

SM50

OEM Sensor Module

Description

The Aeroqual SM50 range of gas sensor modules provides state of the art gas measurement in a flexible cost effective package. Each module is ready to use with multi-point calibration (NIST traceable). Outputs include analog voltage, relay and status indicators with optional RS232, RS485 and LCD or VFD displays. The modules are compact and produce a linear output with gas concentration. Recommended applications include ozone generator control, health and safety monitoring, food and beverage, sanitation, refrigeration and solvent emissions monitoring (actual sensor and calibration is subject to application).



SM50 Sensor module (sensor side)



SM50 Sensor module (relay side)

Software Options

The SM50 sensor module can be used as a simple switching device or as a control device. Three on-board software options are available allowing the module to be used in the following ways:-

- AA Alarm-Above:** the relay or alarm (if fitted) is programmed to energise or activate above the selected set point. Typical applications are health and safety alarm/warning systems or switching external equipment on and off.
- AB Alarm-Below:** the relay or alarm (if fitted) is programmed to energise or activate below the selected set point. Typical applications are process alarm/warning systems or switching external equipment on and off.
- C10 Control $\pm 10\%$:** the relay is programmed to energise and de-energise around the selected set point $\pm 10\%$ to create a "dead band". Typical application is for maintaining a specific gas concentration between user defined levels through the control of an external device e.g. ozone generator.

Note: Specialised software is required to be loaded at our factory prior to dispatch. Software loaded prior to delivery can only be altered by returning it to Aeroqual Limited

Optional On-Board Alarm

Depending on the sensor configuration and the operating conditions, there is an option to fit a piezo alarm creating an on-board audible alarm which is activated above a user defined set point.

Operating Instructions

1. Warm Up

The SM50 module is designed to run continuously. Prior to operation the SM50 module must be warmed up to burn off contaminants on the sensor. When the module is first switched on, it will warm up for between 3 and 10 minutes depending on the particular gas being monitored. Note: the SM50

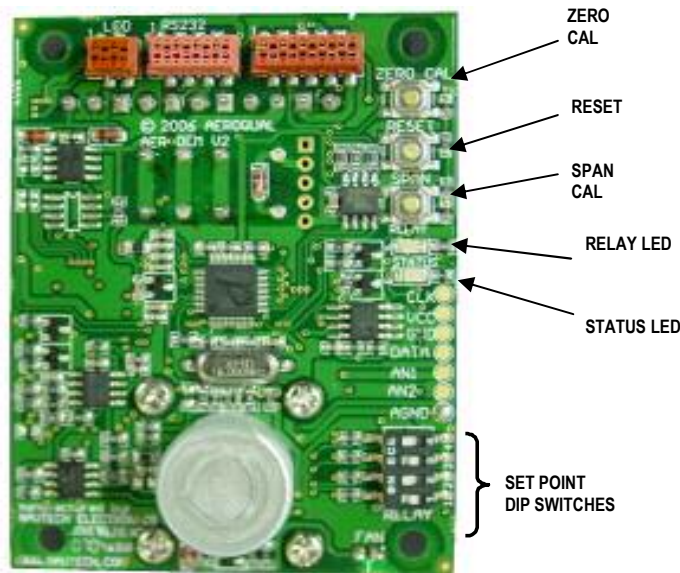
sensor module should be run for 24 hours prior to taking critical measurements prior to first time operation and if it has been switched off for more than 7 days.

2. Operation as a Single Point Switching Device

Setting the Relay and Alarm Set Point

The Relay and Alarm Set Point is factory set (unless otherwise specified) to OFF-ON-OFF-ON as shown in the table below. The Alarm and/or Relay Set Point can be altered by adjusting the set-point dip-switches as shown below.

Note: The relay, alarm and sensor diagnostics are inactive during the warm up period.



