

Product Specifications

Product name : Air quality sensor

Multiple detection type

Part number : SN-GCQB1

Issue Date : 6 November, 2024

Specifications number :

Please return us one copy after confirming this Product Specifications.

(Confirmation acceptance sign)

Accepted this Product Specifications.

Date : . .

- By signing the Product Specifications, you acknowledge that you are a legal representative for your company and that you understand and accept the contents herein.
- If the signed version of the Product Specifications has not been returned to Panasonic within 30 days after receipt of the product or Product Specifications, the specifications shall be deemed to be accepted by you.

Panasonic Lighting Devices Co., Ltd.

Development Department signature :

Quality Assurance Department signature :

[Revision records]

Revision	Date	Description	Approval	In charge
1.0	6. Nov, 2024	Officially Issued	Umehara	Sumisaki

■ Outline

This is a sensor that can easily and optically detect fine particulate matter (PM) in the air, and also detect total volatile organic compounds (TVOC), temperature, and humidity using semiconductor elements.

It outputs the fine particulate matter (PM), TVOC, estimated values of CO₂ (eCO₂), temperature and humidity via I²C and UART. TVOC outputs level values referred the IAQ standards of the German Environment Agency (UBA).

■ Features

- Maintain performance by unique Auto Calibration Function
- Minimize dust accumulation by optimized air pathway structure and it makes possible to avoid “tracking” for electrical safety
- Special resin is used for the outer shell to protect against electromagnetic waves

■ Environmental Responsiveness

- This product complies with RoHS directive.

■ Dimensions

37 x 37 x 12 (thickness) [mm]

■ Weight

Approx. 12 [g]

■Operating characteristics

(Ta=25°C, RH=50%)

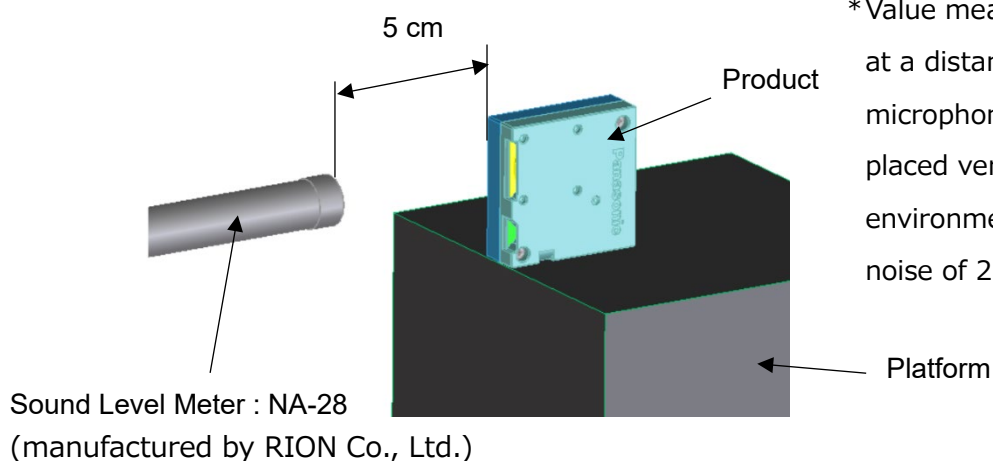
Item		Characteristic	Remarks
Operating voltage		DC5V ± 10 %	
Consumption current		Below 100 mA	
Operating temperature		-10 ~ 60 °C, under 95%RH	No dew condensation
Storage temperature		+5 ~ +35 °C, under 85%RH	Storage in the delivery state, no dew condensation Please use it within one year from the date of delivery *-40 ~ 70°C, 95%RH or less during transport
PM	Minimum detection particle size	0.3 μm	
	Concentration output range	0 ~ 2,000 $\mu\text{g}/\text{m}^3$ (UART) 0 ~ x,xxx $\mu\text{g}/\text{m}^3$ (I ² C)	No output upper limit
	PM2.5 concentration accuracy (Note1)	± 10 % $\pm 5 \mu\text{g}/\text{m}^3$	35 ~ 1,000 $\mu\text{g}/\text{m}^3$ 0 ~ 35 $\mu\text{g}/\text{m}^3$
TVOC (Note2)	IAQ value output range	Levels 1 ~ 5 IAQ Level and output Level1: 1.000 ~ 1.999 Level2: 2.000 ~ 2.999 Level3: 3.000 ~ 3.999 Level4: 4.000 ~ 4.999 Level5: 5.000	TVOC range of UBA IAQ Level (reference) Level1: 0.0 ~ 0.3 mg/m^3 Level2: 0.3 ~ 1.0 mg/m^3 Level3: 1.0 ~ 3.0 mg/m^3 Level4: 3.0 ~ 10.0 mg/m^3 Level5: 10.0 mg/m^3 or higher refer Handling Instruction (14) • TVOC output range 0.015 ~ 10 mg/m^3 Atmospheric ethanol
	IAQ value accuracy	± 1	
eCO ₂ (Note2)	Output range	400 ~ 5,000 ppm	Estimated from TVOC If the output is outside the range, the lower or upper limit is output.
	Accuracy (reference information)	(± 20 %) (± 25 %)	2,000 ~ 5,000 ppm 400 ~ 2,000 ppm
Temperature	Output range	-10 ~ 60 °C	If the output is outside the range, the lower or upper limit is output. Estimated from inside sensor unit temperature.
	Accuracy (reference information)	(± 0.4 °C)	
Humidity	Output range	0 ~ 95 %RH	If the output is outside the range, the upper limit is output. Estimated from inside sensor unit humidity.
	Accuracy (reference information)	(± 3 %RH)	10 ~ 90%RH

