BREATHING AIR QUALITY TEST KIT

AIRQUAL-1

PRODUCT MANUAL

IN COMPLIANCE WITH BS EN12021

AQUA GAS

CONTENTS

1. SAFETY INFORMATION

Important: Failure to perform the procedures detailed within this user guide may impair the performance of this equipment. For maximum safety and optimal performance please read and follow the following procedures and conditions. The volume flow and quality of the supplied air should be thoroughly tested at intervals as specified by a competent person after risk assessment.

The AIRQUAL-1 is to be used to test compressed air for; oil mist, water vapour, carbon monoxide (CO), carbon dioxide (CO_2), oxygen (O_2), temperature, flow and pressure in accordance to your local governing body (see section 2).

Any attempt to repair or substitute components can cause error and possible damage of components. Only replace consumable parts with genuine components specified for use as direct replacement for the AIRQUAL-1. See section 11.

The quality of the air supplied to a breathing apparatus should be tested at least every three months and more frequently when the quality of the air supplied cannot be assured.

The regulators and flow restrictors are factory set to deliver the required flow rates specified by GASTEC at 1 bar. Flow rates can be adjusted see. Section 5 for further details.

When disposing of old parts always follow local waste disposal regulations.

Additional Warnings for the O_2 Detector: The O_2 Detector has a life span of 2 years from start up. A countdown timer shows the remaining life of the O_2 Detector. At the end of the O_2 Detector life, the unit will shut down. Please note this is a disposable unit. Contact a1-cbiss for further information.

WARNING: The AIRQUAL-1 contains a lithium battery which may leak or explode if the instrument is mistreated. Do not attempt to disassemble or dispose of in fire.

WARNING: The O_2 Detector is marked with the symbol “Exia”, which is used by the Canadian Standards Association to designate the instrument as INTRINSICALLY SAFE. The intrinsic safety is not certified by CSA when this instrument is used in atmospheres containing oxygen concentrations above 21%. For Europe Only: The O_2 Detector has been certified to meet the following standards on a calibration interval of 30 days or less: 1) EN 45544-1.

The O_2 Detector is certified for use within ambient temperature range of -40ºC to 60ºC. The O_2 Detector complies with the relevant provisions of European ATEX Directive 94/9/EC and EMC Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC The EC Type Examination Certificate is DEMKO 05 ATEX 0503099 with marking code EEx ia I/IIC T4, for Equipment Group and Category I M2 and II 2G.

Never cover or insert foreign objects into the alarm signal opening, the opening must remain clear and free of foreign objects, otherwise any alerts made during an alarm state may not be heard or identified.

2. INTERNATIONAL STANDARDS

Table 1

Substance	Europe BS EN12021:2014	USA 29 CFR 1910.134	Canada CSA Z180.1-00	Australia AS/NZS 1715:1994
Oxygen (O_2)	21% (+/-1%)	19.5% -23.5%	20%-22% By volume (dry air)	19.5%-22%
Carbon Dioxide (CO_2)	≤ 500 PPM	≤ 100ppm	≤ 500 PPM	≤ 800ppm
Carbon Monoxide (CO)	≤ 5 PPM	≤ 10 PPM	≤ 5 PPM	≤ 10 PPM
Oil Mist/ Vapour	≤ 5 mg/m³	≤ 5 mg/m³	≤ 1mg/m^3	≤ 1mg/m^3
Odour/Taste	Without significant odour or taste	Without significant odour or taste	Without significant odour or taste	Without significant odour or taste
Water (Liquid)	There should be no free water	There should be no free water	There should be no free water	There should be no free water
Water (Vapour)	Air for compressed air line breathing apparatus shall have a dewpoint sufficiently low to prevent condensation and freezing. Where apparatus is used and stored at a known temperature, the pressure dewpoint shall be at least 5°C below the likely lowest temperature. Where conditions of usage and storage of the air is not known, the pressure dewpoint shall not exceed -11°C.	4°C (39°F) pdp @ 50psig.	The pressure dewpoint of the compressed breathing air shall be at least 5°C (9°F) below the lowest temperature to which any part of the compressed breathing air pipeline or the accepted respirator maybe exposed at any season of the year.	Airline pressure should be at least 5°C below the lowest known temperature or -11°C if the lowest is not known.