Relay dipswitch (1 2 3 4)	O3 0-0.150 (ppm)	O3 0-0.5 (ppm)	O3 0.5-20 (ppm)	NO2 0-0.200 (ppm)	CO 0-100 (ppm)	CO 0-1000 (ppm)	NH3 0-100 (ppm)	NH3 0-1000 (ppm)	VOC Isobutylene (ppm)	H2S 0-10 (ppm)	SO2 0-10 (ppm)	SO2 0-100 (ppm)	CH4 0-10000 (ppm)
on on on on	0.000	0.000	0	0.000	0	0	0	0	0	0.0	0.0	0	0
off on on on	0.010	0.025	1	0.010	5	20	5	10	20	0.5	0.5	5	500
on off on on	0.020	0.050	2	0.020	10	40	10	20	40	0.6	1.0	10	750
off off on on	0.030	0.075	3	0.030	15	60	15	30	60	0.7	1.5	15	1000
on on off on	0.040	0.100	4	0.040	20	80	20	40	80	0.8	2.0	20	1500
off on off on *	0.050	0.125	5	0.050	25	100	25	50	100	0.9	2.5	25	2000
on off off on	0.060	0.150	6	0.060	30	120	30	60	120	1.0	3.0	30	2500
off off off on	0.070	0.175	7	0.070	35	140	35	70	140	2.0	3.5	35	3000
on on on off	0.080	0.200	8	0.080	40	160	40	80	160	3.0	4.0	40	3500
off on on off	0.090	0.225	9	0.090	45	180	45	90	180	4.0	4.5	45	4000
on off on off	0.100	0.250	10	0.100	50	200	50	100	200	5.0	5.0	50	5000
off off on off	0.110	0.300	12	0.120	60	250	60	150	250	6.0	6.0	60	6000
on on off off	0.120	0.350	14	0.140	70	300	70	250	300	7.0	7.0	70	7000
off on off off	0.130	0.400	16	0.160	80	350	80	500	350	8.0	8.0	80	8000
on off off off	0.140	0.450	18	0.180	90	400	90	750	400	9.0	9.0	90	9000
off off off off	0.150	0.500	20	0.200	100	500	100	1000	500	10.0	10.0	100	10000

* Factory default setting

Status LED / Diagnostics

The Status LED (glows green) is only of interest if the monitor appears to be operating incorrectly. At start up, the Status LED will flash 2 to 6 times at an interval of 0.5 seconds. During the 3 to 10-minute warm-up, the Status LED will flash at an interval of 2 seconds. The Status LED remains on under normal operation indicating that the unit is on. If the sensor fails, the status LED will flash quickly at an interval of 0.3 seconds.

Relay LED

The Relay LED (glows red) indicates that the gas concentration has reached the "Relay-Set-Point" (as set with the dip switches) and the relay is activated.

Using the Relay Outputs

The relay output is a set of volt-free contacts that can be used to trigger an external device directly (max. 24V @ 2A) or for a higher voltage and current loads via a secondary relay. A typical external device is an alarm bell, siren, extractor fan, etc.

When the gas concentration reaches the desired set point, the relay is energised and the relay LED will light up (red). This will:-

- close the relay in the case of a “normally open relay” and
- open the relay in the case of a “normally closed relay”

When the gas concentration drops below the set point, the relay is de-energised and switches to the opposite condition.

Normally Open Relay

This relay will close when the set point is reached and switch on the external device; and then reverse this condition when the gas concentration drops below the set point. This is the safest way to operate the relay because if the power should fail, the external device is switched off (fail-safe condition).

Normally Closed Relay

This relay will open when the set point is reached and switch off the external device; and then reverse this condition when the gas concentration drops below the set point. This does not create a fail-safe condition.

