



Features and Benefits

- Robust enclosure
- Easy installation with LED indication
- Built-in circuitry diagnostics

Technical Overview

The GS-AQ series of air quality sensors determine the air quality through measurement of Total Volatile Organic Compounds (TVOC's). This signal can be used to control fresh air fans and dampers according to the ventilation load.

There is also an optional direct resistive temperature output as well as an optional backlit LCD display, set point adjust & momentary switch.

A feature of this sensor is when in 3-wire mode it automatically detects the controller input type, 4-20mA or 0-10Vdc. This can be overridden via a DIP switch if required. Sensors have on-board LED indication for power up status, output mode type and useful self-test feature.

Product Codes

GS-AQ-D Duct Air Quality and Temperature Sensor

Suffixes (replace -T with type)

-T Direct resistive temperature output *

Thermistor types:

A (10K3A1)	B (10K4A1)	C (20K6A1)
H (SAT1)	K (STA1)	L (TAC1)
M (2.2K3A1)	N (3K3A1)	P (30K6A1)
Q (50K6A1)	S (SAT2)	T (SAT3)
W (SIE1)	Y (STA2)	Z (10K NTC)

Platinum types:

D (PT100a)	E (PT1000a)
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Nickel types:

F (NI1000a)	G (NI1000a/TCR (LAN1))
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Interface Options (add to part code)

-TR Custom temperature range between -20 & +50°C

-LCD Integral LCD

-5V Output 0-5Vdc (instead of 0-10Vdc)

Specification

Outputs:

3-wire (optional -T)	0-10Vdc (0-5V for -5V) or 4-20mA PTC/NTC resistive sensing element
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Power Supply:

24Vac/dc ±10% (3-wire)
24Vdc ±10% (2-wire)

Supply current:

30mA (3-wire) max.

Electrical connections

Pluggable spring loaded terminal block min. 0.2mm ² , max. 1.5mm ²

Output ranges:

IAQ	0-1000ppb TVOC
Temperature	-20 to +50°C

Environmental:

Housing:	-30 to 60°C
	5 to 95% non-condensing
Media:	-10 to +50°C

Housing:

Material	PC/GF (Halogen free, flame retardant & UV stabilized)
Dimensions	123 x 103 x 54mm

Probe:

Material	Probe PVC - End cap Delrin
Dimensions	200 x 20mm dia.

Protection

IP65

Country of origin

UK

Conformity

EMC, CE & UKCA Marked

WEEE Directive:



At the end of the products useful life please
dispose as per the local regulations.
Do not dispose of with normal household waste.
Do not burn.



Sensor Characteristics

Air Quality

Type	MEMS Siloxane, TVOC (Total Volatile Organic Compounds)
Accuracy	Typical $\pm 15\%$ of measured value
Measurement range	0-1,000ppb TVOC

Temperature

Measurement range	-20 to +50°C
Accuracy (20 to 40°C)	$\pm 0.5^\circ\text{C}$
Long term stability	$< 0.02^\circ\text{C p.a.}$
Response time	8 sec. (t 63%) @ 25°C 1 m/s air flow

Optional Passive Output

Type	Resistive PTC & NTC types
Accuracy:	
Thermistor	$\pm 0.2^\circ\text{C}$ 0 to 70°C
Platinum types	$\pm 0.2^\circ\text{C}$ @ 25°C
Nickel types	$\pm 0.4^\circ\text{C}$ @ 25°C

Display Option

LCD	To show IAQ & Temperature
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Installation



Antistatic precautions must be observed when handling these sensors. The PCB contains circuitry that can be damaged by static discharge.

1. Select a location in the duct where dust & contaminants are at a minimum (i.e. after filters etc.) and which will give a representative sample of the prevailing air condition.
2. Fix the housing to the duct with appropriate screws, or by using the optional duct mounting flange.
3. Release the snap-fit lid by gently squeezing the locking tab and feed the cable through the waterproof gland and terminate the cores at the terminal block. Leaving some slack inside the unit, tighten the cable gland onto the cable to ensure water tightness.
4. If the sensor is to be mounted outside, it is recommended that the unit be mounted with the cable entry at the bottom. If the cable is fed from above then into the cable gland at the bottom, it is recommended that a rain loop be placed in the cable before entry into the sensor.
5. Set the switch on the PCB to the 3-wire position (default). Please refer to "Selecting output mode and LED indication" for more details.

IMPORTANT Do not alter the switch position while sensor is powered up. Do not select 2-wire when a 0v connection (3-wire) is made. Permanent damage to the sensor or BMS controller may result.

IMPORTANT Ensure the Terminal Block is fitted the correct position and direction. The cable entry faces the centre of the sensor.

6. Connect all sensor outputs to the controller inputs or to the device, the sensor output(s) are connected to.
7. Before powering the sensor, ensure that the supply voltage is within the specified tolerances.

IMPORTANT Make all electrical output connections before applying the supply voltage. If the sensor is not connected in this sequence, damage may be caused to the input circuitry of the controller or device the sensor output(s) are connected to.

