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Contents

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Foreword

20.01.09

Aeroqual Limited
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Statements of Compliance

1. The Aeroqual SM70 Monitor/Controller complies with EN 61000-6-3:2001
2. The Aeroqual SM70 Monitor/Controller complies with EN 61000-6-1:2001
3. The Aeroqual SM70 Monitor/Controller complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

   NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

   — Reorient or relocate the receiving antenna.
   — Increase the separation between the equipment and receiver.
   — Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
   — Consult the dealer or an experienced radio/TV technician for help.

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Warranty

Thank you for purchasing this Aeroqual product. To get maximum use of the features of your new product we recommend that you follow a few simple steps:

- Read the guidelines for safe and efficient use.
- Read all the terms and conditions of your Aeroqual Warranty.
- Save your original receipt. You will need it for warranty repair claims.

Should your Aeroqual product need warranty service, you should return it to the dealer from whom it was purchased or contact Aeroqual.

Our Warranty

Aeroqual warrants this product to be free from defects in material and workmanship at the time of its original purchase by a consumer, and for a subsequent period as stated in the following table:

Products	Warranty Period
SM70 PC Board	One year from the date of purchase
Sensor heads for all gases	Six months from the date of purchase

This warranty is expressly limited to the original owner who purchases the equipment directly from Aeroqual or from an authorized Aeroqual dealer.

What we will do

If, during the warranty period, this product fails to operate under normal use and service, due to improper materials or workmanship, Aeroqual subsidiaries, authorized distributors or authorized service partners will, at their option, either repair or replace the product in accordance with the terms and conditions stipulated herein.

Conditions

1. The warranty is valid only if the original receipt issued to the original purchaser by the dealer, specifying the date of purchase, is presented with the product to be repaired or replaced. Aeroqual reserves the right to refuse warranty service if this information has been removed or changed after the original purchase of the product from the dealer.

2. If Aeroqual repairs or replaces the product, the repaired or replaced product shall be warranted for the remaining time of the original warranty period or for ninety (90) days from the date of repair, whichever is longer. Repair or replacement may be via functionally equivalent reconditioned units. Replaced faulty parts or components will become the property of Aeroqual.

3. This warranty does not cover any failure of the product due to normal wear and tear, damage, misuse, including but not limited to use in any other than the normal and customary manner, in accordance with Aeroqual's user guide for use, faulty installation, calibration and maintenance of the product, accident, modification or adjustment, events beyond human control, improper ventilation and damage resulting from liquid or corrosion.

4. This warranty does not cover product failures due to repairs, modifications or improper service performed by a non-Aeroqual authorized service workshop or opening of the product by non-Aeroqual authorized persons.

5. The warranty does not cover product failures which have been caused by use of non-Aeroqual original accessories.

6. This warranty becomes void if a non-Aeroqual approved AC/DC adaptor or battery is used.

7. Tampering with any part of the product will void the warranty.

8. Damage to the sensors can occur through exposure to certain sensor poisons such as silicones, tetraethyl lead, paints and adhesives. Use of Aeroqual sensors in these environments containing these materials may (at the discretion of Aeroqual) void the warranty on the sensor head. Exposure to gas concentrations outside of the design range of a specific Aeroqual sensor head can adversely affect the calibration of that sensor head and will also void this warranty as it applies to the replacement of sensor heads.

9. Aeroqual makes no other express warranties, whether written or oral, other than contained within this printed limited warranty. To the fullest extent allowable by law all warranties implied by law, including without limitation the implied warranties of merchantability and fitness for a particular purpose, are expressly excluded, and in no event shall Aeroqual be liable for incidental or consequential damages of any nature whatsoever, however they arise, from the purchase or use of the product, and including but not limited to lost profits or business loss.

10. Some countries restrict or do not allow the exclusion or limitation of incidental or consequential damage, or limitation of the duration of implied warranties, so the preceding limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which may vary from country to country.

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For Your Safety

Read these simple guidelines. Ignoring these guidelines may be hazardous.

