



# SM50 Sensor Module Guide



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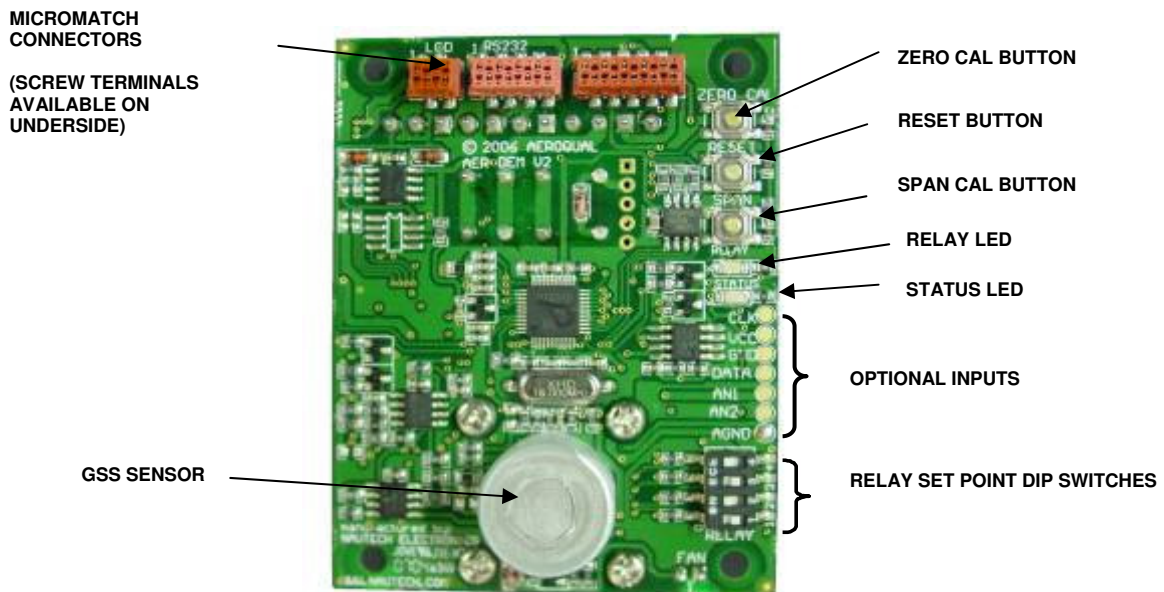
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## Description

The Aeroqual SM50 range of gas sensor modules provides state of the art gas measurement in a flexible cost effective package. They utilise Aeroqual's GSS Technology to provide reliable and sensitive measurement for a wide range of gases. There are two gas response specifications available - "Standard" for industrial process control or leak detection applications and "High Spec" for low level ambient gas measurements. Furthermore the modules are available in diffusion, fan and pump sampling versions. Please consult your Aeroqual Business Development Manager for further information.

Each SM50 module is calibrated to give a linear output with gas concentration. There are multiple outputs fitted as standard including diagnostic LEDs, 0-5V signal, relay, RS232, and RS485 digital communications. I2C is available as an option.

Standard inputs include dipswitch settings for the relay and calibration buttons. Optional inputs include two analog voltages and two x GPIO which can be used to connect a temp/RH sensor.



## Operating Instructions

### Power

The SM50 module will run off a DC input voltage in the range 11 - 24 VDC. Connect power to the V+ and GND screw terminal connectors or to the VIN and GND pins on the micromatch connectors. Power consumption varies depending on the SM50 sensor in the range 2.5 to 6W.

### Warm Up

The SM50 module is designed to run continuously. On first time use or after a period of non-use the SM50 module should be run for a couple of hours to burn off contaminants on the sensor. When power is switched on the SM50 will warm up for 3-10 minutes before full operation.

### Calibration

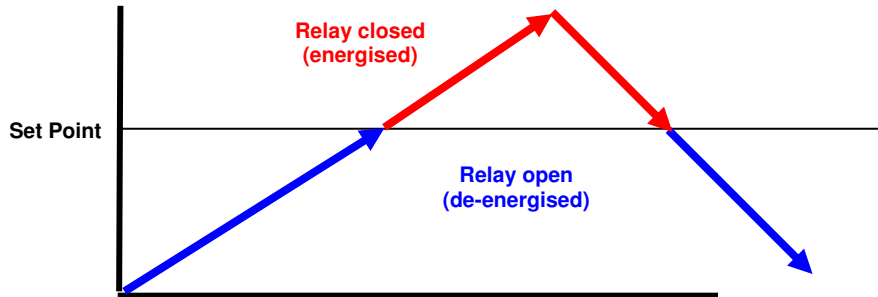
**Zero Cal:** Pressing the Zero Cal button will initiate an automatic zero calibration. The unit should be in clean contaminant free air prior to activating this function.