8. Allow 3 minutes before checking functionality, and at least 30 minutes before carrying out pre-commissioning checks. This will allow the electronics time to stabilise.

Terminal Block:

For easier installation, the terminal block can be detached from the PCB.

When used with ferrules it doesn't require any tools to release the spring loaded terminal block. When used with stranded cable, push in the orange latch to compress the spring load. Feed in the wire and release the spring to secure the wire connection.

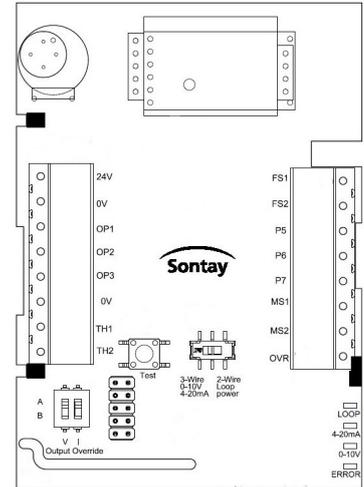
IMPORTANT Make sure the Terminal Block is fitted the correct position and direction. The cable entry faces the centre of the sensor.

Electrical Connections:

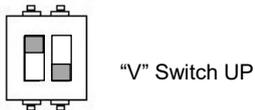
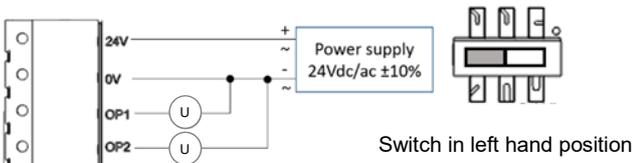
- 24V** Supply 24Vac/dc
- 0V** Supply 0V (Common 0V)
- OP1** Air quality output
- OP2** Temp. output
- OP3** Not used
- 0V** Not used
- TH1** Direct Thermistor output (-T only)
- TH2** Direct Thermistor output (-T only)

LED Indication:

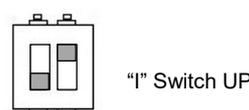
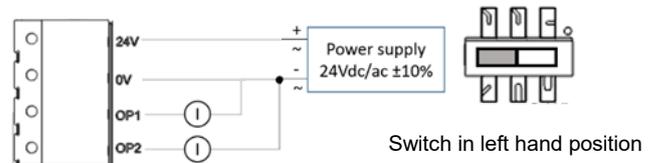
- LOOP Blue
- 4-20mA Yellow
- 0-10V Green
- ERROR Red



3-wire, 0-10Vdc / (0-5Vdc optional):



3-wire, 4-20mA:



-T, direct resistive output:



See next page for further information on setting output modes.

Selecting output mode and LED indication:

IMPORTANT Do not alter the switch position while sensor is powered up. Do not select 2-wire when a 0v connection (3-wire) is made. Permanent damage to the sensor or BMS controller may result.

3-wire connection:

Ensure there is no power to the sensor before changing the switch. Set the switch in the left hand position. The sensor automatically sets the outputs to 0-10V or 4-20mA based on the resistive load on the outputs. All outputs MUST be connected to the same type of load:

- If ALL the loads are $>2k2\Omega$, all the outputs will be set to 0-10Vdc and the green 0-10V LED will light.
- If ALL the loads are $>50\Omega$ and $<550\Omega$, all the outputs will be set to 4-20mA and the yellow 4-20mA LED will light.
- If ANY of the loads are $<50\Omega$ or >550 and $< 2k2\Omega$, all the outputs will be switched off and the red ERROR LED will light.

Auto detection can be overridden via 2-way DP switch situated on the left hand side of the PCB.

Set the auto detection 2-way DIP switch to the **3-wire** position

Set the override 2-way switch to:

- Voltage (0-10V/0-5V) switch DIP1 (V) to ON
- Current (4-20mA) switch DIP2 (I) to ON

The ON position for the switch is labelled on the switch itself.

Example, if you set the V switch (left) to OFF and the I switch (right) to ON, the device will force 3-wire current mode. The device is also set up to detect a change on these switches and reboot itself after 5 seconds - the error LED will flash during this period then the yellow 4-20mA LED will illuminate.

The LEDs will switch off after 15 minutes.

Self-Test Button:

The self-test button helps the installer to validate the wiring for each output and helps to commission the system.

When self-test button is pushed it cycles all outputs as follows: 0%, 50%, 100%, normal operation. After 30 seconds in any mode the system resets to normal operation.

When self-test button is held for more than 3 seconds, it sets all outputs to 50%, when released the outputs return to normal operation.

Recommended TVOC Monitoring Levels

German Federal Environmental Agency translates TCOV concentration (parts per billion) on a logarithmic scale:

Level	Recommendation	TVOC
Excellent	Target value	0 to 65ppb
Good	Ventilation / airing recommended	65 to 200ppb
Moderate	Intensified ventilation recommended	220 to 660ppb
Poor	Intensified / airing ventilation necessary	660 to 2200ppb
Unhealthy	Intense ventilation necessary	2200 to 5500ppb

Thereby the 5 stages or so called IAQ levels extend from excellent to unhealthy. Extended exposure to increased IAQ levels ie bad air, can affect the comfort, well being and health of building occupants. Poor indoor air quality is linked to sick building syndrome, reduced productivity and impaired learning in schools.