Data output frequency	1 second		
Data output start time	Approx. 8 sec after power-on		
Measurement stabilization time	PM	Approx. 28 sec after power-on	20 sec for average processing
	IAQ/eCO ₂	Approx. 120 min after power-on	refer Handling Instruction (13)(14)
	Temperature and humidity	Approx. 20 min. after power-on	
Output method	Digital signal output method I ² C and UART(TTL)		Refer to the communication specifications.
Noise	MAX 38 dB (LAeq)		Initial value * See below for measurement conditions.

(Note1) PM2.5 concentration accuracy is the performance during adjustments in process under "PM standard measurement method" in the specifications.

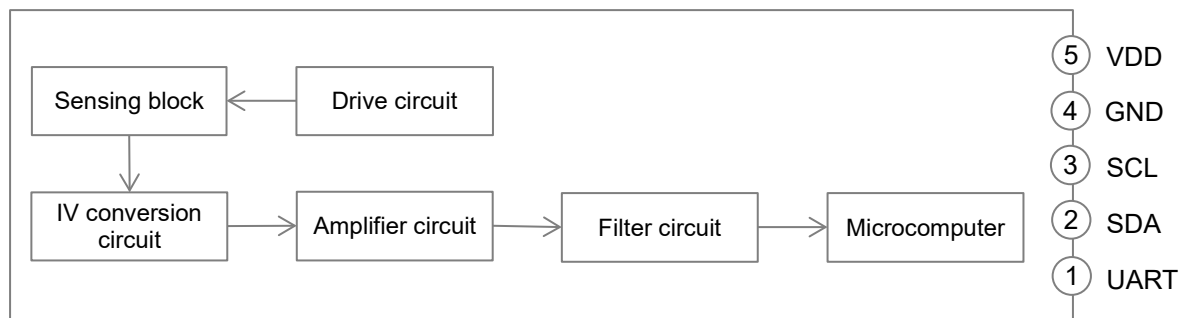
(Note2) IAQ value and eCO₂ after 48h of pre-operation in clean air. refer Handling Instruction (13)

* Noise measurement conditions



* Value measured for 10 seconds at a distance of 5 cm from the microphone with the product placed vertically in an environment with background noise of 20 dB or less.