Connecting to the Relay

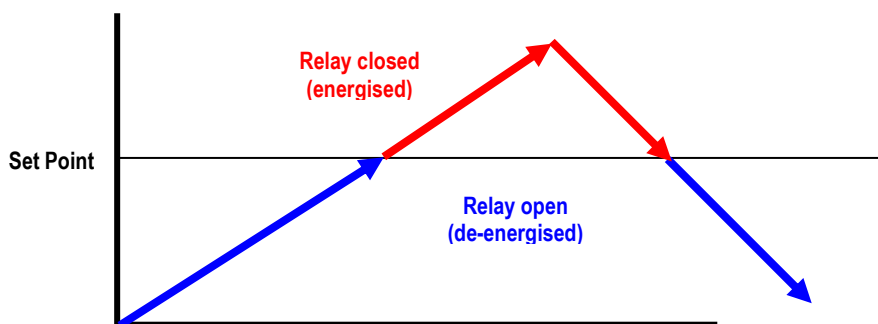
Connect the desired external device to either the normally open (NO) or normally closed (NC) contacts as shown below.



Please note that the maximum rating for the SM50 on-board relay is 24V @ 2A. Should switching a higher voltage or current be required, consult a licensed electrician regarding fitting an external secondary relay (piggy-back) with a higher rating.

3. Operation using Alarm-Above Software with Normally Open Relay (fail-safe)

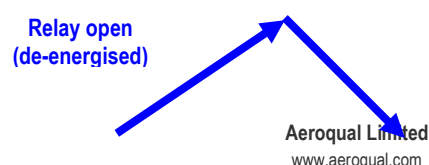
The Alarm-Above specialised on-board software as demonstrated in the diagram below.

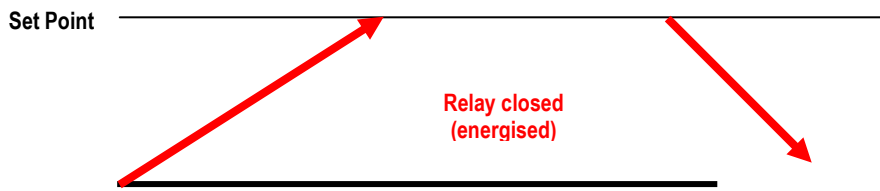


- When gas concentration is rising from below the “Set Point”, relay remains opens (de-energised)
- When gas concentration rises and reaches the “Set Point”, relay closes (energised)
- When gas concentration drops from above the “Set Point”, relay remains closed (energised)
- When gas concentration drops and reaches the “Set Point”, relay opens (de-energised)

4. Operation using Alarm-Below Software with Normally Open Relay (fail-safe)

The Alarm-Below specialised on-board software as demonstrated in the diagram below.



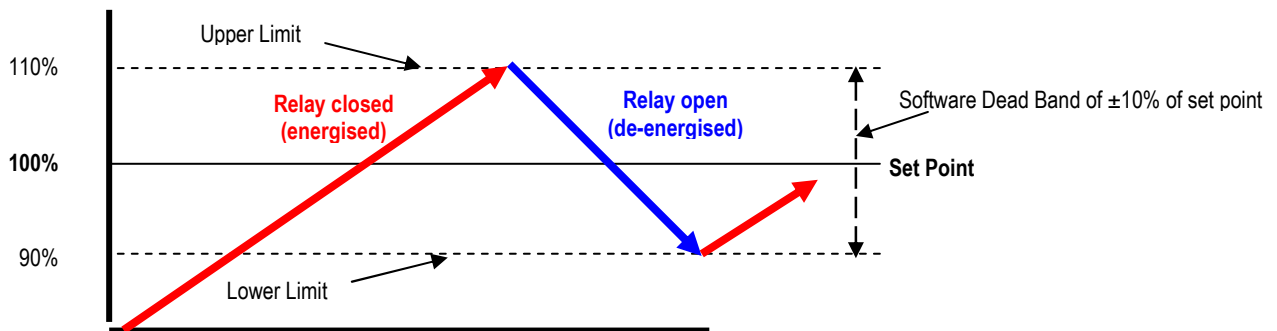


- When gas concentration is rising from below the "Set Point", relay remains closed (energised)
- When gas concentration rises and reaches the "Set Point", relay opens (de-energised)
- When gas concentration drops from above the "Set Point", relay remains open (de-energised)
- When gas concentration drops and reaches the "Set Point", relay closes (energised)

5. Operation as a Control Device using Control Software

Note: the default condition is to always use relays in normally open mode so as to create a "fail safe" solution

The SM50 used as a control device allows the user to maintain a specific gas concentration between defined levels through the control of an external device via the on-board relay. The specialised on-board software creates a "dead band" ($\pm 10\%$) around the selected set point as demonstrated in the diagram below.



