APM Pumped Detectors

Technical Manual

Commercial in Confidence

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Table of contents

List of figures

List of tables

Warnings, cautions and notes

Warnings and cautions are used in this manual to highlight potential hazards and safety risks. Notes are used to provide supplementary information that is not hazard-related.

WARNING: **THIS INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.**

CAUTION: **THIS INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN EQUIPMENTDAMAGE OR LOSS OF DATA.**

NOTE: **THIS INDICATES INFORMATION THAT IS CONSIDERED IMPORTANT BUT IS NOT HAZARD RELATED.**

Abbreviations and acronyms

Abbreviation	Description
kPa	Kilopascal
l/min	Litres per minute
O_2	Oxygen
ppm	Parts Per Million
R134a	1,1,1,2-tetrafluoroethane (Refrigerant gas)
CO_2	Carbon dioxide

1 Safety warning

1.1 Electrochemical sensors (Oxygen)

Electrochemical sensors contain toxic compounds. Under normal conditions the sensor will be safely sealed. To prevent leakage, the unit must not be exposed to temperatures outside the specified range, or be exposed to organic vapours, which may cause physical damage to the body of the sensor. The unit must not be stored in areas containing organic solvents or in flammable liquid stores.

When the life of the sensor has expired, or it is leaking or otherwise damaged it must be disposed of safely in accordance with local regulations.

Oxygen cell contains caustic electrolyte (potassium hydroxide). In the event of an accident, use the following first aid procedures.

Table 1 Electrochemical sensor first aid procedure

Body Part	Effect	First Aid Procedures
Skin	Contact could result in a chemical burn. Persons with pre-existing skin disorders may be more susceptible to the effects of the substance.	Immediately flush the skin thoroughly with water for at least 15 minutes. Remove contaminated clothing and wash before re-use. Obtain medical advice if continued irritation.
Ingestion	Corrosive. May cause sore throat, abdominal pain, nausea, and severe burns of the mouth, throat, and stomach, and may be fatal.	If swallowed DO NOT INDUCE VOMITING. Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical advice immediately
Eye	Persons with pre-existing eye problems may be more susceptible to the effects of the substance. Corrosive. May cause redness, pain, blurred vision, and eye burns. Contact can result in the permanent loss of sight.	Irrigate thoroughly with water for at least 15 minutes. Obtain medical advice immediately.

Body Part	Effect	First Aid Procedures
Inhalation	Persons with pre-existing impaired respiratory function may be more susceptible to the effects of the substance. Inhalation is not an expected hazard unless heated to high temperatures. Mist or vapour inhalation can cause irritation to the nose, throat, and upper respiratory tract.	Remove to fresh air. Rest and keep warm. Obtain medical advice if applicable.

Should leakage of any electrolyte occur as a result of misuse, incorrect operation, manufacturing error, physical damage, etc. then wear protective gloves when cleaning any spills. Should electrolyte contact skin then the affected area should be washed thoroughly with copious water and medical advice sought if there has been any contact with the eyes or mouth. If connected to any electrical equipment, the sensor should be immediately removed.

2 Introduction

This technical manual describes the system operation of the pumped variants of the APM detectors.

Certain procedures are common to all detectors and where this is the case the section heading will stipulate 'All detectors'. Where deviations to the procedures apply to a specific detector these will be described in additional headings within the section.

3 Modification state control (All detectors)

Each instrument is fitted with a serial number plate, as shown below:

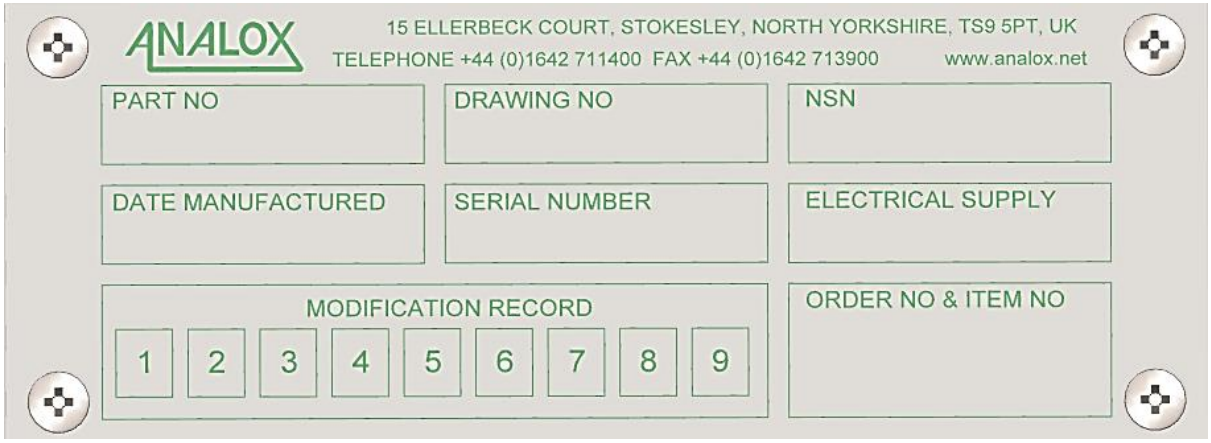


Figure 1 Modification state label

The first detector delivered will initially have no modification numbers crossed out, this is interpreted as "Modification State 0".
As design changes are made that affect the fit, form or function of the instrument, the *Modification Record* boxes will be used to track changes made to individual units. For example, as an instrument receives the first authorised modification it will have the '1' box crossed out, signifying that it is now at modification state 1.
Design changes that are applied to ALL delivered instruments in a controlled and timely manner may be done without updating the modification record; the purpose of the modification record is to signify the differences between instruments.

Table 2 Modification State

Modification state	Date authorised/DCN No	Details
0		First article delivery

4 Product overviews

4.1 R134a detector

The R134a detector is designed to constantly sample the local atmosphere and monitor for R134a & O_2 gases, indicating when concentrations reach alarm levels, or a fault is detected.

Components

- The assembly consists of a 200mm x 200mm x 121mm (see **Figure 2** for full dimensions) mild steel enclosure (Painted) with mounting brackets and compression bulkheads for the gas inlet and outlets.
- Thomas pump module (24V dc)
- 2 x Interface boards (1 per sensor)
- R134a sensor module
- O_2 sensor module
- Flow sensor
- Breather port
- Earth stud
- Particulate filter
- 2 x 1A cartridge fuses

4.2 CO_2 & O_2 detector

The dual CO_2 & O_2 detector is designed to constantly sample the local atmosphere and monitor for CO2 & O_2 gases, indicating when concentrations reach alarm levels, or a fault is detected.

Components

- The assembly consists of a 200mm x 200mm x 121mm (see **Figure 2** for full dimensions) mild steel enclosure (Painted) with mounting brackets and compression bulkheads for the gas inlet and outlets.
- 2 x Interface board
- CO_2 sensor module
- O_2 sensor module
- Flow sensor
- Breather port
- Earth stud
- Particulate filter
- 2 x 1A cartridge fuses

4.3 O_2 detector

The O_2 detector is designed to constantly sample the local atmosphere and monitor for O_2 gases, indicating when concentrations reach alarm levels, or a fault is detected.

Components

- The assembly consists of a 200mm x 200mm x 121mm (see **Figure 2** for full dimensions) mild steel enclosure (Painted) with mounting brackets and compression bulkheads for the gas inlet and outlets.
- 1 x Interface board
- O_2 sensor module
- Flow sensor
- Breather port
- Earth stud
- Particulate filter
- 2 x 1A cartridge fuses

5 Installation (All detectors)

5.1 Overview

The detector units are designed to be installed using the mounting brackets on the top and bottom of the sensor enclosure base. Drilled holes in the brackets allow for suitable M10 hardware to be fitted to secure the sensor detector to its intended installation location.

