QMI

QUALITY MONITORING INSTRUMENTS LTD

MULTIPLEX™ ATMOSPHERIC OIL MIST DETECTION SYSTEM

INSTALLATION AND OPERATIONS MANUAL

SPECIALISTS IN OIL MIST DETECTION

QMI MULTIPLEX™ ATMOSPHERIC

Multiplex™ Atmospheric

Oil Mist Detection System

This Manual provides information to assist with the Installation, Testing and Maintenance of all components relating to the **QMI Multiplex™ Atmospheric Oil Mist Detection System**

Multiplex™ Atmospheric
Oil Mist Detection System

INTRODUCTION

QMI MULTIPLEX™ Atmospheric Oil Mist Detection Systems have been providing an early warning to hazardous levels of oil mist in confined areas for over 35 years, in environments such as: Engine Rooms, Test Cells and Hydraulic pack areas – anywhere where the increasing density of an oil mist adjacent to a hot working surface could cause a fire and personal injury.

If installed and operated correctly, your **MULTIPLEX™ Atmospheric Oil Mist Detection System** can measure an oil mist between 3 and 10 microns from up to 12 discrete areas you intend to gather data from and monitor.

We pride ourselves on the fact that our equipment provides a fast response to a potentially escalating situation, without providing 'false' alarms, and we would encourage you to follow the processes in this Manual to ensure your system is installed, tested and operated effectively.

Our systems have been tested and Type Approved by the following:

Additionally, QMI also manufacture a **TRIPLEX™ Atmospheric Oil Mist Detection System** for installations where up to three points of measurement are required, and also an **Engine Detector Oil Mist System** for similar diesel applications where engine conditioning data is employed to assist with avoiding unnecessary engine wear and resulting expensive repairs, along with the safety aspects as previously described.

For more information, please see our website: www.oilmist.com

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Errors and omissions excepted.

As we strive to improve our service and products specifications may change or vary.

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SECTION 1

PRODUCT DESCRIPTION AND SYSTEM OVERVIEW

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SECTION 1 \ PRODUCT DESCRIPTION AND SYSTEM OVERVIEW

1.1 ABOUT THE QMI SYSTEM

QMI MULTIPLEX™ Atmospheric Oil Mist Detection Systems have been providing a fast response to situations where hazardous levels of oil mist in confined areas, such as in Engine Rooms, Test Cells and Pump Rooms, could cause a fire and endanger life.

Oil Mist is measured using the principle of light scatter (nephelometry) across a series of Atmospheric Sensors. A signal, which is proportional to the oil mist in the sample, is sent simultaneously and continuously to the MULTIPLEX™ Monitor (CMU) every 500 milliseconds.

1.2 KEY COMPONENTS

There are three components which make up the operating elements of the system:

· **MULTIPLEX™ Monitor** (CMU)
· **Atmospheric Sensors with Articulated Joints** (up to a maximum of 12 Sensors)
· **Junction Box** – which connects the Atmospheric Sensors to the MULTIPLEX™ Monitor

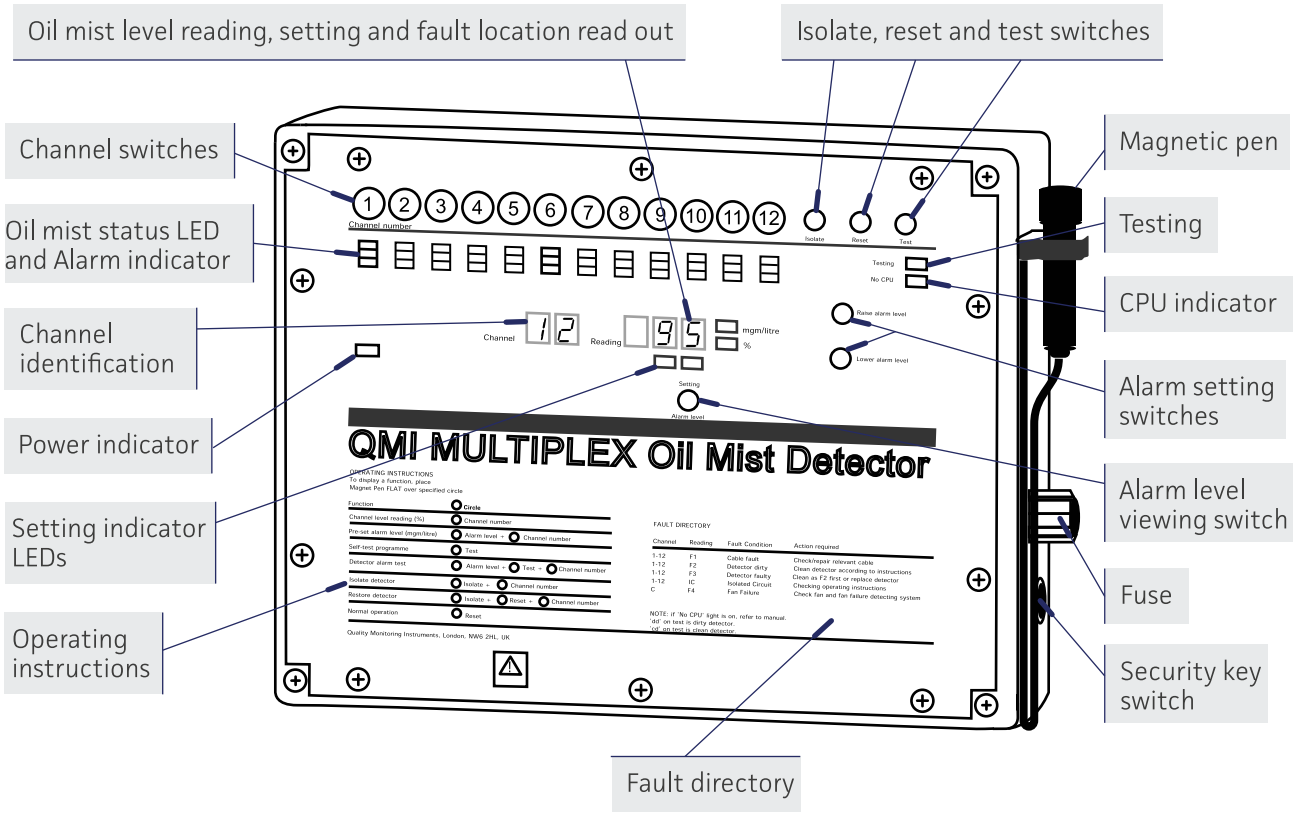
MULTIPLEX™ Monitor (CMU) Part No. Q01H

Junction Box Part No. Q07

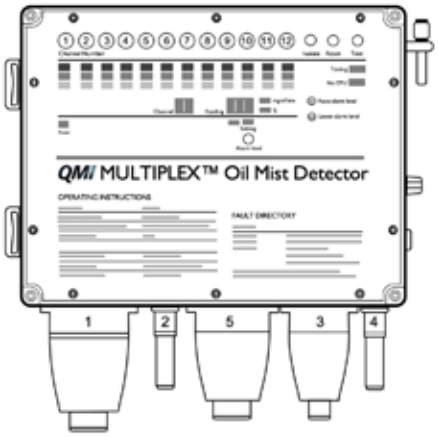
Atmospheric Sensor With Articulated Joint
Part No. Q10C

1.3 MULTIPLEX™ MONITOR CENTRAL MONITORING UNIT (CMU)

The layout of the QMI MULTIPLEX™ Monitor (CMU) is designed for rapid monitoring, ease of use and simple functionality.



The Monitor has five connectors as shown below – one of which is optional.



Five Multi-way Connectors using terminal plugs and Harting Connectors for wiring of alarms and functions, Sensors and mains power supply

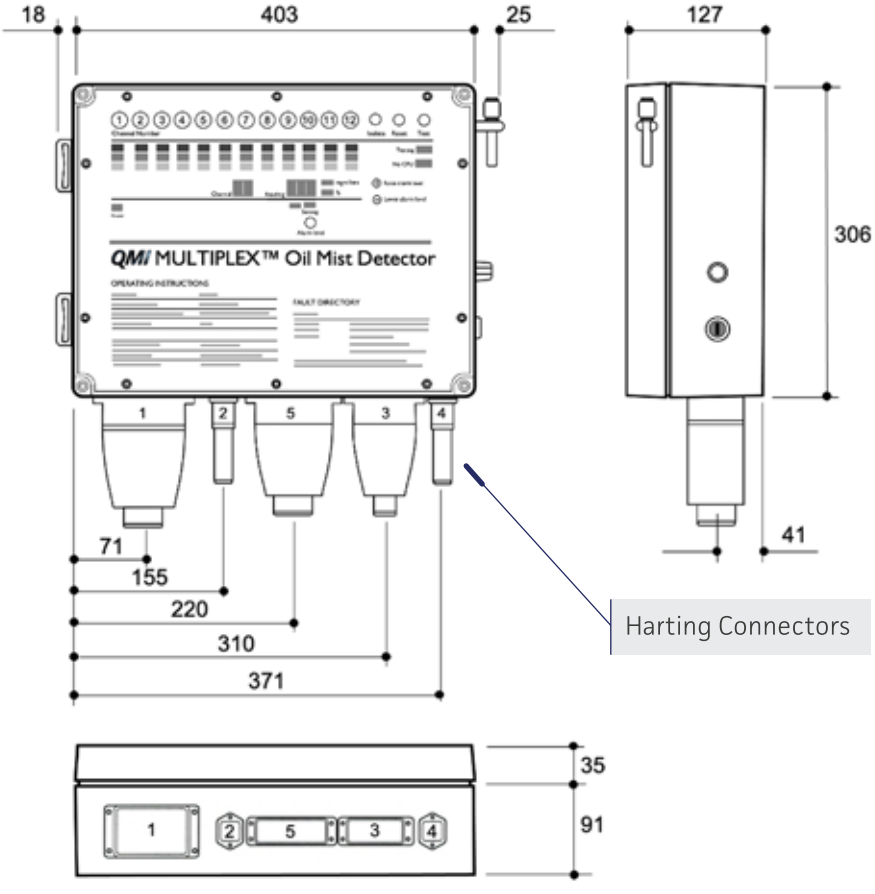
INTERNAL Not shown, Relay Board with Power Supply Unit (PSU)

1.3 MULTIPLEX™ MONITOR CENTRAL MONITORING UNIT (CMU)

Physical and technical properties of the MULTIPLEX™ CPU are as follows:

DISPLAY PANEL

Access to the PCB/Relay Board is by way of the hinged Display Panel sub-assembly. The 4 x M6 socket head screws retain the display panel. Upon removal of the screws the panel can be swung away from the main enclosure.



Dimensions in **mm**

PCB (PART NO. Q0104A)

The Display Panel sub-assembly carries the main MULTIPLEX™ PCB type MP12 v3.2 Processing Board, with the Binary Switch and Flash Memory Chip which is attached to the display, (the Monitor faceplate) by 6 x Cheesehead screws.

RELAY BOARD with PSU FITTED (Part No. Q0118)

The Relay Board consists of a switch mode Power Supply Unit (PSU) mounted on a PCB. The PCB holds the fuses, the transistor TR1 (Part No. Q0111) and the terminal plugs and carries the alarm relays.

HARTING CONNECTORS LISTING

1/ 32 WAY Harting signal/supply to the Junction Box.

2/ 4 WAY shutdown – open or closed relay (nominated). This will be used as a data output to individual Shutdown Box when an individual shutdown set up is required.

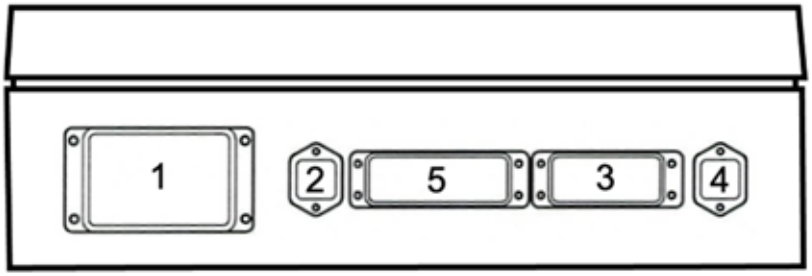
3/ 10 WAY alarm outputs.

4/ 4 WAY mains.

5/ 16 WAY Data Logger Output (Optional).

1.3 MULTIPLEX™ MONITOR CENTRAL MONITORING UNIT (CMU)

Mating Connectors for a Monitor with **HARTING CONNECTORS** is as below.



	HARTING CONNECTOR	PART NO.
1/	**32-WAY** (1-16 male; 17-32 female)	Q01H1
2/	**4-WAY MALE** Maximum overall dimension of cable 12mm	Q01H2
3/	**10-WAY MALE** Maximum overall dimension of cable 20mm	Q01H3
4/	**4-WAY FEMALE** Maximum overall dimension of cable 12mm	Q01H4
5/	**16-WAY MALE** Maximum overall dimension of cable 20mm	Q01H5

Connector No. 1 (Part No. Q01H1)

Connector No. 2 (Part No. Q01H2)

Connector No. 3 (Part No. Q01H3)

Connector No. 4 (Part No. Q01H4)

Connector No. 5 (Part No. Q01H5)

1.3 MULTIPLEX™ MONITOR CENTRAL MONITORING UNIT (CMU)

The Technical Specifications of the MULTIPLEX™ CMU are as follows:

POWER SUPPLY	Nominally 110/240V AC 50/60 Hz
MAXIMUM POWER CONSUMPTION	100W
MAXIMUM SAMPLING CHANNELS	12
CYCLE TIME	500 milliseconds simultaneously on all channels
SYSTEM OUTPUTS - RELAYS	All relays fitted with maximum change contacts voltage rating 110V@8A to 240V 5A
Main alarm	Normally energised with 1 set of change over contacts
Early warning alarm	Normally energised with 1 set of change over contacts
Function shutdown alarm	Normally de-energised with 1 set of change over contacts.
Fault alarm	Normally energised with 1 set of change over contacts
MULTIPLEX™ - DIMENSIONS (mm)	403 x 312 x 128
MULTIPLEX™ - WEIGHT (kg)	10
MONITOR SEAL	Monitor is sealed to IP65
OPERATING TEMPERATURE	5-70 °C Monitor (Part No. Q01H)
FEATURES	Continuous self-monitoring fault diagnosis. Manual test facility of all functions except the functional shutdown.
OPTIONAL	4-20mA data output for up to 12 individual alarms or data-logging of alarms

SENSOR DETAILS:

SENSOR - DIMENSIONS (mm)	359 x 113 x 73
SENSOR - WEIGHT (kg)	2.30
MAXIMUM DISTANCE	Maximum cable length between Sensor and CMU is 100 metres. (For longer lengths contact QMI)

FUSE ARRANGEMENTS:

Internal FS1	Head Interface 1.25A anti-surge
Internal FS2	12V DC Fan Failure Supply 400mA anti-surge
Internal FS3	400mA Data Logger PCB Protection
External FS4	110/240V AC 3.15A anti-surge

1.4 ATMOSPHERIC SENSOR WITH ARTICULATED JOINT (Part No. Q10C)

The Sensor operates using the principle of light scatter (nephelometry). The power and signal are transmitted to and from the Monitor through a single cable sending a timed analogue signal.

All Sensors sample simultaneously and continuously every half-second (500 milliseconds.)
The assembled Sensor comprises of:

a) Sensor

b) Articulated Joint

a) SENSOR

Inside the Sensor unit are sensing lenses, an integral fan and PCB. Power is supplied to the 12V fan by a single cable, which is connected to the Monitor (or to a Junction Box). The fan draws the samples of air past the Sensors and exhausts through the outlet ports. In the front of the Sensor unit are the air intake louvers and an LED, which shows green when the fan is working. The electronics are mounted on the back of the chamber casing and are protected by the cover sealed to IP65. At the back of the unit is the multi-purpose power and signal connector. Next to this connector is the mounting spigot.

b) ARTICULATED JOINT

The Articulated Joint is fitted to the bulkhead or deckhead allowing the Sensor to be positioned facing the flow of air in the chamber being monitored. The Sensor is fitted to the Articulated Joint with 4 screws, which can be removed if, and when, the Sensor lenses require cleaning or the fan changing.

