

factair



F8104 SAFE-AIR MONITOR OPERATING MANUAL

FAC QAM 221 Issue B 04/20

Contents

	Page No
Introduction	3
Calibration & Warranty	3
Diagram & Display Icons	4
Equipment List	5
Technical Data	6
1 - Pre Use	7
2 - Start Up	7
3 - Continuous Monitoring Display	8
3.1 – Completing an oil test using a Dräger Impactor or tube	9
4 - Configuring the Instrument	10
4.1 – Selecting a test standard	10
4.2 – Configuring the main alarm	11
4.3 – Configuring the pre alarm	14
4.4 – Auxiliary inputs / outputs	14
4.5 – Sensors	15
5 - Exporting the Data Log	16
Appendix 1 – Using the test port for the Dräger oil mist tube	17
Appendix 2 - Reading the Dräger Oil Impactor and Chemical Reagent Tube	19
Appendix 3 – Volatile Organic Compounds	22
Appendix 4 - Helpful Tips	23
Air Quality Testing – Why?	24
Medical Air Standards	25

Introduction

The F8104 Safe Air Monitor is designed to provide continuous monitoring of breathing-air and compressed-air systems. Once set up the instrument will continue to monitor and data log the air quality at user defined intervals, validating the air quality against a range of alternative international standards. For medical, surgical, dental air and medical gas the F8104 is programmed to test against the requirements of European Pharmacopoeia and in the UK, HTM 02-01.

The F8104, is designed primarily for use on airline systems up to 10 bar but can also test higher pressure systems up to 20 bar when used in conjunction with the F3005 High Pressure Regulator. High pressure cylinder air can also be tested with the F3002 HP regulator.

The F8104 is supplied in a plastic protective case with storage provision for accessories.

The test is carried out using built in electrochemical cells for carbon monoxide and oxygen; infrared LED sensor for the carbon dioxide and a Photo Ionisation Detector (PID) for Volatile Organic Compounds. The moisture is measured with an electronic dewpoint meter and the instrument also records pressure and ambient temperature. For measuring oil aerosols, Dräger Impactors are used in the side mounted test port (or alternatively the Dräger oil chemical reagent tube). The Dräger Impactors are supplied in packs of 10 and show the degree of oil contamination on the cut glass baffle plate.

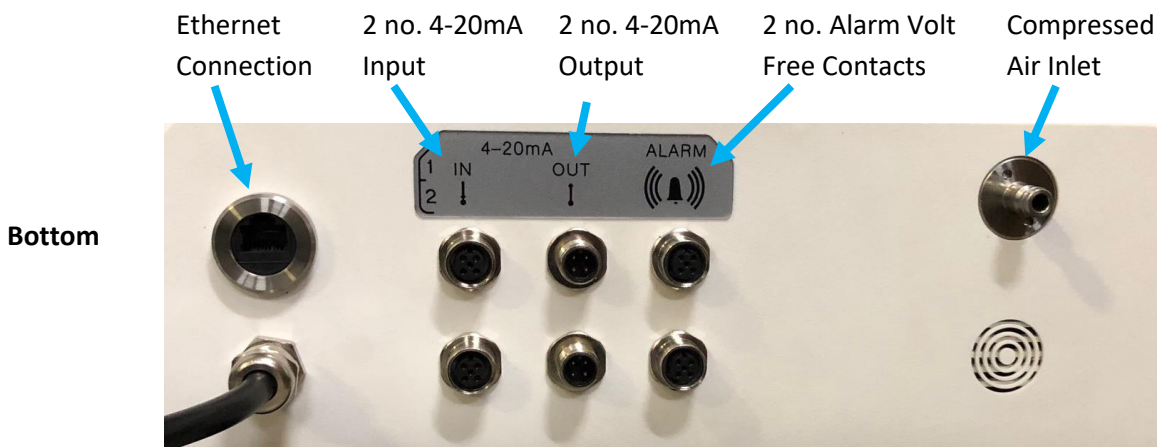
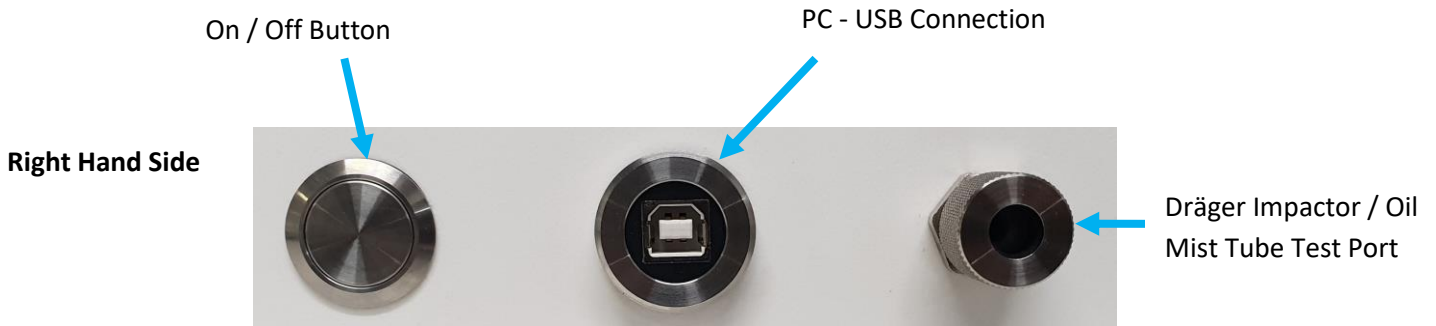
Calibration and Warranty

Safe-Air Monitors leave our factory with a 12-month warranty and calibration certificate. If the instrument is returned to Factair for annual calibration, our standard turnaround is 10-15 working days providing there is no major damage that requires an extensive rebuild. *Note:- Please download all stored data before returning the instrument to Factair.*

Temperature Parameters

Storage: -10/+50°C Operating Range: -5/+40°C


IMPORTANT – IT IS RECOMMENDED THAT YOUR SAFE-AIR MONITOR IS RECALIBRATED AND SERVICED WITHIN 12 MONTHS FROM THE ISSUE DATE OF ITS CALIBRATION CERTIFICATE



Home Screen Display Icons


Sensor Status

 = OK

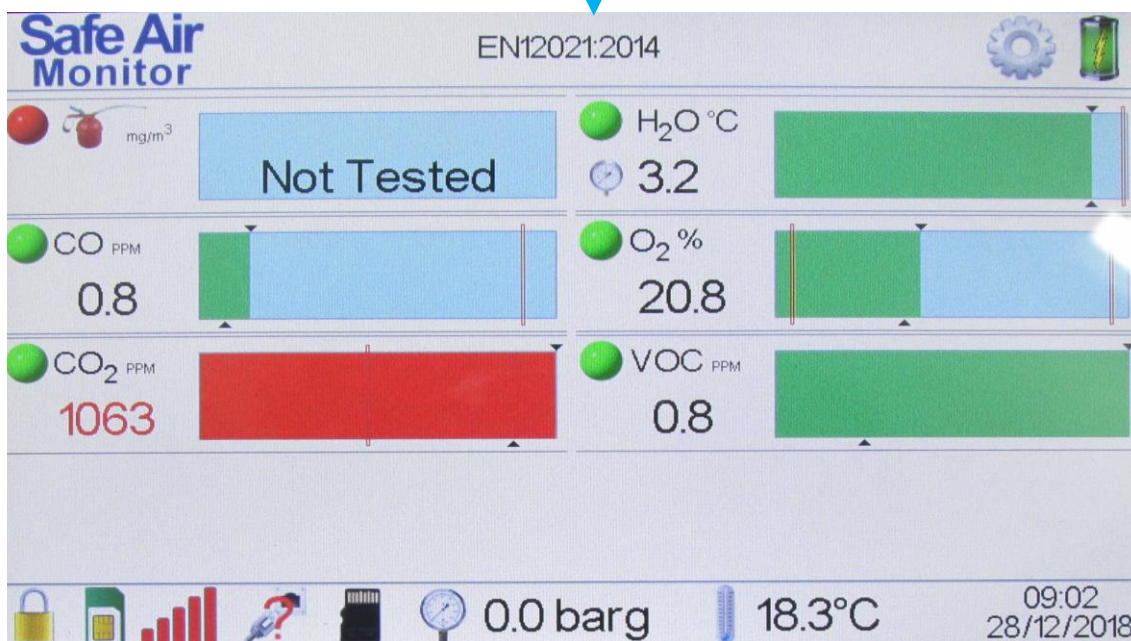
 = Sensor

Out of Calibration

H_2O only :
Dewpoint close to measurement limit

 = Sensor Fault

 only :