5.2 Mechanical installation (All detectors)

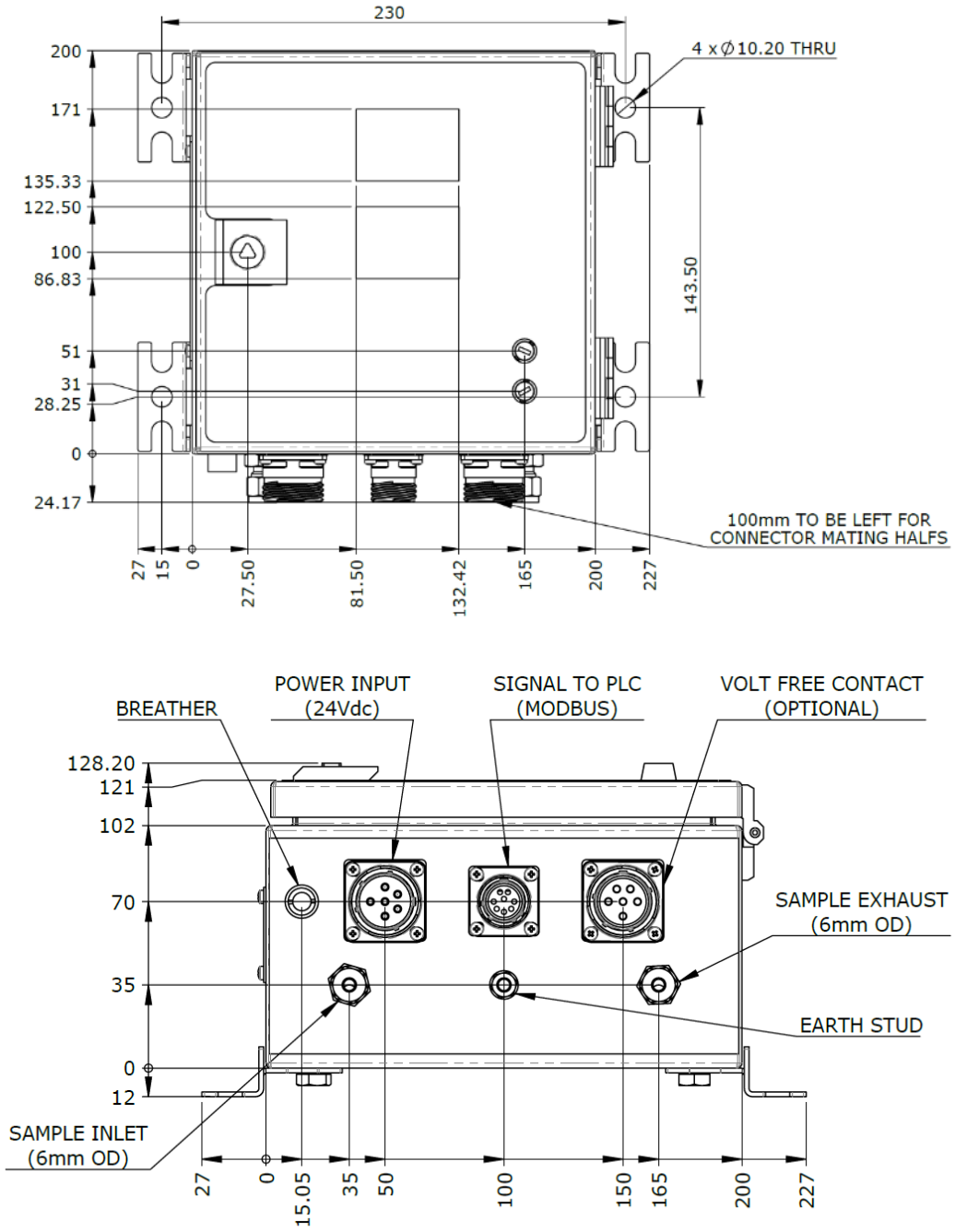


Figure 2 Dimensions

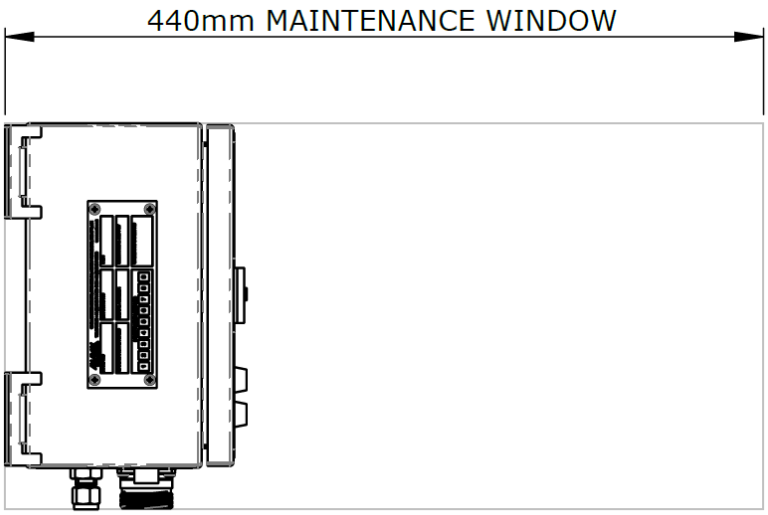


Figure 3 Maintenance window

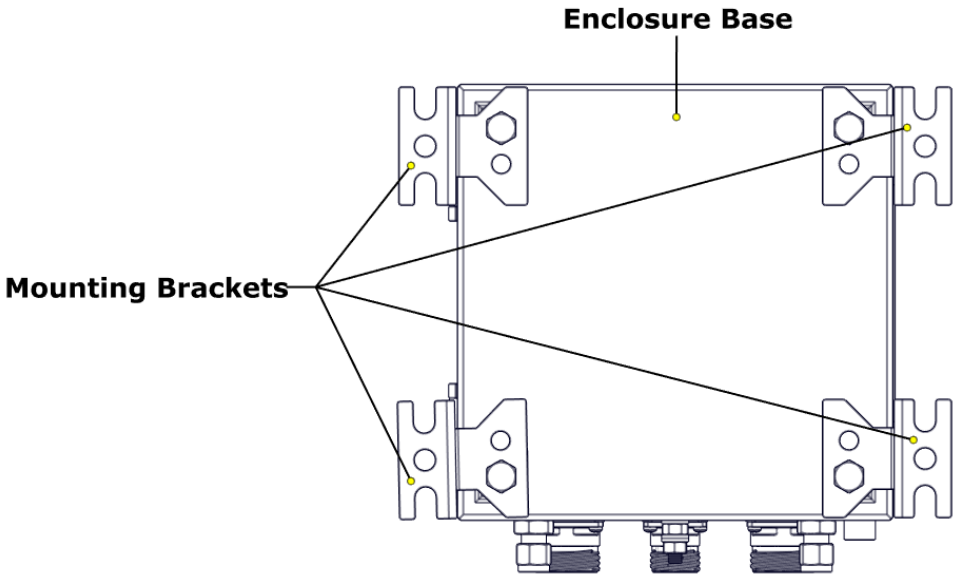


Figure 4 Mounting brackets

5.3 Electrical installation (R134a, CO_2 & O_2 detectors)

NOTE: **THE SECOND AND THIRD CONNECTORS ARE OPTIONAL, WHEN NOT REQUIRED A CONNECTOR CAP IS FITTED INSTEAD, AS ILLUSTRATED IN Figure 5.**

3 x D38999 Series III connectors are mounted on the bottom of the unit. From left to right they are Power 24V connector, Modbus Master Communications connector and ECS / Beacon signal connector.

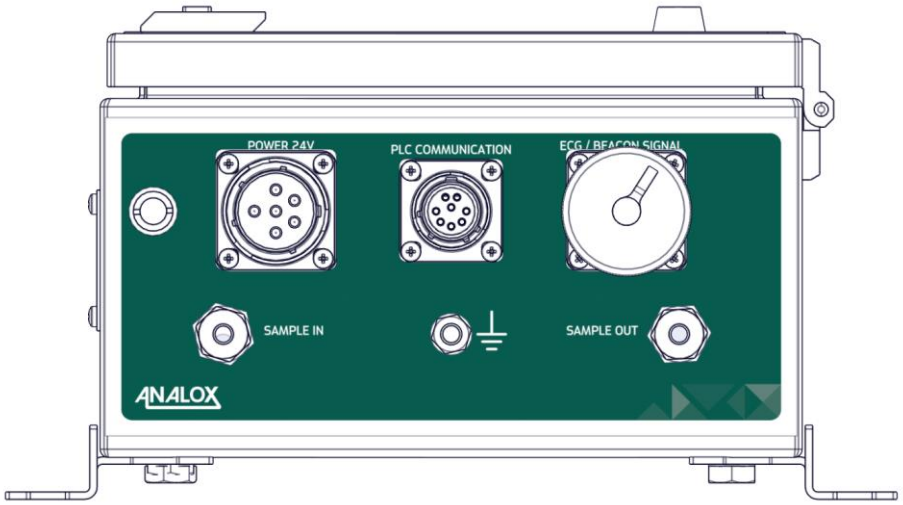


Figure 5 Electrical connections

5.3.1 Detector connections (All detectors)

NOTE: **ADDITIONAL SIGNAL CONDUCTORS HAVE BEEN INCLUDED IN THE CABLES FOR FUTURE USE.**

Three external electrical connections are available:

- Power input
- Signal to Modbus Master
- Volt Free Contact
- External earth stud

Cables are to be terminated with the following connectors:

Table 3 R134a Detector connector identification

	Connector description	Manufacturer's part number
Power input (24Vdc)	MIL-C-38999 female socket, straight	D38999/26FE6SN
Signal to Modbus Master (Modbus over 485)	MIL-C-38999 male pin, straight	D38999/26FC8PN
Volt Free Contact (24V DC)	MIL-C-38999 male pin, straight	D38999/26FE6PN

NOTE: **THE MIL-C-38999 CONNECTIONS ARE SUPPLIED WITH CRIMP PINS/SOCKETS FOR CONNECTIONS TO THE SUBMARINES INTERNAL WIRING.**

NOTE: **UNUSED CONNECTOR WILL BE FITTED WITH DUST CAP**

Table 4 Detector connector pin-outs

	Pin no.	Function
Power input (24Vdc)	A	24Vdc
	B	0V
	C*	Earth
	D	N/A
	E	N/A
	F	N/A
	Body	Earth
Signal to Modbus Master (Modbus over 485)	A	485 A Input
	B	485 B Input
	C	N/A
	D	N/A
	E	N/A
	F	N/A
	G	N/A
	H	N/A
	Body	Earth
Signal to Beacon (24Vdc)	A	Relay 1 NO
	B	Relay 1 Common
	C	Relay 2 NC
	D	24V DC
	E	Relay 2 NO
	F	N/A
	Body	Earth

** No connection is to be made to pin C of the cable-mounted power connector. Pin C of the cabinet-mounted plug is connected to the cabinet body in order to make protective earth connection during factory set up and testing.*

6 Pneumatic gas paths

6.1 R134a detector

Inlet 6mm bulkhead compression fitting through to a 10µm filter and then through to a Thomas 24v Pump sub assembly. Out of the pump into the flow sensor (1/8" NPT fittings, set point is set at 0.3 l/min), then across the O_2 and R134a sensors to the outlet.
Flow sensor does restrict the gas flow and is therefore upstream of the gas sensors in the assembly to prevent pressurisation of the sensors.

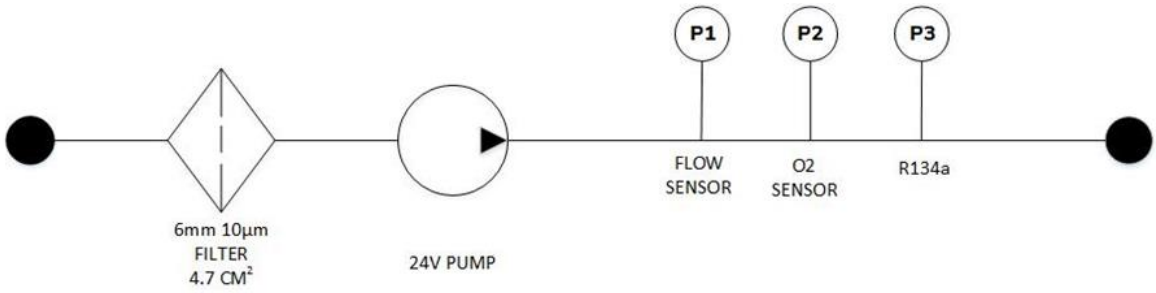


Figure 6 Gas flow (R134a)

6.2 CO_2 & O_2 detector

Inlet 6mm bulkhead compression fitting through to a 10µm filter and then through to a Thomas 24v Pump sub assembly. Out of the pump into the flow sensor (1/8" NPT fittings, set point is set at 0.3 l/min), then across the O_2 and CO_2 sensors to the outlet.
Flow sensor does restrict the gas flow and is therefore upstream of the gas sensors in the assembly to prevent pressurisation of the sensors.