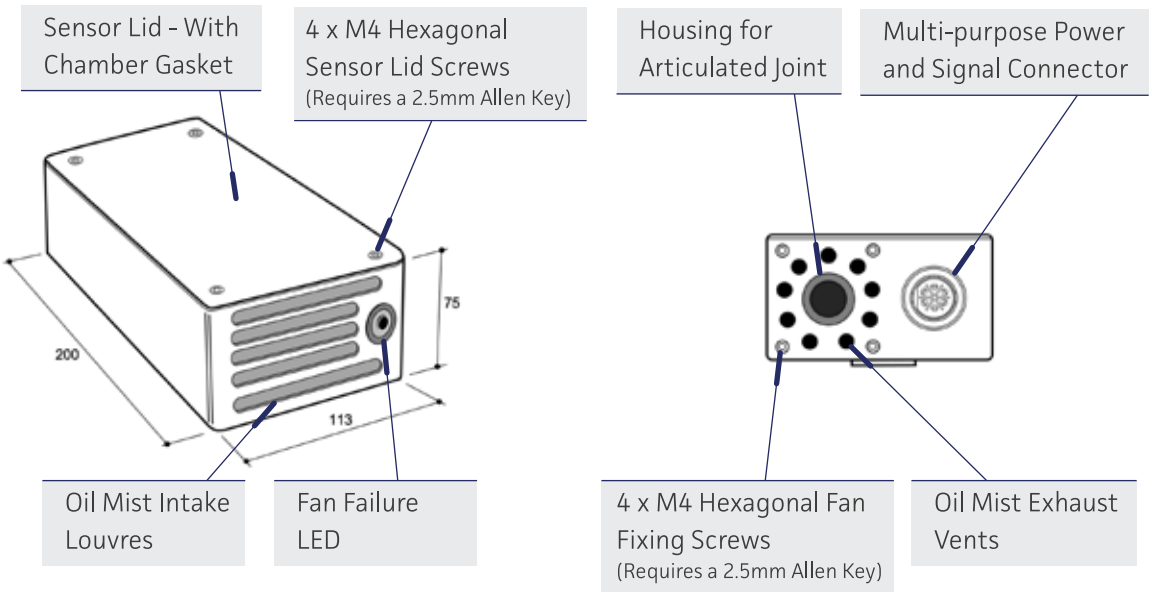
PART No. Q10C Atmospheric sensor with integral fan, mating connector and articulated joint

1.4 ATMOSPHERIC SENSOR WITH ARTICULATED JOINT (Part No. Q10C)

The physical dimensions of the Sensor are as shown below, (not to scale.)

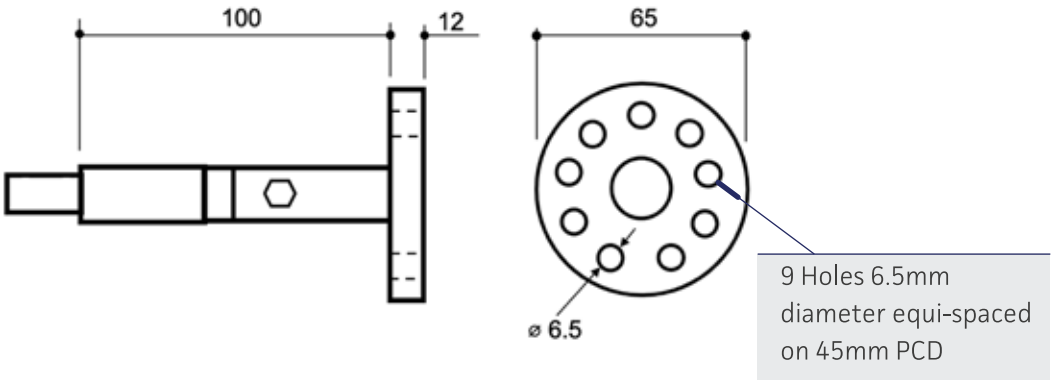
SENSOR

Weight: 1.5kg



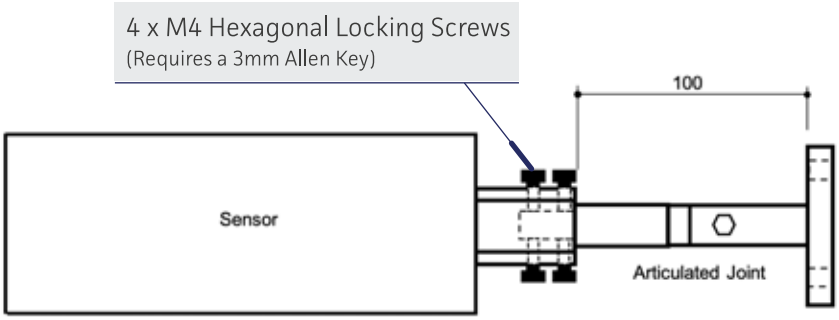
ARTICULATED JOINT

Weight: 0.8kg



SENSOR and ARTICULATED JOINT ASSEMBLED

Weight: 2.3kg



Dimensions in **mm**

SECTION 2

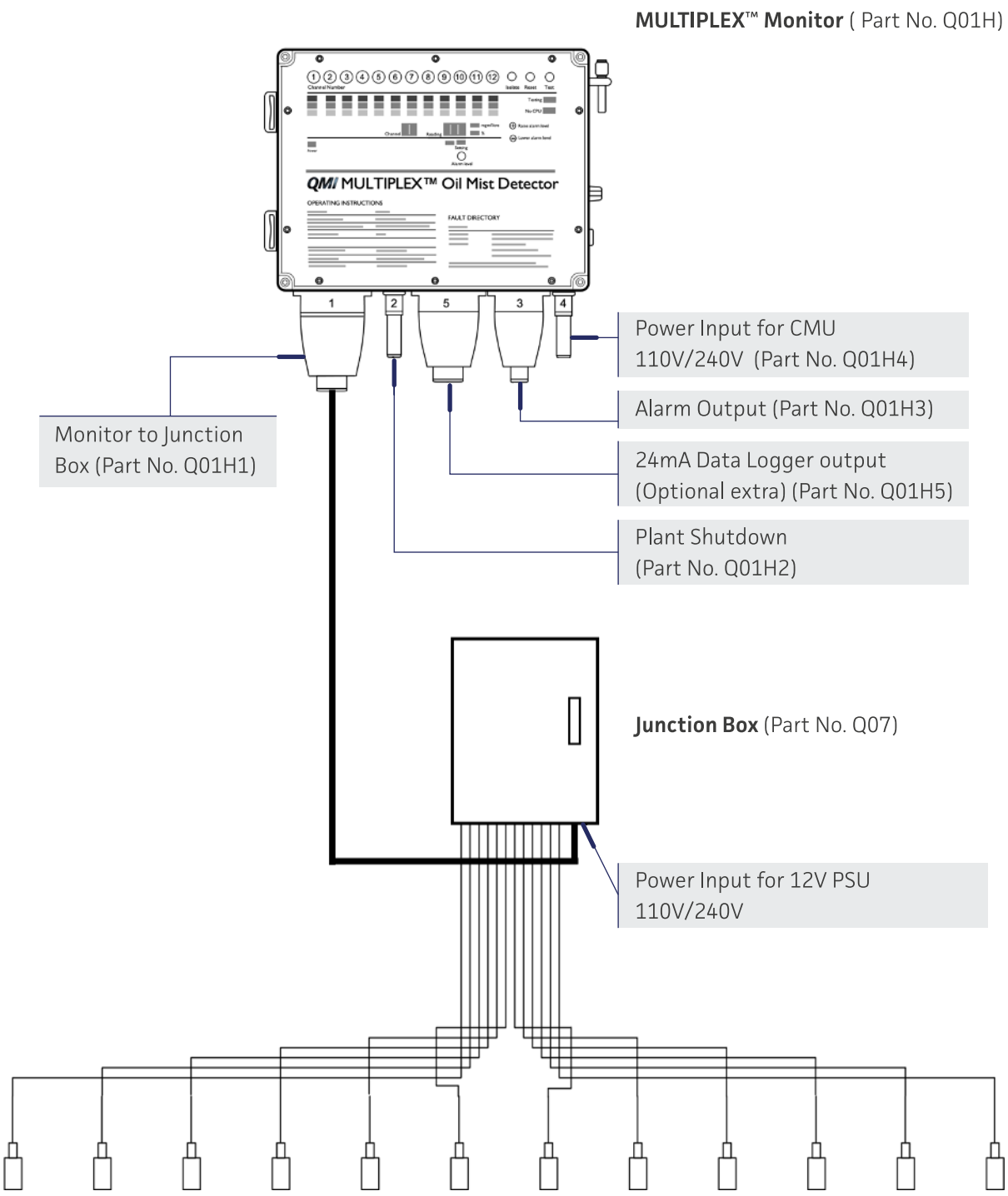
INSTALLATION GUIDELINES

2.1 General Arrangement Page 10

2.2 Panel mounting of the MULTIPLEX™ Monitor Page 11

2.1 GENERAL ARRANGEMENT

A general arrangement for an installation would be as follows:



2.2 PANEL MOUNTING OF THE MULTIPLEX™ MONITOR

Should you wish to mount the MULTIPLEX™ CMU to either a panel or on to a pre-fabricated wall bracket, please follow the instructions below and use this template to prepare the mounting position. Please also inform QMI as you will need Part No. Q0120

1/ To access the unit, open the Monitor cover, which will hinge at the left via 4 socket screws. This will expose 4 counter-bored screws to suit M6 x 55mm socket head screws used to attach the Monitor.

2/ First remove lower hinge screws from Monitor.

3/ Remove bezel from Monitor.

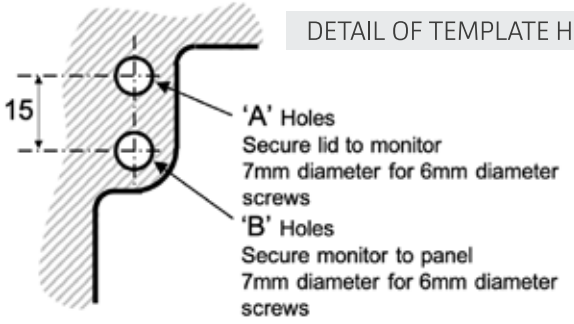
4/ Cut panel using template below.

5/ Temporarily place bezel in cut out and mark holes for hinge screws.

6/ Mark and drill key switch hole.

7/ Fit bottom side of Monitor using mounting kit, Part No. Q0120

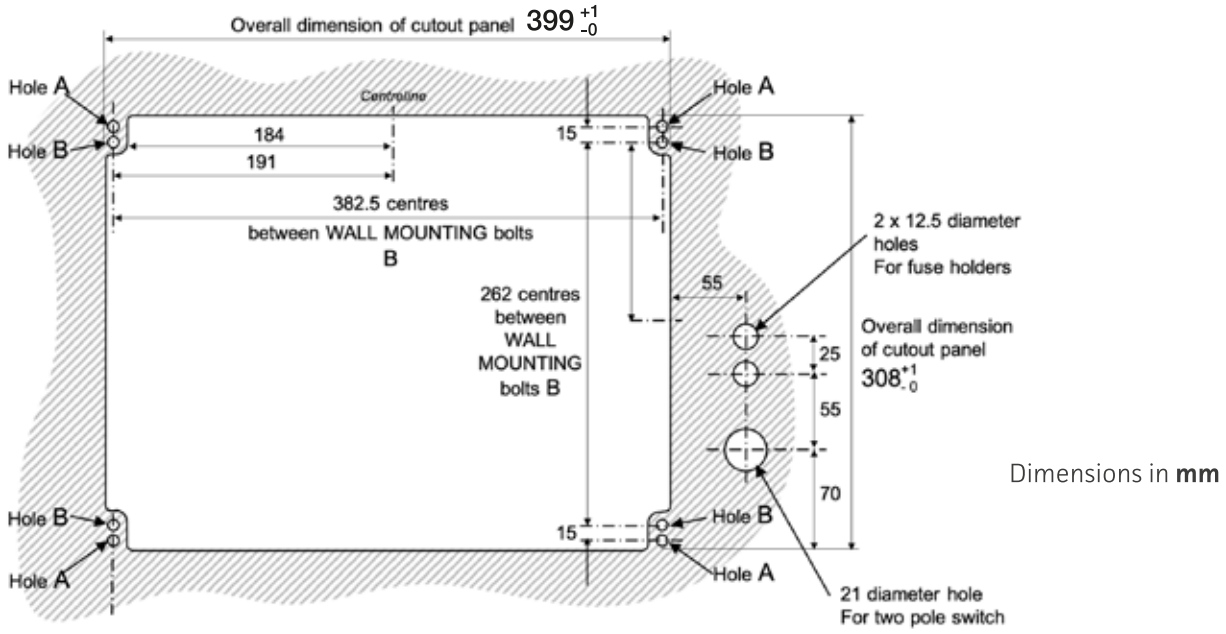
DETAIL OF TEMPLATE HOLES



8/ Placing bolts through inner holes in the cutout and then through the Monitor housing using the nuts supplied, bolting the housing in place.

9/ Place the bezel in place and mount the screws through the hinges and bolt in place, tightening the four Allen key bolts in the bezel.

10/ The Monitor is now installed.



Dimensions in **mm**

Front view of template for cut out to house the monitor / Dimensions in **mm**

SECTION 3

SENSORS – POSITIONING AND LOCATION

3.1 Number of Sensors Required Page 14

3.2 Location of Sensors Page 14

3.3 Positioning of a Sensor Pages 15-17

3.1 NUMBER OF SENSORS REQUIRED

When deciding on the number of Sensors required to monitor an area or system, several factors need to be considered. How many failure points are there? Which way is the air flowing past these failure points? Is there a large extractor operating in the space? In large engine rooms, we have fitted up to 24 Sensors to monitor the atmosphere, but in smaller hydraulic power pack rooms, possibly only one or two Sensors would be required to give adequate Sensor coverage. When deciding on the number of Sensors to be fitted in an area, good engineering practice and an understanding of the air flow in that area should be used.

NOTE: Sensors CANNOT be used in any space with a HAZARDOUS ZONE classification, such as certain pump rooms or open deck areas.

3.2 LOCATION OF SENSORS

Please follow the guidelines below to get the best results.

We recommend using a smoke test aerosol or smoke generator to ascertain the way the air flows over the machinery. (See also section 3.3.) Normally, air will move toward ventilation extractors or the turbo charger, therefore the Sensor must be placed in the air stream as close as possible to the machinery.

The Sensor comes with a fixing flange which is welded on to the Articulated Joint. We suggest the length of the cable that runs to the Sensor is longer than required to enable the Sensors to be moved at a later date if deemed necessary.

To confirm that the Sensors are correctly positioned you should carry out the following test; Wait until the engines, ventilation and other machinery are fully operational, then once again use your smoke test aerosol or smoke generator to prove the Sensors are correctly positioned. The Sensor should be rotated until positioned mid-airflow as indicated by the movement of smoke.

NOTE: Always place the Sensor in a position so that it can be easily maintained as the Sensors should be cleaned regularly.

3.3 POSITIONING OF A SENSOR

We discuss below how the movement of oil mist in the atmosphere responds in working environments and suggest how the placement of Sensors in an optimum position is determined by the flow of air. The Sensors may have to be adjusted when setting up the system, (or even later,) when any structural alterations are made or when machinery changes or more powerful fans are introduced within the area.

There are so many variables in the detection of oil mist in the atmosphere that it is by no means an exact science. Common sense has a part to play when positioning Sensors.

3.3.1 HOW MUCH DOES THE SENSOR DRAW?

It pulls through 23 cubic feet/min or 0.65m^3/min.