Selected Test Standard

Settings

Battery Charge & Charging Indicator

Installer Access Status

SIM Card Signal

Ethernet Connectivity status

SD Card Memory Status

Supply Pressure

Supply Temperature

Time and Date



Unlocked

Red – No Signal



Locked

Green - Signal

By pressing the icon you can change display units between barg and psig

By pressing the icon you can change display units between °C and °F

By pressing the icon you can adjust the date and time

Standard Equipment List
F8104 Safe-Air Tester
USB Download Cable
Stylus Pen
Wall Mounting Plate
ASSY0013 supply hose with rectus 21 plug and socket connections
F1946 Connection ¼ BSP inlet adaptor with rectus 21 socket

Optional Extras
TUB0053 – 8103560 Dräger Oil Impactor – Box of 10
TUB0003 – 6728371 Dräger Oil Tubes – Box of 10
F3002 High-Pressure Regulator
F1946 Connection ¼ BSP inlet adaptor
F2193 Safe-Air Tester to Dräger/Scott compatible plug
F2194 Connection adaptor terminating in a Rectus Plug
F2195 Connection adaptor terminating in a Instantair plug

Technical Data

Model	F8104
Minimum Working Pressure	2 barg
Maximum Working Pressure	10 barg
Air Inlet Connection	Rectus Series 21 Plug
Internal Rechargeable Batteries	Lithium Ion 3.7V Capacity : 15,600 mAh
Supply Voltage	230V/1ph/50Hz 13A supply
Internal Memory	8 GB

Sensors	Range	Sensor Type
Oxygen (O ₂)	0 – 25%	Electrochemical
Carbon Monoxide (CO)	0 - 20 PPM	Electrochemical
Carbon Dioxide (CO ₂)	0 – 2000 PPM	Non-Dispersive Infrared
Volatile Organic Compounds (VOC)*	0 – 40 PPM	10.6 eV Photoionisation Detector
Nitrogen Oxide (NO _x)	0 – 10 PPM	Electrochemical (NO and NO ₂ sensors)
Sulphur Dioxide (SO ₂)	0 – 10 PPM	Electrochemical
Moisture	-100°C to +20°C PDP	Ceramic Moisture Sensor Dewpoint Meter
Pressure	0 – 10.0 barg	Transducer
Test Port – Compatible with the following Dräger Impactors / Tubes	8103530 6728371	TUB0053 Oil Impactor TUB0003 Oil Chemical Reagent Tube
Dimensions	315 mm (h) x 330 mm (w) x 105 mm (d)	
Weight	5 kg	

* Optional 0-3 PPM VOC sensor also available, with this sensor fitted the unit can be pre-set at Factair to display in mg/m³ referenced against isobutylene calibration gas

1. Pre-Use

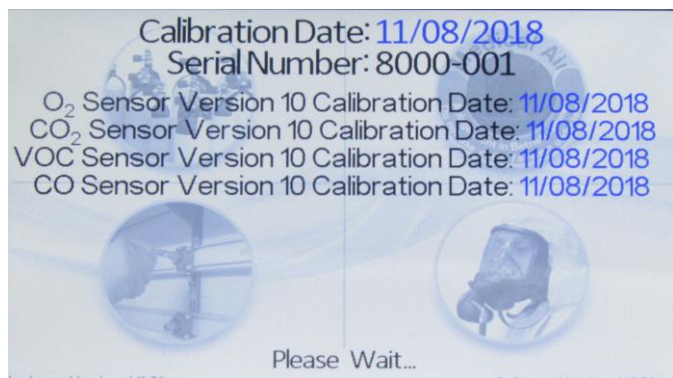
The F8104 is supplied with a mounting plate which enables the instrument to be wall mounted at the most suitable location to test your breathing-air / compressed-air supply. The test location needs to be as close to the breathing-air supply point as possible, in a well ventilated area free from dust and with a 230V mains power supply available. To install the back plate mark the hole locations on the wall and check with a spirit level. Ensure you use the correct fixings to suit the wall.

Once you have installed the back plate mount the F8104 in place and connect the power supply. It is important the unit is free from vibration during use. The F8104 Safe-Air Monitor requires a 230V/1ph/50Hz mains power supply.

The maximum compressed air supply pressure for the F8104 Safe-Air Monitor is 10 barg. If the instrument is intended for use on a high pressure system contact Factair for advice on suitable regulators and connection arrangements.

2. Start-Up

To turn the instrument on press and hold the “on” button, located on the right-hand side of the unit, for approximately 3 seconds.



A stylus pen is provided for use with the touch screen. The display will show the calibration date, serial number and check the status of each sensor. Once each sensor status has been checked follow the touch screen prompt on screen to proceed.

The compressed-air supply can then be connected to the instrument (minimum 2 barg, maximum 10 barg).

3. Continuous Monitoring Display

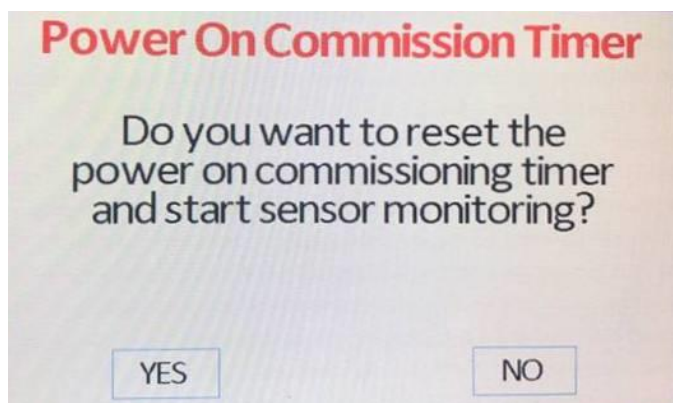


By tapping the calibration date screen, the instrument will then display the home screen.

In the top right hand corner a countdown will commence for a commissioning delay during which time the sensor readings are stabilising and the alarms will be disabled.

The duration of the commissioning delay can be later adjusted in the installer menu.

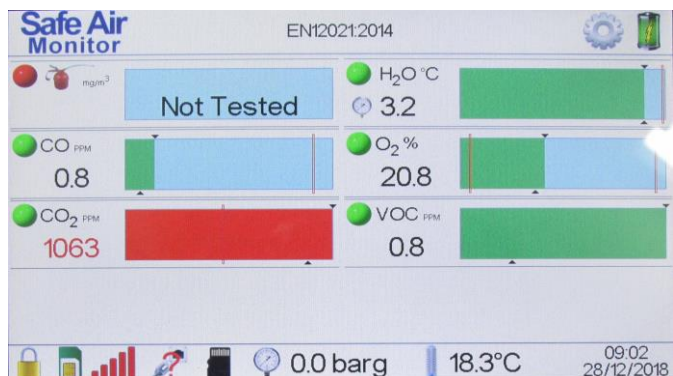
If the sensor readings have already stabilised you can commence immediate sensor monitoring by pressing the "Commissioning Delay" countdown icon.