**Span Cal:** \*\*\*\*Caution\*\*\*\* Span calibration is for factory use only. Pressing this button will permanently alter the calibration.

## Using the Relay Output

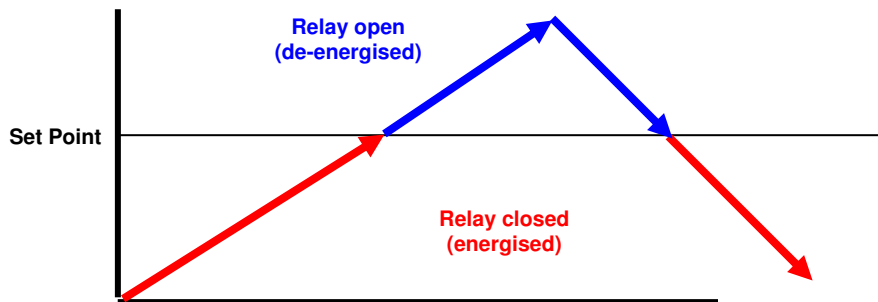
The SM50 sensor module can be used as a simple gas sensitive relay switch to control devices or activate alarms using the on board relay. Three relay control software options are available: **AA, AB, C10**. The user should specify the software prior to delivery. The relay logic of the three software versions is described below. External equipment connected to the on-board relay should be wired appropriately to the normally open or normally closed contacts

**AA** Alarm-Above: the relay 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. **This is the default software.**



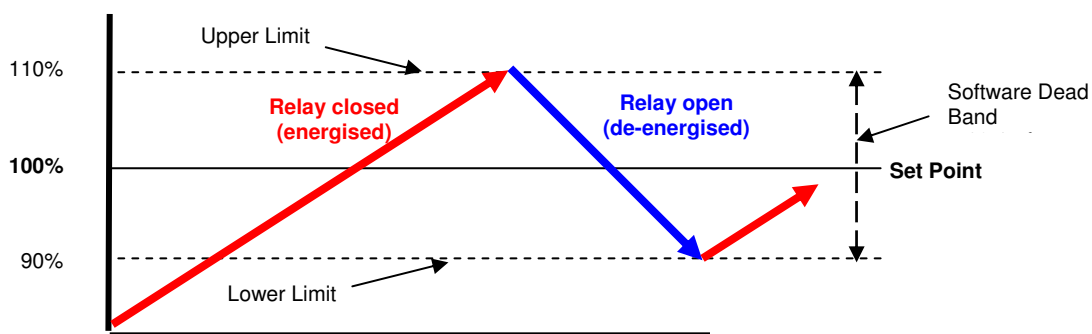
- When gas concentration is rising from below the "Set Point", **relay remains open (de-energised)**
- When gas concentration rises and reaches the "Set Point", **relay closes (energised)**
- When gas concentration drops and reaches the "Set Point", **relay opens (de-energised)**

**AB** Alarm-Below: the relay is programmed to energise or activate below the selected set point. Typical applications are fail safe warning systems or controlling a gas generator.



- 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 and reaches the "Set Point", **relay closes (energised)**

**C10** The relay is programmed to energise and de-energise around the selected control 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.



- 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)**

## Setting the Relay and Alarm Set Point

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

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

Relay dipswitch (1 2 3 4)	O3 0-0.150 (ppm)	O3 0-0.500 (ppm)	O3 0-10 (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 0-10.0 (ppm)	SO2 0-10 (ppm)	SO2 0-100 (ppm)	CH4 0-10000 (ppm)
on on on on	0.000	0.000	0.00	0.000	0	0	0	0	0	0.0	0.0	0	0
off on on on	0.010	0.025	0.50	0.010	5	20	5	10	20	0.5	0.5	5	500
on off on on	0.020	0.050	1.00	0.020	10	40	10	20	40	0.6	1.0	10	750
off off on on	0.030	0.075	1.50	0.030	15	60	15	30	60	0.7	1.5	15	1000
on on off on	0.040	0.100	2.00	0.040	20	80	20	40	80	0.8	2.0	20	1500
<b>off on off on *</b>	<b>0.050</b>	<b>0.125</b>	<b>2.50</b>	<b>0.050</b>	<b>25</b>	<b>100</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>0.9</b>	<b>2.5</b>	<b>25</b>	<b>2000</b>
on off off on	0.060	0.150	3.00	0.060	30	120	30	60	120	1.0	3.0	30	2500
off off off on	0.070	0.175	3.50	0.070	35	140	35	70	140	2.0	3.5	35	3000
on on on off	0.080	0.200	4.00	0.080	40	160	40	80	160	3.0	4.0	40	3500
off on on off	0.090	0.225	4.50	0.090	45	180	45	90	180	4.0	4.5	45	4000
on off on off	0.100	0.250	5.00	0.100	50	200	50	100	200	5.0	5.0	50	5000
off off on off	0.110	0.300	6.00	0.120	60	250	60	150	250	6.0	6.0	60	6000
on on off off	0.120	0.350	7.00	0.140	70	300	70	250	300	7.0	7.0	70	7000
off on off off	0.130	0.400	8.00	0.160	80	350	80	500	350	8.0	8.0	80	8000
on off off off	0.140	0.450	9.00	0.180	90	400	90	750	400	9.0	9.0	90	9000
off off off off	0.150	0.500	10.00	0.200	100	500	100	1000	500	10.0	10.0	100	10000