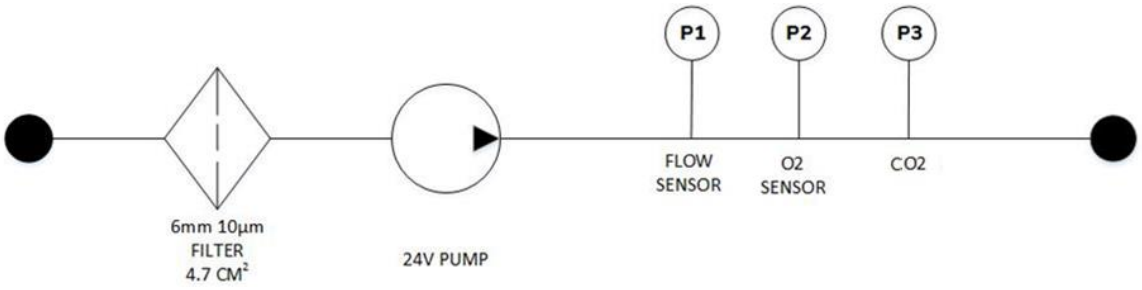


Figure 7 Gas flow (CO_2 / O_2)

6.3 O_2 detector

Inlet 6mm bulkhead compression fitting through to a 10µm filter and then through to a Thomas 24v Pump sub assembly. Out of the pump into the flow sensor (1/8" NPT fittings, set point is set at 0.3 l/min), then across the O_2 sensor to the outlet.
Flow sensor does restrict the gas flow and is therefore upstream of the gas sensors in the assembly to prevent pressurisation of the sensors.

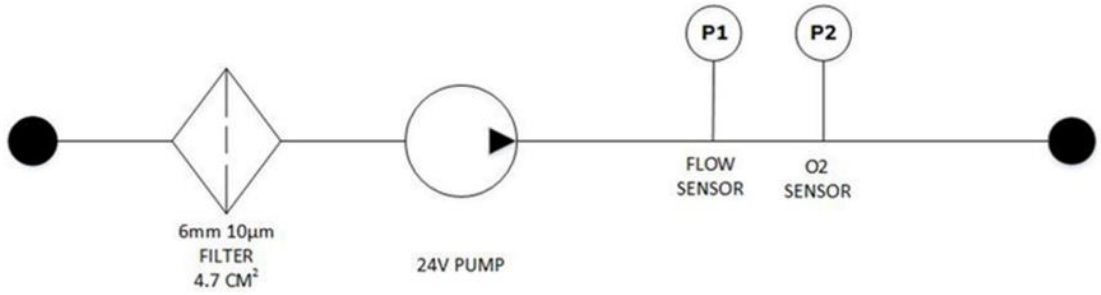


Figure 8 Gas flow (O_2)

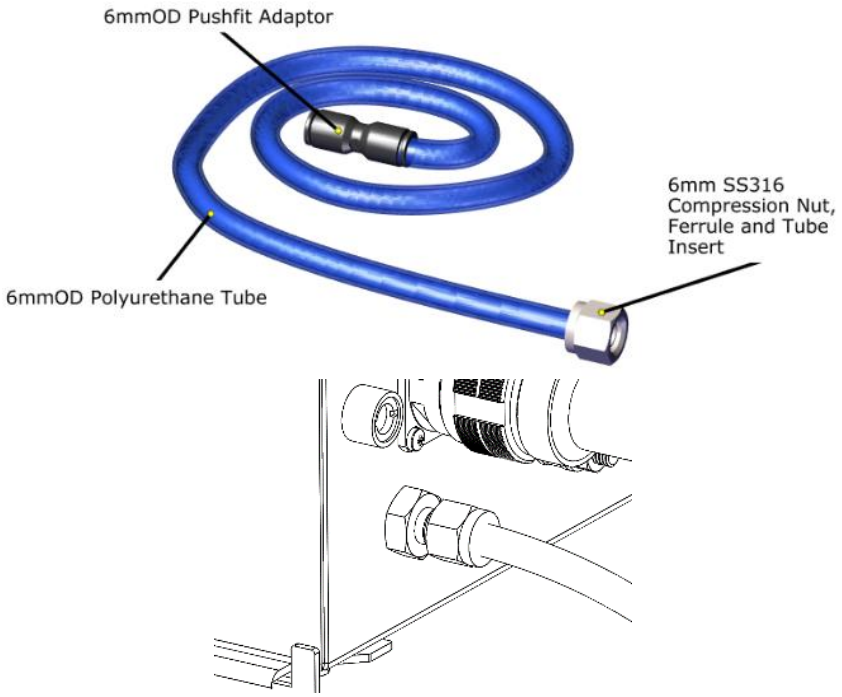
7 Calibration (All detectors)

NOTE: **FOR INCREASED ACCURACY CALIBRATE AT OPERATING TEMPERATURE**

For the calibration procedure refer to the Configuration Tool User Guide (P0277-8001)

Calibration should be performed using the calibration tube adaptor – SA8R134AO2CTA.

1] Connect the 6mm compression nut to the inlet of the detector.



2] Connect the tube from the calibration gas flow regulator to the 6mm push fit adaptor on the free end of the calibration tube adaptor and turn on the required calibration gas.

3] Follow P0277-8001 to calibrate each of the sensors.

7.1 Calibration intervals

Calibration of each detector should be performed at intervals detailed in the following table.

Table 5 ***Calibration intervals***

Sensor Type	Calibration Interval
R134a	Every 12 months
O_2	Every 3 months
CO_2	Every 3 months

8 Alarm and fault notifications

The screens on the front lid displays the current gas readings and the sensor status or if a fault has occurred.
The bottom of the screen will be colour coded to indicate the status of the sensor.

- Green = The sensor is running as normal
- Red = The sensor has an active alarm
- Yellow = The sensor has detected a fault within the sensor

NOTE: **IF THE DETECTOR SHOWS A FAULT, TURN THE DETECTOR OFF AND THEN BACK ON USING THE UP LINE CIRCUIT BREAKER SEE IF THE FAULT CLEARS.**

8.1 Example of alarm and fault notifications

NOTE: **EACH DISPLAY WILL SHOW BOTH THE NATIVE SENSOR READINGS AND THE PARTIAL PRESSURE READING FOR THE ASSOCIATED SENSOR.**

Figure 9 Alarm & fault notifications

8.2 Alarm set points

Table 6 Alarm set points

Alarm Type	Set Point	Threshold Direction
R134a	Hi	200ppm
R134a	HiHi	1000ppm
R134a	HiHiHi	1000ppm
O_2	LoLo	160mBar
O_2	Lo	180mBar
O_2	Hi	22%
O_2	HiHi	23%
CO_2	Hi	0.5%
CO_2	HiHi	1.5%

9 Maintenance

CAUTION: ENSURE THAT THE CIRCUIT BREAKER FOR THE DETECTOR IS IN THE OFF POSITION PRIOR TO REMOVING THE POWER CONNECTOR FROM THE DETECTOR.

CAUTION: DISCONNECT ALL ELECTRICAL CONNECTIONS TO THE DETECTOR BEFORE OPENING THE DETECTOR ENCLOSURE AND PERFORMING MAINTENANCE.

NOTE: ANALOX ASSUME THAT REPLACEMENT DETECTORS ARE FULLY CALIBRATED PRIOR TO INSTALLATION.

9.1 Sensor Bump Test

If the accuracy or performance of the detector is in question a bump test can be performed using span calibration gas. A bump test should be performed before each boat departure.

1] **Connect the regulator to the span gas cylinder and connect the bottle.**

2] **The live gas reading is displayed. When the reading is stable, confirm it is within an acceptable tolerance of the gas bottle contents**

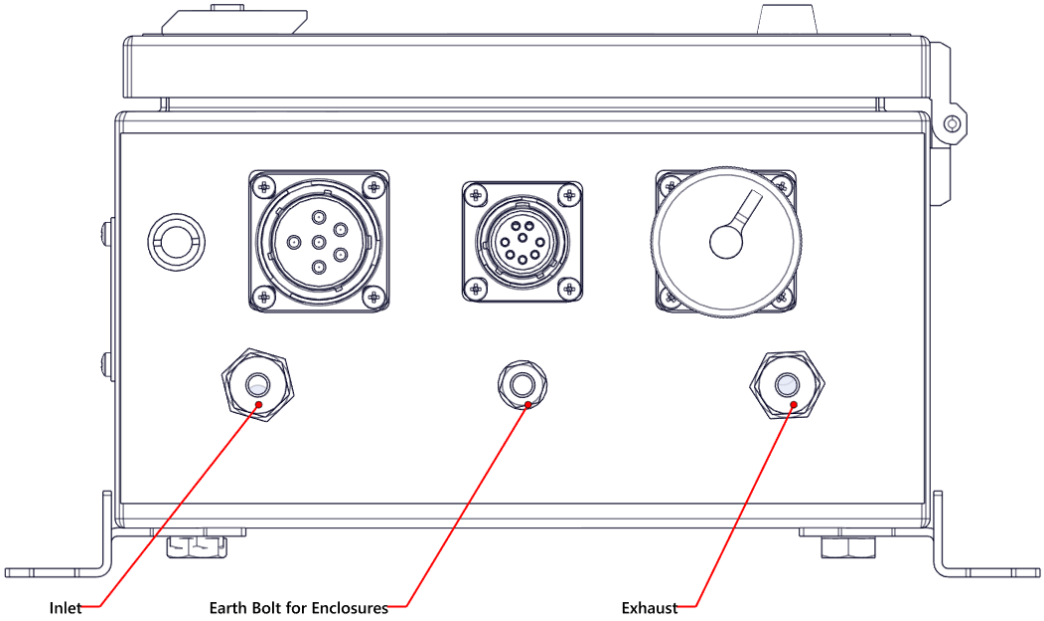
If the detector does not read within an acceptable tolerance perform a sensor calibration as per section 7

9.2 Replacing the complete detector

Once the full detector has been removed, fit a new detector to the desired installation location, making sure all electrical connectors are re-fitted (refer to Mechanical Installation in section 5.2 and Electrical Installation in section 5.3).

9.3 Disconnecting pipework and earth bonding

1] If required disconnect the inlet and exhaust pipes using a 14mm spanner to release the compression nuts from the bulkheads.



2] Disconnect the earth wire from the earth bolt.
3] Remove the M10 fixings and release the unit from its installation location.

9.4 Opening the lid

1] Lie the unit on a flat surface.
2] Unlock the enclosure using the 7mm triangular key and open the lid left to right.

9.5 Corrective maintenance schedule

Table 7 Maintenance schedule

Item	Task	Frequency
1.	Replace MEC oxygen cell	2 years (or as required)
2.	Replace MEC O_2 sensor module	As required
3.	Replace R134a cell	5 years (or as required)
4.	Replace MIR CO_2 sensor module	5 years (or as required)
5.	Replace pump module	12 months (or as required)
6.	Replace particulate filter	6 months (or as required)
7.	Replace flow switch	As required
8.	Replace fuses	As required

9.6 Tubing arrangement (R134a detector)

Pipework is composed of flexible 6mm OD polyurethane tubing throughout the detector and is connected by push on tube fittings, 6mmOD push fit pneumatic fittings or 6mmOD compression fittings.