3.3.2 WHAT IS THE DETECTING RANGE?

There is no detecting range for the Sensor. The Sensor uses its internal fan to draw in air, which is then tested for oil mist. Three sensor devices inside the Atmospheric Sensor measure backscatter of light from oil mist (smoke/steam) particles drawn into the Sensor, and dirt on the lenses.

3.3.3 WHAT ARE THE FACTORS THAT DETERMINE THE POSITIONING AND NUMBER OF SENSORS NEEDED?

Four factors determine good positioning and number of Sensors. These factors should be considered together, and a smoke generator is a good way to observe air movement and test positioning of the Sensors.

1/ Size of room or chamber (e.g. hydraulic pack area or engine room)

The fan in the Sensor has a through-put of 0.65m^3 per minute. In a large room more Sensors will allow a faster response. Also, dispersal of oil mist will be greater in a larger space and will require more careful positioning of the Sensors in the path of airflow.

2/ Air circulation

In addition, the movement of air affects how many Sensors should be installed. If a room has only one vent then the Sensor placed near this vent will be able to sample air extracted from the room. However, if there is more than one vent or point of extraction a Sensor is best placed in each path of air being drawn towards each of the vents.

This is why a smoke test aerosol or a smoke generator is used to ensure the Sensor points towards the potential source of oil mist. The Sensor should be installed with the intake louvres facing the path of the smoke as shown by the smoke generator. The smoke generator will also show any eddies or paths that the air may follow in the chamber which is important to ensure that Sensors are correctly positioned.

In hydraulic pack areas there should be a Sensor between each extractor and the packs which normally means 2 to 3 Sensors, especially if the pack is in the engine room. This should be borne in mind with any areas being monitored.

3/ Proximity to potential source of oil mist

A Sensor should be placed downstream of the airflow around a potential source of oil mist (e.g. hydraulic pump). The closer a Sensor is to the machinery, the faster the response time should be.

4/ Number of potential sources of oil mist

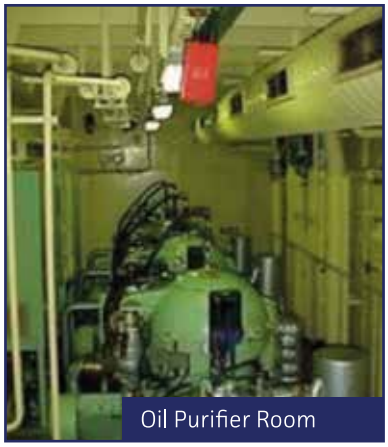
A fourth factor is the number of potential sources of oil mist. To make it easier to determine the source of oil mist, each piece of machinery or potential oil mist source should have a Sensor installed immediately downstream of the air flow to ensure the fastest response possible.

In an engine room several Sensors are needed but the exact location will vary according to the air flow.

Some examples of Sensor installations and positioning.

Fan Room

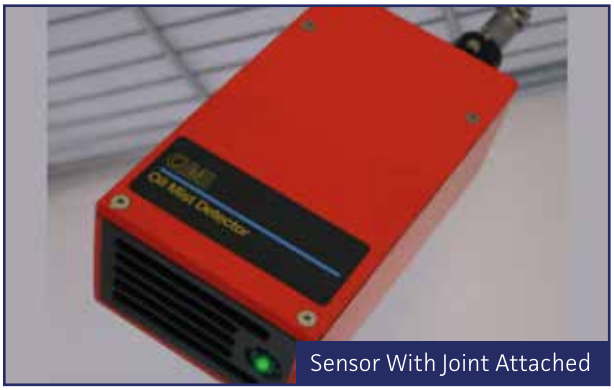
Inert Gas Generator


Oil Purifier Room

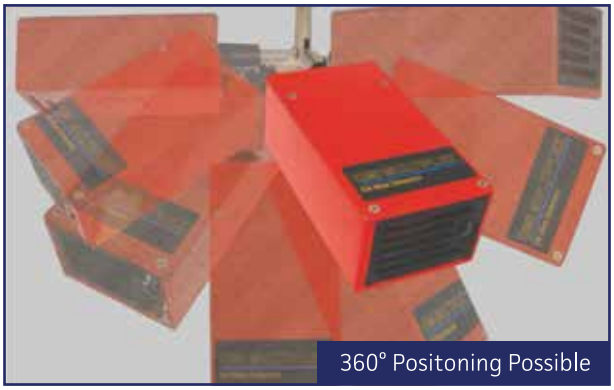
3.4 POSITIONING OF A SENSOR – BEST PRACTICE

In order to assist with the best positioning of a Sensor, QMI have developed an Articulated Joint, which is supplied with the Sensor.

Articulated Joint


Sensor With Joint Attached

The articulation available through use of this Joint allows the Sensor to be positioned mid airflow, in any direction.


360° Positoning Possible

BEST PRACTICE

Until the system is operational, to avoid contamination of the lenses of the Sensor after installation, cover Sensors with a plastic bag. This will prevent paint or other materials dirtying or damaging the lenses or blocking the Sensor louvres and fan. This outcome permanently damages the sensors and may require them to be returned to QMI for repair.

When oil mist detection system is in operation:

- Do not conduct painting in the same space as the Sensors
- NEVER cover the Sensors

When Sensors are installed but not in operation:

- Keep Sensor(s) sealed in a plastic bag

SECTION 4

CABLING AND WIRING

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Shown here is a correctly wired Junction Box (PART No. Q07)

4.1 CABLE SPECIFICATIONS

For the following connection we RECOMMEND THE MINIMUM TYPE AND SIZE as follows:
Halogen free instrumentation, control and communication cable for fixed installation in ships or equivalent appropriate specifications for application.

Conductor: Standard copper conductor, annealed, IEC228 CLASS2
Insulation: According to appropriate standards
Pairs: Two core twisted cable size 1 x 4 x 0.5mm^2 or 0.75mm^2
Stranding: Pairs stranded together
Screening: Braid of Annealed Copper Wires. Filler tape under braid.

CONNECTOR	CONNECTION	NUMBER OF CONDUCTORS AND CROSS SECTION (n x mm^2)
1	Monitor to Junction Box	19 x 2 x 0.75mm^2
2	Monitor to Alarms or Shutdown	4 x 2 x 0.5mm^2
3	Monitor to Main Alarm	4 x 2 x 0.5mm^2
4	Monitor Power	3 x 1.5mm^2 rating Minimum 3A LNE not twisted
	Junction Box to Sensors	4 x 2 x 0.5mm^2 (for lengths over 100m 0.75mm^2 size wire should be used)
	Power to Junction Box	3 x 1.5mm^2 rating Minimum 3A LNE not twisted

Example supplier: Helkama of Finland (LKM – HF for 3 x 1.5 power cable) and RFE – HF for 4 x 2 x 0.5mm^2 twisted connection cables.

4.2 WIRING OF ALARM

If wiring just one side of each relay is either open or closed, use 6 cores.
If both sides of relay are being wired 9 cores will be required.

4.3 EARTHING OF SENSORS

The screen is normally connected to Pin 5. No earth should be made at the Sensor end as this could result in ground loops. Earths made to any other point from the screen wire between Monitor and Sensor will be ineffective and could cause additional interference.

4.4 WIRING DESCRIPTION

The wires are terminated into Harting plugs. These plug into the connectors on the MULTIPLEX™ power supply board.

4.4.1 WIRING FOR POWER SUPPLY 110/240 VAC

The Mains connector is a 4-pin with Live, Neutral and Earth. On the Power Supply Board this is marked L, N +. (See also drawing of Connector No. 4 (Part No. Q01H4) - Section 4.12.) Cable is a 3 core of 1.5mm^2 and can be sourced from Helkama; part number LKM – HF 3 x 1.5.

4.4.2 WIRING FOR SENSORS

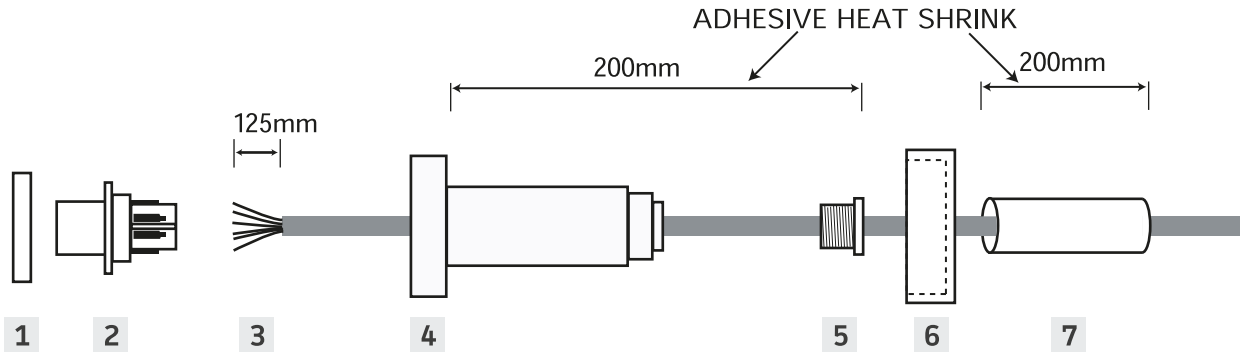
The Sensors are wired using 3 twisted-pair cable. Each connector is wired left to right and numbered 1 to 6. The cable specification is 3 twisted pair of 0.5mm^2 or 3 twisted pair of 0.75mm^2 where the distance is over 100 metres. This cable can be sourced from Helkama; part number RFE – HF 4 x 2 x 0.5mm^2 or 4 x 2 x 0.75mm^2.

Terminal 1 = Sensor supply +
Terminal 2 = Sensor signal
Terminal 3 = Sensor supply common
Terminal 4 = Sensor signal common
Terminal 5 = Drain wire/screen
Terminal 6 = Fan 12V DC supply

There are three warning alarms: Early warning, Shutdown and Main. There is also a Fault Alarm.

The cable to use for wiring of alarms can be the same as used for wiring of Sensors. If you intend to use all four alarms you will need a 4 twisted pair cable.

4.5 WIRING OF SOCKET



1/	RETAINING RING
2/	CONNECTING BLOCK WITH TERMINALS
3/	BARED AND TINNED WIRES
4/	MAIN HOUSING OF SOCKET
5/	CABLE LOCKING SCREW
6/	MAIN SECURING THREAD TO HOLD SOCKET TO PLUG
7/	24mm ADHESIVE HEAT SHRINK SLEEVING (Not supplied by QMI)

ASSEMBLY INSTRUCTIONS

1/ Strip back about 125mm of outer sheathing of cable and separate the wires. Then tin the ends of wires and the drain/wire screen being used.

2/ Assemble socket on to wire in the sequence shown in illustration. By passing wires through parts **4** , **5** , **6** and **7**

3/ Wire bared wires and screen to correct numbered terminals of Part 2. Numbers are shown by the terminals. See section 4.4.2., page 21.

4/ Reassemble and lock with part number **1**

5/ Pull heat shrink **7** over first part of **4** and wire to main cable and then shrink in the appropriate way.

4.6 MULTI-CORE CABLE SIZING TABLE WHEN LESS THAN 10 ATMOSPHERIC SENSORS ARE USED

It is not necessary to use a 19 twisted pair cable between the CMU and the Multi-way Junction Box if less than 10 Sensors are needed.

Below is a Table on how to select a multi-core cable. If fewer Sensors are to be used the terminals to be wired in the Junction Box are as follows:

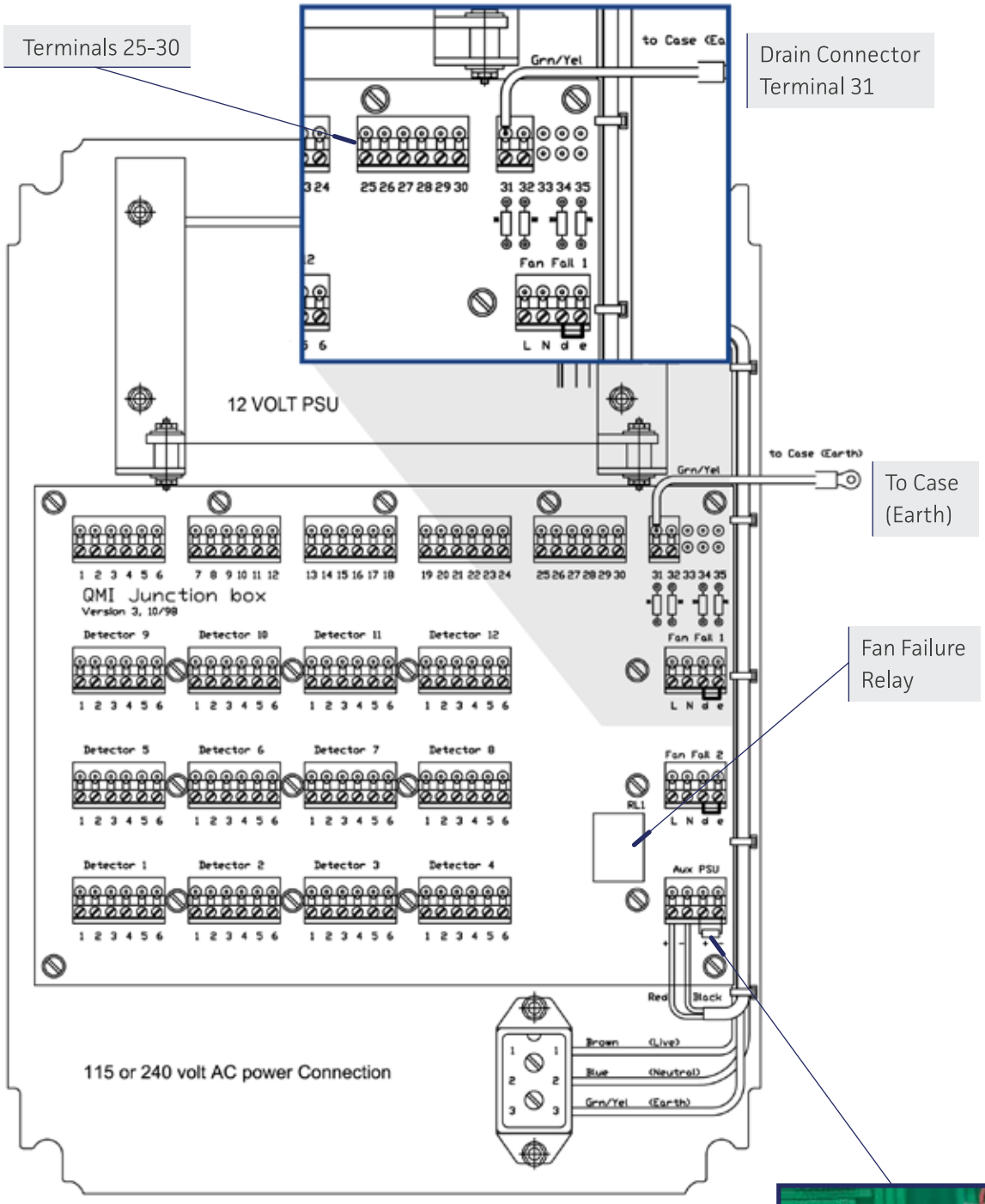
- Drain connector (31) must always be used
- Supply common (25) is used when only 3 or 4 Sensors are used
- Supply common (25 & 26) are used when more than 3 or 4 Sensors are used
- Supply + (27) is used when only 3 or 4 Sensors are used
- Supply + (27 & 28) is used when more than 4 Sensors are used
- Fan failure connections (29 & 30) are always used
- 12V Fan Failure connection (32) is always used

NOTES:

For further wiring details see other parts of Section 4.
Numbers shown in brackets above (25 to 32) refer to terminals as shown on the illustration on the following page.