\* Factory default setting

## Status LED / Diagnostics

At start up, the green 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 red Relay LED indicates that the relay coil is energised.

## 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 relay is energised (the red relay LED will light up) the normally open (NO) will short to common (COM) and the normally closed (NC) will be open with respect to COM.

## Connecting to the Relay

Connect the desired external device to the normally open (NO), normally closed (NC) and COM contacts on the screw terminal as shown below.



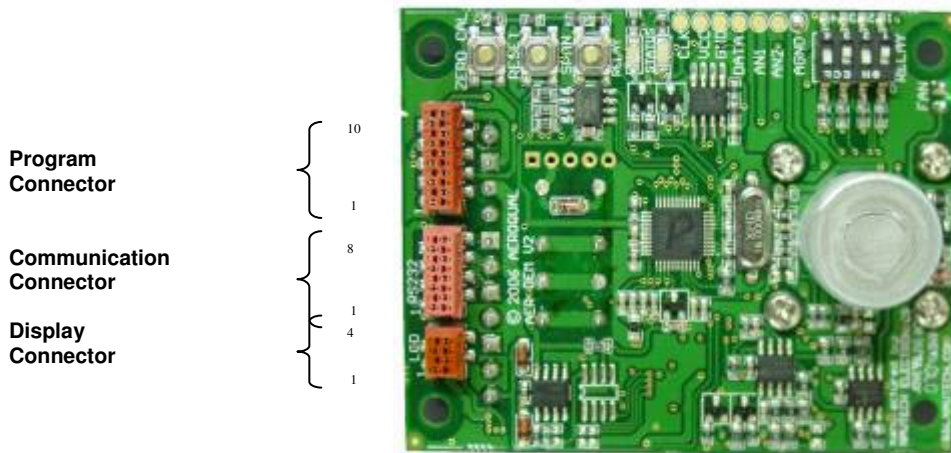
## Using the Analog 0-5V Output

The gas concentration is available on the 0-5V signal at the 0-5V and AGND connectors on the screw terminal block and on the 0-5V OUT and AGND pins on the communication micromatch connector. 0 volts = zero ppm and 5 V = designated range of sensor (for example, a 0-0.5 ppm O<sub>3</sub> SM50 module would output 5V at 0.500 ppm ozone). The standard resolution of the analog signal is 8 bit but a 12 bit version is available if required (see your Aeroqual Business Development Manager).

## Using the Serial Digital Communications

Gas concentration data and diagnostic information is available on the Rs232 and Rs485 digital communication. These are both 2-wire and connection is via either the micromatch or screw terminal connectors. The communication protocols for these serial connections are provided in the Appendix. The RS232 serial protocol is not ASCII and therefore is not supported by Hyperterminal programs. The RS485 protocol does not support network architecture.

An optional I2C interface is available on the 4-way micromatch Display connector. Please contact the factory if you wish to use this interface.



### Program Connector

PIN	1	2	3	4	5	6	7	8	9	10
CONFIG.	VCC (5V)	BUSY	CLK	R x D RS485	GND	RESET	CNV	T x D RS485	N/A	VIN (11-24V)

### Communication Connector

PIN	1	2	3	4	5	6	7	8
CONFIG.	VIN (11-24V)	GND	METER_TX (RS232)	METER_RX (RS232)	SPAN	ZERO	0-5V OUT (analog)	AGND (analog GND)

### Display Connector

PIN	1	2	3	4
CONFIG.	VCC (5V)	SCL (clock)	SDA (data)	GND

## Appendix

### Specification

#### Power

Input	11 - 24 VDC
Consumption	2.5 - 6 W max

#### Outputs

0-5V analog	8 bit
Relay	Onboard 24VDC / 2A, NO, NC, COM
2 x LED indicators	Relay status        Red = activated Sensor status       Green = normal Green slow flash (2 seconds) = warming up Green fast flash (0.3 seconds) = failure
RS232	2-wire proprietary protocol (not ASCII)
RS485	2-wire proprietary protocol (not networkable)
I2C	optional