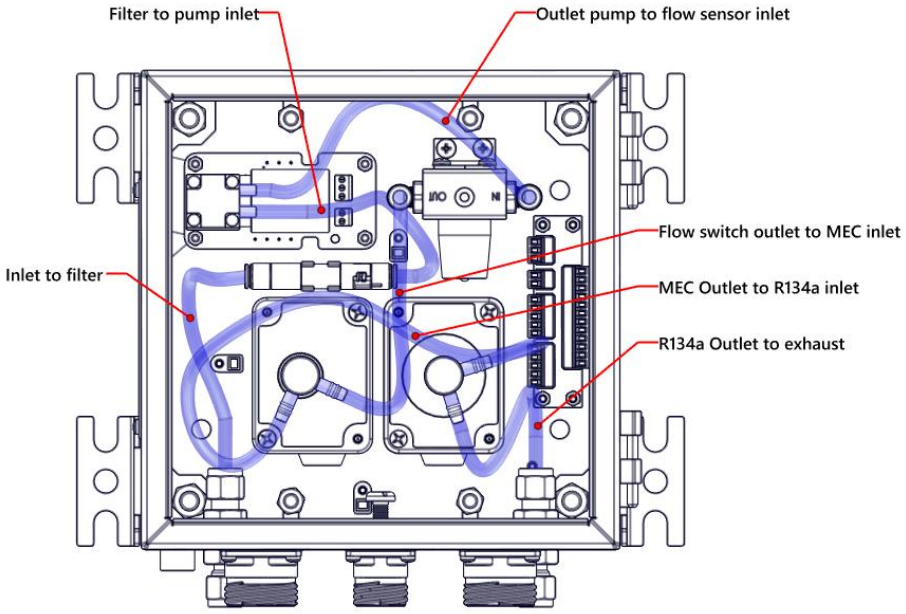


Figure 10 Tubing Arrangement (R134a detector)

9.7 Tubing arrangement (CO_2 & O_2 detector)

Pipework is composed of flexible 6mm OD polyurethane tubing throughout the detector and is connected by push on tube fittings, 6mmOD push fit pneumatic fittings or 6mmOD compression fittings.

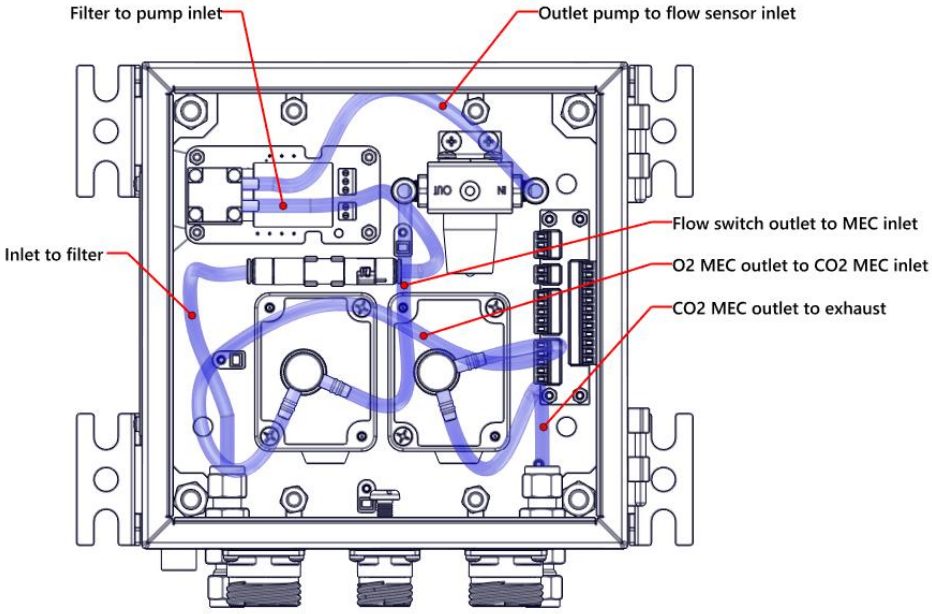


Figure 11 Tubing Arrangement (CO_2 & O_2 detector)

9.8 Tubing arrangement (O_2 detector)

Pipework is composed of flexible 6mm OD polyurethane tubing throughout the detector and is connected by push on tube fittings, 6mmOD push fit pneumatic fittings or 6mmOD compression fittings.

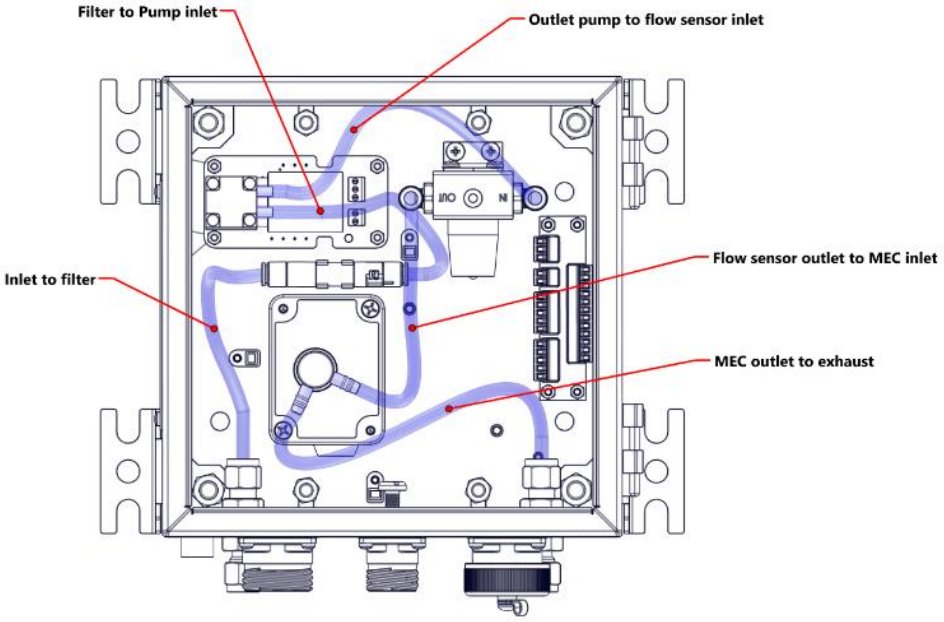


Figure 12 Tubing Arrangement (O_2 detector)

9.9 Part identification

9.9.1 R134a detector

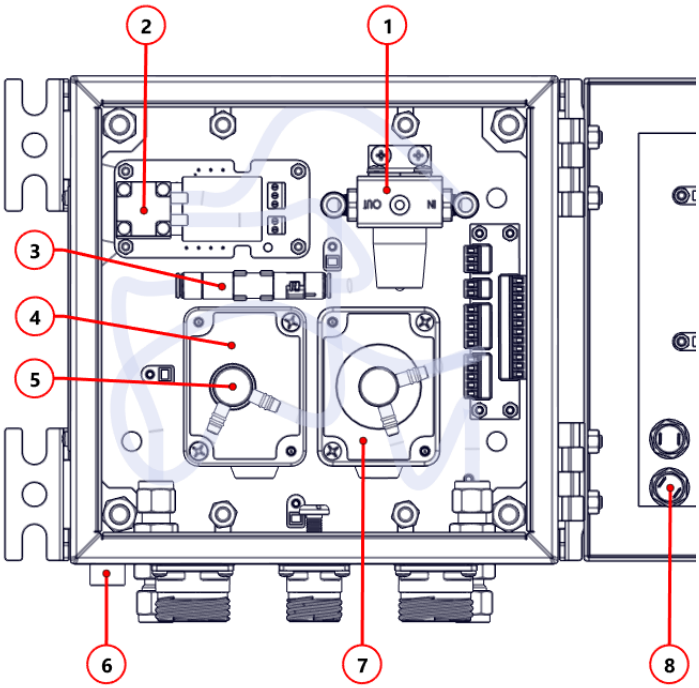


Figure 13 R134a detector part identification

Table 8 R134a detector part identification

Number	Description
1	Flow Switch
2	Pump module
3	Filter
4	O2 MEC
5	Gas Port
6	Breather
7	R134aMEC
8	Fuse

9.9.2 CO_2/O_2 detector

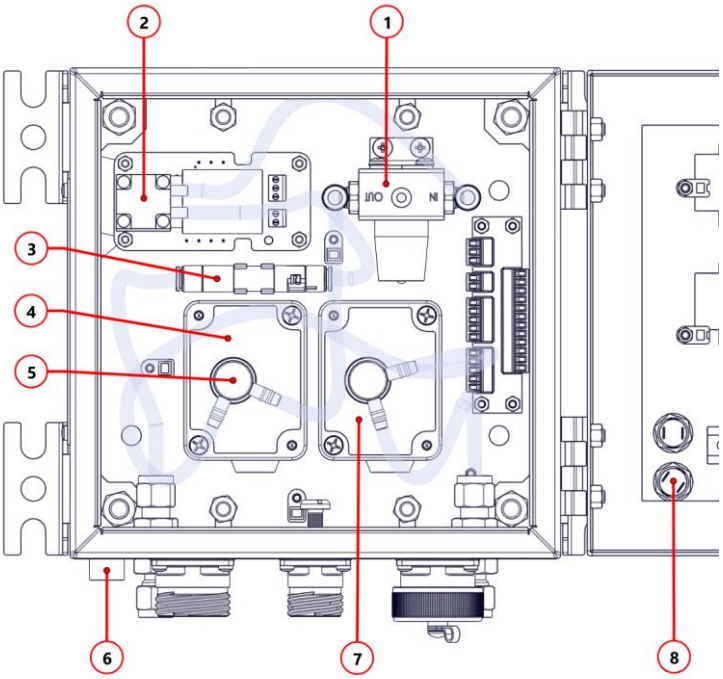


Figure 14 CO2 / O2 Part Identification

Table 9 CO_2 / O_2 Part Identification.