- When gas concentration is rising from below "Lower Limit" to "Upper Limit", relay remains closed (energised)
- When gas concentration is falling from above "Upper Limit" to "Lower Limit", relay remains open (de-energised)
- External equipment connected to the on-board relay should be wired appropriately to the normally open or normally closed contacts
- If in doubt, please consult an authorised electrician or contact Aeroqual before powering up any electrical circuits

Power

Input 11 - 24 VDC
Consumption 2.5 - 6 W max

Outputs

0-5V analog 8 bit

Environmental

Operating temperature 0°C to 50°C (-20°C to 50°C if enclosed)
 Operating humidity 5% to 95% RH (non-condensating)

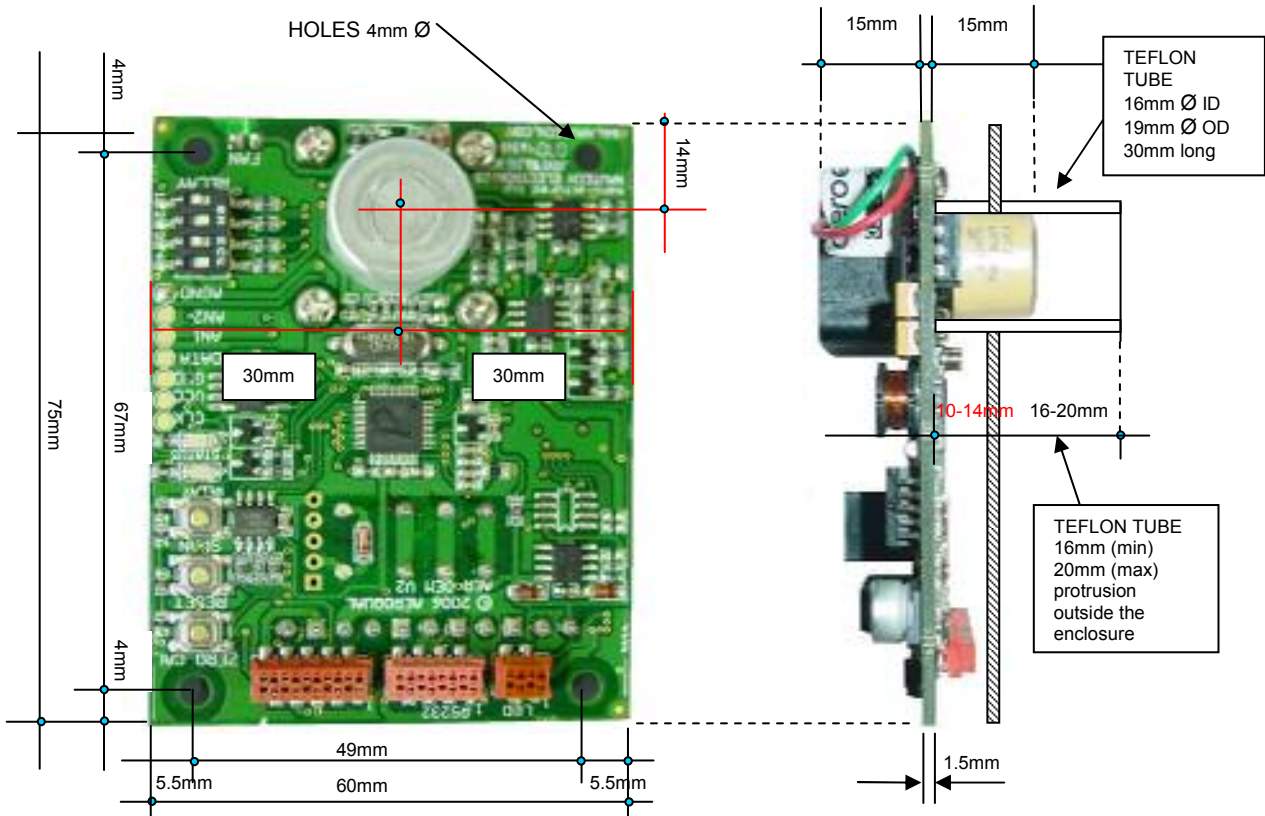
Approvals



Warranty

1 year limited warranty (excluding calibration)

Mounting Dimensions



SM50 Standard OEM Specifications For Industrial and Health & Safety Applications

Sensor	Calibrated Range	0-5V output scale	LDL	Accuracy	Resolution	Response Time (T90)	Sampling Method ⁵	Operating Temp. (environmental)	Relative Humidity (non-condensing)
Ammonia 0 - 100 ppm	0 - 100	0 - 100	0.5 ppm	<± 5ppm 0 - 100 ppm	0.1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
Ammonia (leak) 0 - 1000 ppm	0 - 1000	0 - 1000	2 ppm	<± 15%	1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%

Carbon monoxide 0 - 1000 ppm	0 - 1000	0 - 1000	1 ppm	<± 20%	1 ppm	< 150 s	D	-5°C to 40°C	5 to 95%