■ Block Diagram

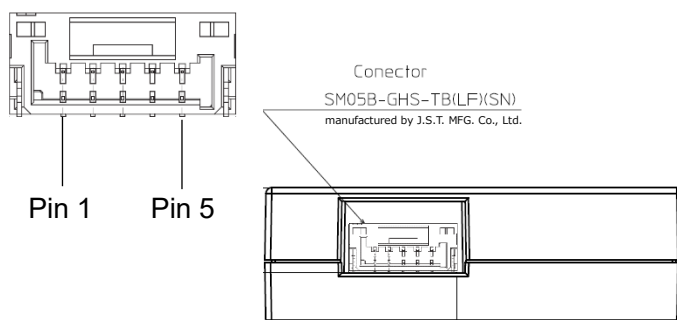


Connector: SM05B-GHS-TB(LF)(SN) (manufactured by J.S.T. MFG. Co., Ltd.)

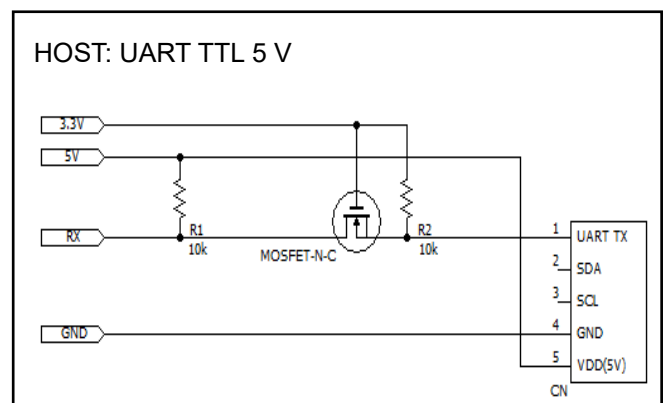
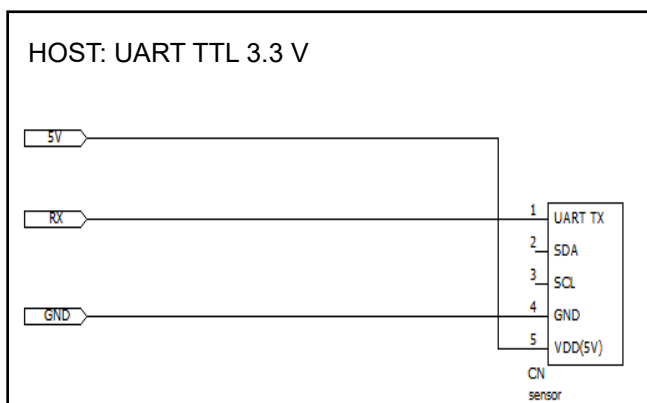
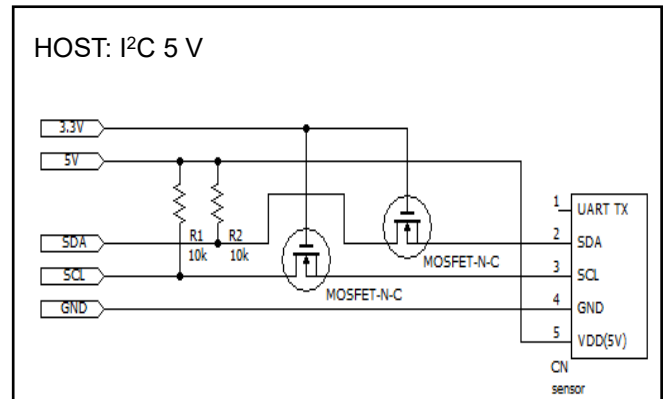
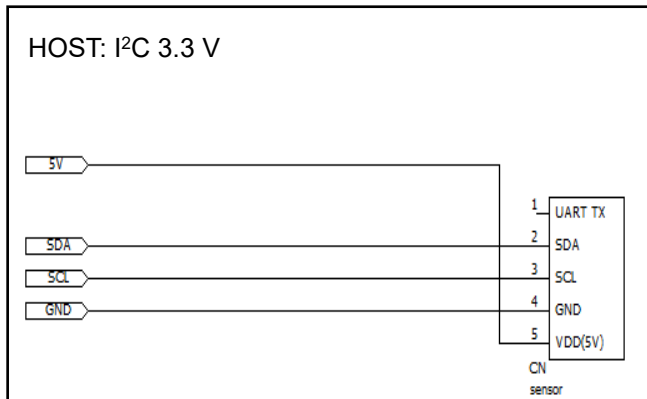
■ Pin functions