		Supply Common 25 & 26		Supply + 27 & 28		Fan Failure 29 & 30		12V Fan Failure 32	
No of Sensors	No of Twisted Pairs	Wire No	Pair No	Wire No	Pair No	Wire No	Pair No	Wire No	Pair No
3	7	7 & 8	4	9 & 10	5	11 & 12	6	13 & 14	7
4	8	9 & 10	5	10 & 11	6	13 & 14	7	15 & 16	8
6	12	13 & 14 15 & 16	7 8	17 & 18 19 & 20	9 10	21 & 22	11	23 & 24	12
7	13	15 & 16 17 & 18	8 9	19 & 20 21 & 22	10 11	23 & 24	12	25 & 26	13
8	14	17 & 18 19 & 20	9 10	21 & 22 23 & 24	11 12	25 & 26	13	27 & 28	14
9	15	19 & 20 21 & 22	10 11	23 & 24 25 & 26	12 13	27 & 28	14	29 & 30	15

4.7 MULTI-WAY JUNCTION BOX (Part No. Q07) – PCB WITH 12V PSU



Note: For Customers with older systems there has been a minor update to the Fans in the Q10 Sensor as they were an end-of-life product. The new Fans draw less resistance and will cause the power supply not to power up in the Junction Box.

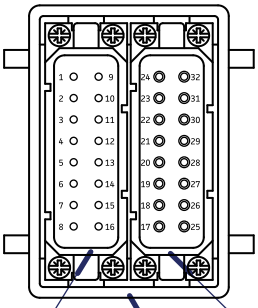
Any installation seeing flickering of the green LED on the front of Sensor and an audible clicking noise in the Q07 Junction Box relay either has a power supply failure or will require a resistor to be fitted between pins + and – as shown in the illustration above and the photo here.

Please use a 68 Ohms 3-watt resistor. The make and model does not matter as long as the rating is correct. We would recommend trying this before ordering a new power supply.

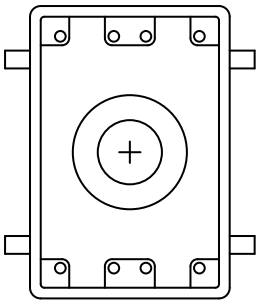
4.8 CONNECTOR No. 1 (Part No. Q01H1) DETAILS – JUNCTION UNIT

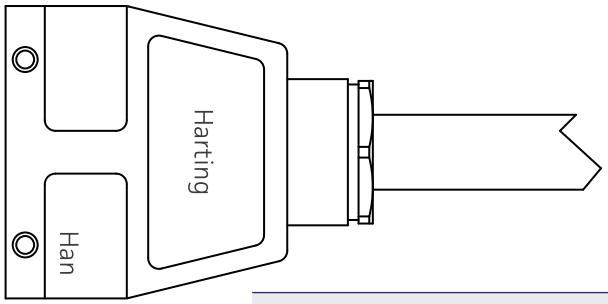
OVERALL VIEW OF CONNECTOR NO. 1

Hood with Terminal Inserts fitted



Inside View Of Hood





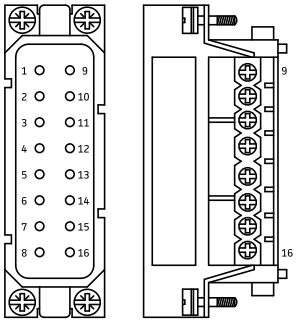
Han 16A Screw-Terminal Insert

Han 32A Screw-Terminal Insert

Top Entry Hood

Left unterminated. Connect to corresponding pinout on Detector PCB on QMI Junction Box PCB

EXPLODED VIEW OF 16A PLUG (Male)



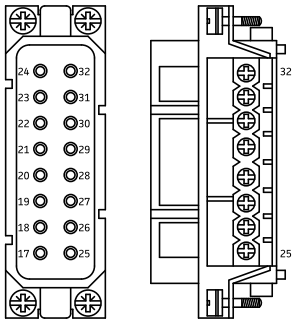
19W Twisted pair-wires are mounted into this face

Pin View

Screw Fix View

Connector No. 1 (Part No. Q01H1)

EXPLODED VIEW OF 16A SOCKET (Female)



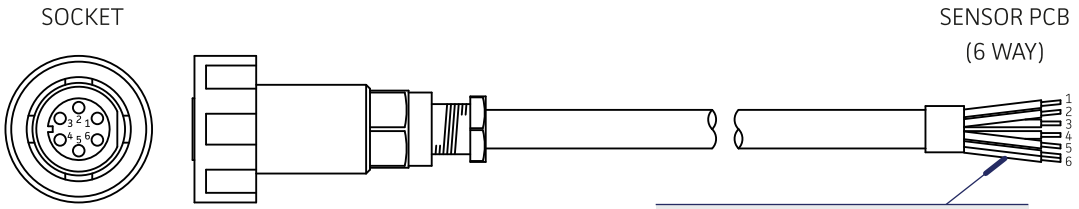
19W Twisted pair-wires are mounted into this face

Pin View

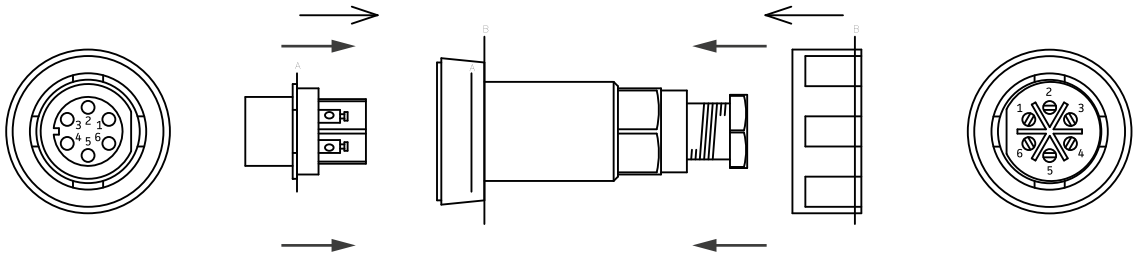
Screw Fix View

4.9 CABLE DETAILS FOR ATMOSPHERIC SENSORS 6 POLE SOCKET (Part No. Q0208)

CABLE DRAWING



EXPLODED VIEW OF CONNECTOR



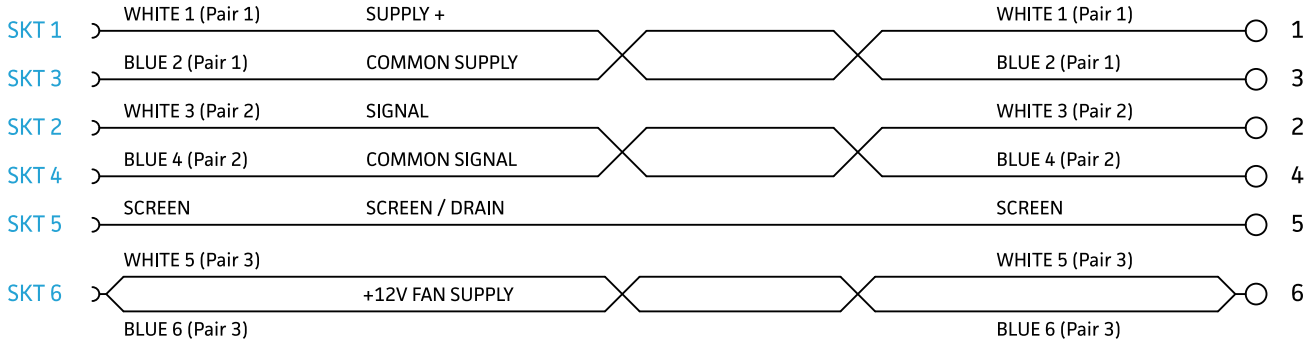
NOTES:

The cable for the above is specified as: HELKAMA Ref. RFE-HF (0.5mm² 4 pair)

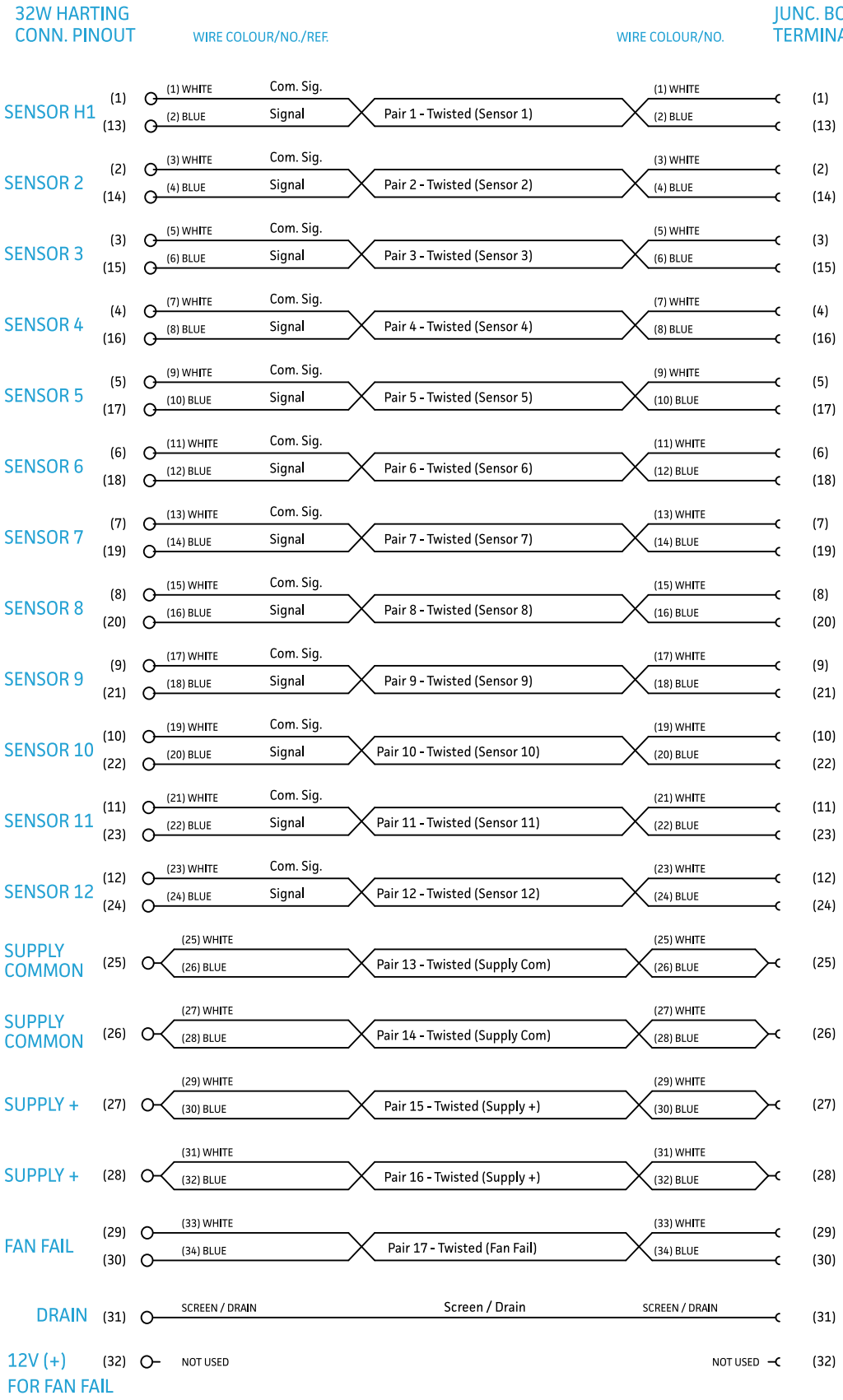
Pair 4 is not used

6 Pole socket (Part No. Q0208)

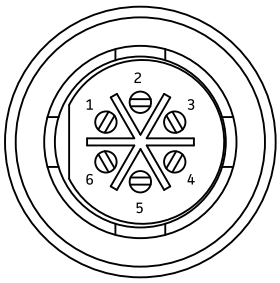
SOCKET — **WIRING INFORMATION** — SENSOR PCB (6 WAY)



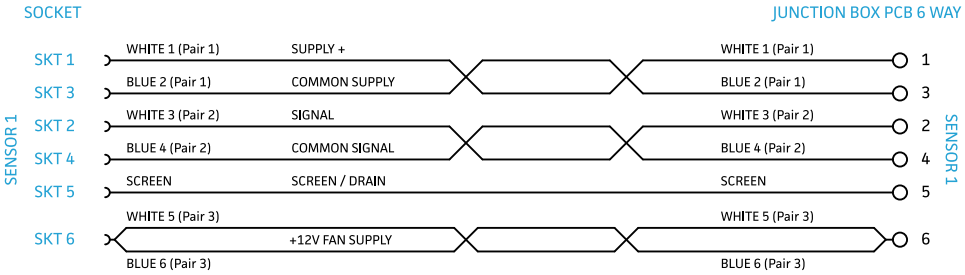
4.10 CONNECTOR DETAILS FOR MULTIPLEX™ MONITOR – JUNCTION BOX WHEN WITH 12 ATMOSPHERIC SENSORS (Part No. Q10)



4.11 WIRING DETAILS FOR JUNCTION BOX (Part No. Q07) TO ATMOSPHERIC SENSORS



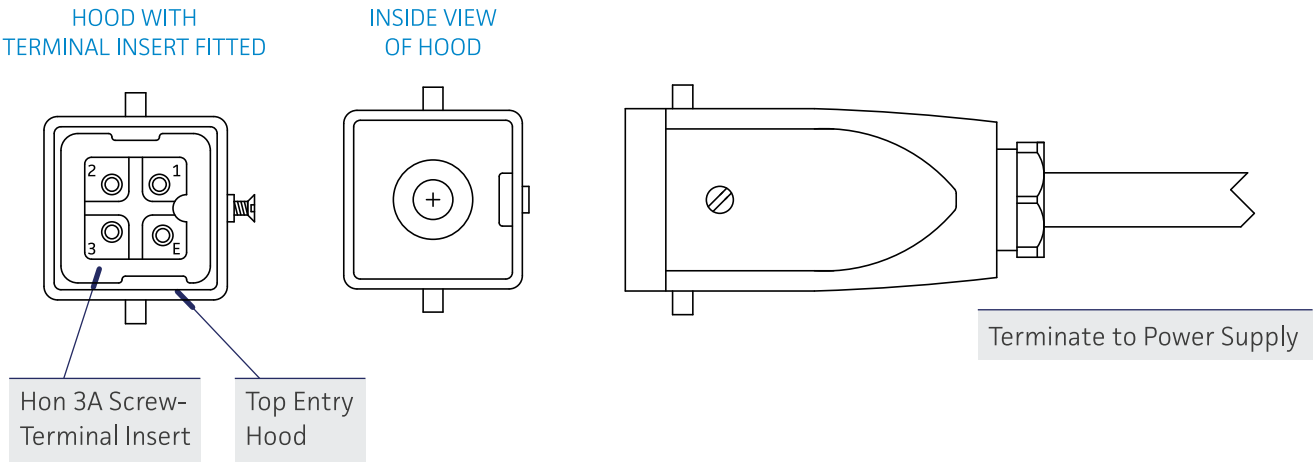
VIEW FROM INSIDE OF SOCKET



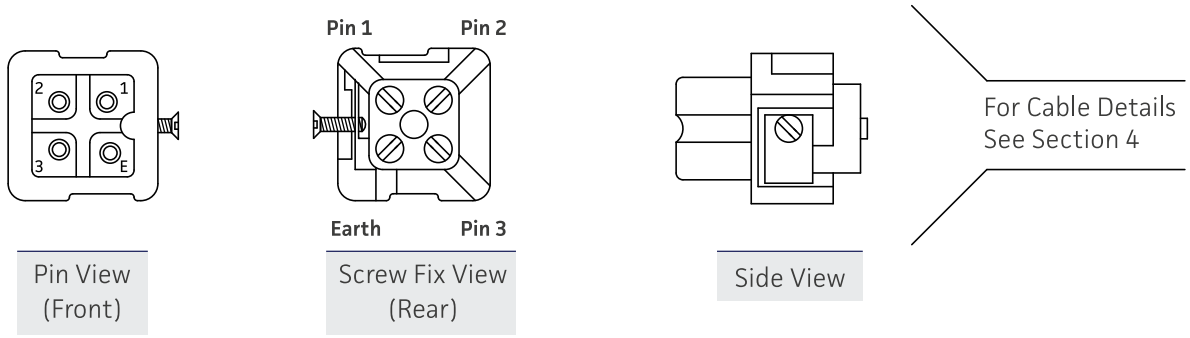
PLEASE REPEAT WIRING DETAILS FOR THE ATMOSPHERIC SENSORS 2-12

4.12 CONNECTOR NO. 4 (Part No. Q01H4) - DETAILS FOR MULTIPLEX™ MAINS 110/240V POWER SOCKET

OVERALL VIEW OF CONNECTOR NO. 4



EXPLODED VIEW OF HON 3A SCREW TERMINAL INSERT (SOCKET)



110/240V POWER SUPPLY WIRING

HARTING PIN NO	FUNCTION
1	Live
2	Neutral
3	No connection
4	Earth

Connector No. 4 (Part No. Q01H4)

1/ The 110/240V AC power supplies the Monitor.