3. TECHNICAL SPECIFICATION

AIRQUAL-1

Table 2

Maximum Inlet Pressure	10 bar g (145 psig)
Maximum Inlet Flow	600 lpm
Analysis Operating Pressure	1 bar g (14.5 psig) - Factory setting
Maximum Inlet Temperature	40°C (104°F)
Minimum Inlet Temperature	15°C (59°F)
Flow Accuracy	±4%
Air Flow Range for Detector Tubes	30 - 5000 ml/min
Connections	6 mm & 8 mm Air flow vent push fit & 1/4” BSP female
Approved Detector Tubes	Calibrated to GASTEC tubes

GASTEC Tubes

Table 3

Gas	Tube	Range	Flow Rate ml / min	Sample Time (Minutes)	Colour Change		Shelf Life (Years)
Carbon Monoxide	1A	5-50 ppm	100	3	Yellow	Dark Brown	2
Carbon Dioxide	2A	250-3000 ppm	100	5	Orange Yellow	Yellow	2
Carbon Dioxide	2AG	200-3000 ppm	100	1.5	Pale Blue	Purple	3
Water Vapour	6AH	500-5000 ppm	300	1	Green	Purple	2
Water Vapour	6A	30-80 mg/m^3	100	5	Yellow	Green	2
Water Vapour	6AG	150 - 3000 mg/m^3	300	1	Green	Purple	2
Nitrogen Oxides	11A	0.06-2 0.02-0.7	100 100	2 5	White	Bluey Green	3
Oil Mist	109AD	0.2-5.0 mg/m^3	1000	20	Pale Red	Pale Blue	2
Oil Mist	109A	0.3-1.5 mg/m^3	1000	60	White	Dark Green	2

Hydro-Thermometer

Table 4

Measuring Range	20 - 99% RH
Measuring Range	0-50 °C
Display Accuracy	+/-5 % RH; +/-1°C
Display Resolution	1% RH; 0.1 °C
Display Update	10 Seconds
Battery	3v - CR2032
Display Size	33 x 27 mm
Product Size	49.5 mm (w) x 41 mm (h)

Flow Meters

Table 5

In Line Flow Meter (Set at 200) (Page 7, fig 1, item 4)	60 - 600 SCFH Air
Calibration Flow Meter (Page 7, fig 1, item 2)	0 - 0.5
Calibration Flow Meter (Page 7, fig 1, item 3)	0.6 - 5 lpm
Maximum Temperature	38°C (100°F)
Pressure	10 bar g (145 psig)
Accuracy	5% of full scale

Pressure Gauges

Table 6

In Line Pressure Gauge (Page 7, fig 2, item 14)	0 - 10 bar
Regulator Pressure Gauge (Page 7, fig 2, item 13)	0 - 4 bar

4. AIRQUAL-1 LAYOUT

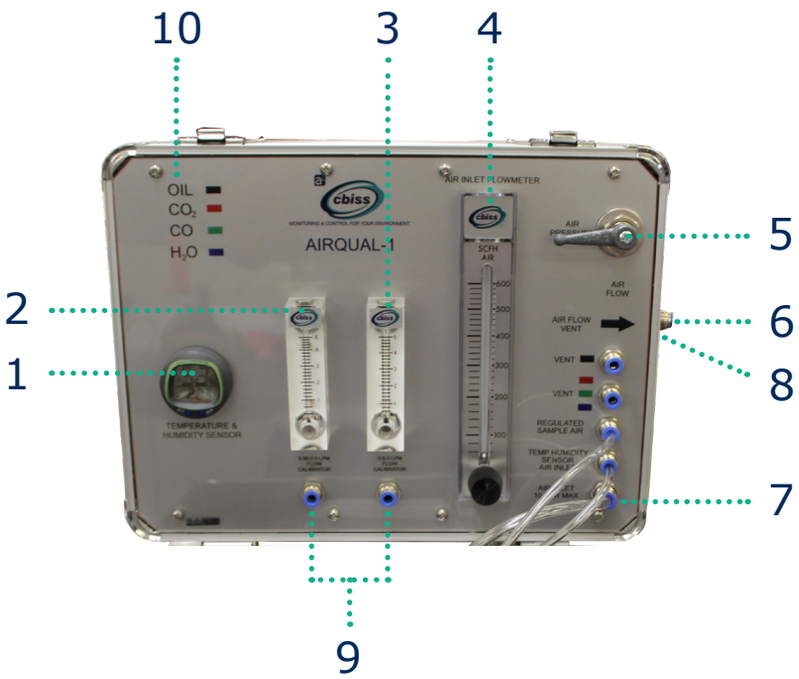


Fig. 1

1	Temp & RH Sensor
2	0-0.5 lpm Calibration Flow Meter
3	0.6-5 lpm Calibration Flow Meter
4	Inline Flow Meter 0-600 SCFH (set @ 200)
5	Pressure / Flow Control
6	Flow Vents
7	6 mm & 8 mm Push Fit Connectors
8	Calibration Vent
9	Calibration Flow Connectors
10	Tube Colour Codes