Pin	Symbol	Input/output	Function
1	TX	Output	UART TX data output pin: 3.3 V
2	SDA	Input/output	I ² C bus serial data input/output pin: 3.3 V*
3	SCL	Input	I ² C bus serial clock input pin: 3.3 V*
4	GND	-	Ground pin: 0 V
5	VDD	-	Power supply pin: 5 V

* The SCL pin and SDA pin have internal pull-up resistors at 3.3 V.

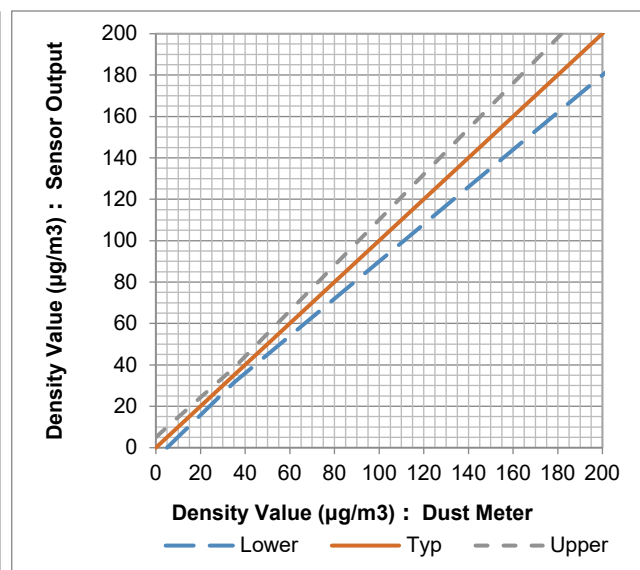
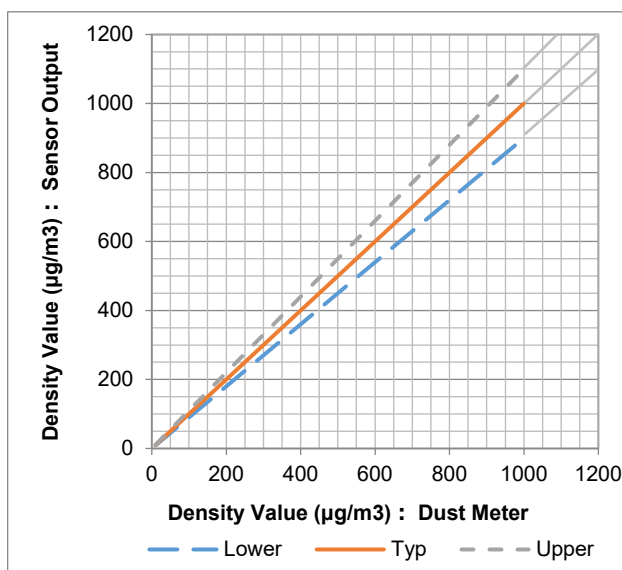