#### Inputs

Relay set points	4-way dip switch
Zero calibration	Auto-calibration zero button
Reset	Microprocessor reset button
Span calibration	Factory use only
Analog inputs	2 Voltage (optional)
Digital input	2 x GPIO (optional, can be used for digital temp/RH sensor)

#### Diagnostics

If sensor failure then:-	
Status LED	fast green flash
Relay	AA version (energised) LED red AB version (de-energised) LED off C10 version (de-energised) LED off
0-5V analog output	5V

#### Mechanical

Board Size	60 mm x 75 mm
Mounting	Screw or extrusion slot
Fan (if required)	On-board ball-bearing 50,000 hours
Sensor filter	On-board

#### Options

Serial Display	Display Connector
High resolution 0-5V analog	12 bit
Temp/RH sensor	GPIO option
I2C output	Display Connector

#### Environmental

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

#### Approvals

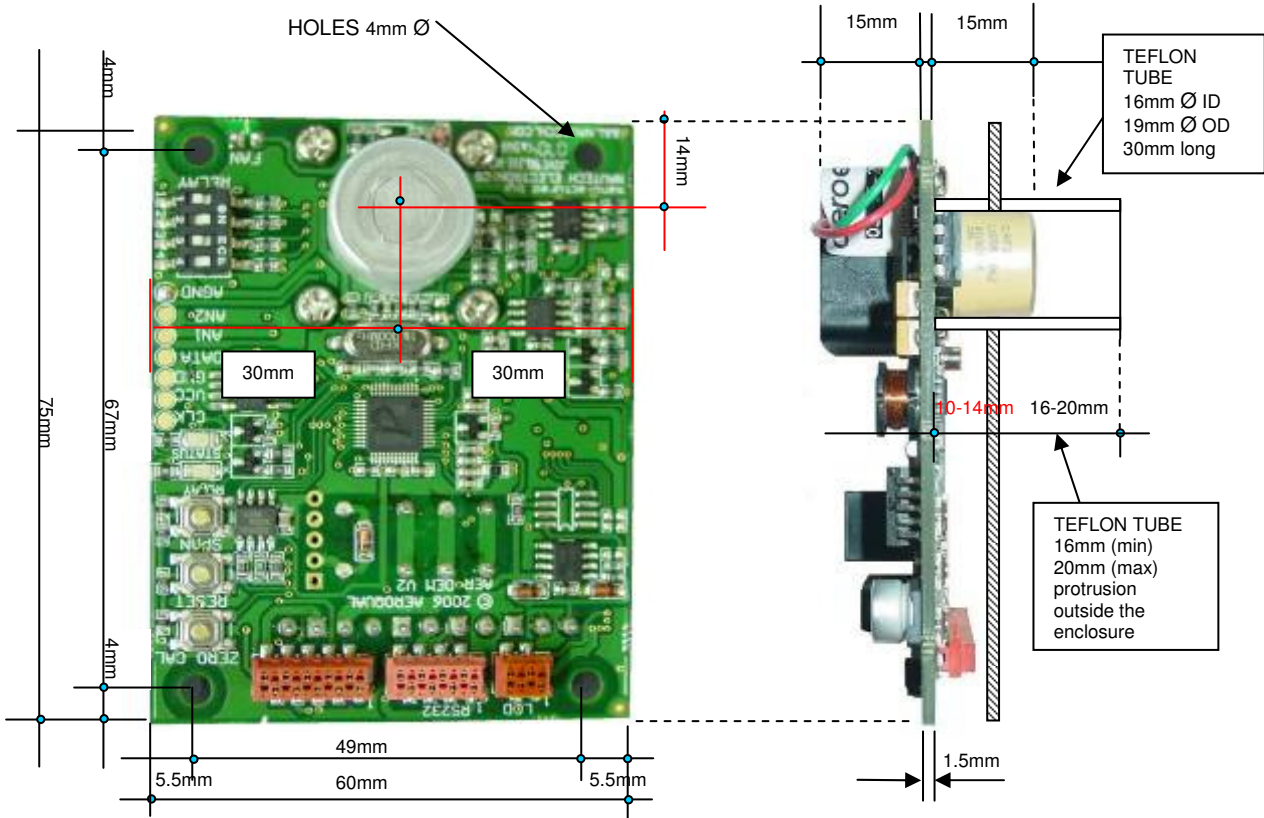


#### Warranty

1 year limited warranty (excluding calibration)

## Mounting Dimensions

The mounting points and dimensions are given below for an SM50 ozone sensor. Individual SM50 modules may differ slightly to that shown.