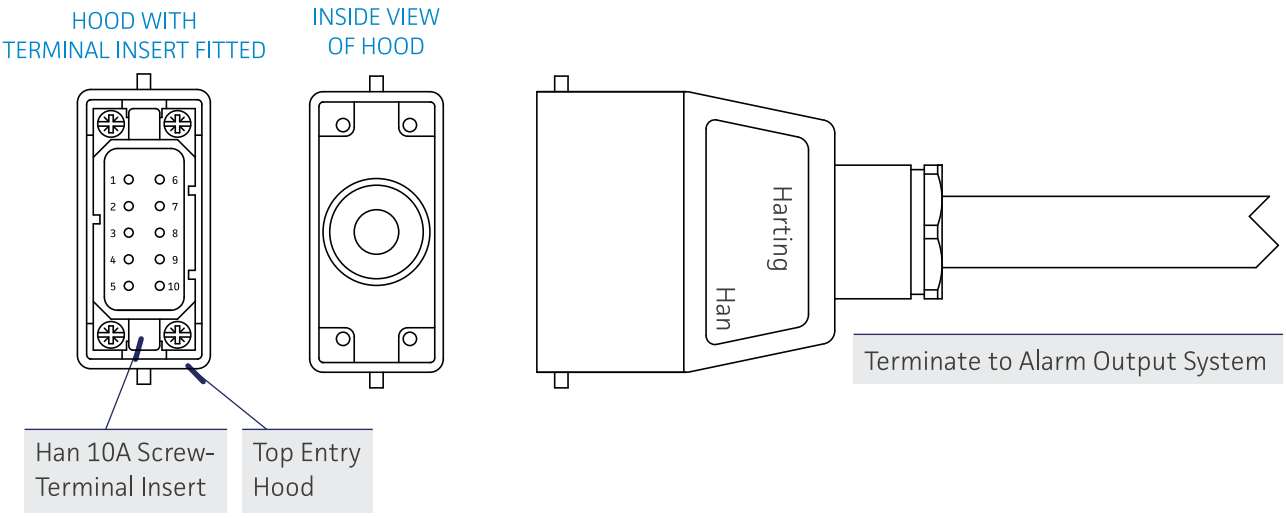
2/ The table here shows the wiring for 110/240V AC Power Supply.

3/ The cable used should be of minimum 3 cores and can range from a minimum thickness of 0.25mm^2 up to 2.5mm^2 maximum.

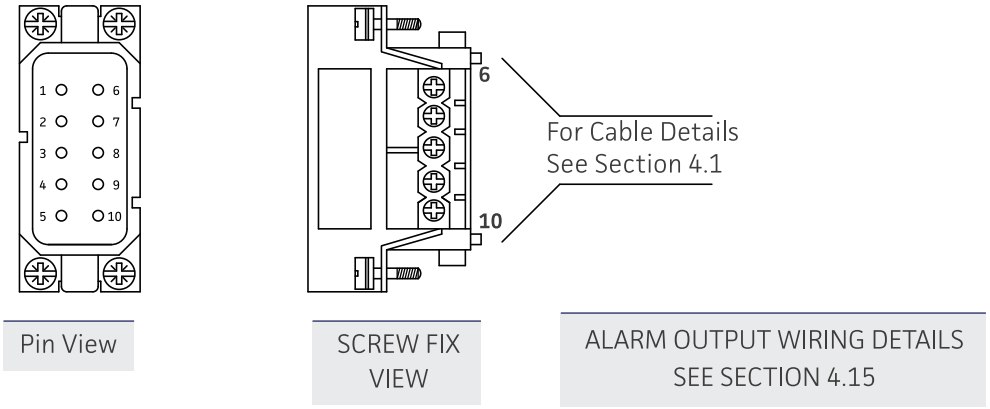
4/ Do not use twisted cables.

4.13 CONNECTOR No. 3 (Part No. Q01H3) - DETAILS FOR RELAY ALARM OUTPUT

OVERALL VIEW OF CONNECTOR NO. 3



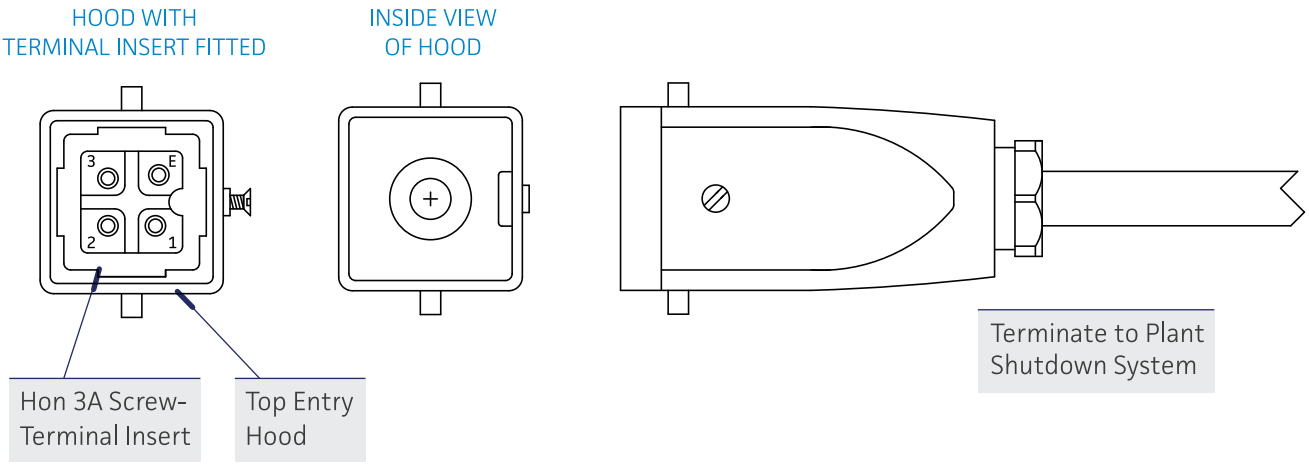
EXPLODED VIEW OF HON 10A SCREW TERMINAL INSERT (PLUG)



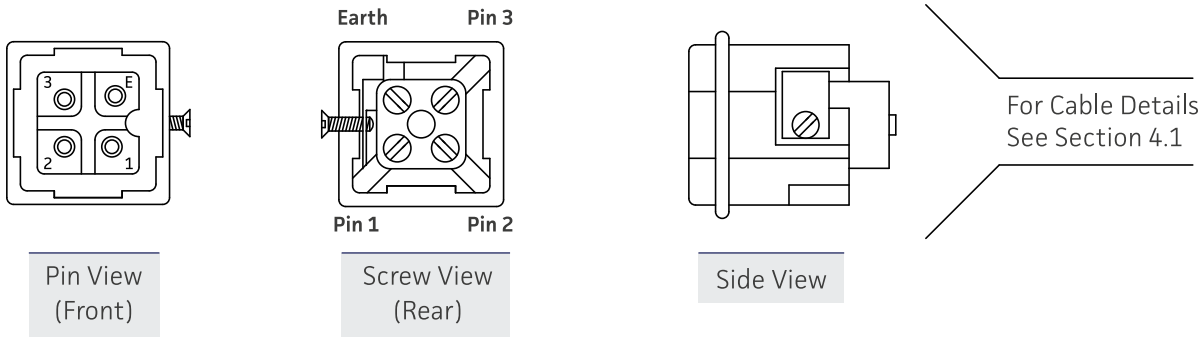
Connector No. 3 (Part No. Q01H3)

4.14 CONNECTOR No. 2 (Part No. Q01H2) - DETAILS FOR RELAY SHUT DOWN OUTPUT

OVERALL VIEW OF CONNECTOR NO. 2



EXPLODED VIEW OF HON 3A SCREW TERMINAL INSERT (PLUG)



Connector No. 2 (Part No. Q01H2)

PLANT SHUTDOWN WIRING DETAILS SEE SECTION 4.16

4.15 ALARM OUTPUT WIRING

1/ The alarm outputs are transmitted from the Monitor.

2/ The alarms operate via Open or Closed contacts (Relays).

3/ Below are wiring details for the following Alarm types

i. Main Alarm (Relay 10)

ii. Early Warning Alarm (Relay 7)

iii. Functional Shutdown Alarm

iv. Fault Alarm Relay (Relay 8)

4/ The cable used should be of minimum 6 cores and can range from a minimum thickness of 0.25mm^2 up to 2.5mm^2 maximum.

RELAY NO	HARTING PIN NO	FUNCTION	NON-ALARMED	ALARMED
RL7	1	Early Warning Alarm	Connect to Pin 2	Disconnect
	2	Common		
	3	Early Warning Alarm	Disconnect	Connect to Pin 2
RL8	4	Fault Alarm	Connect to Pin 5	Disconnect
	5	Common		
	6	Fault Alarm	Disconnect	Connect to Pin 5
RL10	7	Main Alarm	Connect to Pin 8	Disconnect
	8	Common		
	9	Main Alarm	Disconnect	Connect to Pin 8

4.16 OPTIONAL PLANT SHUTDOWN WIRING

1/ The Plant Shutdown outputs are transmitted from the Monitor via a 4-way Harting Plug.

2/ The Shutdown operates via Open or Closed contacts (Relays).

3/ Below shows the wiring details for Plant Shutdown (Relay 9).

4/ The cable used should be of minimum 2 cores and can range from a minimum thickness of 0.25mm^2 up to 2.5mm^2 maximum.

RELAY NO	HARTING PIN NO	FUNCTION	NON-ALARMED	ALARMED
RL9	1	Plant Shutdown	Disconnect	Connect to Pin 2
	2	Common		
	3	Plant Shutdown	Connect to Pin 9	Disconnect

4.17 MULTIPLEX™ 4-20mA DATA LOGGER OUTPUT (Part No. Q08)

The Data Logger function in Atmospheric systems is used for alarm panel integration or black box data recording.

The Monitor sends out a 4-20mA signal corresponding to the displayed mist percentage for each Sensor. This is a digitally calculated reading taking into account temperature non-linearity of the Sensors and oil deposit build-ups within the Sensor.

The signal can be used on a master alarm panel, or data logger and corresponds to the reading shown in the display.

Current = (Display % x 16 ÷ 156) + 4

Display	0	10	20	30	40	50	60	70	80	90
mA	4.00	5.00	6.00	7.10	8.10	9.10	10.20	11.20	12.20	13.20

Display	100	110	120	130	140	150	160	170	180
mA	14.30	15.30	16.30	17.30	18.30	19.40	20.41	21.40	22.50

The 4-20mA output from the Monitor is available on the 16-way Connector No. 5 in the centre of the box. See following page.

PIns 1 to 12 correspond to channel connections which are 0 Volts.

Pin 13 not used

Pin 14 This is a +12volts d/c connection which is common to all 12 channels.

Pin 15 not used

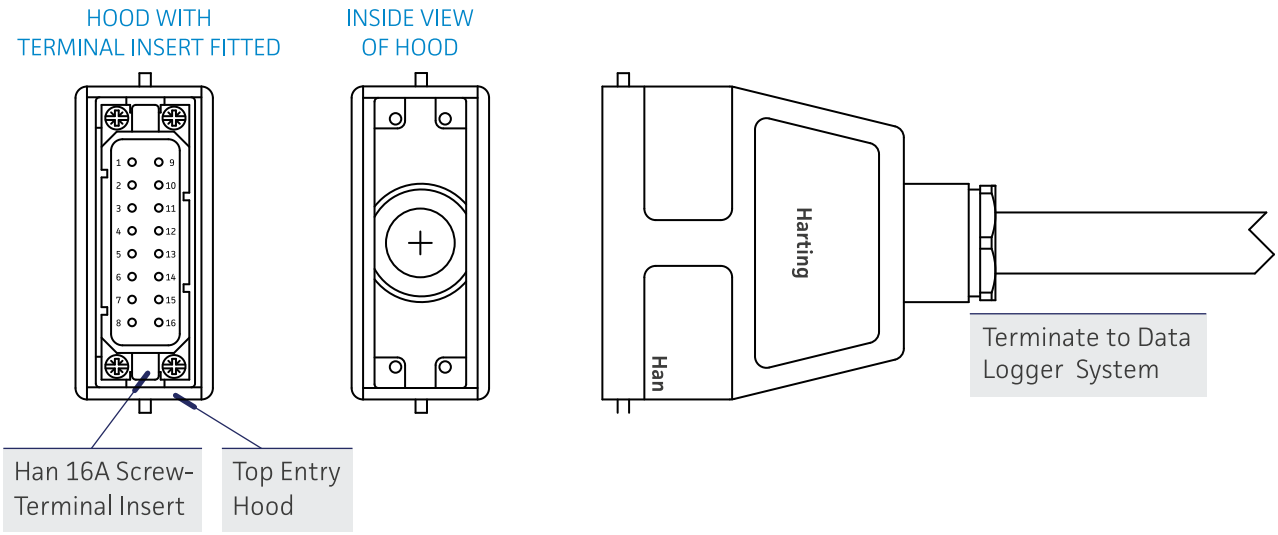
Pin 16 not used

You will need to connect the individual channels of the instrumentation to Pins 1 to 12. These are 0 Volt outputs from the QMI Monitor. Then Pin 14 should be connected to the instrumentation. This is a +12V d/c output from the Monitor. This output is common to all 12 channels.

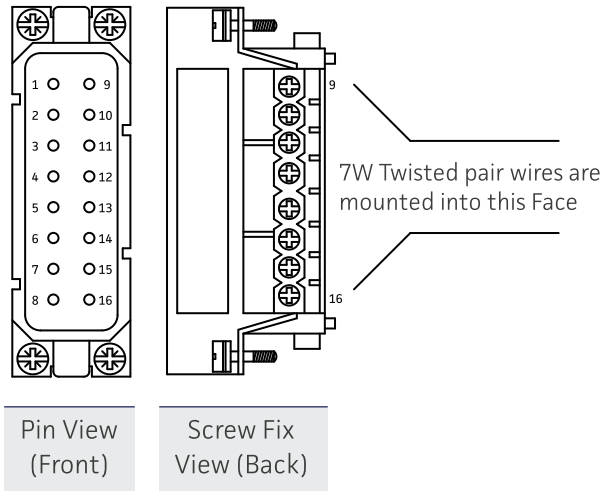
The FS3 400mA Fuse has been built in to protect the Data Logger PCB. It has a LED3 Green light which is constantly lit (not flashing) showing there is no fault with the Data Logger.