■ Wiring Reference



■ PM Sensor Characteristics

Measurement accuracy



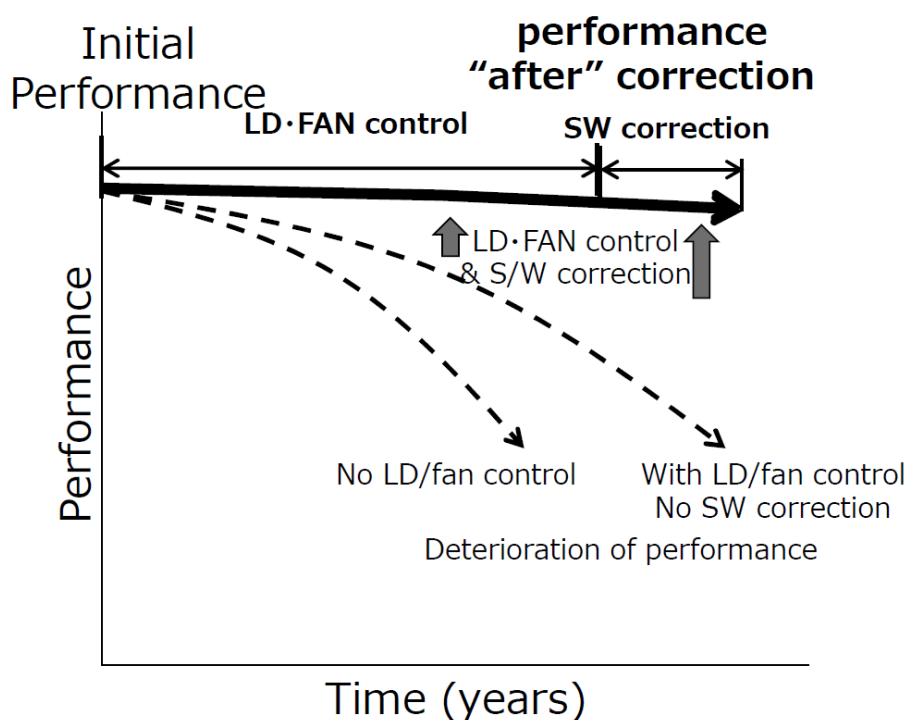
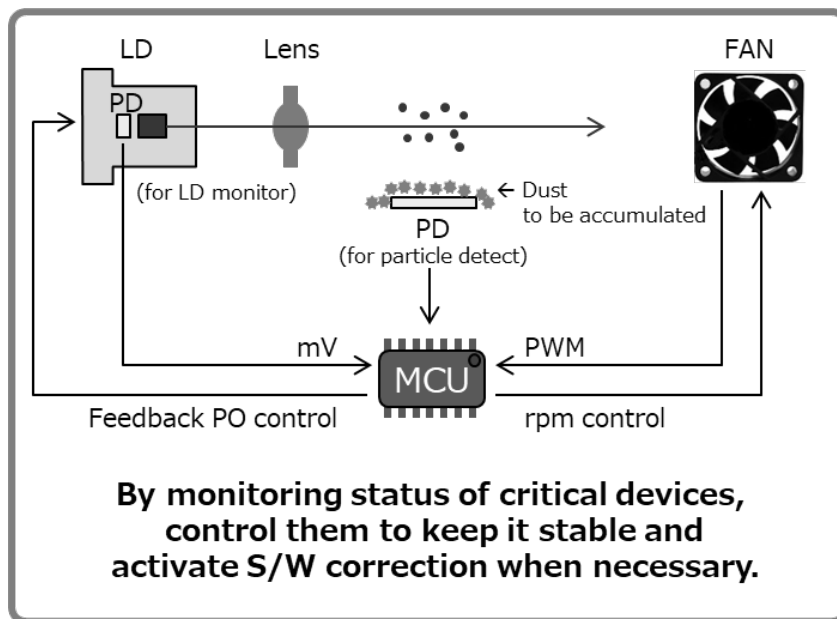
(Low concentration range expanded)

■ PM standard measurement method

Item	for PM2.5 measurement	for PM10 measurement (technical evaluations)
Ambient temperature	26±5℃	
Room capacity	31m ³	0.1m ³
Test particle	Cigarette (MEVIUS or Hong Ta Shan)	JIS Test Particle 1-5, Fly Ash
Particle generator	Cigarette smoke suction machine (complies with JEM1467)	Customized particle generator
Dust meter	DUSTTRAK II Aerosol Monitor 8530 (with PM2.5 impactor)	DUSTTRAK II Aerosol Monitor 8530 (with PM10 impactor)
Test procedure	Generate smoke in the room and stir the air by electric fan. Reduce the concentration by air purifier to designated level and keep the level to measure. After stabilized, check the difference against dust meter with the average in 600 sec.	Feed the air to the test chamber with stirring test particle. Check the difference against dust meter with the average in 600 sec.
Position of test piece	Center of the room, 40~ 140cm from the floor level	Center of the test chamber
Input voltage	DC 5V±2%	