- **USE SENSIBLY**
  Use only as per this user guide.
- **USE AEROQUAL APPROVED SERVICE**
  Only approved service personnel must work on this product.
- **ACCESSORIES**
  Use only approved accessories. Do not connect incompatible products.
- **CONNECTING TO OTHER DEVICES**
  When connecting to any other device, read the appropriate user guide for detailed safety instructions. Do not connect incompatible products.
- **HAZARDOUS ENVIRONMENTS (Ozone Sensors Only)**
  Do not use the Ozone Sensors in or near volatile fuel or chemicals.
- **HEALTH AND SAFETY IN THE WORKPLACE**
  The Aeroqual SM70 Monitors are used to monitor ambient gas concentrations. Aeroqual does not guarantee user safety. In hazardous environments, an appropriate Health and Safety plan should be in place.

Monitor Components

SM70 Monitor / Controller

The following components are supplied with the SM70 Monitor:

- SM70 Monitor
- 12 VDC 800 mA AC/DC adaptor
- Enclosure mounting brackets
- User guide
- Cable gland (for use only when relay outputs are required)

Please check that all these components have been supplied and contact your dealer or Aeroqual on email at: sales@aeroqual.com if any of the components are missing.

About Your Monitor / Controller

The Aeroqual **SM70 Monitor/Controller** is designed to measure and control gas concentrations by activating an internal relay (switch). The unit is pre-configured with specific software to operate in only one of two ways:-

1. **As a simple switching device** (switching equipment on and off).
2. **As a control device** (to maintain a specific gas concentration between user defined levels through the control of an external device via the on-board relay)

The Aeroqual SM70 Monitor/Controller has been specifically designed to incorporate Aeroqual's in-depth knowledge of accurate ambient gas measurement. Different sensor modules are used for specific gases and concentrations and the configuration of the SM70 may change slightly depending upon the actual gas monitoring requirements.

The sensor module (sensor & printed circuit board) is calibrated prior to delivery and does **not normally need to be re-calibrated** during its life. (Specific user guides are supplied where special configuration of particular sensor modules is needed).

The Aeroqual SM70 Monitor/Controller comes with **in-built diagnostics**, which will inform the service personnel if the sensor is not operating correctly – see Status LED on page 12.

An **optional buzzer** can be fitted to the SM70 (excluding ozone SM70) which is activated above a user defined set point.

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Installation

Wall mounting brackets are provided and fit into the holes at each corner of the enclosure – see picture below.
Concealed, tamperproof screw fixing through the corner posts of the enclosure is also possible without using the fixing brackets.

The **SM70** should be installed at a location that is free from contaminants that might affect the performance of the sensor module. In general the SM70 should **never** be exposed to:

- steam, fumes, water or chemical spray,
- high condensing humidity
- cooking vapors/aromas
- paint fumes
- high levels of dust
- constant high air flows

Turning the monitor on and off

The SM70 is designed to run constantly. To turn the monitor on:

- Connect the AC/DC adaptor to the mains supply. Ensure that the adaptor is correctly rated for the power supply.
- Plug the adaptor into the monitor.

To turn the SM70 off, simply disconnect the power supply by unplugging the adaptor.

Warm up

Prior to operation the monitor must be warmed up to burn off contaminants on the sensor. When the monitor is first switched on, it will warm up for between 3 & 10 minutes depending on the particular gas being monitored. The monitor should be run for 24 hours prior to use if it has been switched off for more than 7 days.

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Operating Instructions

1. Operation as a Switching Device

Setting the Relay and Buzzer Set Point

The Relay and Buzzer Set Point is factory set to the following values (unless otherwise specified):

Relay dipswitch (1 2 3 4)	Ozone Low (ppm)	Ozone High (ppm)	VOC (ppm)	Perc (ppm)	Hydrocarbon (ppm)	Ammonia (ppm)
off on off on	0.125	5	100	50	100	50

The Alarm Buzzer and/or Relay Set Point can be altered by opening the enclosure and adjusting the set-point dip-switches on the printed circuit board as shown in the picture below.