Once commissioning is complete the home screen will display all live sensor readings.

Individual sensor readings can be further interrogated by pressing on their readings bar.

The number and order of the displayed sensors can be changed in the installer menu.

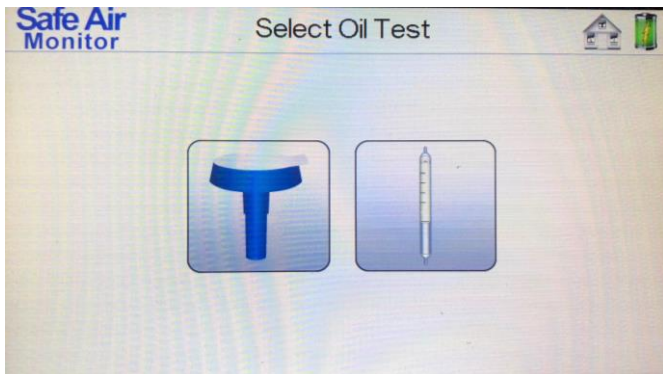


3.1 Completing an oil test using a Dräger Impactor or tube



The instrument displays the date and result from the last oil Impactor or tube test.

To undertake a new test tap the result button.

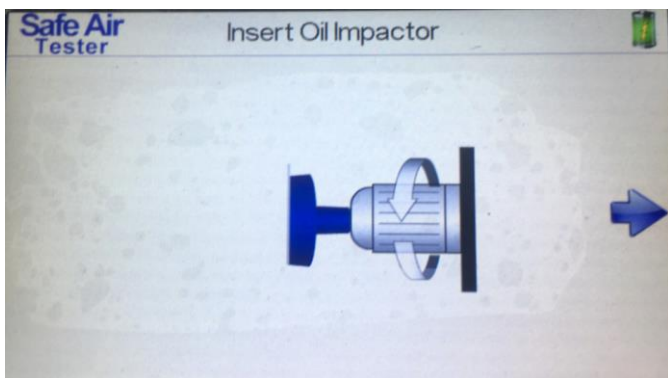


Choose between using a Dräger oil Impactor or Dräger chemical reagent tube in the test port.

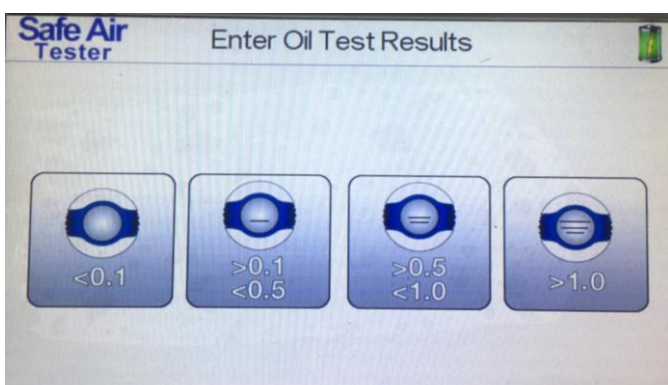
For breathing-air tests the most commonly used option is to select a Dräger oil Impactor. Instructions for using the Dräger tube can be found in appendix 1.



The instrument will now commence a 5-minute purge sequence, during which time an airflow will be passed through the test port. This clears contaminants from previous tests and ensures that a representative sample is being tested.



Once the purge has finished, the Dräger Impactor/oil tube should be inserted into the test port and tightened firmly; ensure the Impactor has an intact protective seal. **This seal must remain in place for the duration of the test.** Press the arrow on the right hand side to start the test.



At the end of the test the Impactor result screen will be shown. The Impactor should now be taken out of the test port, sticker removed and evaluated.

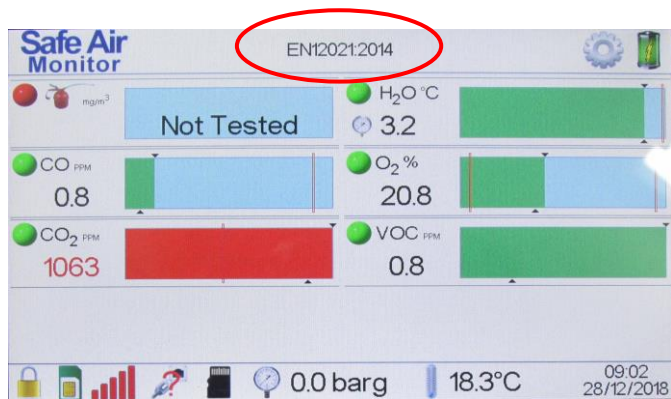
To enter the results press the corresponding icon on the screen.

Note:- Instructions on reading the Impactor can be found in Appendix 2 at the back of the manual.

The test result and date of test will then be displayed on the home screen.

4 Configuring the instrument

4.1 Selecting a test standard



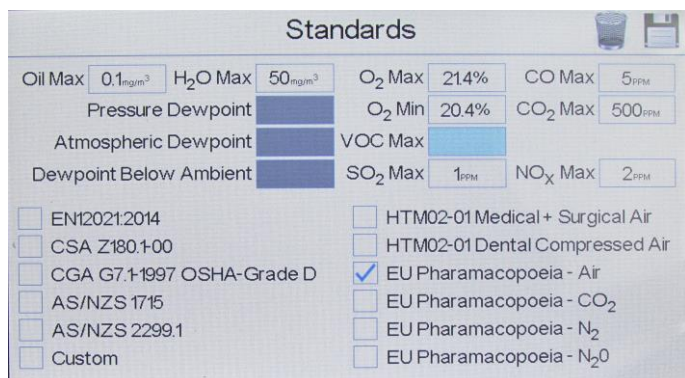
To enter the installer mode press this icon, which is located in the top right hand corner of the screen near the battery icon.



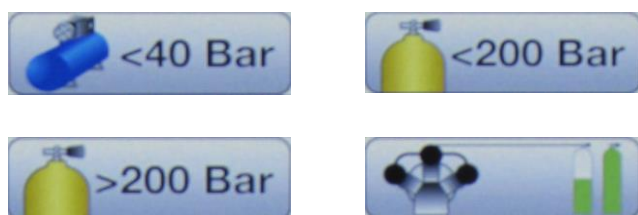
To change the test standard, from the home screen, press on the current standard.



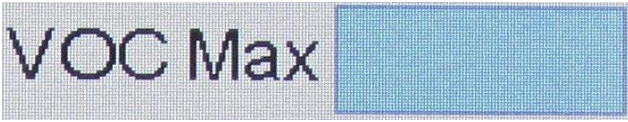
Enter user log in password "installer".



The standards menu will then display the available test standards.



As well as medical standards the F8104 can also test breathing-air to EN12021:2014. This standard has 4 different requirements depending if you are testing an airline system <40 bar; Cylinder <200 bar; Cylinder >200bar or direct from a high pressure charging compressor. By toggling the icon at the top of the screen the default limits will be displayed.



If you also want to test for Volatile Organic Compounds then by clicking on the adjacent box you can set a maximum limit. For further guidance on VOCs see appendix 3.

Click on the tick to confirm the VOC value you have entered as a test parameter.