■PM Auto Calibration Function

Monitor the status of light output of laser diode (LD) and the rotational speed of fan with passage of time, and the MCU controls to pump up each devices up to its control bound to keep the initial performance. After the bounds, the MCU calculate an optimal correction value and start s/w correction automatically. This function is also effective for the degradation of detection performance of Photo diode (PD), and it can make s/w correction for the dirt on the surface of PD caused by dust accumulation during the lifetime. By making these controls and corrections, the sensor maintains a certain level of performance during the lifetime (it means the measurement value will maintain center of variation against dust meter).



■ Reliability

Test Category	Test condition	Judgement Criteria (Ta=25℃, RH=50%)
Drop impact	Free fall from 70cm over the ironwood Repeat 3 times in random.	No damage and crack To be satisfied operating characteristics. PM: <±15% @35-1,000µg/m ³ <±7.5µg/m ³ @0-35µg/m ³
Vibration	Frequency 10 ~ 55Hz / acceleration 1G / Sweep 1min. X、Y、Z directions each 30min.	To be satisfied operating characteristics. PM: <±15% @35-1,000µg/m ³ <±7.5µg/m ³ @0-35µg/m ³
Temperature cycle	-40℃ (30min) → (Within 10 sec) → +80℃ (30min), 10 cycles	
THB	65℃, 90 ~ 95%RH, DC5V, 1000h	
High temp, high humidity storage	80℃, 90 ~ 95%RH, 1000h	To be satisfied operating characteristics.
Low temp storage	-40℃, 500h	
Power ON-OFF	45℃, 90 ~ 95%RH, ON(5min) / OFF(5min) Repeat the cycle during 500h.	To be satisfied operating characteristics.
Open / short circuit	Open or short the each terminal of electrical components with applying operating voltage.	No firing, burning (Permit smoke generation, burnt deposit)
Tracking resistance	Drop 0.2% ammonium chloride solution with intervals 30sec, up to 200 drops.	No firing, burning (Permit smoke generation, burnt deposit)
Solder crack	-40℃ (30min) → (Within 10 sec) → +80℃ (30min), 200 cycles.	No crack on the soldering

* IAQ value and eCO₂ after 48h of pre-operation in clean air. refer Handling Instruction (13)

■ Life Duration

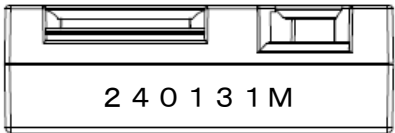
Design life: 10 years under normal operating situation (continuous operation) at a temperature of 25℃ and a humidity of 60% or less

■Lot Number

7-Digit (2-digit Production year, 2-digit Production month, 2-digit Production date, identification symbol)

Production Year (first 2-digits)	: 24=2024、25=2025、26=2026、27=2027、 . . .
Production Month (2-digits)	: 01 = January、 . . . 、 12 = December
Production Date (2-digits)	: 01 = Day1、 . . . 、 10=Day10、 . . . 、 31=Day31
Identification symbol (last 1 digit)	: M= Multiple detection type

(Example)



■Handling Instruction

- (1) This product is supposed to use for home appliance products.

Do not use the appliance to require high reliability and safeness, like medical instrument and disaster prevention instrument, etc.

- (2) When install the sensor into product, do not place any interception in front of air intake and outlet in order not to avoid intercept air flow. Also do not place sensor somewhere in a recess of the product.

(Please refer to the product outline drawing for the air intake and outlet.)

- (3) When install the sensor into product, make sure that the sensor would not have strong wind in the face of air intake / outlet.

- (4) When install the sensor into product, fix the sensor by using screw and etc. in the product.

- (5) Do not use the sensor in the strong magnetic field.