## Standard SM50 Gas Performance Data For Industrial and Health & Safety Applications

Sensor	Calibrated Range (ppm)	0-5V output scale	LDL	Accuracy of Factory Calibration	Resolution (ppm)	Response Time (T90)	Sampling Method <sup>1</sup>	Operating Temp. (environmental)	Relative Humidity (non-condensing)
Ammonia 0-100 ppm	0-100	0-100	0.5 ppm	<± 5ppm 0-100 ppm	0.1	< 60 s	D	-5°C to 40°C	5 to 95%
Ammonia (leak) 0-1000 ppm	0-1000	0-1000	2 ppm	<± 15%	1	< 60 s	D	-5°C to 40°C	5 to 95%
Carbon monoxide 0-1000 ppm	0-1000	0-1000	1 ppm	<± 20%	1	< 150 s	D	-5°C to 40°C	5 to 95%
Carbon dioxide 0-2000 ppm	0-2000	0-5000	-	<± (40 ppm + 3%)	10	< 60 s	D	-5 to 40°C	5 to 95%
Carbon dioxide 0-5000 ppm	0-5000	0-5000	-	<± (150 ppm + 5%)	10	< 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 <sup>1</sup>	0-5000	0-5000	5 ppm	<± 10 %	1	< 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	< 60 s	D	-5°C to 40°C	5 to 95%
Methane 0-10000 ppm	0-9999	0-10000	-	<± 15%	1	< 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	< 60 s	F,P	-5°C to 40°C	5 to 95%
Ozone <sup>2</sup> 0-10 ppm	0-10	0-10	10 ppb	<±0.1ppm 0-1 ppm; <±15% 1-10 ppm	0.01	< 60 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	< 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	< 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	<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	< 60 s	D	-5°C to 40°C	5 to 95%
VOC <sup>3</sup> 0-500 ppm	0-500	0-500	1 ppm	<±10 ppm 0-200 ppm <±10% 200-500 ppm	1	< 60 s	F	-5°C to 40°C	5 to 95%
Other Gases	Contact Aeroqual with specific requirements for gas and concentration								

<sup>1</sup> Other specific concentrations available on request  
<sup>2</sup> Accuracy < 0.1 ppm is unspecified (for applications that require accurate measurement < 0.1 ppm use low or ultra-low sensor heads)  
<sup>3</sup> Calibrated against Isobutylene. Other specific VOC calibrations are available on request  
<sup>4</sup> D= diffusion, F = fan, P= pump

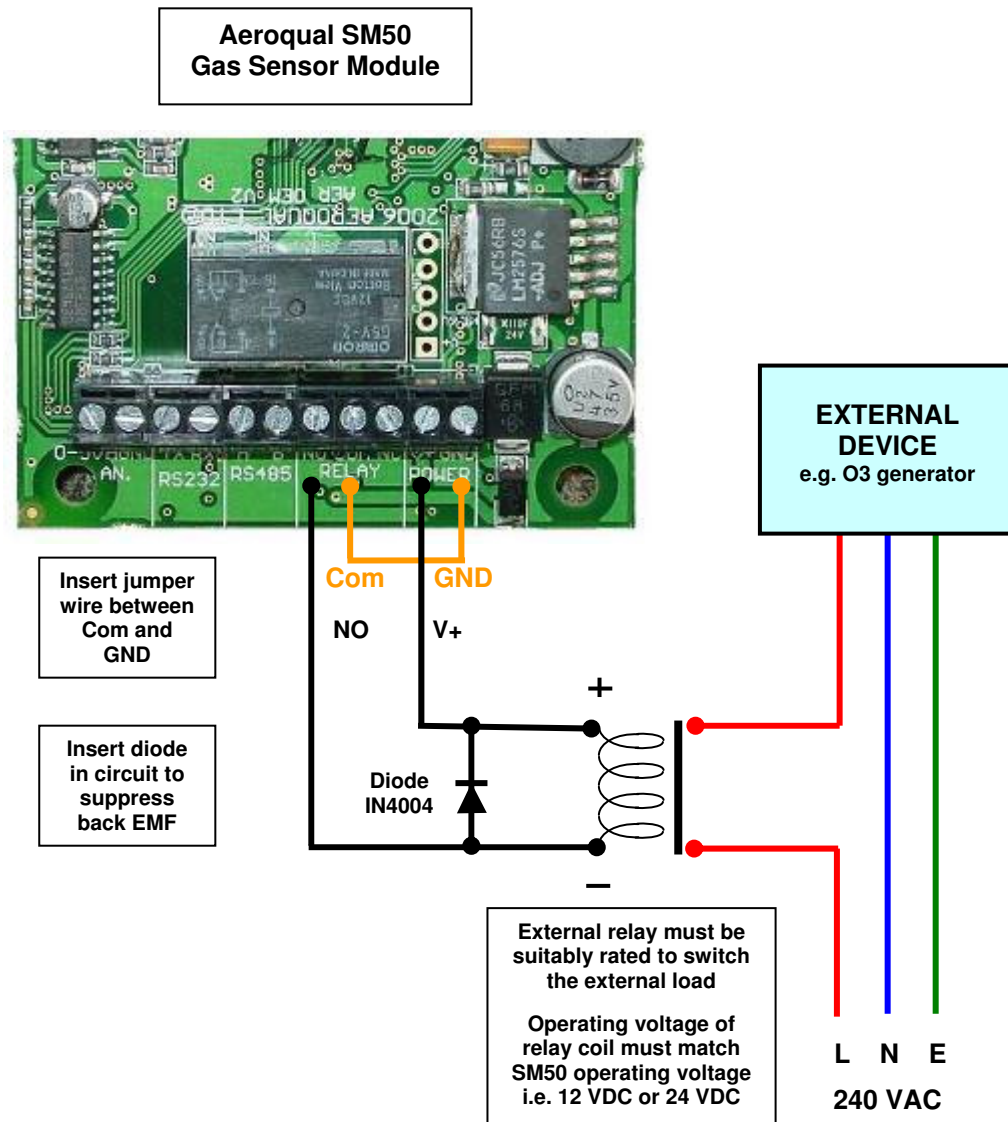
## High Spec SM50 Gas Performance Data For Ambient Measurements