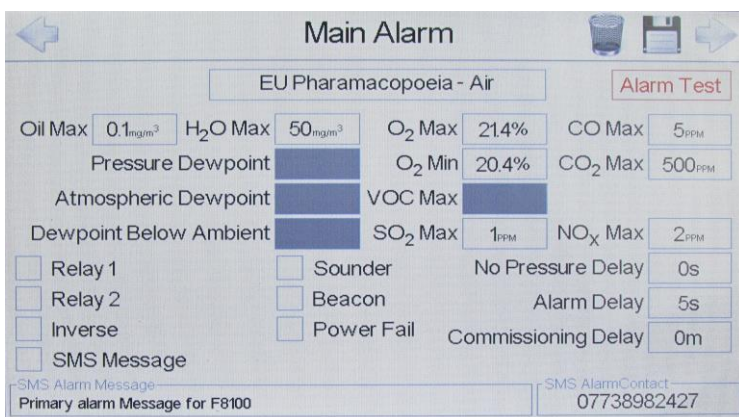
Once you have selected the appropriate standard press the save button to update the change or alternatively to discard press the waste basket icon.

4.2 Configuring the main alarm

To enter the set up mode press this icon, which is located in the top right hand corner of the screen near the battery icon.



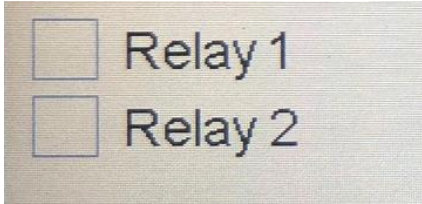
Enter user log in password “installer”.



The F8104 has 2 configurable alarms, a main and pre alarm. Both of the configurations pages are located in the settings pages.

The alarm values are based on the selected alarm standard. The values can be changed from this screen.

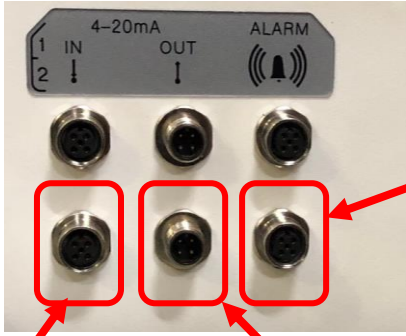
If a maximum limit for VOC has been inputted then the alarm will also activate if this is exceeded.



Relay 1 and 2 are used to set each alarm. These correspond with the alarm output connections located at the bottom of the instrument.

If Relay 1 is selected for Main Alarm only, Relay 2 can be selected for Pre Alarm.

The ratings for volt free contact is 1A at 24V AC/DC.



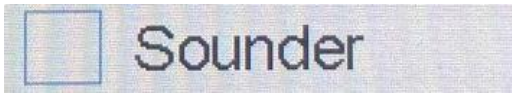
1	Normally closed
2	Common
3	Not Used
4	Normally open

2 matching plugs are provided with each F8104.

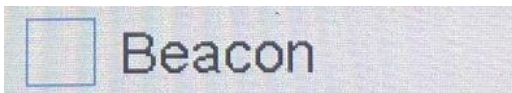
1	Sensor Out
2	Sensor V-
3	Sensor V+
4	Not used

1	-
2	+
3	Not Used
4	Not Used

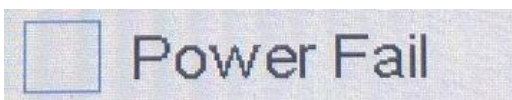
The action of the contacts can be adjusted in the software from active to passive by selecting the Inverse tick box.



This is an optional, factory fitted feature which allows a sounder to be fitted inside or on the unit itself. By selecting the Sounder, an audible tone will be emitted in the event of any of the readings exceeding their minimum and maximum value.



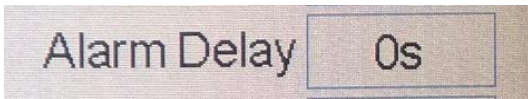
This is an optional, factory fitted feature which allows a beacon to be fitted on the unit itself.



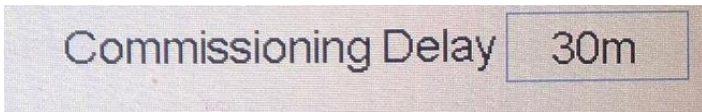
If Power Fail is selected, then in the event of a failure of the mains power supply, it will activate the alarm.



To function correctly the F8104 requires a minimum 2 barg supply pressure (10 barg maximum). In the event the supply pressure falls below 2 barg, the unit will activate its alarm. For situations where the drop in pressure may only be temporary a delay can be added (in seconds) before the alarm is activated.



An Alarm delay (in seconds) may be set, between the sensor values exceeding their minimum/maximum values and when the alarms will be triggered.



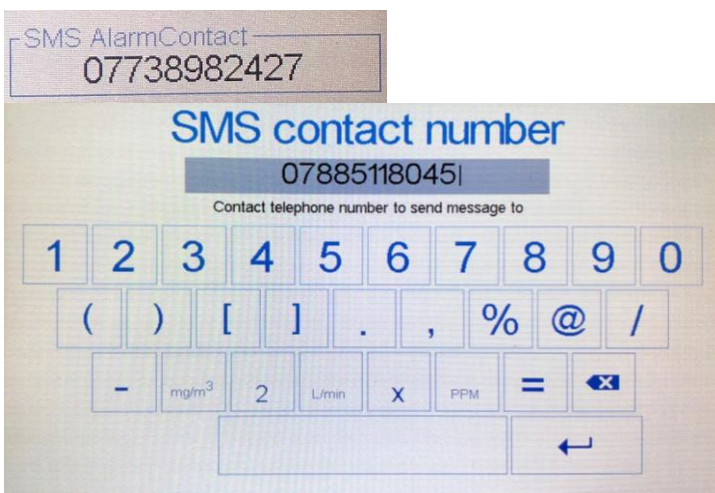
A commissioning delay may be set to prevent the unit activating the alarms when the instrument is first turned on, allowing time for the sensors to acclimatise.



If a SIM card is fitted in the instrument the SMS Message feature can be enabled by selecting this tick box. When activated a message will be sent when any of the readings reach their alarm values.



The SMS alarm message can be altered by pressing on the text.

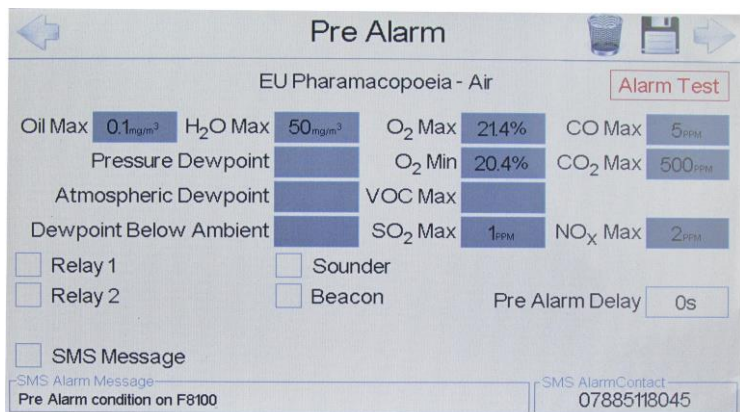


The SMS contact number can be set by clicking on the existing number.



Once you have configured the “Main Alarm” press the arrow button in the top right section of the screen to access the Pre Alarm menu. Alternatively you can save or discard the changes and return to the home screen.

