ACG datasheet

Real time continuous monitoring of contaminants in compressed breathing air

Aids compliance with relevant standards including: BS EN 12021, DEF STAN 68-284 and BS 8478

Compressed breathing air

Why is it used?

Compressed breathing air is produced by a breathing air compressor and purification system. The air protects workers engaged in tasks like sandblasting, spray painting, chemical spill clean-up, welding, grinding, pipe and tank cleaning and similar activities where repeat exposure can pose a health threat.

What are the different types of compressed breathing air systems?

- Constant flow. Air is passed continuously through the respirator to minimise leakage and entry of external contaminants into the respirator, to ventilate the respirator and to provide Grade D breathing gas.
- Demand flow. Air is supplied to the respirator only as the wearer inhales or demands air. Air flow adjusts automatically to the users breathing rate. This system is used for short duration work and is usually supplied by compressed air cylinders or an online compressor.
- Pressure demand. Positive pressure is maintained in the respirator at all times by providing a constant air flow, with increased air flow upon inhalation. It requires a tight fitting respirator and is supplied by an online compressor or compressed air cylinder.

Why do you need a compressed breathing air analyser?

Relevant standards including BS EN 12021, DEF STAN 68-284 and BS 8478 require adherence to specific limits of constituents in breathing air. For example BS EN 12021 requires the following air purity limits:

CO	**-**	**<15ppm**
CO_2	**-**	**<500ppm**
Oil mist	**-**	**<0.5mg/m^3**
H_2O	**-**	**<25mg/m^3**
O_2	**-**	**21 ±1%**

Fatal accidents have occurred where workers have been supplied from a contaminated compressed air supply. By having an online analyser you eliminate these potential risks by continuously monitoring, ensuring you are adhering to the required safety standards.

Who needs a compressed breathing air analyser?

Anyone who utilises the following equipment or is involved in any of these industries will need to ensure the quality of their compressed air:

Equipment -

Breathing air compressors
Breathing air masks
Breathing air cylinder charging stations
Chemical safety suits
Clean suits
Process air compressors
Paint spraying
Pharmaceutical

Industries -

Bottling plants
Clean process air
Confined space entry
Diving industry
Fire fighting
Food processing
Petrochemical

Common compressed breathing air risks

Carbon monoxide (CO)

CO is a highly toxic gas which cannot be detected by sight or smell. It only takes a small concentration of CO to have an adverse effect on the human body. Symptoms of CO poisoning include fatigue, headaches and confusion. However, prolonged exposure could lead to unconsciousness, brain damage and even death. CO can enter the breathing air system through the air intake, it can be produced by overheating of piston type compressors or it can also be produced within a compressor as a result of breakdown of the lubricating oil caused by pyrolysis (chemical decomposition by heat). Pyrolysis can occur when the system is hot, but not necessarily overheating and the resulting short-term high levels of CO would not necessarily be identified during periodic sampling.

Oxygen (O_2)

Air normally contains approximately 21% O_2 with the remainder consisting mostly of nitrogen. Individuals exposed to reduced O_2 atmospheres may suffer a variety of symptoms including dizziness, impaired judgement and an increase in breathing rate. There are a number of risks associated with O_2 deficiency within compressed gas, these risks can be caused by:

- Air contaminated with exhaust fumes drawn into a compressor may have low O_2.
- Incorrect pre-mixed gas connected to the compressor inlet.
- Partial combustion of oil in a compressor can reduce oxygen levels.

Water (H_2O)

Air contains moisture which is drawn into a compressor and then enters the air stream as a vapour. As the compressed air flows through the system it cools, causing the vapour to condense in the face piece or helmet. Potentially, the vapour could freeze, blocking the cylinder valve and preventing the flow of air to the user. Moisture can combine with oil and other solid contaminants to form a sludge which has the possibility of clogging or damaging system components. Excess water vapour could also cause rust in the pipeline as well as potentially freezing in cold weather with both issues causing blockages.

Carbon dioxide (CO_2)

CO_2 is toxic. Due to it being a colourless and odourless gas it cannot be detected by human senses. As its concentration in the ambient air increases, lower quantities of carbon dioxide leave the blood stream resulting in the reduced uptake of oxygen into the body. This effect is called intoxication. CO_2 intoxication is entirely independent of the effects of oxygen deficiency (i.e. asphyxiation) therefore the O_2 content in the air is not an effective indication of the danger of intoxication.

CO_2 can be caused by:

- Vehicle exhaust emissions near the compressor air intake.
- CO_2 leakage from storage drawn into the compressor.
- Build up from other sources drawn into the compressor.
- Failing HP air filter systems.