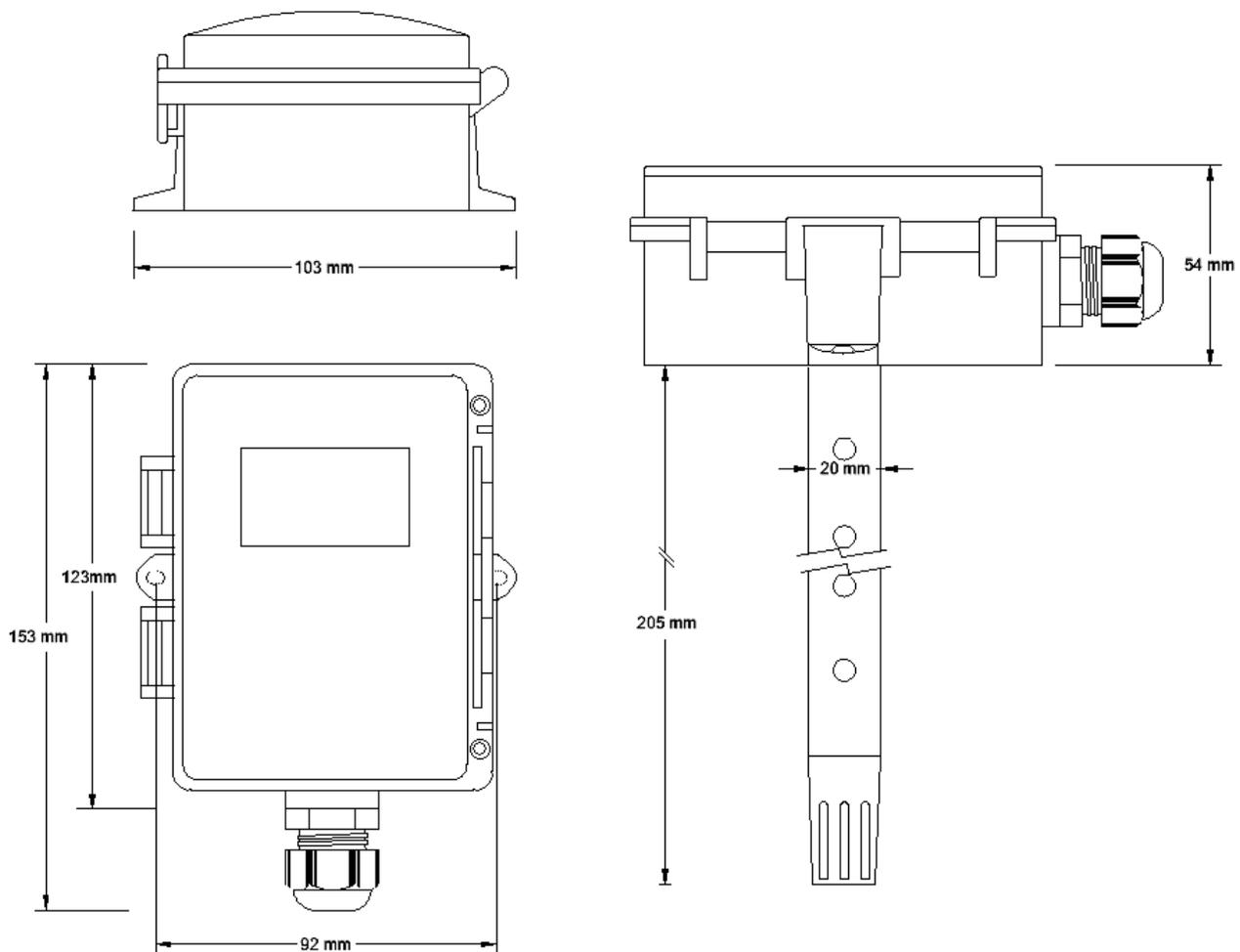
Please note that the measuring range of this sensor type is 0 to 1000ppb

Recommended TVOC Monitoring Levels (continued)

The World Health Organisation released indoor air quality guidelines for Europe which are classified by means of TVOC concentration values. Different air quality classes and their corresponding class limits in TVOC concentration:

Level	Recommendation	TVOC
1	Target value	0 to 50ppb
2	Average (harmless)	50 to 100ppb
3	Slightly increased (harmless)	100 to 200ppb
4	Significantly increased (only temp. exposure)	200 to 610ppb
Outside quality classes	Greatly increased (not acceptable)	>610ppb

Dimensions:



Revision History:

Rev.	Description of change	Page No.	Date
7.3	Remove reference of 2-wire connection	1,2 & 3	07/07/2023
7.2	Output type override & dimensions	3, 4 & 5	18/07/2022
7.1	UKCA added	1	27/08/2022
7.0	New product	All	13/11/2019

Whilst every effort has been made to ensure the accuracy of this specification, Sontay cannot accept responsibility for damage, injury, loss or expense resulting