Number	Description
1	Flow switch
2	Pump module
3	Filter
4	O2 MEC
5	Gas port
6	Breather
7	CO2 sensor
8	Fuse

9.9.3 O_2 detector

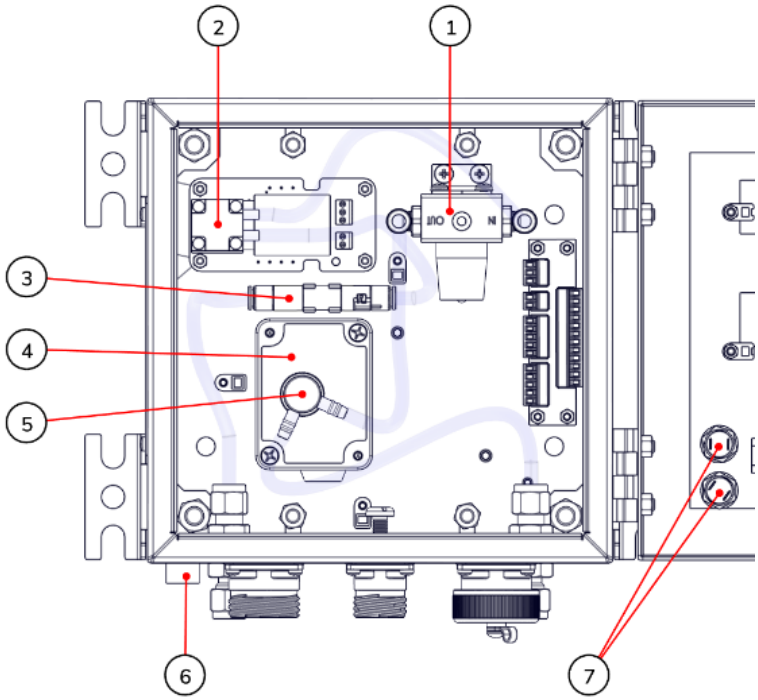


Figure 15 O_2 detector part identification

Table 10 O_2 Part Identification.

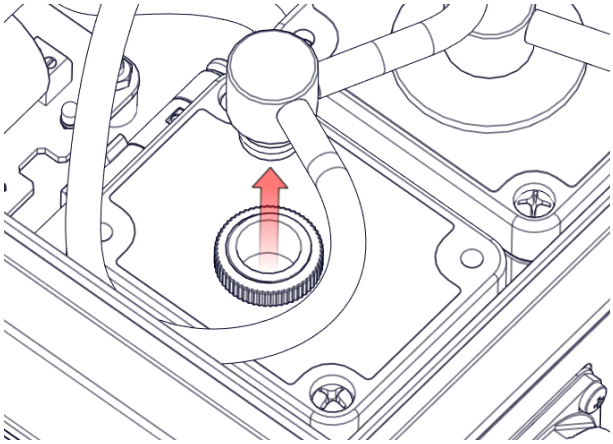
Number	Description
1	Flow switch
2	Pump module
3	Filter
4	O2 MEC
5	Gas port
6	Breather
7	Fuse

9.10 Removing and Replacing a Sensor Cell

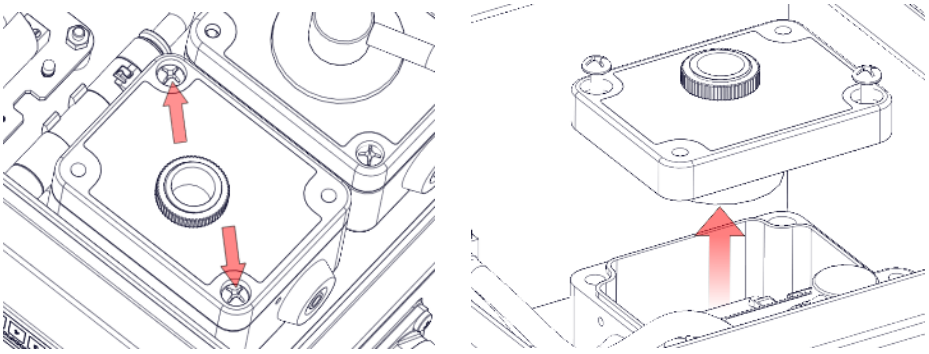
9.10.1 O_2 sensor cell replacement

This procedure is the same for both the R134a detector and the CO_2 / O_2 detector.

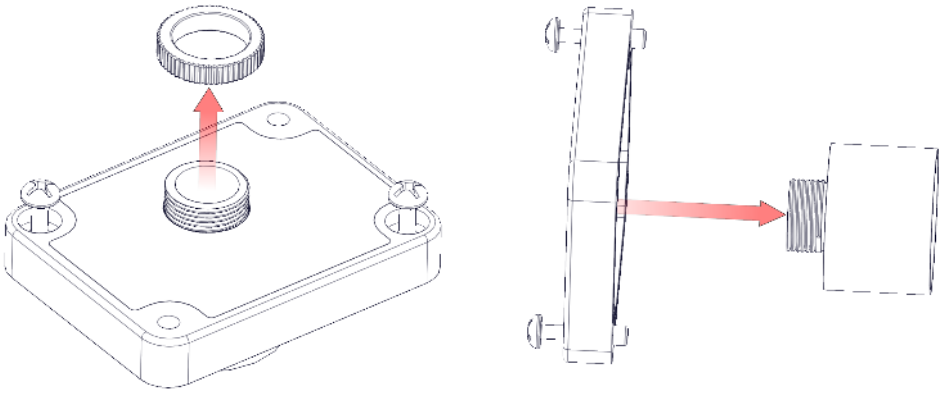
1] Pull out the Push-in flow adaptors from the O_2 sensor module.



2] Remove the sensor lid by unscrewing the captive screws and remove the lid.



3] Unscrew the plastic locking nut to release the cell from the sensor lid.



4] Release the O_2 cell wiring by disconnecting the white connector(see Figure 16)

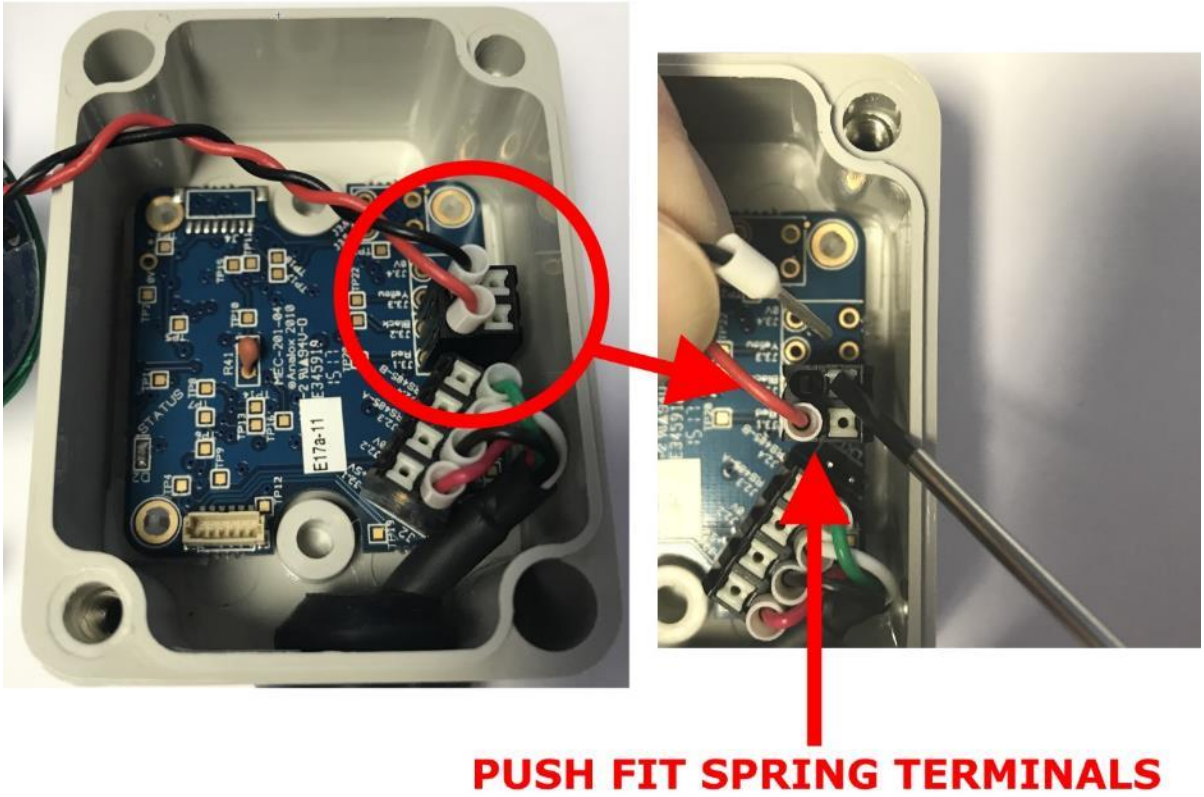


Figure 16 0_2 Cell Push-fit Spring Terminals

5] Follow the above procedure in reverse order to fit a new cell. The wiring is inserted into the connector on the sensor.

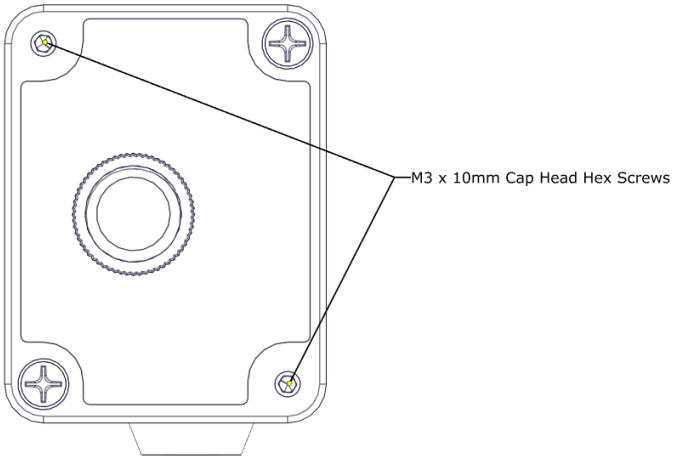
NOTE: AFTER REPLACING A SENSOR IT IS ADVISABLE TO RE-CALIBRATE THE UNIT USING THE CONFIGURATION TOOL (SEE P0271-8005)

9.11 Removing and replacing a sensor module

9.11.1 O_2 sensor module replacement

1] Disconnect the sensor from the connection board at location J3

2] Remove the push-in flow adaptor as detailed in the cell replacement procedure.
3] Using a 2.5mm Allen key unscrew the M4 x 10mm Cap Head Hex screws that fix the sensor module to the base plate.