Sensor	Calibrated Range (ppm)	0-5V output scale	LDL	Accuracy of Factory Calibration	Resolution (ppm)	Response Time (T90)	Sampling Method <sup>2</sup>	Operating Temp. (environmental)	Relative Humidity (non-condensing)
Carbon monoxide 0-100 ppm	0-100	0-100	0.5 ppm	<± 5 ppm	0.1	< 150 s	D	-5°C to 40°C	5 to 95%
Hydrogen sulphide	0-10	0-10	10 ppb	<± 0.5 ppm	0.01	< 60 s	D	-5°C to 40°C	5 to 95%
Ozone 0-0.15 ppm	0-0.150	0-0.500	1 ppb	<± 0.005 ppm	0.001	< 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	<±0.008 ppm 0-0.1 ppm	0.001	< 60 s	F, P1,P2	-5°C to 40°C	5 to 95%
NMHC <sup>1</sup> 0-25 ppm	0-25	0-25	0.1 ppm	<± 10% 0.1-25 ppm	0.1	< 60 s	D	-5°C to 40°C	5 to 95%
PID 0-20 ppm	0-20	0-20	0.01 ppm	<10%	0.01	<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	< 60 s	D	-5°C to 40°C	5 to 95%
VOC <sup>3</sup> 0-25 ppm	0-25	0-25	0.1 ppm	<± 10% 0.1-25 ppm	0.1	< 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%

<sup>1</sup> Non Methane Hydrocarbon sensor (lower sensitivity to alcohols & esters)  
<sup>2</sup> D=diffusion, F=fan, P1=economy pump, P2 = long-life pump  
 Note: These units come with optional 12 bit DAC on analog outputs (special – not x-stock).

## Wiring Guide for External Relay to SM50

Example of a wiring diagram for a Normally Open relay circuit



## RS232 Protocol

The Aeroqual OEM sensor's digital information output is based on the following RS232 protocol. These command protocols are specified by Aeroqual Limited, all rights reserved. Aeroqual reserves the right to change the protocol without notification.

### Version 2.2

Date: 23-09-2009

- \* Added zero calibration function.
- \* Combined with temperature and relative humidity sensor data.

### Section 1.

Descriptions of communication commands (for data format and representations please refer to section 3). Comma and spaces are not applied for every command and reply data stream, they are just used for clearly specifying data stream:

1. OEM sensor regular data report command; the data report interval varies with sensor.  
It is 15 bytes data stream:

SENSOR, DATA\_REPORT, DATA1, DATA2, DATA3, RESERVED2, STATUS1, STATUS2, CHECKSUM

- \* SENSOR - 1 byte monitor reply data stream header, see section 2 for its value.
- \* DATA\_REPORT - 1 byte data report command, see section 2 for its value.
- \* DATA1 - 4 bytes floating point data, gas concentration value.
- \* DATA2 - 2 bytes unsigned int used for optional sensors of temperature reading, its value scaled up by 10.  
that means if the reported value is 256, then the actual reading is 25.6 Celsius degree.
- \* DATA3 - 2 bytes unsigned int used for optional sensors of relative humidity reading, its value scaled up by 10.  
that means if the reported value is 515, then the actual reading is 51.5%.
- \* RESERVED2 - is 2 bytes reserved.
- \* STATUS1 - 1 byte sensor status indication, refer section 3 for details.
- \* STATUS2 - 1 byte sensor status indication, refer section 3 for details.
- \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.

