the terminal 7 of the sensors as shown in Figure 13.

• AC transformer (24 V AC power supply)

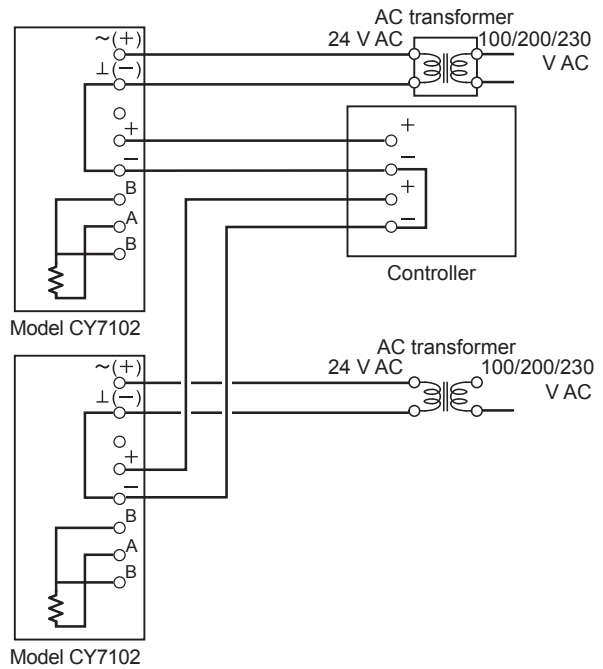


Figure 14.

To supply power to Neosensor through AC transformer (24 V AC power supply), be sure to follow the instructions below.

IMPORTANT • Use an isolated transformer to supply 24 V AC power. To connect the sensor with a controller that has common mode analog inputs, separate 24 V AC power is required for the sensor from the controller. If multiple devices are powered by a single power supply (transformer), the common wiring will form a loop and the product will get damaged. So do not share the power supply with other devices.

If the AC transformer (24 V AC power supply) is shared by two sensors, a loop will be made in the circuit and the sensors may fail.

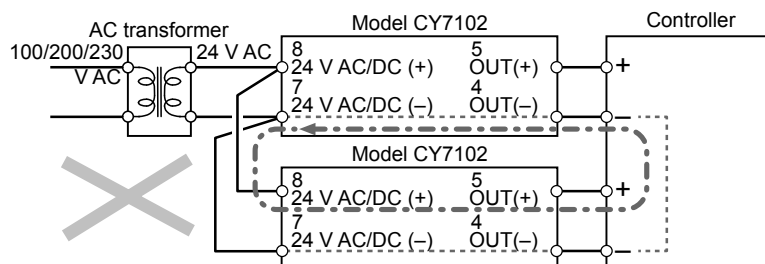


Figure 15. A loop is made in the circuit

If the AC transformer (24 V AC power supply) is shared by two sensors and wires are connected wrongly between terminals 7 and 8 as shown in Figure 18, a short circuit is made in the sensor through the common loop and the sensors may fail.

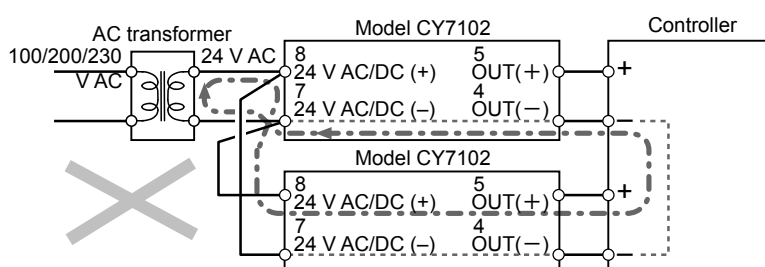


Figure 16. Example of wrongly wired

■ Operation and LED indication

Table 2., Output signal (CO₂ concentration) and LED indication, shows relation between the output signals in the operating states and LED indications.

Table 2. Output signal (CO₂ concentration) and LED indication

Item	Output signal (CO ₂ concentration)	LED indication
Initializing	Approx. 1 V	ON
Operating normally	1–5 V	OFF
CO ₂ gas calibration	Value before calibration	Blinking
Error	Approx. 0.5V	ON

When an error occurs, it may be recovered by executing the zero gas calibration. If the error was not recovered by the zero gas calibration, the product may be faulty. Please contact one of our sales or service persons.

Note: For the zero gas calibration, refer to ■ Maintenance, ● Zero gas calibration.

■ Maintenance

IMPORTANT • Do not disassemble this product. Doing so may cause device failure.

The product is maintained as described below.

(1) Regular inspection

The Neosensor detects CO₂ contained in the air that flows into the sensor.

Check if the cover is clogged and clean it once a year.

⚠ CAUTION

! After maintenance, reattach the cover. Failure to do so may result in electric shock.

(2) Troubleshooting

If any problem occurs during operation, refer to *Table 3., Troubleshooting*, for corrective actions.

Table 3. Troubleshooting

Problem	Check point	Corrective actions
No output Unstable output	Loose connection or wiring	Redo wiring.
	Disconnected wires	
	Power supply voltage	
	Damaged sensing element	Replace the sensor.
Slow response to output	Dust on the cover and main unit.	Remove dust on the cover and the main unit.
Measurement errors	Installation location	Refer to ■ <i>Installation</i> .
		Clean the cover and inside box and remove the clogs.
	Error between actual measurement and output value	Execute zero gas calibration.
		Replace the sensor.
		Correct the value using the controller (to which the value is input).