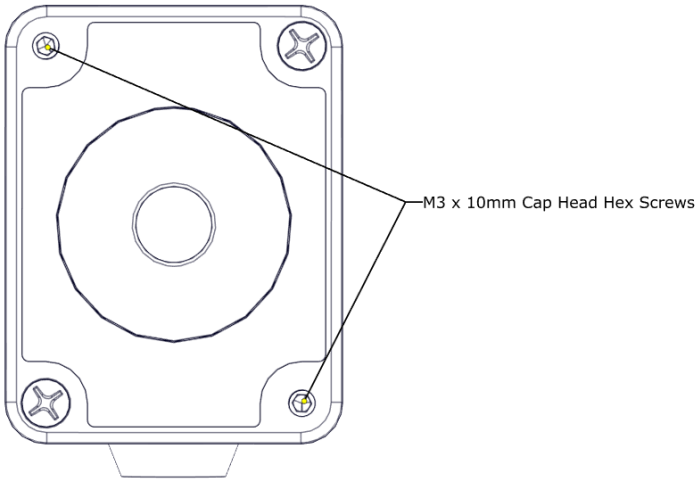
4] Remove the lid of the sensor and remove the M4 x 10mm Cap Head Hex screws, retain the screws for use with the replacement sensor.
5] Remove the sensor lid of the new sensor module and insert the M4 x 10mm Cap Head Hex screws, replace the lid.
6] The new sensor can now be fitted by reversing steps 1 to 4.

NOTE: AFTER REPLACING A SENSOR IT IS ADVISABLE TO RE-CALIBRATE THE UNIT USING THE CONFIGURATION TOOL (SEE P0271-8005)

9.11.2 R134a sensor module replacement

1] **Disconnect the sensor from the connection board at location J4**

2] **Remove the push-in flow adaptor as detailed in the cell replacement procedure.**
3] **Using a 2.5mm Allen key unscrew the M4 x 10mm Cap Head Hex screws that fix the sensor module to the base plate.**



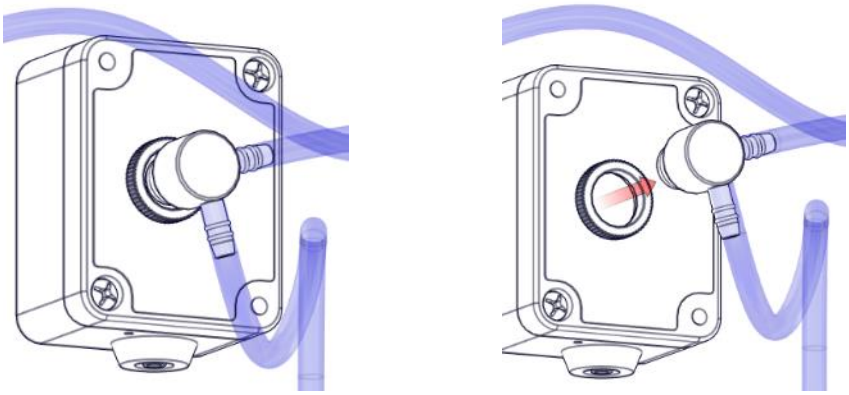
4] **Remove the lid of the sensor and remove the M4 x 10mm Cap Head Hex screws, retain the screws for use with the replacement sensor.**
5] **Remove the sensor lid of the new sensor module and insert the M4 x 10mm Cap Head Hex screws, replace the lid.**
6] **The new sensor can now be fitted by reversing steps 1 to 3.**

NOTE: **AFTER REPLACING A SENSOR IT IS ADVISABLE TO RE-CALIBRATE THE UNIT USING THE CONFIGURATION TOOL (SEE P0271-8005)**

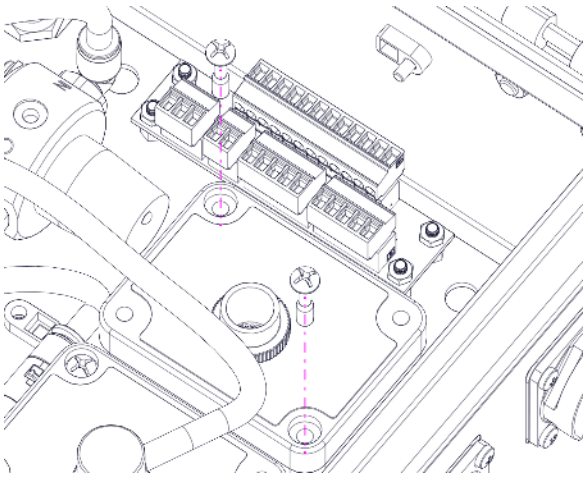
9.11.3 CO_2 sensor replacement

1] Disconnect the sensor from the connection board at location J3

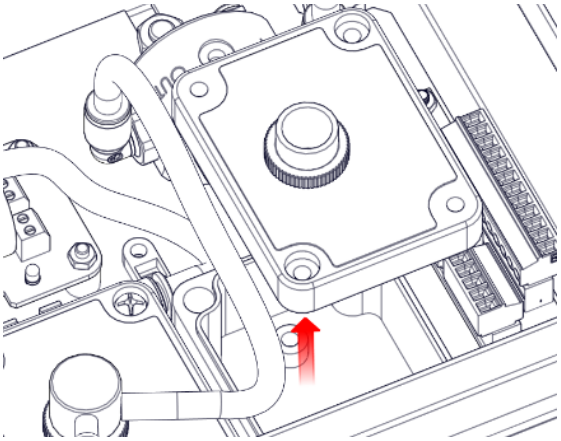
2] Remove the push-in flow adaptor from the CO_2 module.



3] Remove the 2 off M4 x 16mm Pozi pan screws securing the sensor module lid.

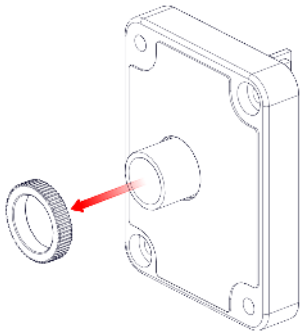


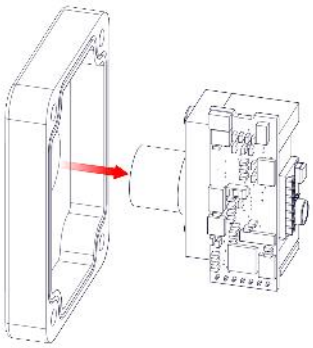
4] Remove the lid from the CO_2 sensor module.



5] Disconnect the Molex connector form the MIR module.

6] Remove the locking ring and remove the MIR CO_2 module.





7] The new sensor can now be fitted by reversing steps 1 to 6.

NOTE: **AFTER REPLACING A SENSOR IT IS ADVISABLE TO RE-CALIBRATE THE UNIT USING THE CONFIGURATION TOOL (SEE P0271-8005)**

9.12 Removing and replacing the pump module

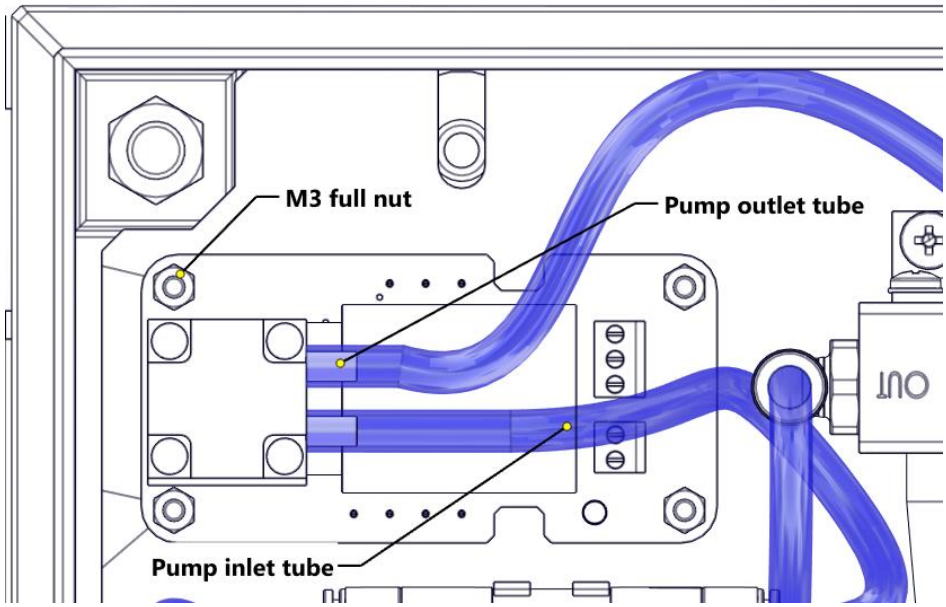


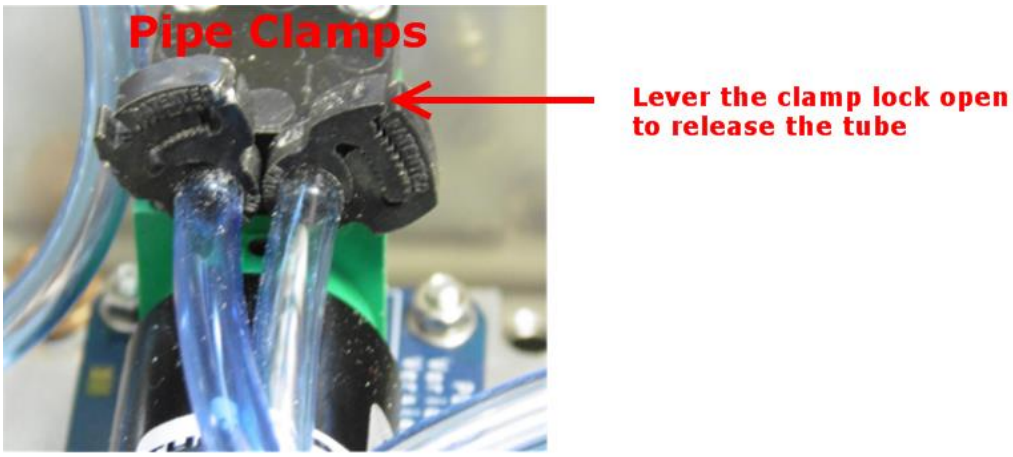
Figure 17 Pump module

1] Disconnect the wiring from the pump printed circuit board as shown below.

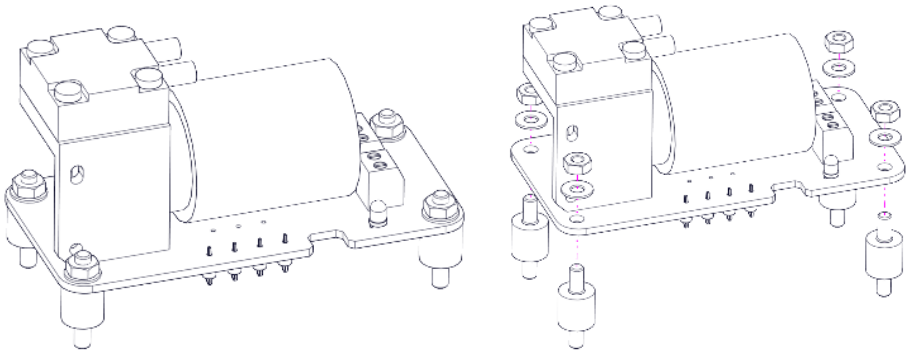
Table 11 Pump wiring detail.

