BIOTO-010
Space Mounted IAQ & Temperature Sensor

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Features and Benefits

- Easy installation with LED indication, test button and auto-output mode detection (3-wire)
- Supports 2-wire loop powering or 3-wire installation
- Pluggable terminal blocks and tool free installation
- Optional set point, fan speed & momentary switch

Technical Overview

The BIOTO series of air quality sensors determine the air quality though 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.

A valuable feature of this sensor is it automatically detects the controller input type, Vdc or mA, when set to 3-wire mode.

IMPORTANT! The sensor is not designed, manufactured or intended to use or re-sale as control or monitoring equipment in environments requiring life safety performance, in which the failure of the sensor could lead directly to death, personal injury or severe physical or

Product Codes

BIOTO Space Air Quality & Temperature transmitter

Suffixes (add to part code)

-T Direct resistive temperature output (replace **T** with option below)*

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)

Nickel types:

F (NI1000a) **G** (NI1000a/TCR (LAN1))

Interface Options (add to part code)**

-SP	Resistive set point 0-10kΩ or 11-1kΩ
-FS3	Resistive 3-speed fan switch
-FS4	Resistive 4-speed fan switch
-FS5	Resistive 5-speed fan switch
-MS	Momentary switch

Options:

-LCD	LCD Display
-TR	Custom temperature range –20 to +50°C
-5V	Output 0-5Vdc (instead of 0-10Vdc)

Accessories

DECOR	Decorators trim plate
GASKET	Insulating gasket (pack of 10)

** Interface Restrictions

SP only	SP-MS only
MS only	SP-FS only

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.

Specification

Outputs:
0-10Vdc (0-5V for -5V version) or 4-20mA 3-wire
4-20mA 2-wire, loop powering via DIP switch
(optional -T) PTC/NTC resistive sensing element

Power Supply:	24Vac/dc ±10% (3-wire)
	24Vdc ±10% (2-wire)
Supply current	Max. 30mA (3-wire)
Electrical connections	Pluggable spring loaded terminal Block, min. 0.2mm², max. 1.5mm²
Output ranges:	
IAQ	0 to 1,000ppb TVOC
Temperature	0 to 40°C
Environmental:	
Temperature	-10 to 60°C
Humidity	5 to 95% non-condensing
Housing:	
Material	ABS (flame retardant)
Colour	RAL 9003 polished white finish
Dimensions	115 x 85 x 30mm
Protection	IP30
Country of origin	UK

CE

The products referred to in this data sheet meet the requirements of EU Directive 2014/30/EU

Sensor Characteristics

Air Quality

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

Temperature

Measurement range	0 to 40°C
Accuracy (20 to 40°C)	±0.5°C
Long term stability	<0.02°C p.a.
Response time	5 to 30 seconds (t 63%)

Optional Passive Outputs

Type	Resistive PTC & NTC types
Accuracy:	
Thermistor	±0.2°C 0 to 70°C
Platinum types	±0.2°C @ 25°C
Nickle types	±0.4°C @ 25°C
Set point	Resistive 0-10kΩ or 11-1kΩ ±30% For 1-11kΩ use the 0-10kΩ and add An inline 1kΩ resistor on the BMS input side
Fan speed	Resistive, see page 4
Momentary switch	VFC 24Vac/dc 50mA max.

Installation

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

Note: This range of air quality sensors are not suitable for use in swimming pool & spa applications. Sensors used in these types of applications are not covered under AP's warranty terms. Chemicals used in swimming pool & spas can contaminate the humidity element, which results in a reduced service life.

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 either to the 3-wire or 2-wire position.

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

6. Plug the terminal block on the pins header on the PCB. Check polarity and orientation. Replace the housing to the base plate and tighten the tamperproof screw (if required) through the lug at the bottom of the base plate.