• Zero gas calibration

Note that output drift of the sensor is max. ± 150 ppm/year when it is continuously energized.

Be sure to execute the zero gas calibration once a year.

To execute the calibration, the CO₂ service bag (separately sold) is required.

Refer to AB-5803, *Specifications/Instructions of Zero Calibration Service Bag Part No. 83104511-001*.

IMPORTANT

- As mentioned in ■ *Installation*, if the sensor has not been energized for a long period, it may cause drift shown in *Table 1. Output drift of the main unit continuously non-energized (reference value)*. In such a case, the zero calibration must be executed after the sensor is powered again.
- When the sensor is powered on after a long period unenergized condition, approx. 10 days are needed to stabilize its output.
Calibrate it in 10 days after it is powered on.
- Be careful so as not to drop the CO₂ service bag.
Sling it over your shoulder or place and securely hold it on a stepladder, and execute the calibration work.
- If this product is powered off during calibration, it may break down. After calibration is complete, turn off the power.

(1) Remove the front cover from the main unit.

(2) Detach the adapter attached to the rear surface of the cover. Insert the adapter into one of the calibration gas inlets of the sensor. Either inlet can be used.

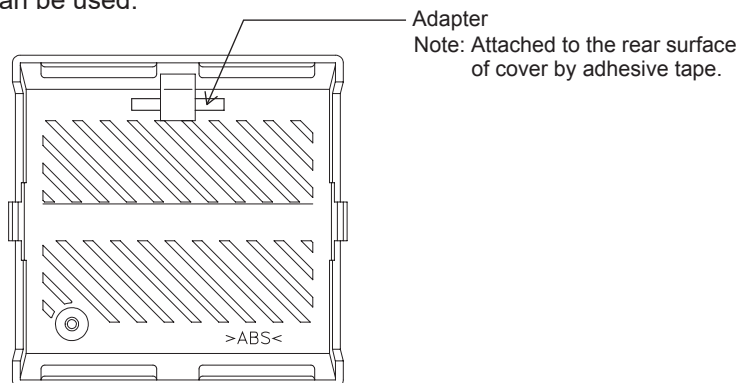


Figure 17. Adapter on the rear surface of cover

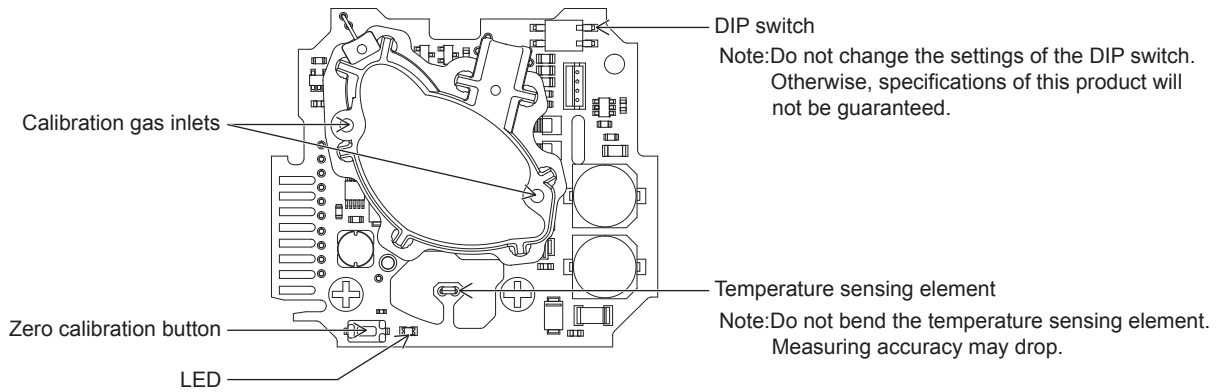


Figure 18. Zero gas concentration button, calibration gas inlets

- (3) Connect the tube, for supplying gas, of the zero calibration service bag to the adapter inserted into the calibration gas inlet. Securely connect the tube so that the gas will not leak.
- (4) Supply CO₂ gas for calibration.
Turn on the switch on the CO₂ service bag to supply the gas.
- (5) Press and hold the zero gas calibration button for approx. 3 seconds.
Check that the LED on the PCB* blinks.
- (6) Continue supplying the gas (approx. 2 min) until CO₂ concentration gets stable.
When calibration is complete, the LED on the PCB turns off.
- (7) Remove the gas supplying tube.
- (8) Remove the adapter.
Note: Securely keep the gas supplying tube so as not to lose.
It can be used for calibrating other system's sensors.
- (9) Fix the cover to the main unit with the screw (provided on the cover).

* PCB: printed circuit board

■ Disposal

When this product is no longer needed, dispose of it as industrial waste in accordance with local regulations. Do not reuse all or part of this product.

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This product complies with the essential requirements of the Electromagnetic Compatibility Directive (EMCD).

EMCD: EN 61326-1 Class B, Table 1 (for use in a basic electromagnetic environment)

azbil

Specifications are subject to change without notice.

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Building Systems Company

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