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

The relay / alarm buzzer set-point settings in “parts per million” (ppm) are as follows:

Relay dipswitch (1 2 3 4)	Ozone low	Ozone High	VOC	Perc	Hydro carbon	Ammonia
on on on on	0.000	0	10	0	0	0
off on on on	0.025	1	20	10	**20**	10
on off on on	0.050	2	30	20	40	20
off off on on	0.075	3	40	30	60	30
on on off on	0.100	4	50	40	80	40
off on off on	**0.125**	**5**	**75**	**50**	100	**50**
on off off on	0.150	6	100	60	120	60
off off off on	0.175	7	125	70	140	70
on on on off	0.200	8	150	80	160	80
off on on off	0.225	9	175	90	180	90
on off on off	0.250	10	200	100	200	100
off off on off	0.300	12	250	120	250	250
on on off off	0.350	14	300	140	300	500
off on off off	0.400	16	350	160	350	750
on off off off	0.450	18	400	180	400	1000
off off off off	0.500	20	500	200	500	2000

Performance Checking

It is common practice for all sensor equipment to be checked and tested regularly. Aeroqual recommends that this be done at least six-monthly. Basic “Performance Checking” can be carried out very simply by users of the sensor equipment.

Aeroqual recommends two simple tests:-

1. Simple “Bump” Test
   (demonstrates that the sensor is responsive to an increase in gas concentration)
   This requires exposing the sensor to the gas in question (eg. perchloroethylene, ammonia, VOC or ozone vapour), so as to trigger the on-board buzzer, relay and/or digital readout.

2. Field Calibration Check
   This requires that the **SM70** monitor and an Aeroqual handheld monitor be exposed simultaneously to an increase in gas concentration and the readings compared. The readings should be within +/- 15% of each other.

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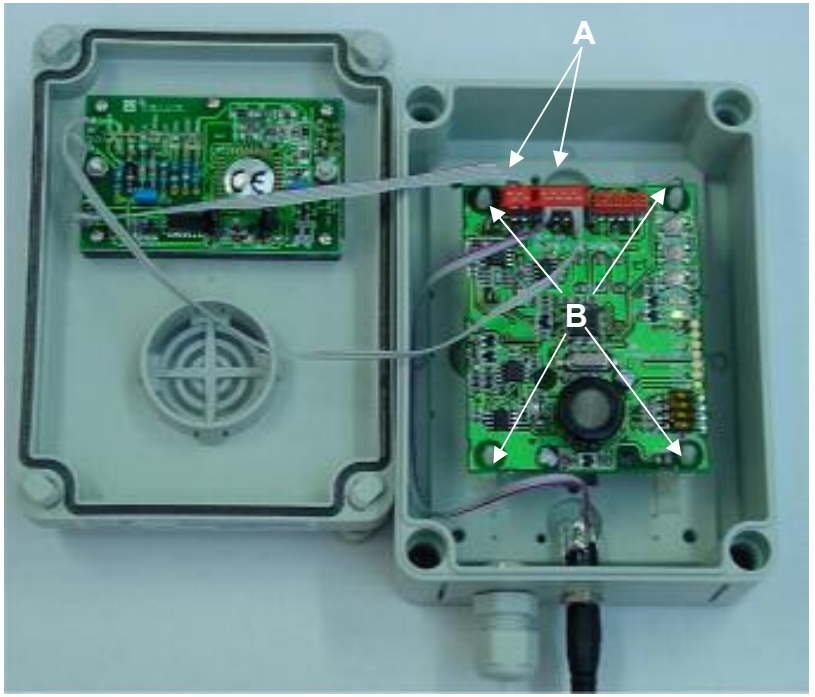

If you have performance concerns after these simple tests the unit may require re-calibration servicing. Contact Aeroqual Limited or your distributor for a recommended calibration laboratory.