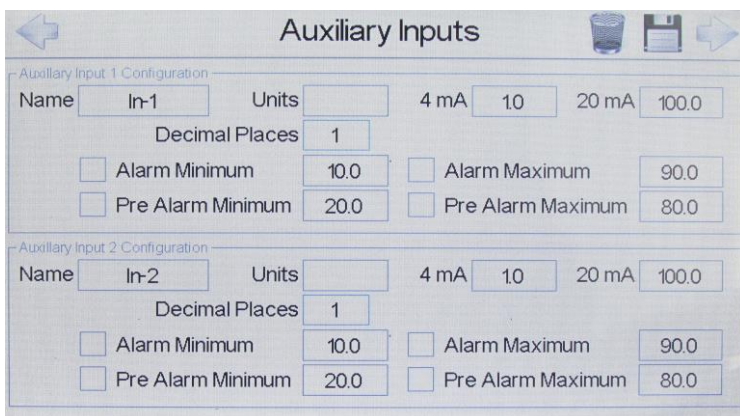
4.3 Configuring the pre alarm



The Pre Alarm screen provides the option to set a lower alarm value which can be used to notify the user before the main alarm values are exceeded.

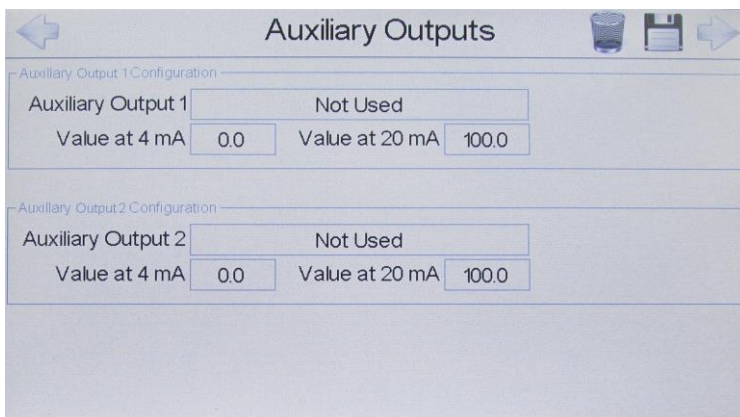
As with the main alarm the pre-alarm has a range of configurable options including an alarm output, sounder, pre alarm delay and if a SIM card is fitted, an SMS message.

4.4 Auxiliary Inputs and Outputs



The F8104 can display readings from external sensors which have a 2 wire, 15V, 4 – 20 mA output.

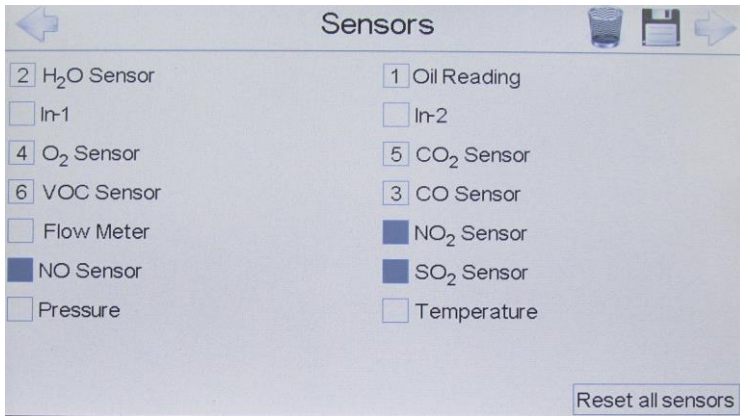
The description, units of measure and the 4 and 20mA parameters, for the sensors need to be set to match the external device(s).



It is also possible to program 4-20mA outputs for 2 of the F8104 sensors. These can be used if you need remote indication for these sensor values.

By selecting the Auxiliary Output 1 and Auxiliary Output 2 fields, you can choose which sensors you wish to output.

4.5 Sensors



The order in which sensors are displayed on the home screen can be set, you can also choose which sensors you want to be displayed.

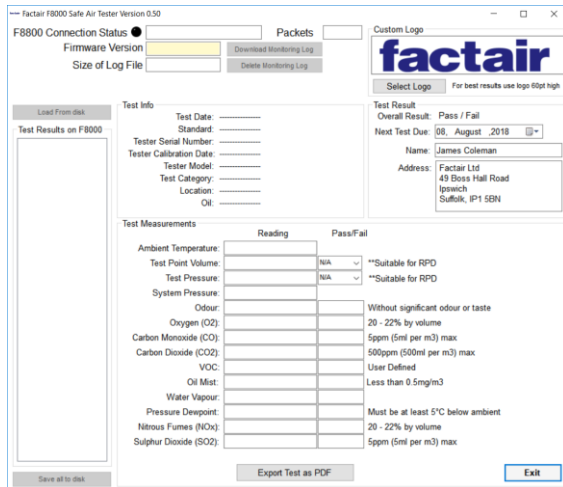


Any changes need to be saved to take effect.

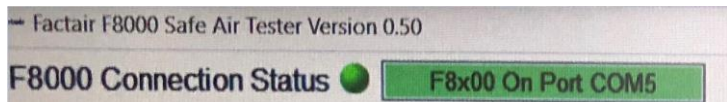
5. Exporting Test Results and PC Software.

To transfer the datalog from the F8104 Safe-Air Monitor to the PC software you must first install the software on your PC. This is available in the download section of Factair's website:

<http://www.factair.co.uk/downloads>

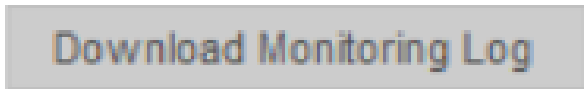


To transfer the datalog from the Safe-Air Tester to the PC software, turn on the F8104, connect the USB cable between the F8104 and your PC and open the Safe-Air Tester Results F8000 series software.

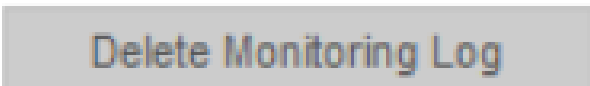


With the F8104 successfully connected the status light will turn green.

The unit will then automatically read the instruments firmware version, saved test results and the size of the data monitoring file.



The data log file can be downloaded by clicking on this button. Results are stored in a CSV format.



The monitoring log file on the F8104 SD card can also be deleted using this software.

When complete you can save the test result file.

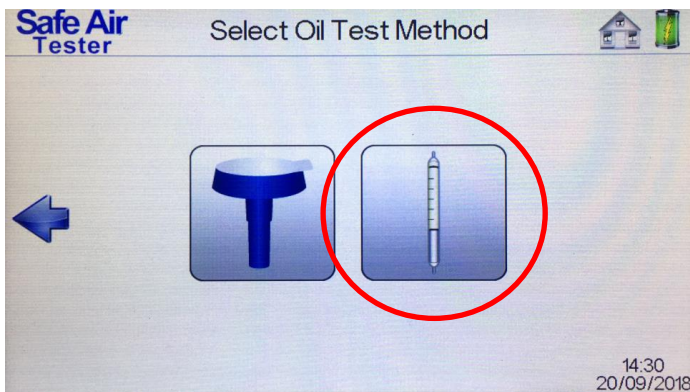
Appendix 1 - Using the test port for the Dräger oil tube

As well as the Dräger oil Impactor the F8104 test port can also be used with the Dräger oil tube.