- (6) This product may generate noise depending on how it is fixed. Please check in advance whether noise will be generated when this product is incorporated, and take design considerations into consideration.

- (7) Due to the method of fixing this product and the material of the object to be fixed, there will be a difference in the temperature and humidity output from this product compared to the actual temperature and humidity. Please check the temperature and humidity in advance with this product installed and make corrections on the device to be installed.

- (8) Do not connect / shorted the outer shell to the terminals except GND because the shell has electric conductive and is connected to the GND.

- (9) The voltage for data communication is 3.3V. Please use level shift IC or something to adjust if the driven voltage of host MCU is 5V.

- (10) This product is not designed to use stand-alone. Please considerate flame resistance, compliance with the related regulations and standards at your hardware side.

- (11) Do not attempt to disassemble the sensor in any case.

- (12) We strive to improve the quality control, however, in general the electrical parts will fail with a certain probability. And also depend on using condition the characteristics will be changed. When install the sensor, please check the performance and reliability in actual using condition. If use with deteriorated condition, there is possibility of abnormal heating, smoking and firing. Please care regular maintenance and safety design like redundant design, fireproof design and malfunction preventing design.

- (13) If the sensor is stored longtime, IAQ value may be offset temporally by storage environment condition. The sensor can be brought back by pre-operation for 48 hours in clean air (IAQ

Level 1).

(14) If the sensor starting condition is exceed IAQ Level 1, output value may be offset temporarily.

After sensor detect clean air, offset would be canceled.

(15) The conditions and substances listed below may affect the characteristics of the sensor.

- Used or stored in an environment outside the rated temperature and humidity range
- Condensation inside the sensor
- Water freezes in the detection part
- In an atmosphere other than general atmospheric oxygen concentration
- Prolonged exposure to high concentration gas during use or storage
- Exposed to organic vapors from alcohols, acetone, volatile oils, etc.
- Exposed to extreme dust and oil mist.
- Silicone adhesives, hair products containing silicone, silicone rubber, silicone putty, etc.
- Contamination of the sensor with alkali metals. In particular, salt water mist etc. may directly hit the sensor.
- Prolonged exposure to highly concentrated corrosive gases such as sulfur and chlorine.

(16) sensor output would be affected by gas and/or PM distribution, uniformity and air flow because sensor detect gas and PM from tiny volume of air nearby. Reproducibility also would be affected by these as well as accuracy.

■ Others

In case the questions arise for this specification sheet, it will be resolved by mutual agreement.