Carbon dioxide 0 - 2000 ppm	0 - 2000	0 - 5000	-	<± (40 ppm + 3%)	10 ppm	< 60 s	D	-5 to 40°C	5 to 95%
Carbon dioxide 0 - 5000 ppm	0 - 5000	0 - 5000	-	<± (150 ppm + 5%)	10 ppm	< 60 s	D	-5 to 40°C	5 to 95%
Carbon dioxide 0 - 5.00%	0 - 5.00%	0 - 5%	-	<± 5%	0.01%	< 60 s	D	-5 to 40°C	5 to 95%
Hydrogen 0 - 5000 ppm ¹	0 - 5000	0 - 5000	5 ppm	<± 10 %	1 ppm	< 90 s	D	-5°C to 40°C	5 to 95%
Hydrogen sulphide 0 - 50 ppm	0 - 50	0 - 50	0.05 ppm	<+/-10%	0.1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
Methane 0 - 10000 ppm	0 - 9999	0 - 10000	-	<± 15%	1 ppm	< 60 s	D	-5°C to 40°C	30 to 80%
Ozone 0 - 0.5 ppm	0 - 0.500	0 - 0.500	1 ppb	<± 15%	0.001 ppm	< 60 s	F,P	-5°C to 40°C	5 to 95%
Ozone 0.5 - 20 ppm ²	0.5 - 20	0 - 20	10 ppb	<± 15%	0.01 ppm	< 35 s	F,P	-5°C to 40°C	5 to 95%
Nitrogen dioxide 0 - 0.2 ppm	0 - 0.200	0 - 0.5	1 ppb	<± 15%	0.001 ppm	< 60 s	F,P	-5°C to 40°C	30 to 70%
Perchloroethylene 0 - 200 ppm	0 - 200	0 - 500	1 ppm	<± 5 ppm 0 - 50 ppm <± 10% 50 - 200 ppm	1 ppm	< 60 s	D	-5°C to 40°C	30 to 80%
PID 0 - 2000 ppm	0 - 2000	0 - 5000	0.1 ppm	<10% of reading	0.1 ppm	<30 s	D	-5°C to 40°C	5 to 90%
Sulphur dioxide 0 - 100 ppm	0 - 100	0 - 100	0.5 ppm	<± 10%	0.1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
VOC 0-500 ppm	0 - 500	0 - 500	1 ppm	<± 10 ppm 0 - 200 ppm <± 10% 200 - 500 ppm	1 ppm	< 60 s	F	-5°C to 40°C	5 to 95%
Other Gases	Contact Aeroqual with specific requirements for gas and concentration								