4.18 CONNECTOR No. 5 (Part No. Q01H5) - DETAILS FOR MULTIPLEX 4-20mA DATA LOGGER OUTPUT

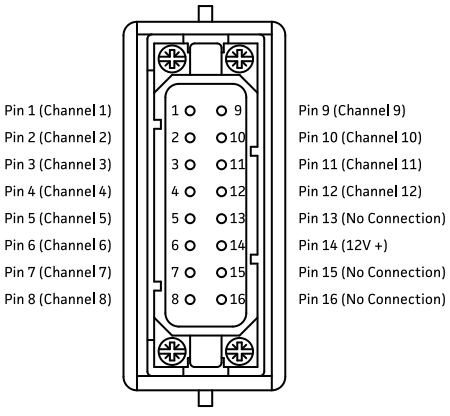
OVERALL VIEW OF CONNECTOR NO. 5



EXPLODED VIEW OF HON 3A SCREW TERMINAL INSERT (PLUG)



TERMINATION NAMES



Connector No. 5 (Part No. Q01H5)

SECTION 5

SETTING UP THE SYSTEM

5.1	Setting up Sensors	Page 36
5.2	Changing the number of Sensors	Page 37
5.3	Isolating or restoring a Channel	Page 38
5.4	Test sequence	Pages 39-40

5.1 SETTING UP SENSORS

On the start up of the Monitor, if all dip switches are off the software version of the Monitor will be displayed followed by a looping test programme until the dip switches are set up for the required number of Sensors. If the display is showing 12 channels and (for example) only 7 Sensors have been fitted then the display will show positions 8 to 12 as flashing amber, green and red lights. Also the display reading will show 'F1' fault. To correct or change the MULTIPLEX™ Monitor to show only 7 channels and cancel the other positions showing, the following procedure should be carried out:

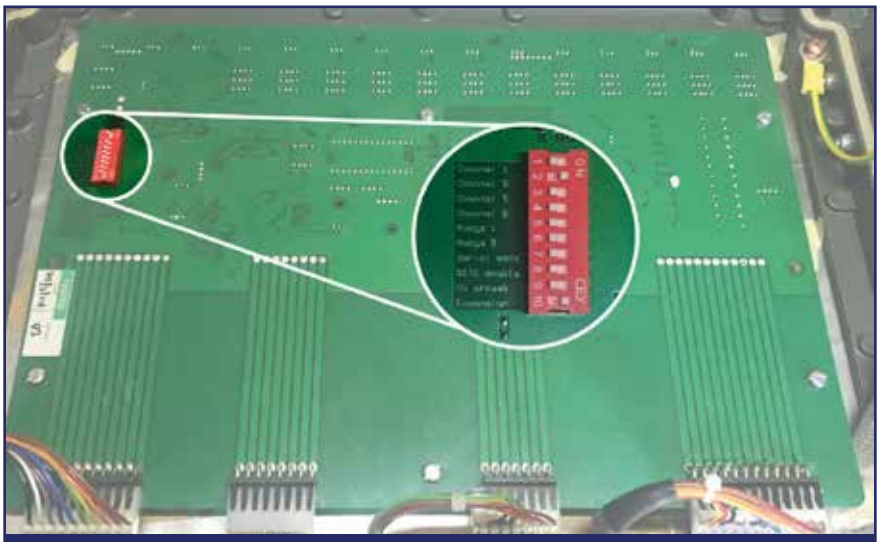
1/ Disconnect the power to turn off the Monitor and switch off the system.

2/ For safety, unplug the 3-pin power connector from the Monitor.

3/ Using the 'T' handled Allen key provided, unscrew the front 4 x M6 screws, one located at each corner of the Monitor.

4/ The front of the Monitor is hinged, and the front panel can now be swung open. The display MP12 PCB v3.2 can be seen screwed into the lid. There is no need to remove or unscrew this PCB from the lid.

5/ The Binary switch blocks are located on the back of the MP12 PCB v3.2. There are a total of 10 Binary switches. The Binary switch block looks as follows.



PART NO. Q0104A MP12v3.2 PCB

6/ To program the switches for a number of Sensors, switch to the positions shown on the following page. (Section 5.2. Changing the number of Sensors.)

5.2 CHANGING THE NUMBER OF SENSORS

The MULTIPLEX™ system CMU can be set up for a different number of Sensors and can have a total of 12 Sensors connected to it. If there are 12 Sensors attached the display will show 12 positions illuminated.

The number of Sensors in use can be adjusted by switches located on the back of the MP12 PCB v3.2.

There is a 10-way Binary switch located on the MP12 PCB v3.2, with each Switch operating as follows.

SENSORS REQUIRED	SWITCH 1	SWITCH 2	SWITCH 3	SWITCH 4	SWITCH 5	SWITCH 6	SWITCH 7	SWITCH 8	SWITCH 9	SWITCH 10
01	ON	OFF	OFF	OFF	SEE NOTE	OFF	OFF	OFF	SEE NOTE	OFF
02	OFF	ON	OFF	OFF		OFF	OFF	OFF		OFF
03	ON	ON	OFF	OFF		OFF	OFF	OFF		OFF
04	OFF	OFF	ON	OFF		OFF	OFF	OFF		OFF
05	ON	OFF	ON	OFF		OFF	OFF	OFF		OFF
06	OFF	ON	ON	OFF		OFF	OFF	OFF		OFF
07	ON	ON	ON	OFF		OFF	OFF	OFF		OFF
08	OFF	OFF	OFF	ON		OFF	OFF	OFF		OFF
09	ON	OFF	OFF	ON		OFF	OFF	OFF		OFF
10	OFF	ON	OFF	ON		OFF	OFF	OFF		OFF
11	ON	ON	OFF	ON		OFF	OFF	OFF		OFF
12	OFF	OFF	ON	ON		OFF	OFF	OFF		OFF

NOTES:

Switch 5 is for the oil mist range:

· With Switch set to **OFF** the oil mist range is from 0 up to 1.30mg/L

· With Switch set to **ON** the oil mist range is from 0 up to 2.0mg/L

· After changing the Switch from OFF to ON or ON to OFF, the alarm levels should be adjusted for each channel.

Switch 9 is for Channel selection display:

· With Switch 9 set to **OFF** the Monitor display will show Channels 1-12

· With Switch 9 set to **ON** the Monitor will display Channels 13-24

· If a change is made to Switch 9, the Monitor will need to be reset by placing the magnetic pen over the RESET circle, or by turning the key a quarter turn, and then back.

5.3 TO ISOLATE OR RESTORE A CHANNEL

If a Sensor becomes faulty and requires changing ‘F3’ will appear on the display and the green, amber and red display will flash

As a temporary measure it is possible to isolate the Sensor from the Monitor panel, (‘Isolate’ in this instance is to remove the Sensor signal from the Monitor via the software.)

To carry out the ‘Isolate Function’, turn the security switch key to ‘Settings’ mode, place the magnetic pen on the ‘Isolate’ circle, then place it on ‘Channel’ number. Turn the key back to ‘RUN’ mode. The Channel/Sensor is now isolated and the display will now be blank. If the pen is placed over the ‘Channel’ number ‘IC’ will appear on the display.

After the Sensor has been replaced and/or the lens cleaned, the channel can be reinstated by turning the key to ‘Settings’ mode, place the magnetic pen on the ‘Isolate’ circle then on to ‘Reset’. Finally, place the magnetic pen on to the ‘Channel’ number and turn the security key to operating mode. This will put the channel and associated Sensor back online.

5.4 TEST SEQUENCE

Before beginning the Test Procedure, inform the control room or area supervisor.
To activate the test procedure make sure the security key is turned to running mode then place the magnetic pen over the circle marked 'TEST'. The sequential testing system will commence as follows:

1/ Testing indicators will illuminate the Software Version – 1.03.

2/ The running (green), anticipatory (amber) and alarm (red) indicators will illuminate in sequence.

3/ All digital readouts will indicate '8'.

4/ All digital readouts will then indicate '111' showing that all segments of the numerical display are working with no fade.

5/ Each Sensor lens will be indicated. (**NOTE:** 'Cd' indicates clean lens.) When 'dd' (dirty lens) appears on the display, Sensor lenses are under 80% clean. In this instance refer to Lens Cleaning Instruction; Section 6.2.) When dirty, 'F2' will automatically show on the display. If ignored it will go to 'F3'.

6/ All external relays, with the exception of the of the shut down relay, will operate for 10 seconds. If the system has an audio alarm system, it is recommended that personnel should be warned of the impending test. The test includes a test of the fault monitoring circuit, i.e. watchdog, when 'F9' will appear momentarily. In the event of a CMU failure 'F9' will be display continuously. In this case the PCB Relay Board must be replaced.

7/ After the relays have been tested the CMU will automatically return to display the channel with the highest concentration of oil mist.

8/ NOTE: After 'Power On' or 'Reset' procedures are implemented, the relay outputs are inhibited for 60-120 seconds in the event of an alarm. This must be noted if smoke testing is carried out on a Sensor.

9/ NOTE: When using the self-test facility, the display will show the condition of the Sensor, i.e. 'dd' (the lens is dirty) or 'Cd' (the lens is clean). **HOWEVER, TWO FULL MINUTES SHOULD ELAPSE BEFORE USING THE SELF-TEST FACILITY AGAIN.** This is to allow the software to latch back into the correct running mode, otherwise erroneous signals may be displayed. During this sequence isolated Sensors may be displayed 'Cd'.
Should any function throughout the sequence fail to operate as specified, please refer to the Fault Finding Section and Directory, section 6.5, pages 47-49.

5.4.1 SETTING ALARM LEVELS

For setting alarm levels see section 6.2 of this manual for this procedure.

Begin by setting all the Sensors at 0.05mg/L. There will always be areas where there is oil mist; for instance in the purifier room. The alarm level must be set to a higher level than needed so that the system does not go into alarm when there is no problem.

5.4.2 TEST PROCEDURE

As these Sensors are sensitive to smoke, steam or oil mist, artificial smoke can be used to test the Sensors. This is the most effective way of proving the Sensors are working.

5.4.3 TO CHECK ALARM LEVEL SETTING

To check the pre-set alarm level setting for each individual channel, first place the magnetic pen over the circle marked 'Alarm Level.' The alarm level indicator will illuminate. Place the pen over the 'CHANNEL' number. The channel identification digital display will be shown digitally as a milligrams per Litre value in mg/L of oil mist density. Should the alarm level need to be adjusted then follow the 'Initial Setting-up Procedure' (changing alarm levels) and 'Reset' the system as previously described.

5.4.4 TO READ INDIVIDUAL CHANNELS

Place the magnetic pen over the required channel circle. The channel number selected will be shown digitally on the 'Channel Identification' display alongside the digital read-out of the percentage density of the pre-set alarm level at the channel. After one minute the display will revert to the channel with the highest oil mist reading.

SECTION 6

OPERATING THE SYSTEM

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6.1 OPERATING

A sample of air is continuously drawn through each Sensor and the level of oil mist density is monitored. This process is continuous at each Sensor. The signals are fed to the micro-processor which is located in the Monitor.

The signals are scanned at 500 millisecond intervals and the data is presented as a digital display reading from 0% to 100% of alarm level.

Although oil mist samples are measured in mg/L the reading per channel is presented as a percentage of the alarm setting.

6.1.1 RELAY AND LED CHART

	% ALARM LEVEL	LIGHTS DISPLAYED
	0% to 79%	Green System Operational
	80% to 99%	Amber (flashing) Early warning alarm and relay activated
	100%	Red (flashing) Attention required (Plant will shutdown if wired)
Relays activated	80%	Early warning alarm
	100%	Alarm and plant shutdown

6.1.2 OPERATING RANGES

0 – 1.30mg/L
0 – 200mg/L
As a percentage of the alarm setting

6.2 SETTING AND CHANGING ALARM LEVELS

The QMI MULTIPLEX™ is pre-set. However, should the settings require adjustment and the alarm level set lower, then follow the procedure outlined below.

Normal setting for atmospheric systems should be as low as possible, say 0.04 to 0.05mg/L. This is so that once oil mist starts to form it will be detected as soon as possible.

During the setting-up procedure normal operation of the CMU is disabled, therefore, to set and change alarms levels follow this procedure:

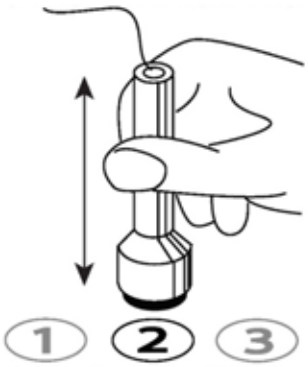
1/ With the security key supplied (Part No. Q0103), release the security switch, which is fitted to prevent un-authorised adjustment of the system.

2/ Turn the key clockwise. The light above 'Setting' will illuminate.

3/ Place the magnetic pen (Part No. Q0109) flat against the circle marked 'Alarm Levels'.

4/ Place the magnetic pen flat against the 'Raise' Alarm Level circle marked with a '+' or the Lower Alarm Level marked with a '-'. Raise or lower the level, each time removing the pen away from the circle for each increment of Oil Mist until the required level is reached. The level will be indicated on the digital 'Reading'.

5/ Place the magnetic pen flat against the circle marked 'Channel Number' to set that channel to the level indicated at the digital reading.

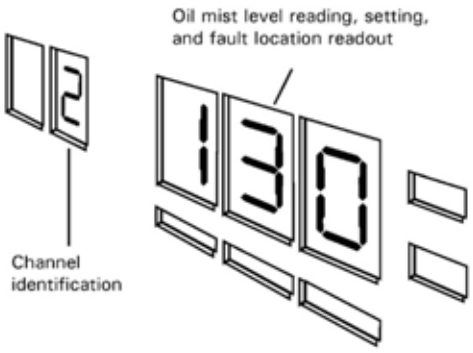


6/ To set another channel repeat steps 4 and 5.

7/ When setting is complete turn the key anti-clockwise. This locks the system, then remove the key.

8/ Now the system is locked, it is possible to check the settings by placing the pen on 'Alarm Level' then on 'Channel Number'. The new set level will then be displayed.

9/ To reset any channel ALL the above items MUST be repeated.



6.3 OPERATION OF ALARM RELAYS

The relays work in conjunction with the lights on the Monitor display panel:

6.3.1 MINIMUM ALARMS

The minimum alarm relays that are required to be wired are the **Main** alarm and the **Fault** alarm.

In addition, there are two other alarm relays available within the Monitor; the **Shutdown** alarm relay and the **Early Warning** alarm relay.

The Shutdown alarm relay is activated at 100% of alarm setting.

The Early Warning alarm relay activates at 80% of alarm setting and is used as an early warning alarm. (With an Atmospheric Oil Mist Detection system this will be in the 'blink of an eye' if the system is set correctly.)

6.3.2 FAULT ALARM

A fault alarm relay is completely divorced from the other relay systems and is only activated after a fault has developed in the Oil Mist Detection System. No relays will activate for 2.5 seconds, as the Monitor will check first that the fault is in the system and not a problem with the environment.

Even when the fault alarm relay is activated the instrument goes on monitoring unless there is a major malfunction of the Monitor or Sensor. Information is also being continuously given as a digital display of the highest concentration of oil mist and its location.

The digital display will always indicate the channel (i.e. area) with the highest level of oil mist. **IN THE EVENT OF A FAULT ALARM IT WILL BE THE FIRST CHANNEL TO GO INTO THE FLASHING GREEN, AMBER OR RED CONDITION THAT IS INDICATED ON THE DISPLAY (F1, F2 and F3).**

NOTE: THERE IS A TWO MINUTE DELAY when the fault alarm sounds. After a self-test or a channel check the display will always revert to the channel with the highest oil mist level reading.

6.3.3 ALARM OPERATING RANGES

With Binary switch 5 set to OFF the alarm operating range is from 0 up to 1.30mg/L.
With Binary switch 5 set to ON the alarm operating range is from 0 up to 2.00mg/L.

6.4 RESPONSE TO AN ALARM

There are two stages of oil mist indication:

1 ANTICIPATORY/EARLY WARNING

At 80% the light will assume a 'flashing' mode.

The channel number will be indicated, and the digital reading will indicate the percentage density of the pre-set mist alarm level. The early warning alarm relay will operate.

NOTE: This alarm is automatically operated when the oil mist density level reaches 80% of the pre-set alarm level.

2 FULL ALARM

At 100% of alarm level the red indicator will flash indicating that the oil mist level is above the pre-set alarm level. The offending channel will be displayed alongside the digital read-out level. The functional shutdown relay alarm RL9 will operate if wired into the system. At this level, RL10, the main alarm, will be activated. Further action should should be taken in accordance with standard procedures.