Test	Dräger ref.	Factair Part No:	Sensitivity
Oil (chemical reagent tube)	6728371	TUB0003	0.1 mg/m ³

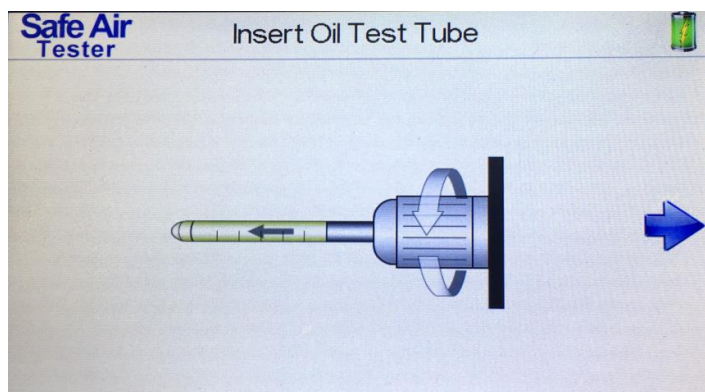
To prepare the tube Factair recommends the F2187 Dräger tube tip cutter.

If you have another Dräger tube, which you wish to use with the instrument, contact Factair for technical advice on its suitability.



To complete a tube test, select a tube test option as shown, press the button to proceed.

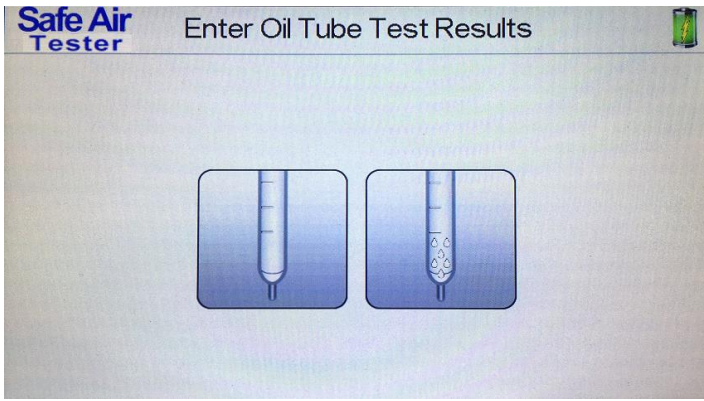
If you can determine with a high degree of certainty the specific compressor lubricant being used, then refer to the “test times” chart provided on Factair’s website marked for the F8104. If you have no knowledge of the type of compressor lubricant being used in the breathing-air system then Factair recommends 15 minutes as this covers the vast majority of lubricants.



Once the instrument has completed its purge sequence you will be prompted to insert the tube into the test port and tighten firmly.

Note: Both ends of the tube should only be cut immediately prior to the test. Ensure the arrow printed on the tube is pointing away from the instrument.

Press the right hand arrow to proceed.



The test will proceed as described in section 4 and at the end of it you will be prompted to enter the result from the tube.

The result will then be displayed on the final test result screen and stored in the instrument's datalog file.

Appendix 2 - Reading the Dräger Oil Impactor and Oil Chemical Reagent Tube

Oil Impactor

The Oil Impactor's protective seal must be kept in place for the duration of the test and only removed after the test has been completed.

With a standard measurement range of 0.1 to 1.0 mg/m³ the Impactor has a limit of detection of 0.05 mg/m³. The Impactor can detect all mineral and synthetic oil mists, it features a series of 3 horizontal lines, each formed by a series of precision manufactured nozzles. These horizontal lines of nozzles are calibrated to a different concentration of oil. When air is passed through these nozzles any oil present in the air is deposited on the glass plate prior to the air being exhausted by vents around its circumference, this allows the user to easily and quickly identify minute quantities of oil.

For tests that pass with an oil concentration of less than 0.05mg/m³, the screen will remain blank. For tests above that read as follows:

The bottom line represents an oil concentration of 0.1 mg/m³. When the oil deposited forms a continuous line then the concentration is in excess of 0.1 mg/m³. The middle line represents a concentration of 0.5 mg/m³, again when the oil deposited forms a continuous line the concentration is in excess of 0.5 mg/m³. The top line represents a concentration of 1.0 mg/m³, again when this forms a continuous line the concentration is in excess of 1.0 mg/m³.



Pass* -
greater
than
0.05mg/m³
but less
than
0.1mg/m³



Pass* -
greater
than
0.1mg/m³
but less
than
0.5mg/m³



Fail* -
greater than
0.5mg/m³
but less than
1.0mg/m³



Fail* -
greater
than
1.0mg/m³

* – The above pass and fail criteria is based on breathing-air standard EN12021

Using the Dräger tube tip cutter

The F2187 Dräger Tube Tip Cutter is an optional extra not provided with the F8000 as standard and is especially designed for cutting the ends of the tube. It has been designed to prevent glass from falling out of the opener by accident. The reservoir for the broken-off tips is easy to empty.

1. Place the end of the tube between the 3 blades, and turn to score the end.



2. Push the tube at an angle to break the tip.



3. Repeat steps 1 and 2 with the other end of the tube

Using the tube tip cutter with the Dräger oil tube

1. Using the Tube Tip Cutter, place the ampoule section in the platform at the bottom. Note: Make sure the tube is against the back wall of the cutter. Line up the black dot nearest the end of the tube with dot on the cutter.



2. With one hand holding the cutter, the other holding the tube and with your thumb against the base of the cutter, apply pressure to the tube, this should break the inner tube.



3. Place your used detector tubes in a safe container until they can be disposed of properly as “sharps” or glass.



Each pack of tubes has its own instruction leaflet but the following notes should help you take readings after the tests have been completed.

Each tube has an expiry date which is located on the back of its storage box.

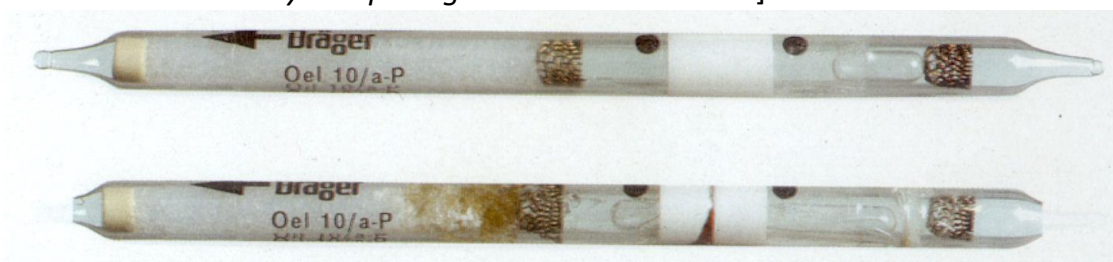
Oil (6728371) -

REQUIREMENT - FOR BREATHING-AIR STANDARD EN12021 THE AIR SHOULD HAVE A MAXIMUM OIL CONTENT OF 0.5 MG/M³ AND SHOULD BE WITHOUT SIGNIFICANT ODOUR OR TASTE.
FOR HTM02-01 THE AIR SHOULD HAVE A MAXIMUM OIL CONTENT OF 0.1 MG/M³

Ensure the oil tube is kept vertical throughout this process.

Satisfactory test: - The white crystals will turn translucent and show at worst a slight discoloration.

Failed test: - (Mineral oil) - The white crystals will show a light brown or darker discoloration.
- (Synthetic oil) - The white crystals will show a yellow discoloration [*Note: best seen by comparing with an unused tube*].



Disposal of Dräger-Tubes

When Dräger tubes have been used, or unopened tubes have exceeded their expiry date, they should be disposed of using one of the following methods:

Used Tubes Submerge the tube(s) in a beaker or metal container filled with water and allow to soak for 24 hours. Treat the residual water in accordance with local authority waste regulations (some tube aqueous waste may require neutralisation prior to disposal). Place the tubes in a “sharps” or glass bin wearing protective gloves and safety spectacles. Dispose of the bin via the company’s normal industrial waste disposal method(s) i.e. landfill or incineration.

OR Place the tubes in a “sharps” or glass bin wearing protective gloves and safety spectacles. Dispose of the bin via the company’s normal hazardous waste disposal method(s) i.e. landfill or incineration.