- ¹ Other specific concentrations available on request
² Accuracy < 0.5 ppm is unspecified (for applications that require accurate measurement < 0.5 ppm use low or ultra-low sensor heads)
³ Non Methane Hydrocarbon sensor (lower sensitivity to alcohols & esters)
⁴ Calibrated against Isobutylene. Other specific VOC calibrations are available on request
⁵ D= diffusion, F = fan, P= pump

SM50 High Spec OEM Specifications For Ambient Measurements

Sensor	Calibrated Range	0-5V output scale	LDL	Accuracy	Resolution	Response Time (T90)	Sampling Method ²	Operating Temp. (environmental)	Relative Humidity (non-condensing)
Carbon monoxide 0 - 100 ppm	0 - 100	0 - 100	0.5 ppm	<± 5 ppm	0.1 ppm	< 150 s	D	-5°C to 40°C	5 to 95%
Hydrogen sulphide 0 - 10 ppm	0 - 10	0 - 10	10 ppb	<± 0.5 ppm	0.01 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
Ozone 0 - 0.150 ppm	0 - 0.150	0 - 0.500	1 ppb	<± 0.005 ppm	0.001 ppm	< 70 s	F, P1, P2	-5°C to 40°C	5 to 95%
Ozone 0 - 0.5 ppm	0 - 0.500	0 - 0.500	1 ppb	<±0.008ppm 0 - 0.1ppm <± 10% 0.1 - 0.5ppm	0.001 ppm	< 60 s	F, P1,P2	-5°C to 40°C	5 to 95%
NMHC ¹ 0 - 25 ppm	0 - 25	0 - 25	0.1 ppm	<± 10% 0.1 - 25 ppm	0.1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
PID 0 - 20 ppm	0 - 20	0 - 50	0.01 ppm	<10%	0.01 ppm	<30 s	D	-5°C to 40°C	5 to 90%
Sulphur dioxide 0 - 10 ppm	0 - 10	0 - 10	0.2 ppm	<± 0.5 ppm	0.01 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
VOC 0 - 25 ppm	0 - 25	0 - 25	0.1 ppm	<± 10% 0.1 - 25 ppm	0.1 ppm	< 60 s	D	-5°C to 40°C	5 to 95%
Temperature	-20 to 100°C	-40 to 120°C	0.01°C	<± 0.3°C	0.01°C	< 1 s	N/A	-40 to 120°C	0 to 100%
Humidity	0 to 100%	100%	1% RH	2% RH	1% RH	< 1 s	N/A	-40 to 120°C	0 to 100%

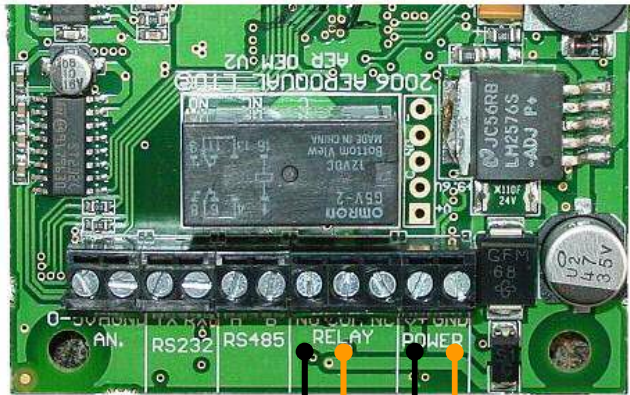
- ¹ Non Methane Hydrocarbon sensor (lower sensitivity to alcohols & esters)
² D=diffusion, F=fan, P1=economy pump, P2 = longlife pump
 Note: These units come with 12 bit DAC on analog outputs as standard.

Wiring Guide for External Relay to SM50

Typical wiring diagram for a Normally Open relay circuit

Note: the default condition is to always use relays in normally open mode so as to create a "fail safe" solution

**Aeroqual SM50
Gas Sensor Module**



Insert jumper wire between Com and GND

Insert diode in circuit to suppress back EMF