Over-riding the QMI MULTIPLEX™ system during procedures that may introduce particles into the atmosphere (e.g. painting) is at the operator's discretion. If such a function is required it should be incorporated into the overall operating system.

IMPORTANT: When any alarm sounds all personnel should leave the area.

IMPORTANT NOTICE:

With Atmospheric Oil Mist Detection Systems, the alarm point should be set quite low so that the Main Alarm activates as soon as there is any Oil Mist sensed in the Atmosphere.

The Oil Mist level will increase so quickly that the Early Warning and Main Alarm will activate almost simultaneously.

The Early Warning Alarm would normally be used in Engine Crank Case Oil Mist Detection systems where the Oil Mist usually increases more slowly.

6.4.1 FAULT ALARMS

The fault alarms indicate if there is any fault in the monitoring system. The Monitor faceplate has a list of the fault alarms and their significance. This uses relay RL8. See table below for the fault conditions as presented on the Monitor faceplate. For more information see the Fault Directory on the following pages.

CHANNEL	READING	RESPONSE
1-12	F1	Check and repair relevant cable
1-12	F2	Clean Sensor according to instructions
1-12	F3	Clean Sensor Check Sensor fan Replace Sensor See Fault Directory – Section 6.5
1-12	F4	Junction Box power supply failure
C	IC	Channel isolated

If “No CPU’ light is on, there is a processor fault.

‘dd’ on test indicates when the Sensor lens are dirty so it is necessary to clean them.

‘cd’ on test indicates when the Sensor lens are clean.

6.5 FAULT DIRECTORY

FAULT	ACTION	REMEDY
F1 and Sensor number is displayed	**1-** Make up a short lead with 6 pin female connectors supplied with the Sensor **2-** Unplug and unwire Sensor with F1 error from junction box channel numbers on PCB, then wire to short lead you made in step 1 If the display becomes steady this confirms there is a fault in the cable between the Monitor and Sensor	Check the cable is earthed between the Monitor and Sensor. Check there are NO OTHER earth leads, or copper earth trips as these will give interference If the F1 error is resettable there is an issue with the wire from the Sensor to the Junction Box If this does not correct the issue you have a wiring issue on the cable from the Monitor to the Junction Box Please refer to wiring diagrams - Section 4
F1 and Sensor number is displayed	Check cable between Monitor and Sensor See Section 4	F1 denotes cable fault Check for split or damaged cable or incorrect earthing – see wiring instruction
F1 and all Channel lights flash	Check Fuse FS1 on the Relay Board See Section 6.6	If the fuse has failed replace it with a 1.25A fuse If the fuse fails again, check complete wiring of the system for short-circuits or damaged wires
If the fuse fails again, check complete wiring of the system for short-circuits or damaged wires	Check the Fuse FS1 on the Power Supply Board See Section 6.8	If the fuse is OK, then TR1 should be replaced
F2	1- Remove Sensor 2- Clean lens See Section 7.2 on page 55	If a Sensor needs frequent cleaning investigate source of dirt
F3 and Sensor number is displayed	Check Sensor lens	1- Take Sensor off 2- Clean lens 3- Replace Sensor If F3 still shows, return Sensor to QMI for repair. Isolate channel (page 38) if there are no spare Sensors
F3 and Sensor number is displayed LED on front of the Sensor flashes RED	Check Sensor fan	Isolate and remove Sensor Replace fan following instructions supplied (Part No. Q1004) – see Section 7.3 on page 57

6.5 FAULT DIRECTORY

FAULT	ACTION	REMEDY
F4 on display	Mains power to the Junction Box has failed or has been turned off	Check that there is mains power getting to the Junction Box
	Fuse on the PSU in the Junction Box has failed	Replace the 3.15A fuse (Part No. Q0115) with a replacement from the Mainteance Kit
	Fuse on the PSU in the Junction Box has failed again	If the fuse fails again, the PSU has failed and is faulty. Order a replacement PSU
	Bad connection between Monitor and Junction Box (in the multi-twisted pair cable)	1- If the PSU is working, remove the mains power to the Junction Box 2- Connect a piece of wire between terminals 29 and 30 on the Junction Box PCB 3- Leaving the mains power disconnected to the Junction Box, reset the Monitor 4- If F4 has now cleared, the cable from the Monitor to the Junction Box is OK 5- Remove the links from terminal 29 and 30
	Bad connection on RED and BLACK wires from PSU to AUX connection + and – on Junction Box PCB	With the power connected to the Junction Box, using a meter when the PSU is working check that there is a shorted connection between terminals 29 and 30 on the Junction Box If there is an open circuit, it could mean that the red and black wires between the PSU and the PCB have a bad connection or the relay has failed
	Relay on the Junction Box PCB has failed	If the connection is sound, the relay could be faulty. Order a new Junction Box PCB
Fault alarm comes on. QMI Monitor shuts down and display ceases	Check FS4 fuse on the side of Monitor above the security key	FS4 3.15A anti-surge fuse may have failed due to an internal fault in the Monitor. Check FS4 fuse (Part No. Q0115) on the side of the Monitor. **NOTE:** Monitors are ex-stock QMI

6.5 FAULT DIRECTORY

FAULT	ACTION	REMEDY
Fault alarm comes on. QMI Monitor shuts down	Check FS4 fuse on side of Monitor above Security Key	Check FS4 fuse on side of Monitor above Security Key Fault alarm will sound if power is shut down
'No CPU' light on	Check internal connectors	The CPU light indicates a fault on MULTIPLEX™ Relay Board This board is either carried as a spare or is ex-stock QMI
LED 1 on Relay Board not flashing	Check fuse FS1	Change failed fuse FS1. (Part No. Q0114)
LED 1 for TR1 does not light	FS1 fuse failed	Replace FS1 with 1.25A anti-surge fuse. If the fuse keeps failing, then check wiring and Sensor for faults.
	TR1 Faulty	Replace TR1 (Part No. Q0111) with spare in Maintenance Kit. (Take care not to short TR1 during soldering.)
On start up of the system Monitor the display is erratic and does not settle down	Check if cable is screened	If cable is screened, check that the screen is connected to Pin 5 at both ends of the cable. Make sure the braid or drain wire does not come into contact with other terminals at either end of the cable. If cable is not screened, check to see if cable runs near any electrical power source. If it does, cover cable in steel conduit. There is no need for extra earthing, however the screen needs to be connected to Pin 5 at both ends.
F4 on display	1- Check that the green light is illuminated on the Sensors. 2- Check if power to PSU in the multi-way Junction Box is live. If not, check fuse on PSU board. (Fuse type 3.15A.) 3- Check the 12V supply is coming out of PSU via red and black wires.	If all these are OK, then check that the wire between the Junction Box and the CMU 19 pairs are all connected and non have become disconnected. Finally if none of the above proves to be at fault, order a new PSU (Part No. Q0701) for the multi-way Junction Box.

6.6 FUSES

There are three fuses on the MULTIPLEX™ Relay Board (see section 6.8) and one on the outside of the Monitor.

FS1 (Part No. Q0114) is a 1.25A anti-surge fuse. This is connected to TR1 and is the supply to the Sensors. The LED1, which is underneath, will flash when all is well.

FS2 (Part No. Q0112) is a 400mA anti-surge fuse for 12V power to the fans. The LED will light when all is well.

FS3 (Part No. Q0112) is a 400mA anti-surge fuse to protect the Data Logger PCB and also has a Green LED3 light which is lit constantly (not flashing).

FS4 (Part No. Q0115) is a 3.15A anti-surge fuse and is fitted to the side of the Monitor.

6.7 SECURITY KEY SWITCH (Part No. Q0103)

Only one key is required to make system changes, (alarm settings, isolating channels etc.) and this key should be kept securely at the discretion of the operator. It is possible to check the settings without using the security key switch, see Part No. Q0103.

NOTE: The Monitor does not have an on/off switch. This is to prevent the oil mist Sensors from being switched off. To turn off the power, disconnect the power at the external power supply.

6.8 TRANSITOR TR1, LEDS AND FUSES ON PCB (Part No. Q0118) - Layout

NOTES: LED 1 will flash when 12V power is being supplied to the sensor heads. If LED 1 is not flashing then fuse FS1 has failed. It needs to be replaced with a 1.25A anti-surge fuse. (Part No. Q0114)

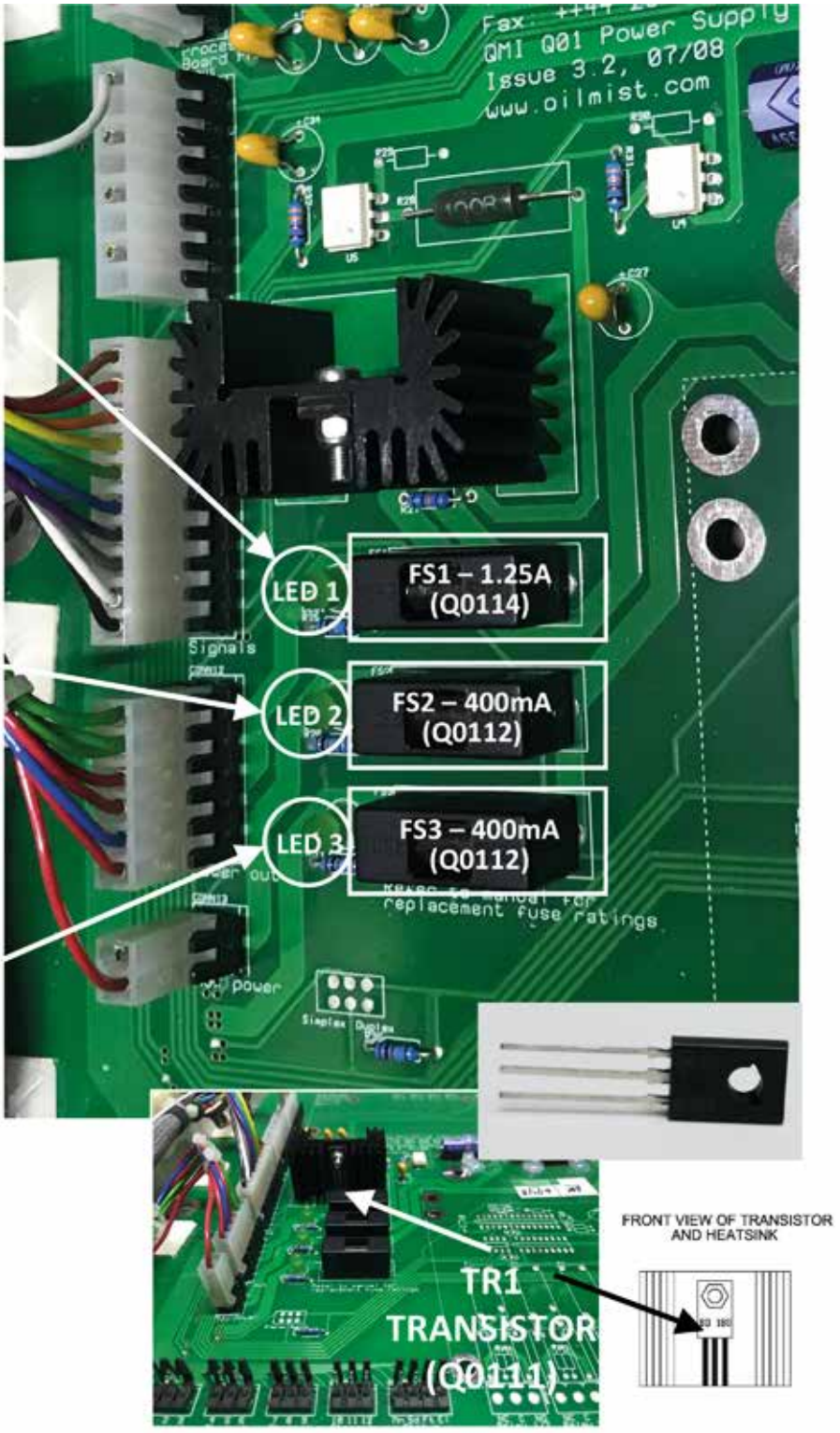
If FS1 continues to fail, check system for faults in wiring or a faulty detector.

LED 2 will light continuously when 12V is being supplied to the Junction Box PSU failure.

If LED does not light then fuse FS2 may have failed. Check wiring for faults, then replace FS2 fuse with a 400mA anti-surge fuse. (Part No. Q0112)

Data Logger PCB. The LED is constantly lit (not flashing) this will always be lit regardless of whether a Data Logger is present or not in the system.

NOTE: If LED 1 is not flashing and you have checked the fuse is OK, it could be that TR1 is faulty. You should then check the system for wiring faults or shorts. If you are satisfied that the system is OK, TR1 (Part No. Q0111) can be replaced using the replacement from the Maintenance kit.



SECTION 7

MAINTENANCE

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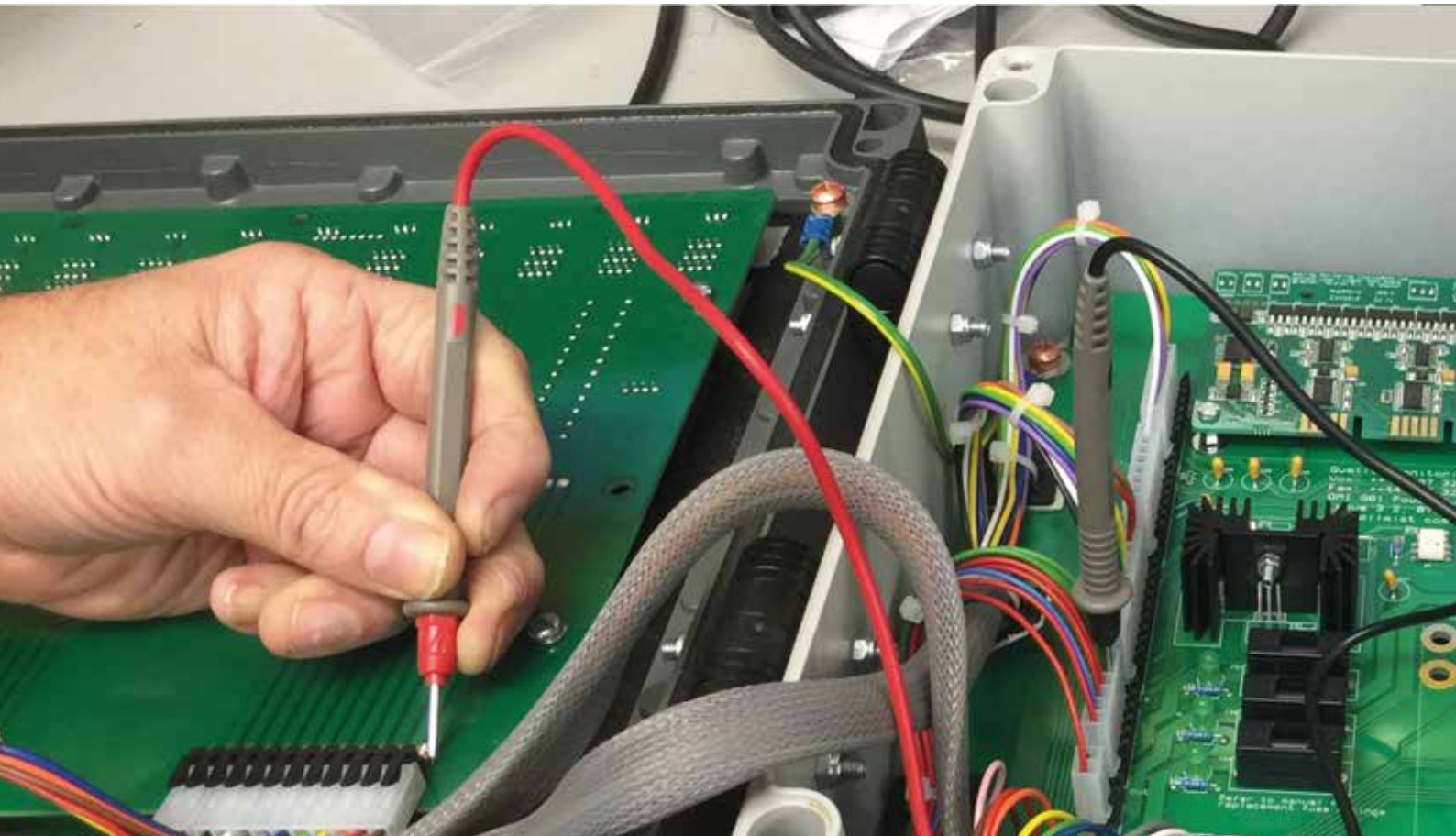
7.2	Lens Cleaning Procedure	Pages 55-56
7.3	Replacing Sensor Fan	Page 57
7.4	Maintenance Kit	Page 58-59
7.5	Suggested Maintenance Plan	Page 60
7.6	Replacement Parts and Spares	Pages 61



7.1 MAINTENANCE PROCEDURES

The QMI MULTIPLEX™ incorporates an operational fault-finding system, which will identify operational and component breakdowns. During operational breakdowns, a fault code is displayed against the relevant Sensor number. The possible fault codes are listed on the Monitor front plate.