PCB Ident	Wire Ident	Function
J2.1	+2.1	+24V
J2.2	-2.1	0V
J2.3	⏚2.1	Not connected

2] Open the tube securing clips by pushing the clip open with a terminal driver to loosen the teeth, then remove the tubing from the inlet (Left tube) and outlet (Right tube).



3] Remove the four off M3 full nuts and washers and retain for use on the replacement pump.
4] Pull out the pump module from the unit.
5] Take the new pump module and remove the M3 full nuts and flat washers securing the bobbin mounts, remove the bobbin mounts.



6] Fit the new pump module to the existing bobbin mounts secured to the baseplate and secure with the M3 full nuts and washers previously removed.
7] Refit the inlet and outlet tubes and secure with the previously removed tube clamps.

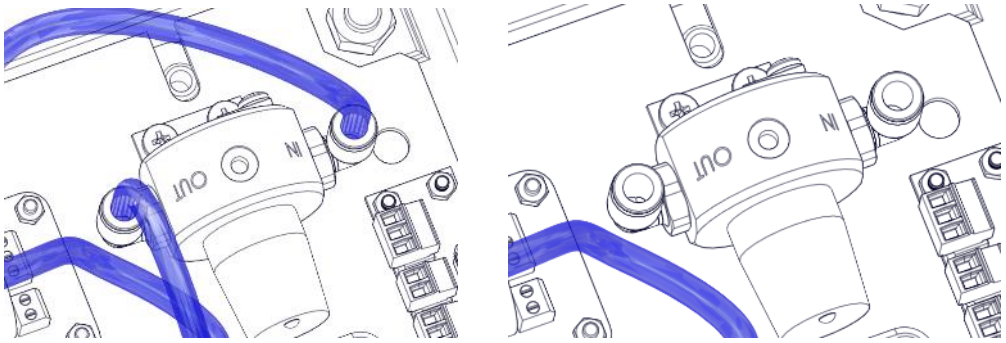
9.13 Removing and replacing the flow switch

Table 12 Flow sensor wiring detail.

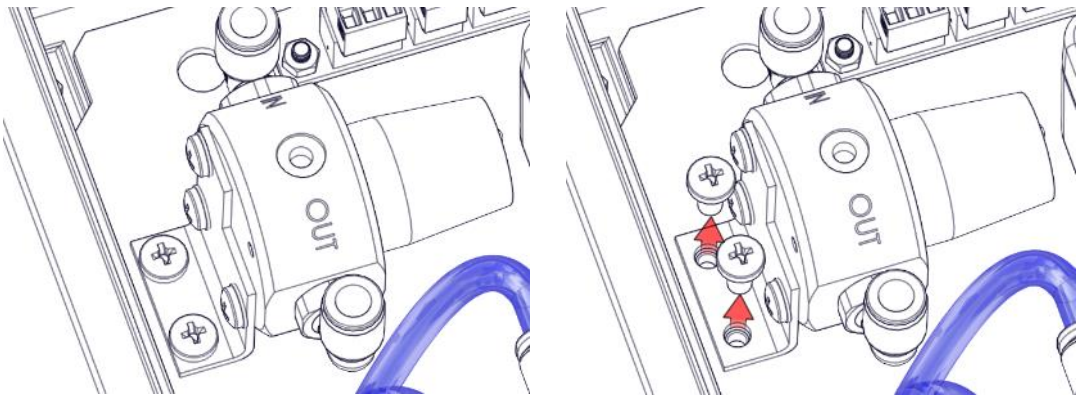
Terminal No.	Wire Identification	Function
J5.1	09/+01	+24V
J5.2	09/D01	Signal

1] Disconnect the flow switch from the connection board at location J5

2] Remove the tubing from the 6mm push elbows.



3] Remove the two M4 x 8mm Pozi Pan screws and retain for fitting the replacement flow sensor.



4] Replace the sensor, secure with the Pozi Pan screws and refit the tubing.

9.14 Removing and replacing the particulate filter

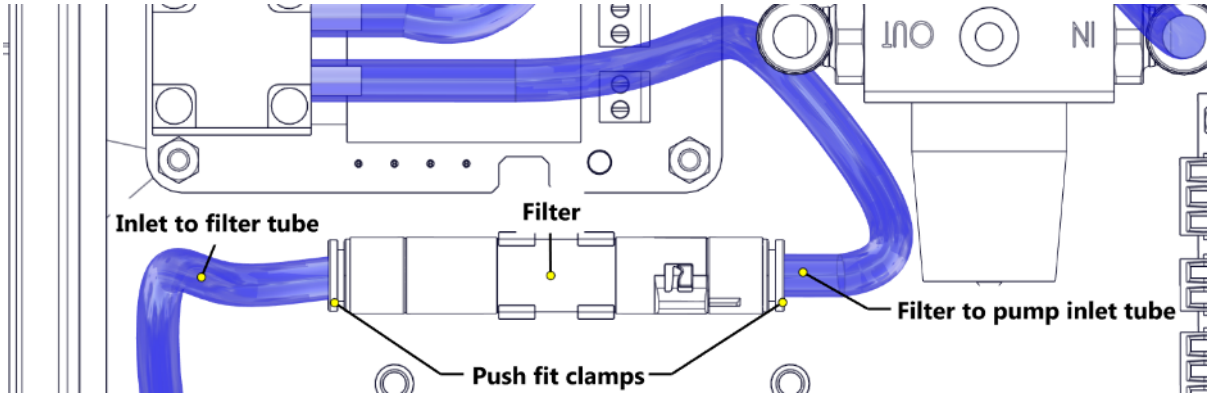
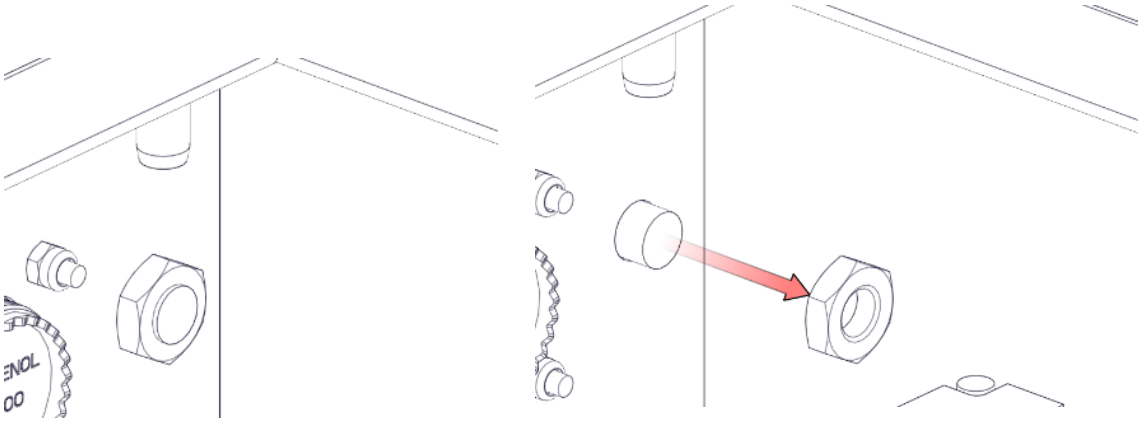


Figure 18 Removing and replacing the filter.

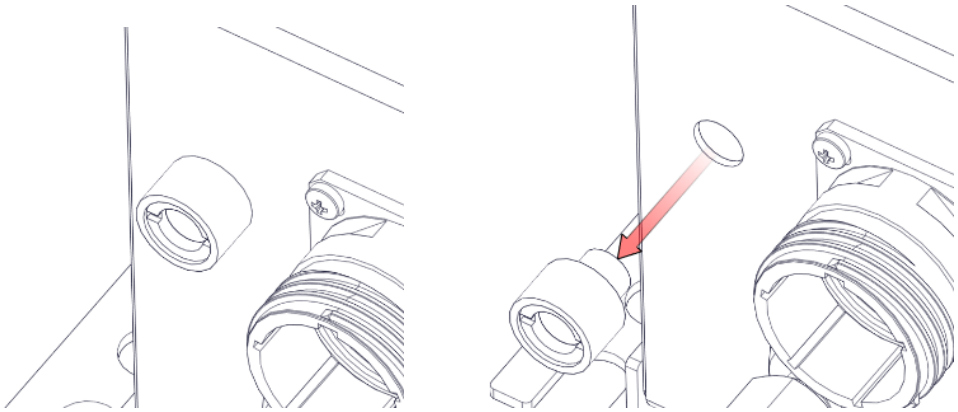
1] Pull the filter free from the housing brackets.
2] To release the tubing press the spring-loaded Push-fit clamp in and pull out the tubing.
3] Replace the filter (Discarding the filter bracket).
4] Re-attach the tubing to the new filter by pressing in the spring loaded Push-fit clamp and pushing in the tubing, then release the clamp.
5] Secure the filter into the existing housing bracket.

9.15 Breather replacement

1] Remove the M8 full nut from the breather on the inside of the enclosure.



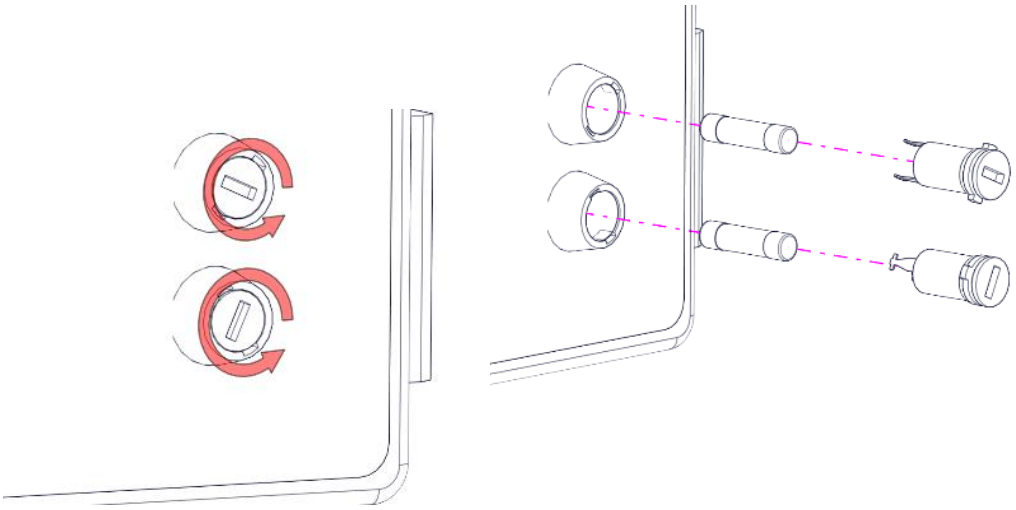
2] Remove the breather.