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

7. Connect all sensor outputs to the controller inputs or to the device, the sensor output(s) are connected to.

8. Before powering the sensor, ensure that the supply voltage is within the specified tolerances

Electrical Connections

24V	Supply 24Vac/dc	**FS1**	Fan speed resistive
0V	Supply 0V (Common 0V)	**FS2**	Fan speed resistive
OP1	Air quality output	**P5**	Set point
OP2	Temperature output	**P6**	Set point, wiper
OP3	Not used (if fitted)	**P7**	Set point
0V	Common 0V (if fitted)	**MS1**	Momentary switch
TH1	Direct Thermistor output (-T only)	**MS2**	Momentary switch
TH2	Direct Thermistor output (-T only)	**OVR**	Not used (if fitted)

Terminal Blocks

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.

Selecting Output Mode & LED Indication

IMPORTANT! Do not alter the switch position while sensor is powered up. Do not select 2-wire if 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 >2k2Ω, all the outputs will be set to 0-10Vdc and the green 0-10V LED will light.
If ALL the loads are >50Ω and <550Ω, all the outputs will be set to 4-20mA and the orange 4-20mA LED will light.
If ANY of the loads are <50Ω or >550 and < 2k2Ω, all the outputs will be switched off and the red ERROR LED will light.

Output 1 is checked first, and if it has determined what this output is set to it will assume that all other enabled outputs are connected to similar loads. The LEDs will switch off after 15 minutes.

2-wire connection:
Ensure there is no power to the sensor before changing the switch and do not connect 0V. Set the switch in the right hand position. All outputs MUST be connected. The blue LOOP LED will light.

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 i.e bad air, can affect the comfort, well being and health of building occupants. Poor indoor qir quality is linked to sick building syndrome, reduced productivity and impaired learning in schools.

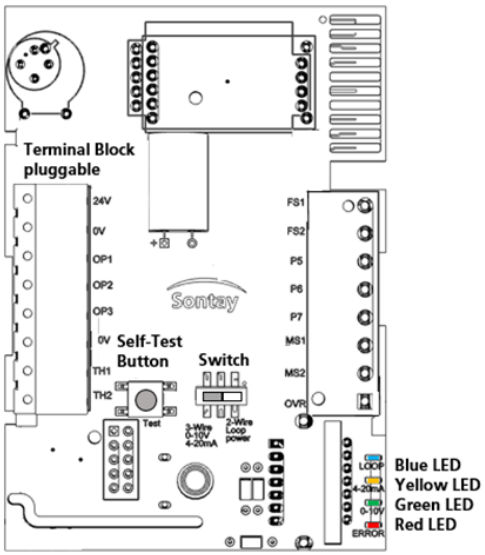
Please note that the measuring range of this sensor type is 0 to 1000ppb

Recommended TVOC Monitoring Levels (continued)

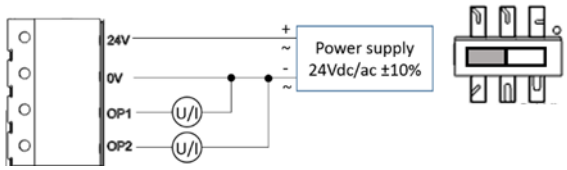
The World Health Organisation released indoor air quality guidelines for Europe which are classififed by means of TVOC concentration values. Different air quality classes and their corresponding class limits in TVOC concentration:

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

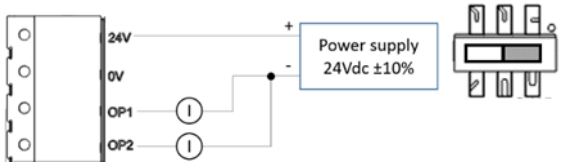
PCB Layout & Connections



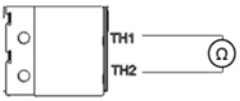
3-wire, 0-10Vdc or 4-20mA



2-wire, 4-20mA



-T Direct Thermistor only



Fan Speed (-FSx)

The position of the selector switch will cause the resistance between the terminals to alter as shown below.

0	Open circuit
1	22.7kΩ
2	26kΩ
3	29.3kΩ
Auto	32.6kΩ

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