In the event of a component breakdown or fault, the CPU light will come on, see Fault Directory, section 6.5.

With all fault indications the fault warning relay is non-energised. The relay may be returned to normal through the 'RESET' function. The warning light on the digital display will persist until the fault is corrected or the channel isolated.

7.1.1 SENSOR CLEANLINESS

A large percentage of returns under Warranty are in fact due to dirty lenses. Very often, due to difficult working conditions and lack of experience, the lenses in the Sensor are not properly cleaned. This problem is made more difficult because the operator has to return to the Monitor in order to check the cleanliness of the lenses. Before sending back any Sensors run the test program and if you see 'dd' on any channel this means the detector is dirty.
If this is the case, read the cleaning process outlined in section 7.2.

NOTE: IT IS HIGHLY RECOMMENDED THAT A CLEAN AND WORKING SPARE SENSOR BE INSTALLED WHILE CLEANING A SENSOR.

7.1.2 REPLACING SENSOR FAN (Part No. Q1004)

The Monitor will indicate when there is a Fan Fault and F3 will appear (See Fault Directory section 6.5.)

To replace the Fan see section 7.3 on page 57.

7.2 LENS CLEANING PROCEDURE

The 'F2' Fault indicates indicates need for lens cleaning on the relevant channel on the MULTIPLEX™ Monitor (Part No. Q01H).

It is advisable to have a clean and working spare Sensor. (Part No. Q10)

To clean the lenses in the event of oil or condensation build up, use the following guidelines:

1/ Isolate the relevant channel on the Monitor:

- Turn Security Key to Setting Mode
  - Using Magnetic Pen
    - Touch Isolate Button
    - Touch Channel Button
- Turn Security Key back to Working Mode.

2/ Unplug cable from Sensor.

3/ Holding the Sensor, undo the 4 screws fixing the Sensor body to the Articulated Joint. Use the Allen Key (Part No. Q1007) tool from the Maintenance Kit.

4/ Replace with a spare Sensor, if available. Proceed to item 8.

5/ In a clean area, remove cover plate by undoing the 4 Button Head Screws. The tool is in the Maintenance Kit.

6/ 3 lenses will be visible inside the chamber. Using a clean cloth, clean the lens with Isopropyl alcohol to wipe the lenses clean. For badly contaminated lenses, repeat until clean. Polish the lenses with a clean and dry cloth. **DO NOT SATURATE THE LENSES WITH FLUID.**

7/ Ensure the chamber is dry. Replace the cover plate.

8/ Replace Sensor on Articulated Joint. Make sure Sensor is in original position.

9/ Reset the Sensor on Monitor:

- Turn Security Key to 'Settings' Mode
  - Using Magnetic Pen
    - Touch 'Isolate' Button
    - Touch 'Channel' Button
- Turn Security Key back to Working Mode.

SEE IMPORTANT NOTES OVERLEAF

IMPORTANT NOTES

1 / The Sensor electronics are factory calibrated and cannot be serviced on site. In the event of a fault the Sensor must be sent back to QMI unless it is a faulty Fan, in which case change the Fan as shown in section 7.3.

2 / DO NOT USE diesel oil, acetone or kerosene to clean Sensors or Sensor lenses.

3 / DO NOT IMMERSE Sensor in any cleaning solution.

A VIDEO SHOWING THE CLEANING PROCEDURE CAN BE FOUND AT:

https://www.oilmist.com/how-to-clean-qmi-q10-sensor

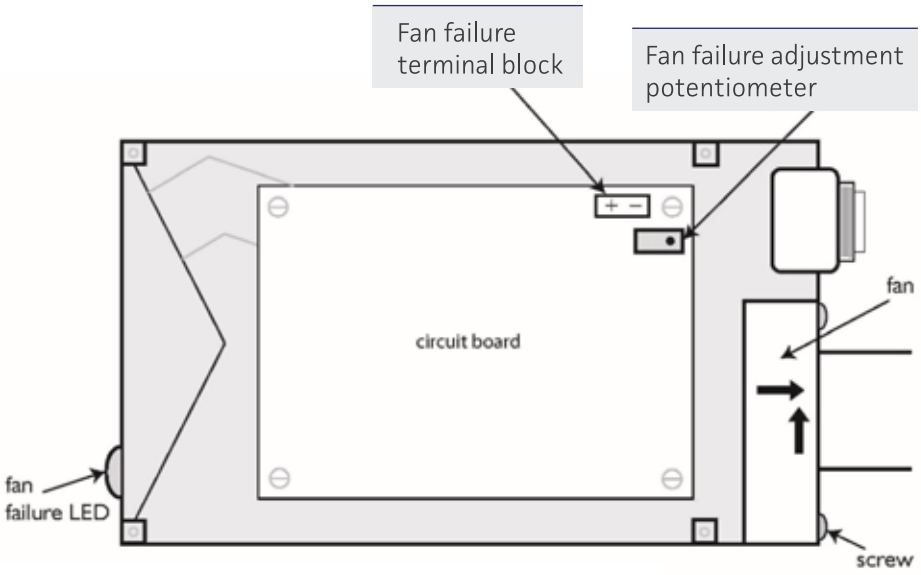
The following QR code can also be used to access the video:

7.3 REPLACING FAN (Part No. Q1004) IN SENSOR

- Remove lid by taking out the four countersunk Allen screws using the 2.5mm Allen key (Part No. Q1007).
- Remove RED and BLACK wires from fan failure terminal block.
- Remove four buttoned Allen screws holding fan to air sensor using the 2.5mm Allen key.
- Fit new fan by replacing four button-head screws. Check direction arrows on the fan.
- Fit RED wire to the ± terminal of fan failure terminal block.
- Fit BLACK wire to the ± terminal of fan failure terminal block.

WARNING

Any attempt to adjust other components on the circuit board will invalidate the guarantee and may stop the Sensor working.



ADJUSTING FAN FAILURE ON SENSOR – (Fan is Part No. Q1004)

1/ Turn the potentiometer screw fully anti-clockwise (15 turns)

2/ Connect Sensor to Monitor. The LED on the front of the Sensor will flash **GREEN**.

3/ Allow 2 minutes before adjusting, by this time the LED should be **AMBER** with a **RED** pulse.

4/ Slowly turn the potentiometer clockwise until the LED turns to a steady **GREEN**.

5/ When the LED is showing steady GREEN, turn the same potentiometer a further quarter turn clockwise.

6/ Test for fan failure operation by gently stopping the fan with your finger.

7/ Check that the LED flashes **RED**.

8/ Refit Sensor lid using the four countersunk Allen screws, ensuring red and black wires are not trapped.

9/ Wait for two minutes and ensure LED remains constant **GREEN**.

10/ Installation of the fan (Part No. Q1004) is now complete. Refit Sensor in chosen position.

7.4 MAINTENANCE KIT

To assist with ongoing maintenance of our Oil Mist Detection systems, there is a QMI Maintenance Kit available.

This kit has most of the tools necessary in order to maintain the systems functionality. The following items included in the Maintenance Kit are shown below.

PART NO.	QMI PRODUCT	DESCRIPTION	PHOTO
Q1004	Replacement Fan	For Q10 Sensor – includes fixing screws	
Q0208	Replacement Socket	6 Pin Bulgin Socket for Sensor	
Q1007	M2.5 Hexagonal Allen Key	For Sensor lid, inspection cover and fan	
Q1008	M3 Hexagonal Allen Key	For Articulated Joint	
Q0113	M4 Hexagonal Allen Key	To open Monitor lid	
Q0103	Monitor Security Key For serial numbers up to M1345	For changing settings on MULTIPLEX™ Monitor Q01H	
Q0103L	Monitor Security Key For serial numbers from M1346 onwards	For changing settings on MULTIPLEX™ Monitor Q01H	
Q0213	Cotton Buds	For cleaning Q10 Sensor lenses. (Approximately 100 buds per pack.)	
Q0109	Magnetic Pen	To activate displays on Monitor	

7.4 MAINTENANCE KIT

PART NO.	QMI PRODUCT	DESCRIPTION	PHOTO
Q0111	TR1 Transistor	TR1 Transistor for Q0118 Relay Board	
Q0112	400mA Anti-Surge Fuse (Pack of 5)	For FS2 on Relay Board For FS3 Data Logger Protection	
Q0114	1.25 Amp Fuse (Pack of 5)	For FS1 on Relay Board	
Q0115	3.15 Amp Fuse (Pack of 5)	For FS4 on side of Monitor For Power Supply Fuse in Q07 Junction Box	

Please Note: QMI recommends IPA (Isopropyl Alcohol) to clean the Sensor Lenses.
The product "Clean All" is no longer available.

It is also recommended that a spare Sensor (Part No. Q10) is purchased.

7.5 SUGGESTED MAINTENANCE PLAN

The only regular operation that can be built into a planned maintenance of QMI equipment is to clean the lenses, but only when a manual test programme is initiated on the Monitor and on a weekly basis. (In service, this time interval should be decided by the system operator after gaining experience of cleaning routines depending on the environmental conditions the system is operating in.)

If, on doing the manual test, the Monitor indicates 'dd' on any channel this means you have 20% dirt on the lenses, in which case it is a good idea to clean as soon as it is feasible. (Note that the system can, however, compensate for up to 40% contamination of dirt on the lenses.)

The process for cleaning Lenses is shown in section 7.2 on page 55.

7.6 REPLACEMENT PARTS AND SPARES - QMI Codes

CODE	QMI PRODUCT	DESCRIPTION
Q01H	MULTIPLEX™ Monitor	With Harting Connectors
Q01H1	Monitor Connector	Harting 32-Way Mating Connector No. 1 (To MULTIPLEX™ Junction Box)
Q01H2	Monitor Connector	(To MULTIPLEX™ Junction Box) (To Shutdown Output)
Q01H3	Monitor Connector	Harting 10-Way Plug Mating Connector No. 3 (To Alarm Output)
Q01H4	Monitor Connector	Harting 4-Way Socket Mating Connector No. 4 (To Power Input)
Q01H5	Monitor Connector	Harting 16-Way Plug Mating Connector No. 5 (To Data Logger Output)
Q0103 and Q0103L	Monitor Security Key	Monitor Security Switch to change settings
Q0104A	PCB Type MP12 v3.2 Processing Board	For Monitor which contains a Flash Memory Chip
Q0106	Switch Mode Power Supply	No case, for Power Supply Unit for Monitor
Q0109	Magnetic Pen	To activate displays on Monitor
Q0111	TR1 Transistor	Transistor for Q0118 Relay Board
Q0112	400mA Anti-surge Fuse	For FS2 on Relay Board For FS3 Data Logger Protection (Pack of 5)
Q0113	M4 Hexagonal Allen Key	To open Q01H Monitor Lid
Q0114	1.25 Amp Fuse	For FS1 on Relay Board (Pack of 5)
Q0115	3.15 Amp Fuse	For FS4 on side of Monitor For Power Supply Fuse in Q07 Junction Box (Pack of 5)
Q0118	Relay Board with Power Supply	Relay Board with PSU fitted (12 channel)

7.6 REPLACEMENT PARTS AND SPARES - QMI Codes - Continued

CODE	QMI PRODUCT	DESCRIPTION
Q10	Atmospheric Sensor	With Integral Fan
Q10C	Atmospheric Sensor Complete	With integral Fan, Mating Connector and Articulated Joint
Q1004	Replacement Fan with Fixing Screws	For Sensor, including fixing screws
Q1005	Maintenance Kit	As detailed in section 7.4
Q0208	Replacement Socket	For Sensor, 6 Pin Bulgin Socket
Q1007	M2.5 Hexagonal Allen Key	For Sensor lid, inspection cover and fan
Q1008	M3 Hexagonal Allen Key	For Articulated Joint on Sensor
Q0213	Cotton Buds	For cleaning Sensor (approximately 100 per pack)
Q0701	Power Supply Unit (12V)	Junction Box Power Supply Unit
Q0702	Chassis mounted PCB with PSU fitted	Chassis mounted PCB with Q0701 PSU

SECTION 8

RETURNS PROCEDURE

RETURNS PROCEDURE Page 64
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GUARANTEE STATEMENT: Sensors returned for service or repair will be guaranteed for 12 months.

Please ensure these instructions are followed:

1/ The equipment being returned has a report with it stating the fault with the equipment; listing the fault number shown on the Monitor; the Serial No. of the Monitor (which is on the Monitor front plate): and the Serial No. of the Sensor, (which is on a sticker inside the front louvre and inside the PCB box). The equipment must be returned CLEAN and intact.

2/ The equipment must have a Manifest/Packing Note stating shipment contents.

3/ The equipment must include a note to advise QMI of who to contact to arrange Purchase Order and Shipping Instructions.

4/ The above documentation should be emailed to QMI in London:

Email: qmi@oilmist.com

5/ Dispatch the retained goods to:

Attention: QMI Repair Manager

Quality Monitoring Instruments Ltd

C/o Cambertronics Ltd

Unit 12, Manfield Park, Guildford Road, Cranleigh, Surrey GU6 8PT

Please ensure that you have included the information and documents in your email to QMI to request repair of equipment. Providing this information will increase the speed at which we can repair and return the goods.

CHECKLIST

- ☐ Fault Report included/attached
- ☐ Monitor Serial Number
- ☐ Fault Number Displayed F1____F2_____F3_____
- ☐ Sensor Serial Number
- ☐ Equipment is clean
- ☐ Numbered Purchase Order – with invoice and return address (Emailed and included)
- ☐ Manifest / Packing Note - of shipping contents (Emailed and included)
- ☐ Name of Contact person email address, telephone number and fax number

CONTINUED SUPPORT

In order to provide you with effective support for your equipment, please complete the Request for Information Sheet below and return to QMI.

QMI MULTIPLEX™ ATMOSPHERIC OIL MIST DETECTION SYSTEM

If you would take the time to provide us the information outlined below it would help us respond more quickly to any questions or problems you might have with QMI equipment in the future.

NAME OF VESSEL/OR SITE: _____

LOCATION OF SYSTEM: _____

SERIAL NUMBER OF MONITOR: _____

NUMBER OF SENSORS: _____

SERIAL NUMBERS OF SENSORS: A _____ to A _____

EMAIL ADDRESS: _____

RETURN ADDRESS FOR EQUIPMENT: _____

_____

_____

_____

If you have a technical problem, please contact us on the following:

Email: **qmi@oilmist.com**

Should you need to return equipment for service or repair, please see details on the previous page of this manual to see how the equipment should be returned.

PRODUCT REGISTRATION

In order to validate the warranty on your product, please complete the Product Registration form which can be found via this link.

THE PRODUCT REGISTRATION FORM CAN BE FOUND AT:
https://www.oilmist.com/product-registration

The following **QR code** can also be use to access the Form:

When completed please return this form by email to **qmi@oilmist.com.**

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QUALITY MONITORING INSTRUMENTS LTD

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