Unused Tubes Open the Dräger tube at both ends using the special tube opener or the cutter on the hand pump. Break any ampoules where applicable. Dispose of the tubes as stated in Methods 1, 2 or 3.

NOTE: As an alternative a local authority approved waste disposal contractor can be employed to collect used and unused tubes from site and dispose of them in a safe manner.

Appendix 3 - Volatile Organic Compounds

The F8104 incorporates a photo ionisation detector (PID) sensor to detect volatile organic compounds.

The European Union defines a VOC as "any organic compound having an initial boiling point less than or equal to 250 °C (482 °F) measured at a standard atmospheric pressure of 101.3 kPa." Volatile organic compounds are organic compounds with a high vapour pressure at room temperature. Their high vapour pressure results from a low boiling point which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air, a trait known as volatility. Most scent or odours are of VOCs.

Example VOCs include petrol fumes, exhaust gases, paint solvents and dry cleaning products. Harmful VOCs typically are not acutely toxic but have cumulative and often synergistic long-term health effects causing damage to the liver, kidneys and central nervous system.

Using a method of ongoing verification, the PID sensor in the F8104 provides an effective method of monitoring the performance of the activated carbon filter fitted in a breathing-air system.

Suggested Test Limits for VOCs

In EN12021:2014 it states compressed gas for breathing shall not contain contaminants at a concentration which can cause toxic or harmful effects. In any event, all contaminants shall be kept to as low as possible and shall be less than one tenth of a national 8 h exposure limit. For breathing air only the limit shall be less than one sixth of a national 8 h exposure limit. For breathing at hyperbaric pressures greater than 10 bar or exposure times greater than 8 h the levels shall be revised to take into account the effects of pressure and exposure times.

As VOCs can indicate a range of potential contaminants it may be useful to use the limit stated of ≤ 30 ml/m³ (PPM) for diving gas mixtures in tables 6, 7, 8 and 9 of EN12021:2014.

The other alternative reference is the technical specification ISO/TS 16975-1:2016 The International Respiratory Protective Devices – Selection and Use Maintenance Document which has a stated VOC limit of ≤ 25 ml/m³ (PPM) for breathable air used to supply breathable gas RPD.

VOC Alternative Sensors

An alternative 0-3 PPM VOC sensor can be factory fitted in the unit, with this sensor fitted Factair can pre-configure the unit to display the reading in mg/m³ referenced against isobutylene calibration gas.

Appendix 4 – Helpful Tips

General

- Never connect to a non-regulated supply from an HP cylinder or compressor.
- Maximum inlet pressure to the tester is 10 barg. If exposed to an overpressure the Tester will display an overpressure warning necessitating its return to the manufacturer for checking and resetting.
- Pressure Dewpoint is, for a given pressure, the temperature at which water will begin to condense out of air.

With Impactor

- Never remove the sticker before or during the test.

With detector tubes

- Ensure that there are no fragments of glass in the tube test port gland prior to fitting detector tubes, clean if required.
- Always remove the ends of the detector tubes cleanly using the correct tube tip cutter. Do not use pincers or other devices.
- Always remove both ends of the detector tubes prior to fitting.
- Always fit detector tube with the arrows facing outwards.
- Never break the glass ampoule in the oil tube before the test.
- Only use the detector tubes that the Tester is calibrated for.
- Once used, be aware that the tube tip cutter contains ground glass and glass fragments. Take appropriate precautions for the disposal of these. Dispose of as sharps.
- When using the tube tip cutter ensure only a light pressure is applied to the tube whilst rotating for scoring.

For any additional advice and information please contact Factair on: +44 (0) 1473 746400.

Air Quality Testing – Why?

Compressed air for breathing normally originates from a compressor system installed or operating at the place of use and there are various factors that can affect the quality and safety of this air.

- The air intake to the compressor can ingest airborne contamination from local processes and vehicle exhaust fumes which are not removed by standard breathing air filtration. Such air borne contamination may not be continuous but the pollution of the air supply may persist for hours or days.
- Malfunctioning compressors, especially reciprocating type, can produce unsafe levels of both carbon monoxide and carbon dioxide.
- Breathing air filtration has a finite life and can fail causing high levels of oil and water contamination to be present in the air.
- The performance of desiccant filters is dramatically affected by operating temperature. Infrequent validation may result in poor quality air being supplied for an extended period
- Failure of the compressed air aftercooling will result in air entering the filtration at too high a temperature, this will cause the filtration to prematurely fail and pass excess levels of oil and water.
- Malfunctioning dryers can disturb the oxygen concentration to outside safe levels within the breathing air.
- High levels of water in can freeze in downstream connections causing the air supply to fail.
- Changes in the performance of compressor and filtration equipment are usually rapid in nature. Any failure affecting outlet air quality may injure users for an extended period if quality validation is infrequent.
- Odour alone is a poor indicator of air quality, toxic as asphyxiant gasses are often odourless, the limits for oil pollution are lower than the threshold detection level that most people will notice.

All employers have a duty of care to their employees to ensure that the medical/surgical/dental air they are supplied with is adequate and safe to breathe. The points raised above may assist in the basis of a risk assessment

