



### Features and Benefits

- Slim design for room applications
- Easy installation with LED indication
- Built-in circuitry diagnostics
- Optional set point, momentary button and LCD available

### 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-S** Space 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)*

<b>-SP</b>	Resistive set point 0-10kΩ or 11-1kΩ
<b>-MS</b>	Momentary switch
<b>-TR</b>	Custom temperature range between -20 & +50°C
<b>-LCD</b>	Integral LCD
<b>-5V</b>	Output 0-5Vdc (instead of 0-10Vdc)

Accessories

<b>DECOR</b>	Decorators trim plate
<b>GASKET</b>	Insulating gasket (pack of 10)

### Specification

Outputs:	3-wire (optional -T)	0-10Vdc (0-5V for -5V) or 4-20mA PTC/NTC resistive sensing element
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 <sup>2</sup> , max. 1.5mm <sup>2</sup>
Output ranges:	IAQ Temperature	0-1000ppb TVOC 0 to 40°C
Environmental:		
Housing:		-10 to 60°C 0 to 95% non-condensing
Housing:	Material Dimensions	ABS (flame retardant) 115 x 85 x 30mm
Protection		IP30
Country of origin		UK
Conformity		EMC, CE & UKCA Marked

### Note\*:

When using the -T option, the thermistor is not compensated for internal self heating.

### 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	0 to 40°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
Set point	Resistive 0-10k $\Omega$ or 11-1k $\Omega$ $\pm 30\%$
Momentary switch	VFC 24Vac/dc 50mA max.
Display Option	
LCD	To show IAQ & Temperature

### 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 on a wall of the controlled space which will give a representative sample of the prevailing room condition. Avoid sitting the sensor in direct sunlight, on an outside wall or near heat sources. An idea mounting height is 1.5m from the floor.
2. Undo the tamperproof screw at the bottom of the housing and remove the front panel from the base.
3. Using the base as a template mark the hole centres and fix to the wall with suitable screws. Alternatively the base plate can be mounted on to a conduit box or standard recessed back box. The base plate is suitable for EU & North America fixings.
4. Feed cable through the hole in the base plate of the housing, unplug the terminal block from the PCB and terminate the cores at the loose terminal block. Leave some slack inside the unit as required.
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.

To perform an accurate comparison between a transmitter output and a portable reference, it is essential that the two probes are held adjacent for a minimum of 30 minutes in a stable RH environment. Only in this way can speed of response and temperature factors be eliminated. It is not uncommon for test instruments and transmitters to disagree by 10% RH or more when site measurements are taken incorrectly. 'Slings' or other mechanical hygrometer should not be used as a reference

## 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.

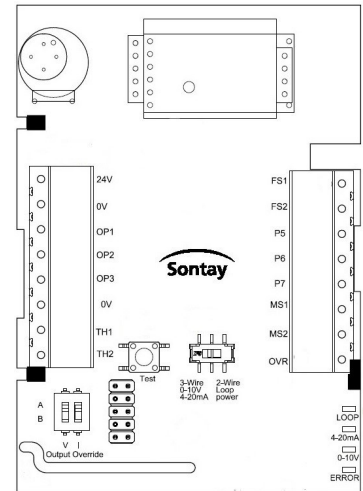
## Electrical Connections:

**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)

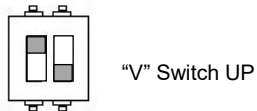
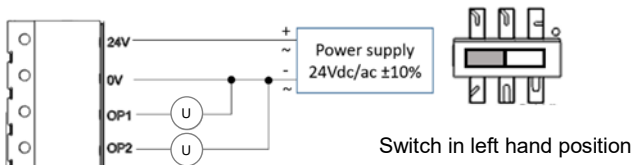
**FS1** Not used  
**FS2** Not used  
**P5** Set point  
**P6** Set point, wiper  
**P7** Set point  
**MS1** Momentary switch  
**MS2** Momentary switch  
**OVR** Override on LCD

## LED Indication:

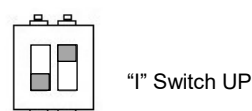
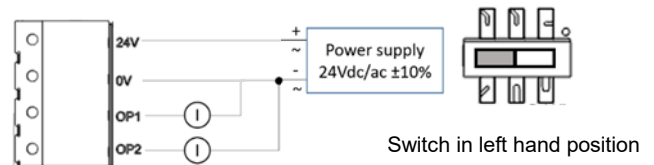
**LOOP** Blue  
**4-20mA** Yellow  
**0-10V** Green  
**ERROR** Red