3] Reverse steps 1 and 2 to refit the breather.

9.16 Replacing the fuses

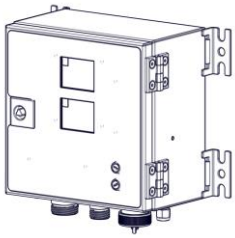
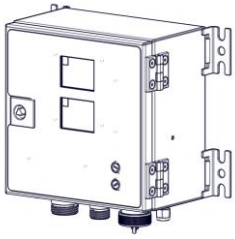
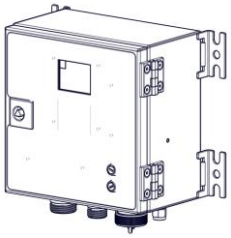
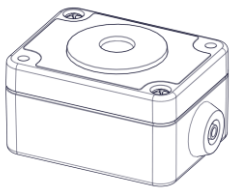
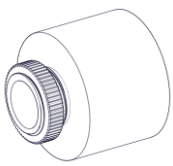
1] **Using a flat bladed screwdriver turn anti-clockwise to unlock and release the fuse holder.**
2] **Pull the fuse free from the holder and replace. Insert the fuse holder and lock by turning clockwise.**

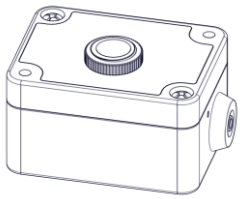
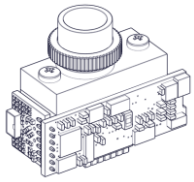
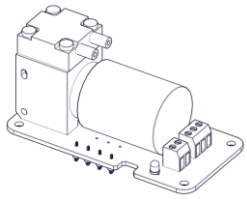
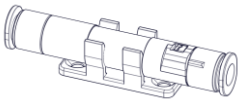
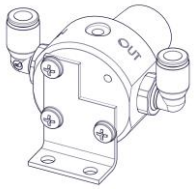
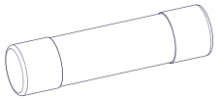
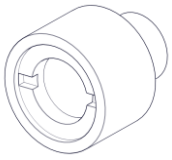


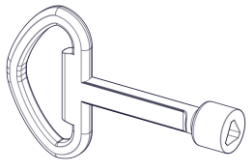
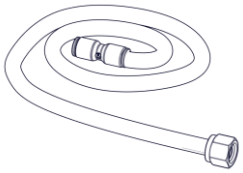
10 Spare parts and accessories

10.1 Spare parts

Table 13 Pumped detector spare parts list

Item	Image of item	Description	Part no.
1.		R134a detector	4000-0277-0002
2.		CO_2 / O_2 detector	4000-0277-0003
3.		O_2 detector	4000-0277-0004
4.		R134a Sensor Module	P0192-6350-00
5.		MEC O_2 Cell	9100-9212-9HM

Item	Image of item	Description	Part no.
6.		MEC O_2 Sensor Module	MECO2ADDP-00
7.		MIR CO_2 Sensor Module	MIRBCNX4
8.		Pump Module	P0192-6250-00
9.		In-Line vacuum filter, 10 micron (Inc. mounting bracket, bracket to be discarded)	E-M-170001
10.		Flow switch (Inc. Mounting Bracket & Push Fit Elbows)	FS6202CV-1M-COSAMS
11.		Fuse, Cartridge, S500 Series, 1 A, 250 V, 5mm x 20mm, 35 A	S500-1-R
12.		Breather	SA2XMRCBL/D6693

Item	Image of item	Description	Part no.
13.		Key, Locking, 7mm Triangular, Zinc Plated	9300-0271-0005
14.		Calibration Tool Loom	SA8R134AO2CTL
15.		Calibration Tube Adaptor	SA8R134AO2CTA

10.2 Accessories

Table 14 R134a detector accessories

Item	Description	Part no.
1.	Zero calibration gas (Pure nitrogen)	To be sourced locally
2.	O_2 Sensor & R134a sensor span calibration gas (20.9% oxygen, 500ppm R134a, balance nitrogen)	To be sourced locally
3.	Calibration bottle demand flow regulator (To suit sourced calibration gas bottles)	To be sourced locally

Table 15 CO_2 / O_2 detector accessories

Item	Description	Part no.
1.	Zero calibration gas (Pure nitrogen)	To be sourced locally
2.	O_2 Sensor span calibration gas (20.9% oxygen, 2% CO_2 balance nitrogen)	To be sourced locally
3.	Calibration bottle demand flow regulator (To suit sourced calibration gas bottles)	To be sourced locally

Table 16 O_2 detector accessories

Item	Description	Part no.
1.	Zero calibration gas (Pure nitrogen)	To be sourced locally
2.	O_2 Sensor span calibration gas (20.9% oxygen, balance nitrogen)	To be sourced locally
3.	Calibration bottle demand flow regulator (To suit sourced calibration gas bottles)	To be sourced locally

11 Specifications

11.1 Mechanical specifications

Table 17 Mechanical specifications

Specification	Description	Value
Nominal instrument dimensions (mm): h x w (Inc. connectors, backshell and mounting brackets) x d (including maintenance window)	Instrument dimensions	254 x 227 x 440
Weight (kg)	Weight excluding cable connections	4.2 ± 10%
Enclosure material		Painted Mild Steel
Gas flow rate (Litres per minute)		0.6

11.2 Electrical specifications

Table 18 Electrical specifications

Specification	Description	Value
Power supply	Power specification for the device (can be dual source, diode OR).	24 VDC
Max. power consumption	Maximum expected power consumption.	10 Watts
Fuse rating	Recommended external fuse.	1 Amp

11.3 Environmental specifications

Table 19 Environmental specifications

Specification	Value
Operating temperature range	0°C - 45°C
Storage temperature	0 - 55°C recommended
Operating pressure range [1]	70 – 130kPa
Operating humidity range	0 – 99% RH (non-condensing)
IP Rating (If water based extinguishing systems exceed these levels there may be damaged caused)	IP44

[1] Instrument will indicate a fault outside the operating pressure.

11.4 Performance specifications

Table 20 R134a performance specifications

Specification	Description	Value
R134a measuring range	The operating R134a measurement range of the instrument.	0 – 1000 ppm (SEV)
Accuracy across normal operating environmental envelope	Accuracy of the R134a measurement.	±4.5% Full scale
Temperature performance	% of reading/°C from the calibration temperature.	±3 Full scale
Response time	Response time to 90% of expected reading (T90) or safety function activation.	<30 seconds
Long term zero stability		±2% Full scale / year
Pressure dependence		0.02% of reading / kPa
Sensor MTBF	Mean time before failure	≥ 5 years in atmospheric air
Cross sensitivity	Sensitivity of other gases to the R134a cell	*See note below

NOTE: R134A IS ONE OF THE HALON GASES. THE R134A SENSOR WILL BE CROSS SENSITIVE TO OTHER HALON GASES THAT HAVE AN ABSORPTION RANGE IN A SIMILAR RANGE OF INFRARED TO R134A. THEREFORE, THE SENSOR WILL GIVE A POSITIVE R134A READING WHEN OTHER HALON GASES ARE PRESENT BUT THE SENSOR WILL NOT BE DAMAGED DUE TO EXPOSURE

Table 21 0_2 performance specifications

Specification	Description	Value
O_2 measuring range	The operating oxygen measurement range of the instrument.	0 to 35kPa O_2
Accuracy across normal operating environmental envelope	Accuracy of the oxygen measurement. Only valid over ±10°C from calibration.	±(0.35%O_2 + 1% of reading + temp coefficient).
Temperature coefficient (tc)	% of reading/°C from the calibration temperature.	0.4% of reading/°C
Response time	Response time to 90% of expected reading (T90) or safety function activation.	<20 seconds
Sensor MTBF	Mean time before failure	≥ 2 years in atmospheric air

Table 22 CO_2 performance specifications

Specification	Description	Value
CO2 measuring range	The operating CO2 measurement range of the instrument.	0 – 5% ppm (SEV)
Accuracy across normal operating environmental envelope	Accuracy of the R134a measurement.	±25ppm + 1% of reading
Temperature performance	% of reading/°C from the calibration temperature.	±1ppm of reading/°C
Response time	Response time to 90% of expected reading (T90) or safety function activation.	<30 seconds
Long term zero stability		±2% Full scale / year
Pressure dependence		0.02% of reading / kPa
Sensor MTBF	Mean time before failure	≥ 5 years in atmospheric air
Cross sensitivity	Sensitivity of other gases to the R134a cell	*See note below

12 Warranty

The warranty period is contract specific and will run from the completion of the factory acceptance test (FAT).

The warranty period applies to all maintainable parts (excluding consumables such as fixings etc.) provided that the purchaser replaces relevant parts according to the replacement schedule advised in the technical documentation delivered with the system.

NOTE: **WHERE THE BUYER/END USER FAILS TO FOLLOW THE SELLERS REGULAR MAINTENANCE INSTRUCTIONS, THE WARRANTY WILL BE VOID.**

13 Fault reporting to Analox

In the event of a fault arising, the following table may be of use when reporting the fault to Analox. Please complete whichever sections are believed to be relevant to the fault and return a copy to Analox along with a copy of the unit's fault logs and latest datalog - contact details can be found on the front page of this manual.

Date	

Customer details

Company/institution name	
Customer contact	
Address	
Country	
Telephone number	
Mobile telephone number	
Email address	

Equipment details (where applicable)

Detector type	
Detector serial no.	
System Operating Voltage	

Description of fault

14 Disposal

According to WEEE regulation this electronic product cannot be placed in household waste bins. Please check local regulations for information on the disposal of electronic products in your area.
Analox will provide a disposal service if this is beneficial to the customer. Analox are registered for the disposal of WEEE in the UK through the Environment Agency (2013 Registration number WEE/KE0043SY).

14.1 Oxygen sensor disposal

Dispose of contents/container in accordance with applicable local regulations.
Note that the oxygen sensor contains lead (Pb).