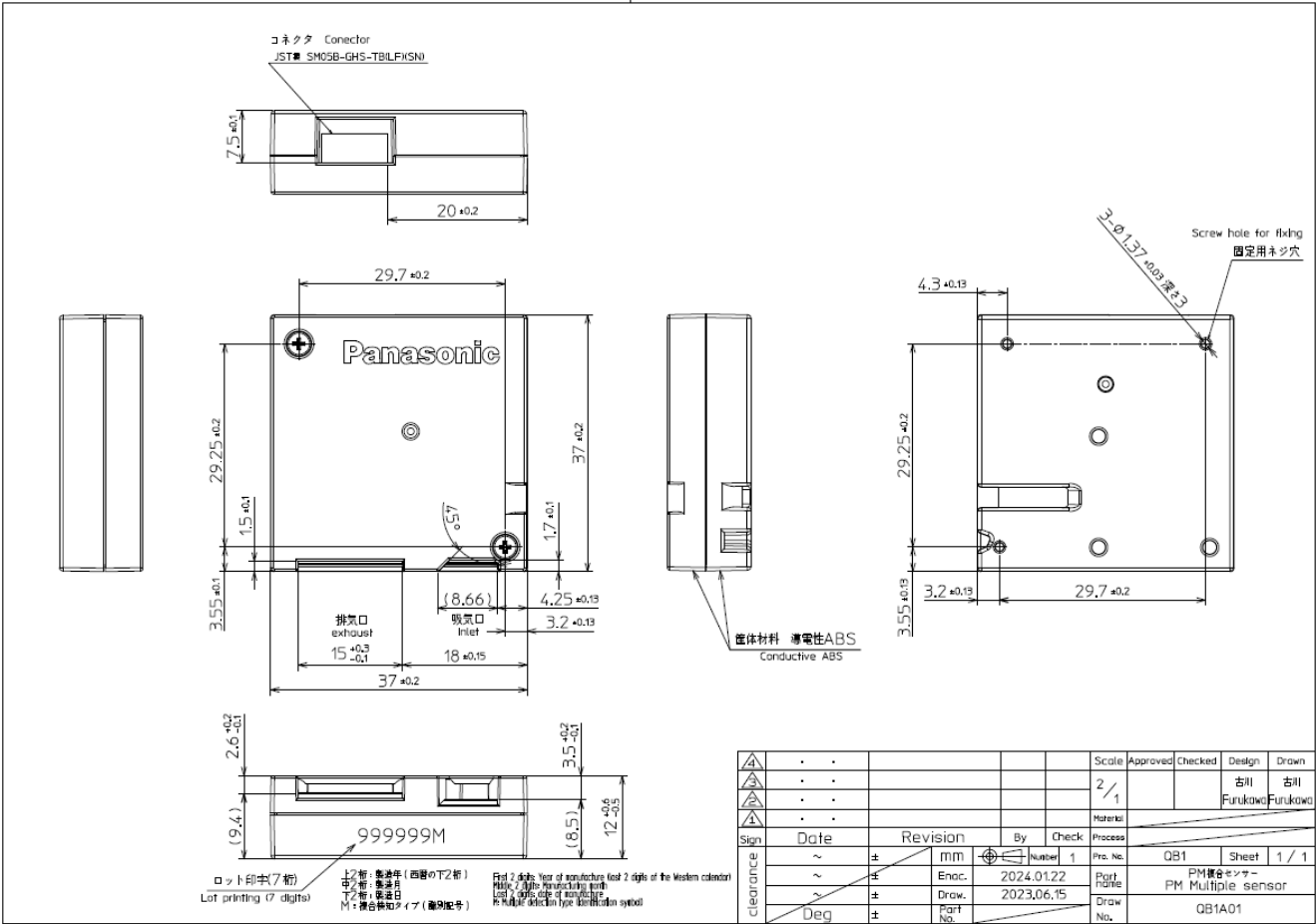
■Special notices

- In case that this sensor defect is expected the influence of human life and property, we recommend from point of view product liability that install the sensor with having safety margin of this specification contents warranty characteristics and performance, and safety design like redundant design and etc.
- Please do not use or dispose (transfer, loan, diversion, license etc.) directly or indirectly for the purpose of military use in accordance to the Foreign Exchange and Foreign Trade Control Law and related ministry ordinance, etc. and export control by resolution of the United Nations Security Council. Please comply with the various regulations related to this specification regarding all tangible items (deliverables, equipment, fixtures, parts, etc.) and intangible (all technologies, know-how, information, intellectual property rights, etc.)
- The contents described in this specification are indicative of the characteristics of the product and do not guarantee or license the right to intellectual property rights or other rights of our company and third parties.
- Please contact us beforehand, in case of malfunction that could result to harm to the human body.
- If you find any trouble etc. in this product, please contact the sales person.
- The quality assurance of this product is guaranteed for one year after shipping, and shall be limited to the items and their ranges described in this specification sheet. If a defect due to our company's responsibility should be identified, we will repair this product or provide alternative products. Our company shall not compensate the responsibility that your product and you get any damage by this defect. And also, we are not liable for any damage arising from natural disasters, inappropriate use, or damage caused by equipment to which this product is attached.

In case of repair and replacement, please take off the sensor from your product and return the sensor to us. If you continue to use the sensor even though the sensor is needed repair and replacement, there is possibility to get the risk in safety, please return the sensor.

- Please do not reverse engineer the product through disassembly or analysis without obtaining permission from our company
- Please understand beforehand that specifications and appearance of this product may be changed without prior notice for improvement.

■Product Outline Drawing



■Packaging Spec