Replacing the Sensor Module (PC Board)

- Unscrew the four lid screws, remove lid and view the interior of the enclosure as shown above.
- Remove the micro-match connectors (A) and release the plastic standoffs (B) securing the printed circuit board by squeezing the top of each standoff.
- Now replace the printer circuit board and refit the micro-match connectors.
- Replace the lid and secure the lid screws.

Status LED

The Status LED (glows **green**) is located on the Sensor board (see picture on page 9), and 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 time, 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**) is located on the Sensor board (see picture on page 9). This LED indicates that the gas concentration has reached the "Relay-Set-Point" (as set with the dip switches - see page 10) 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 @ 5A) or for a higher voltage and current loads via a secondary relay. A typical external devices 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.

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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

Open up the SM70 enclosure and remove the PC board as detailed on page 11. Turn over the PC board so that the underside is visible as shown below.

Using the screw connector on the PC board, wire up the desired external device to either the normally open or normally closed contacts as shown above.

The wiring is then taken through the supplied cable gland as shown on page 15.

Once the connections have been made, re-install the PC board back into the enclosure as detailed on page 11 and replace the enclosure lid.
Please note that the maximum current rating for the SM70 on-board relay is 8A. Should a greater current be required, consult your electrician regarding fitting an external “piggy-back” relay with a higher current rating.

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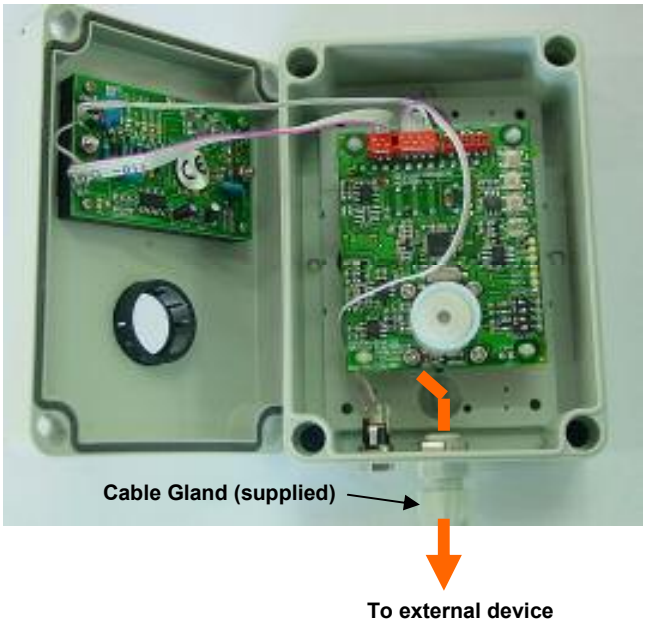
External Wiring through the Cable Gland

The SM70 enclosure is pre-drilled and fitted with a plastic plug. When fitting the supplied cable gland, remove the plastic plug and screw in the cable gland into the same hole as shown below.



Note: Please ensure that your installation is executed by an authorised electrician and that you comply with all the regulatory requirements of the country in which the installation is being made.

Troubleshooting - SM70

Fault Description	Possible cause	Remedy
No power	Lead connection broken	Reconnect power lead
	Power supply failure	Replace 12V DC power supply
	SM70 damaged	Replace unit
	Sensor module damaged	Replace sensor module
Sensor failure when the sensor is new	Insufficient warm up	Run the sensor on full power for 24-48 hours.
	Air contaminated	Move the sensor to cleaner environment and check reading
	Sensor damaged	Replace sensor module
Reading high under zero gas conditions	Background gas level higher than normal	Move sensor to clean air and recheck baseline
	Interferent gas present	Move sensor to clean air and recheck baseline
	Sensor damaged	Replace sensor
Reading lower than expected reading in the presence of sensor gas	Sensor correct	Check calibration.
	Interferent gas present	Move sensor to clean air and check reading upon exposure to known gas concentration
	Local air flow too high (ozone sensors) or too low (VOC, Perc and ammonia sensors)	Modify the airflow into and around the sensor.
	Sensor calibration lost	Replace /refurbish sensor module
Reading higher than expected in the presence of sensor gas	Sensor correct	Check calibration of gas generator.
	Interferent gas present	Move sensor to clean air and check reading upon exposure to known gas concentration
	Sensor calibration lost	Replace /refurbish sensor module
Reading unstable	Power supply unstable	Install stable power supply
	Power supply current rating incorrect	Install power supply with correct rating
	Local air flow too high	Reduce air flow
	Environmental conditions fluctuating	Reduce fluctuations