2. OEM sensor information request command:

Command                    RECEIVER, SENSOR\_INFO, RESERVED1, CHECKSUM

Reply                    SENSOR, SENSOR\_INFO, VERSION\_NO, DISPLAY, NMAE\_LENGTH, SENSOR\_NAME, RESERVED2, CHECKSUM

- \* RECEIVER - 1 byte information request command header, see section 2 for its value.
- \* SENSOR - 1 byte monitor reply data stream header, see section 2 for its value.
- \* SENSOR\_INFO - 1 byte command see section 2 for its value
- \* VERSION\_NO - 1 byte sensor version number, see section 2 for its value.
- \* DISPLAY - 1 byte, gas concentration value display format type, see section 2 for its value.
- \* NAME\_LENGTH - 1 byte specify the sensor name byte length
- \* SENSOR\_NAME - 7 bytes, the gas sensor name ASCII code, its valid bytes are specified by NMAE\_LENGTH
- \* RESERVED1 - 1 bytes reserved use value 0x00.
- \* RESERVED2 - 2 bytes not used.
- \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.

### 3. OEM sensor concentration ppm to mg/m3 conversion factor request command:

Command                    RECEIVER, CONVERT\_FACTOR, RESERVED1, CHECKSUM

Reply                      SENSOR, CONVERT\_FACTOR, FACTOR, RESERVED8, CHECKSUM

- \* SENSOR - 1 byte monitor reply data stream header, see section 2 for its value.
- \* CONVERT\_FACTOR - 1 byte command see section 2 for its value
- \* FACTOR - 4 bytes floating point conversion factor value, see section 3 for details.
- \* RESERVED1 - 1 bytes reserved use value 0x00.
- \* RESERVED8 - 8 bytes reserved.
- \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.

### 4. OEM sensor zero calibration command, 4 bytes:

Command                    RECEIVER, ZERO\_CAL, RESERVED1, CHECKSUM

- \* ZERO\_CAL - 1 byte (0x12) command to start zero calibration for the sensor, see section 2 for its value.
- \* RESERVED1 - 1 bytes reserved use 0x00.
- \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.
- \* During zero calibration OEM status LED will slowly flash, once the flash finished, zero calibration finished too.

## Section 2.

Protocol command values:

RECEIVER	= 0x55	//header command used for receiver command
SENSOR	= 0xAA	//header command used for monitor reply
DATA_REPORT	= 0x10	//regular data report command
ZERO_CAL	= 0x12	//zero calibration command
SENSOR_INFO	= 0xFB	//parameters upload command
CONVERT_FACTOR	= 0x2A	//update monitor real time clock
RESERVED	= 0x00	//the byte not been used for information transfer

CHECKSUM    a data stream's check sum - that makes the command stream total sum is zero.

DISPLAY display format can be following:

- = 0x01 - 1 digit int, 3 decimal points, eg. 0.500 ppm
- = 0x02 - 2 digits int, 2 decimal points, eg. 12.20 ppm
- = 0x03 - 3 digits int, 1 decimal point, eg. 126.8 ppm
- = 0x04 - 4 digits int, no decimal point, eg. 2888 ppm

STATUS1 8 bits monitor and sensor status information

SS0    \* b0 \ 00 sensor working fine,

SS1    \* b1 / 01 sensor failure,

11 sensor aging (for O3 LOW sensor only).

Reserved1	* b2 Reserved not been used
Reserved2	* b3 Reserved not been used
Reserved3	* b4 Reserved not been used
Reserved4	* b5 Reserved not been used
Reserved5	* b6 Reserved not been used
Reserved6	* b7 Reserved not been used

STATUS2	8 bits monitor and sensor status information
Reserved0	* b0 Reserved not been used
Reserved1	* b1 Reserved not been used
Zeroing	* b2 = 0 sensor normal working mode * b2 = 1 sensor zeroing
Reserved2	* b3 Reserved not been used
Reserved3	* b4 Reserved not been used
Reserved4	* b5 Reserved not been used
Reserved5	* b6 Reserved not been used
Reserved6	* b7 Reserved not been used

### Section 3.

Data value format representation:

The floating point data values use IEEE754 32 bits floating point little ending representation. They are:

DATA1 and FACTOR

### Section 4.

Data transfer mechanism

1. Due to the monitor main chips feature, 4 bytes floating point data and 2 bytes int data send sequence are low byte first, high byte last, such as section 3 data DATA1, DATA2, ADAT3 and FACTOR.

2. For regular data report:

The OEM sensor will automatically send out a measured data result to the RS232 serial port according to sensor type. The data report interval will vary with different sensors. The longest report interval is about 2 minutes, the shortest one is only 2 seconds. Please ask Aeroqual for this information when needed.