Oil mist

All compressors require lubrication to minimise frictional heating and wear of their moving parts, the majority are oil lubricated. During normal operation, the movement of a compressors internal parts leads to the deposition of a thin oil residue on all surfaces of the compression chamber. The high speed of motion and the great forces required to compress the air, result in some of the oil being atomised. As a result all compressed gas at the output of the compression chamber will contain some oil mist.

Under normal conditions this oil mist is then removed by the after cooler and filters on the output of the compressor, typically a mixture of coalescing and charcoal filters.

Other sources of oil mist can be as the result of filter carry over. Under certain fault conditions the oil collected by a filter is re-atomised back into the air flow. This is more likely to be caused by high differential pressures across the filter.

In the respect of oil mist creation, both synthetic and mineral oils behave in much the same way. Oil mist can cause breathing discomfort as well as sickness and pneumonia.

What does it offer?

The ACG is a multi sensor gas analyser, specifically designed for the analysis of contaminants in compressed breathing air. The ACG can be permanently connected to a compressor outlet, enabling you to continually verify the quality of your breathing air. This delivers a much greater degree of system safety than a 3 or 6 month spot check. The fixed unit will provide continuous ‘on line’ monitoring of O_2, CO_2, CO, volatile organic compounds (VOCs) and water vapour in compressed breathing air lines.

Maintenance requirements

Ease of maintenance and calibration has been designed into the ACG. We understand that you need to be able to maintain your own unit, so the ACG allows you to:-

• change individual sensors as required
• replace the whole sensor sub assembly
• change individual circuit board assemblies
• calibrate gas sensors (excluding water sensor)
• replace all filters

Service requirements

We recommend that the ACG has a one, two and a six year preventative maintenance schedule. This maintenance can either be completed by yourselves, or arranged through Analox as part of a service agreement. The one year service should include: replacement of inlet filter, checking of the sensor flow rates and sensor calibration. The two year service should include: replacement of electrochemical sensors and the replacement (or service) of the VOC sensor, service of the H_2O sensor*.

The six year service should include: the replacement of O rings and replacement of the display unit.

** service exchange for calibration of H_2O vapour sensor*

Measurement	Range	Accuracy	Technology
Oxygen	0 to 50%	±(0.035% O_2 + 1% of reading + 0.15% of reading/ºC)	Analox MEC intelligent electrochemical oxygen sensor
Carbon dioxide	0 to 1000ppm	±(25ppm CO_2 + 1% of reading + 1ppm CO_2/ºC)	Analox 5S3 intelligent NDIR sensor
VOC	0 to 100ppm	±(1ppm VOC + 5% of reading + 0.25% of reading/ºC)	Analox MEC intelligent PID sensor
Carbon monoxide	0 to 20ppm	±(1ppm CO + 5% of reading + 0.1ppm CO/ºC + 0.5% of reading/ºC)	Analox MEC intelligent electrochemical sensor
Water vapour	0 to 100mg/m^3	±(0.15mg/m^3 H_2O + 20% of reading)	Water vapour sensor using capacitive technology

The ACG is built upon Analox's latest innovations in sensor technology. The new range of 5S3 and MEC intelligent sensors are Analox's most compact, miniaturised range of sensors to date. Each sensor comes with its own electronics for signal processing and temperature compensation which enables each sensor to become a field replaceable item.

Power
Input voltage: 24V DC
Power consumption: 24 W (max)

Optional power supply
Universal mains adaptor;
Input: 95 to 250VAC, 50/60Hz

Sensor response time
T90 < 120 secs
T90 < 15 mins (water vapour sensor)

Flow rate
5LPM (max)