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Care and Maintenance

Your Aeroqual Monitor is a product of superior design and quality and should be treated with care. When using your Aeroqual Monitor:

- Keep it and all its parts and accessories out of the reach of small children.
- Keep it dry. Avoid water and/or condensation as humidity and liquids containing minerals may corrode electronic circuits.
- Do not use or store in dusty, dirty areas.
- Do not store or turn off the monitor in temperatures below 10°C.
- This unit is designed for use at temperatures between -5°C and +50°C (23°F and 120°F). Sudden changes in temperature will cause condensation that may damage the electronic componentry.
- Do not drop, knock or shake as this could lead to internal damage.
- Do not use harsh chemicals, cleaning solvents or strong detergents for cleaning. Wipe with a soft cloth slightly dampened with a mild soap-and-water solution.

Disposal / Recycling

Please note that this is an electronic product and disposal should be in line with your local or country legislation. The plastic casing of the product is made from an ABS blended material and is marked accordingly.

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Specification for SM70

Sensor Specification				
Sensor	**Range**	**0-5V; 5V=**	**Accuracy**	**Resolution**
Ozone[1]	0 – 0.5 ppm	0.5 ppm	<+/- 0.02 ppm, 0-0.1 ppm < +/- 20%, above 0.1ppm	0.001 ppm
	0 – 20 ppm	20 ppm	<+/- 20%(above 0.5ppm)	0.01 ppm
Ammonia[1]	0 to 500 ppm	500 ppm	< +/- 5 ppm (0-100ppm) <+/- 10% (100-500ppm)	1 ppm
Perchloroethylene	0 to 200 ppm	500 ppm	< +/- 10%	1 ppm
Hydrocarbon	0 to 500 ppm	500 ppm	< +/- 10%	1 ppm
Carbon monoxide	0 to 500 ppm	500 ppm	< +/- 10 ppm	1 ppm
Hydrogen sulfide	0 – 10 ppm	10 ppm	< +/- 0.5 ppm	0.01 ppm
Sulfur dioxide	0 – 10 ppm	10 ppm	< +/- 0.5 ppm	0.01 ppm
	0 – 100 ppm	100 ppm	< +/- 10%	1 ppm
VOC[2] (toluene)	0 to 500 ppm	500 ppm	< +/- 15%	1 ppm
Other gases	Please enquire	Please enquire	please enquire	please enquire
Temperature	-40 to 120 ºC	N/A	+/- 0.3 ºC	0.01 ºC
Humidity	0 to 100 % RH	N/A	2 % RH	1% RH

Notes: 1 Other ranges and accuracies are available
2 Other gas calibrations are available

Power	
Input	12 VDC
Consumption	2.5W – 6.0W max
Outputs	
0-5V analog	8 bit
3 x LED indicators	Power, sensor status, relay status
Relay – maximum output = 5A	Onboard 24V (max)
Screw connector block capacity	Onboard 8A maximum
Display	3 digit LCD
Mechanical	
Board Size	60 mm x 75 mm
Fan (if required)	Onboard ball-bearing 50,000 hours
Sensor filter	Onboard
Optional Functions (Non Standard)	
12-bit 0-5V analog	Onboard option
RS232 communication	Onboard option
RS485	Separate board
Environmental	
Operating temperature	-20 ºC to 50 ºC
Operating humidity	5% to 95% RH (non-condensating)

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Dimensions