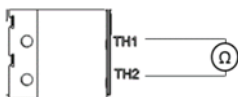
3-wire, 0-10Vdc / (0-5Vdc optional):



3-wire, 4-20mA:



-T, direct resistive output:



**Momentary switch (-MS):**  
max. 500mA @24Vac/dc

**Set point (-SP):**

	-	+
P5/P6	0kΩ	10kΩ
P7/P6	11kΩ	1kΩ

For 1-11kΩ use the 0-10kΩ and add an inline 1kΩ resistor on the controller input side

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  $>2k\Omega$ , 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  $<2k\Omega$ , 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.

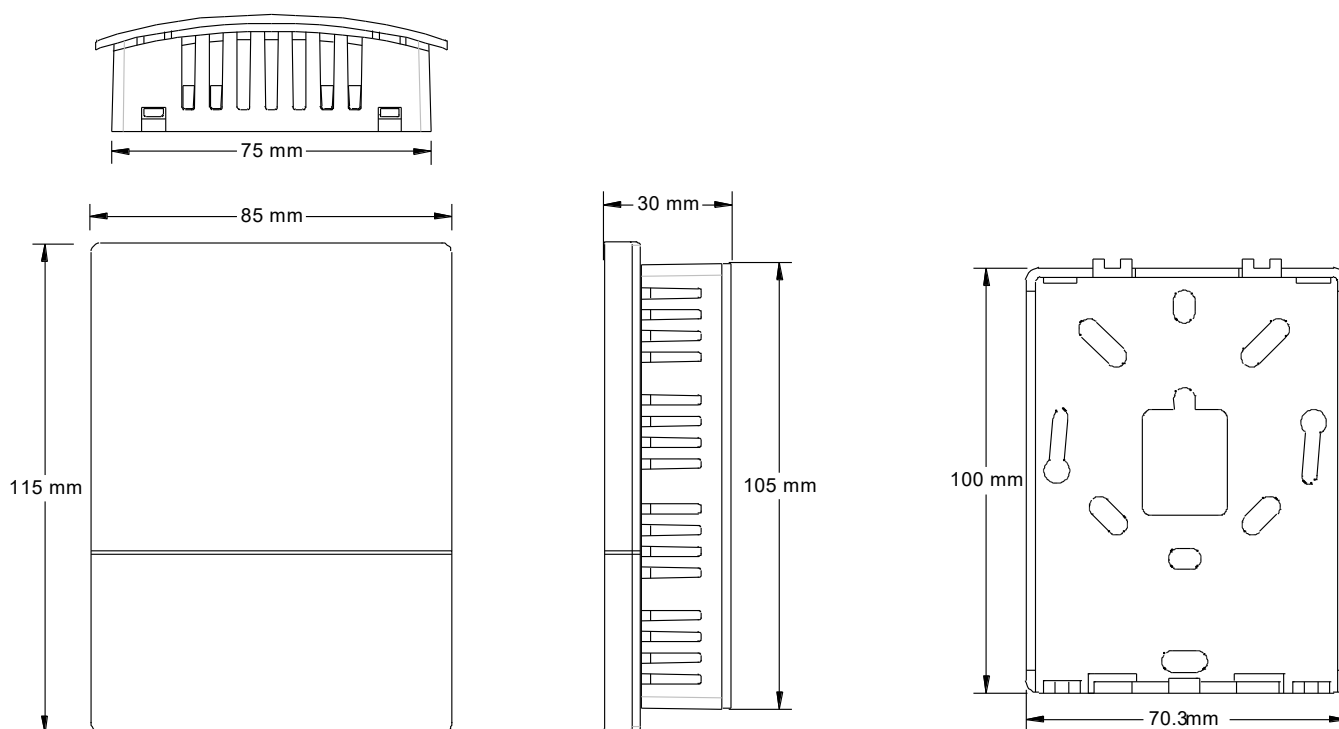
Please note that the measuring range of this sensor type is 0 to 1000ppb

## 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 from errors or omissions. In the interest of technical improvement, this specification may be altered without notice.