Inlet pressure
4 to 7 bar gauge

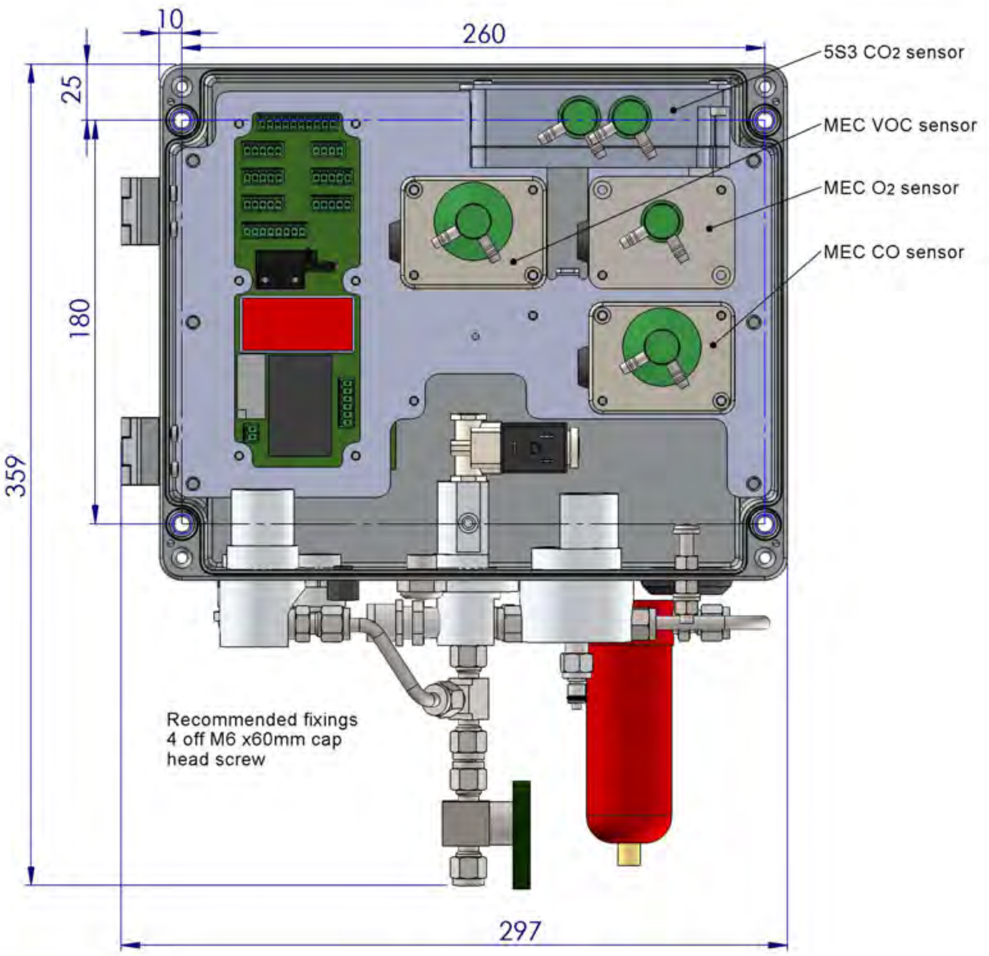
Operating temperature
-5˚C to 50˚C

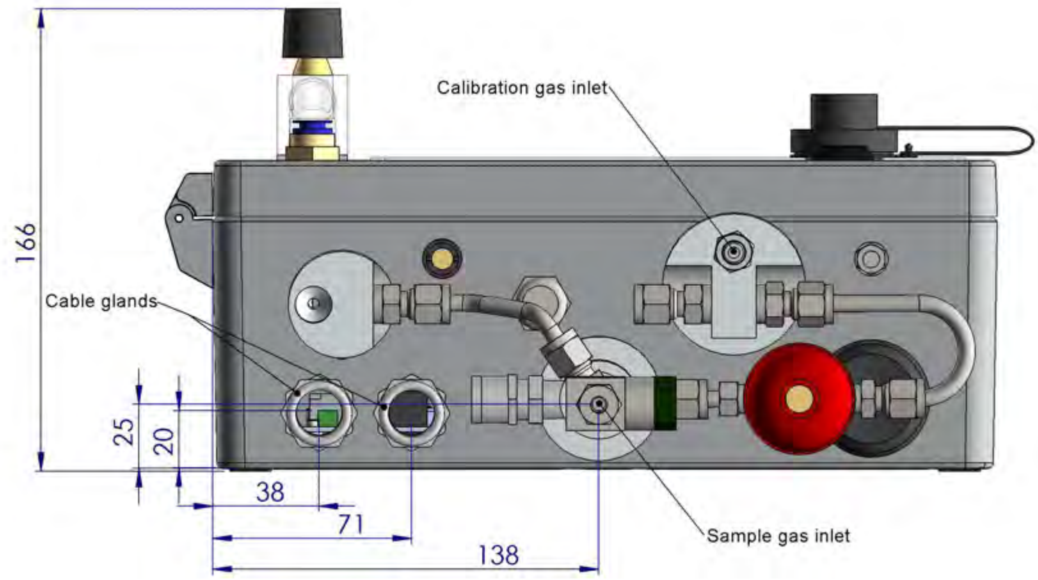
Storage temperature
-10˚C to 60˚C

Humidity
0 to 99% RH (non condensing)

Environmental protection rating
IP54

Outputs
1x Normally open relay contacts
1x Normally closed relay contacts
3x 24V DC switched output


10
260
25
180
359
297
5S3 CO2 sensor
MEC VOC sensor
MEC O2 sensor
MEC CO sensor
Recommended fixings
4 off M6 x60mm cap
head screw


166
Calibration gas inlet
Cable glands
25
20
38
71
138
Sample gas inlet