### Section 5.

RS232 communication port settings:

Baud rate:	9600
Data bits:	8
Stop bits:	1
Parity:	none
Flow control:	none

## RS485 Protocol

The Aeroqual OEM sensors digital information output is available on RS485. These command protocols are specified by Aeroqual Limited, all rights reserved. Aeroqual keep the rights to change the protocol without notification.

Version 1.0  
Date: 05-12-2008

### Section 1.

Descriptions of communication commands (for data format and representations please refer to section 3). Comma and spaces are not applied for every command and reply data stream, they are just used for clearly specifying data stream:

Aeroqual OEM sensor module RS485 protocol is a slave mode. Master receivers need send request command to get response.

1. OEM sensor data request command, it is 4 bytes data stream:

BASE, DATA\_REQUEST, RESERVED, CHECKSUM

example: 0x55, 0x1A, 0x00, 0x91

Reply data stream is 15 byte.

SENSOR, DATA\_REPORT, DATA1, DATA2, RESERVED, STATUS1, STATUS2, CHECKSUM

The second byte (DATA REPORT) will be either 0x1A or 0x0F or 0x10. Only if DATA REPORT = 0x10 will DATA1 be a valid concentration reading.

- \* SENSOR - 1 byte monitor reply data stream header, see section 2 for its value.
- \* DATA\_REQUEST - 1 byte heater data report, see section 2 for its value.
- \* DATA\_REPORT - 1 byte gas concentration data report command, see section 2 for its value.
- \* DATA1 - 4 bytes floating point data, when command reply is DATA\_REPORT, this value is gas concentration in ppm,
- \* DATA2 - reserved
- \* RESERVED - is 2 bytes data space reserved.
- \* STATUS1 - 1 byte monitor and sensor status indication, refer section 3 for details.
- \* STATUS2 - 1 byte reserved.
- \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.

2. OEM sensor information request command:

Command

BASE, SENSOR\_INFO, RESERVED, CHECKSUM

Reply

SENSOR, SENSOR\_INFO, VERSION\_NO, DISPLAY, NMAE\_LENGTH, SENSOR\_NAME, RESERVED, CHECKSUM

- \* BASE - 1 byte information request command header, see section 2 for its value.
- \* SENSOR - 1 byte monitor reply data stream header, see section 2 for its value.
- \* SENSOR\_INFO - 1 byte command see section 2 for its value
- \* VERSION\_NO - 1 byte sensor version number, see section 2 for its value.
- \* DISPLAY - 1 byte, gas concentration value display format type, see section 2 for its value.
- \* NAME\_LENGTH - 1 byte specify the sensor name byte length

\* SENSOR\_NAME - 7 bytes, the gas sensor name ASCII code, its valid bytes are specified by NMAE\_LENGTH  
 \* RESERVED - 1 byte  
 \* CHECKSUM - 1 byte the data stream's check sum - that makes the command stream total sum is zero.

## Section 2.

Protocol command values are in hexdecimals not ASCII:

BASE = 0x55 //header command used for receiver command  
 SENSOR = 0xAA //header command used for monitor reply  
 DATA\_REPORT = 0x10 //regular data report command  
 DATA\_REQUEST = 0x1A //heater data request/report command  
 SENSOR\_INFO = 0xFB //parameters upload command

RESERVED = 0x00 //the byte not been used for information transfer

CHECKSUM \* a data stream's check sum - that makes the command stream total sum is zero.

DISPLAY \* display format can be following:

= 0x01 - 1 digit int, 3 decimal points, eg. 0.500 ppm  
 = 0x02 - 2 digits int, 2 decimal points, eg. 12.20 ppm  
 = 0x03 - 3 digits int, 1 decimal point, eg. 126.8 ppm  
 = 0x04 - 4 digits int, no decimal point, eg. 2888 ppm

STATUS1 \* 8 bits monitor and sensor status information

SS0 \* b0 \ 00 sensor working fine,

SS1 \* b1 / 01 sensor failure,

11 sensor aging.

Reserved1 \* b2 Reserved not been used  
 Reserved2 \* b3 eserved not been used  
 Reserved3 \* b4 Reserved not been used  
 Reserved4 \* b5 Reserved not been used  
 Reserved5 \* b6 Reserved not been used  
 Reserved6 \* b7 Reserved not been used

## Section 3.

Data value format representation:

The floating point data values use IEEE754 32 bits floating point little ending representation.

They are: DATA1, DATA2

## Section 4.

Data transfer mechanism

Due to the monitor main chips feature, 4 bytes floating point data and 2 bytes int data send sequence are low byte first, high byte last, such as section 3 data DATA1 and FACTOR.

## Section 5.

RS485 communication port settings:

Baud rate: 4800  
 Data bits: 8  
 Stop bits: 1  
 Parity: none  
 Flow control: none