Medical Air Standards

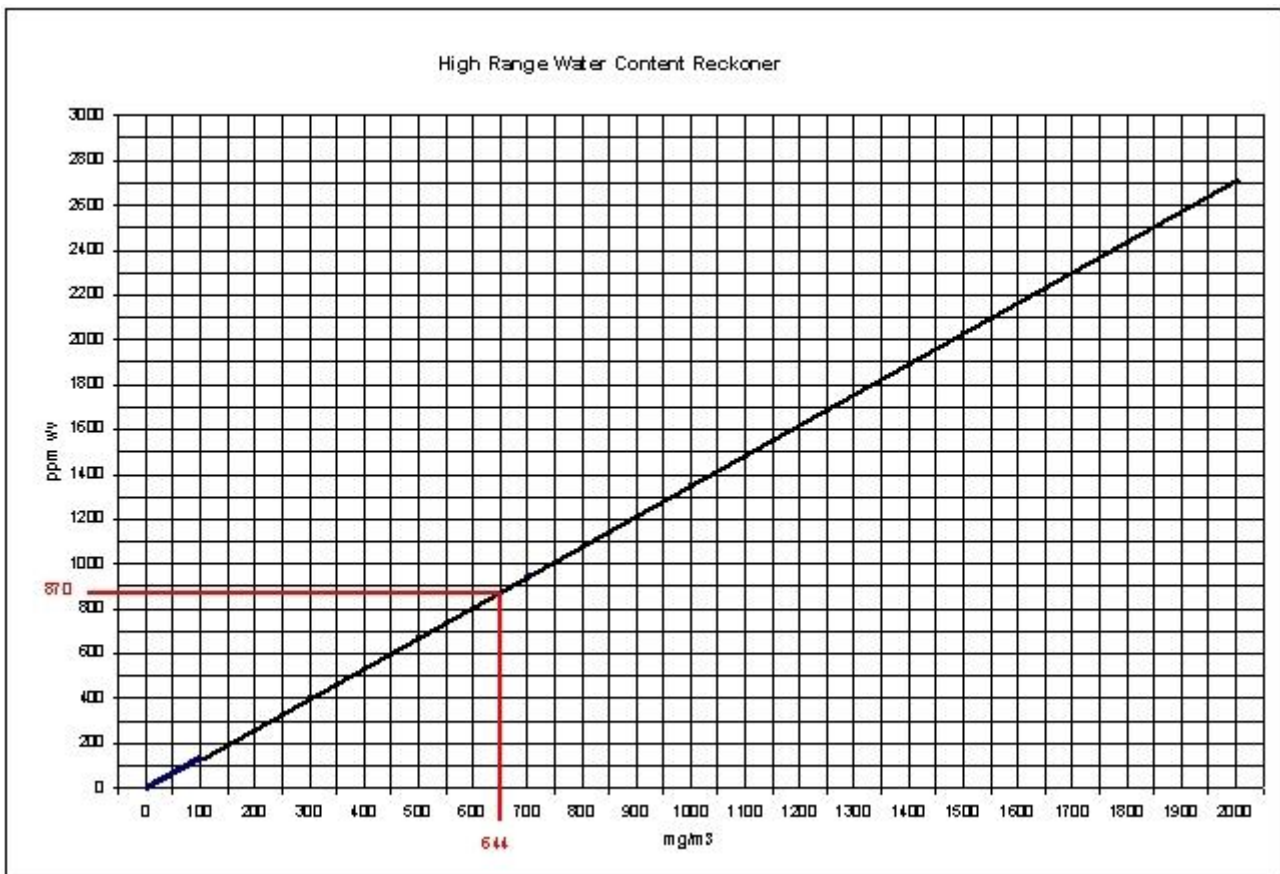
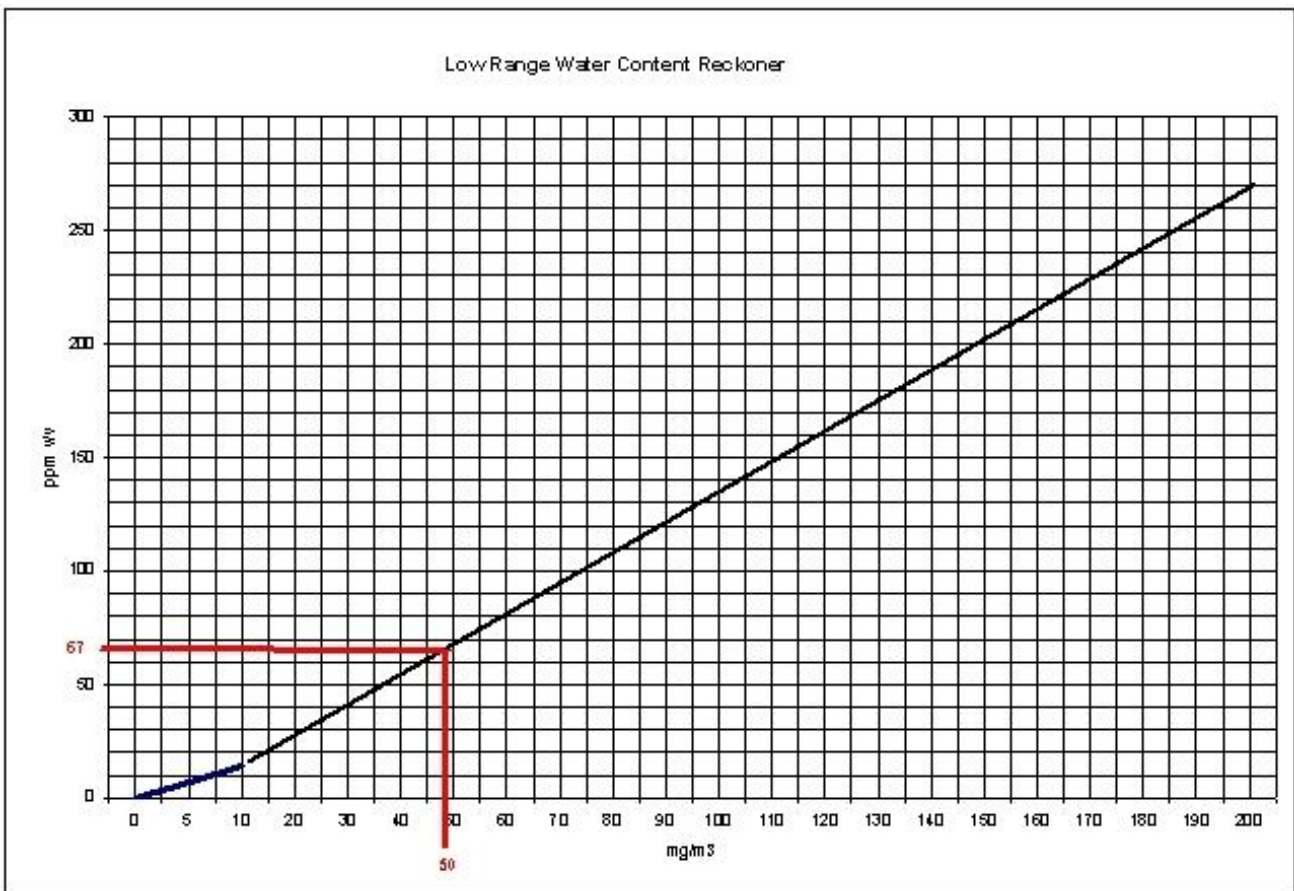
	HTM02-01		
	Medical & Surgical Air	Dental Air	Synthetic Air
Oil	≤ 0.1 mg/m ³	≤ 0.1 mg/m ³	
Water	≤ 67 vpm (≤ 0.05 mg/L, 50mg/m ³ , atmospheric dewpoint -46°C)	≤ 1020 vpm (≤ 0.78 mg/L, 780mg/m ³ , atmospheric dewpoint -20°C)	≤ 67 vpm (≤ 0.05 mg/L, 50mg/m ³ , atmospheric dewpoint -46°C)
Carbon Monoxide	≤ 5 mg/m ³ ≤ 5 PPM v/v	≤ 5 mg/m ³ ≤ 5 PPM v/v	
Carbon Dioxide	≤ 900 mg/m ³ ≤ 500 PPM v/v	≤ 900 mg/m ³ ≤ 500 PPM v/v	
Carbon Monoxide	≤ 5 PPM	≤ 10 PPM	
NO and NO₂	≤ 2 PPM v/v	≤ 2 PPM v/v	
SO₂	≤ 1 PPM v/v	≤ 1 PPM v/v	
Polytest (Optional)	No discoloration	No discoloration	No discoloration
Odour	None	None	

Note – There is also a requirement to conduct a visual particulate test and this should be free from visible particles in a 75 L sample (175 L for surgical air)

Above is an extract only for full details refer to the HTM02-01 standard.

	European Pharmacopoeia 5.0			
	Air, Medicinal	N ₂ O	CO ₂	N ₂
Oxygen	20.4% v/v to 21.4% v/v			
Oil	≤ 0.1 mg/m ³			
Water	≤ 67 vpm (≤ 0.05 mg/L, 50mg/m ³ , atmospheric dewpoint -46°C)	≤ 60 vpm (≤ 0.45 mg/m ³)	≤ 60 vpm (≤ 0.45 mg/m ³)	≤ 60 vpm (≤ 0.45 mg/m ³)
Carbon Monoxide	≤ 5 PPM v/v	≤ 5 PPM v/v	≤ 5 PPM v/v	
Carbon Dioxide	≤ 500 PPM v/v	≤ 300 PPM v/v		≤ 300 PPM v/v
Carbon Monoxide	≤ 5 PPM v/v	≤ 5 PPM v/v		≤ 5 PPM v/v
NO and NO₂	≤ 2 PPM v/v	≤ 2 PPM v/v	≤ 2 PPM v/v	
SO₂	≤ 1 PPM v/v		≤ 2 PPM v/v	
H₂S			≤ 1 PPM v/v	
Odour	None			

Water – mg/m³ to PPM v/v Conversion Charts



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