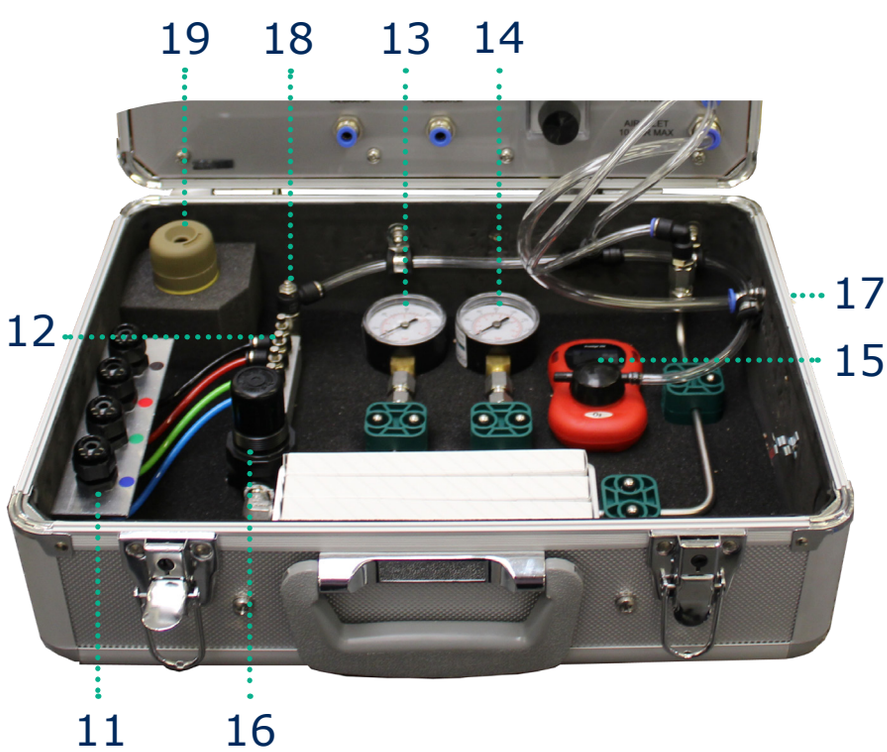


Fig. 2

11	Tube Receptors
12	Adjustable Valve Manifold
13	Test Pressure Gauge (0-4 bar)
14	Inline Pressure Gauge (0-10 Bar)
15	O_2 Detector
16	Pressure Regulator
17	1/4” BSP Female Connector
18	Adjustable Valve for Temp/RH
19	Gastec Tip Breaker

5. OPERATING PROCEDURES

Note (n1) refers to numbered item in fig 1 and 2, page 7)

1. Ensure the valve (5) is set to "Air Flow"

2. Take note of the ambient temperature (1)

3. Select appropriate connection (17 or 7). Either connect a 1/4" BSP Male connection into the Female (17) or remove the tubing from the 8 mm push air inlet fit connector (7) to insert the line into the AIRQUAL-1

4. Ensure the air inlet flow meter (4) is open by turning the valve anti-clockwise. Take note of inlet flow in Standard Cubic Feet per Hour (SCFH)

5. Switch the valve (5) back to "Air Pressure" and take in line pressure reading from the right hand side pressure gauge (14)

6. Use the pressure regulator (16) to reduce the testing pressure to 1 bar, testing pressure indicated on the left hand side gauge (13)

7. Using the flow calibrators (2 & 3) to ensure the correct flow through each tube receptor, connect each tube receptor (11) with the flow calibrators using the PTFE tubing supplied. Cross reference the required flow rate for each tube as shown in Table 3 (pg. 5) and note the results on the test pad supplied. Adjust the flow by turning the needle valves (12). To secure the flow rate tighten the locking nut. Return the valve (5) to "Air Flow"

8. Break the end of the Gastec detector tubes and place into the correct receptor (11) cross referencing the colour coding (10) (see pg. 10).

9. Move the valve (5) to "Air Pressure" to begin test and start timing with the stopwatch provided

10. Note the sample times for each Gastec detector tube (Table 3, pg. 5)

11. While the Gastec detector tubes are inline, you can check the O_2 reading (15), this will typically take 30-60 seconds to stabilise. Optional: Note the inline %RH (1) if you wish to calculate the dewpoint using %RH instead of mg/m^3 water vapour.

12. When the time is up on each tube, keep the Gastec detector tube in the AIRQUAL-1 and note the readings.

13. Complete the test sheet (as supplied, pg. 16)

14. Switch the valve to "Air Flow" to release any back pressure and disconnect the test line from the AIRQUAL-1

NB: DO NOT ADJUST FLOW TO EITHER THE O_2 DETECTOR OR THE TEMP & HUMIDITY SENSOR

6. TUBE PROCEDURES

1. First ensure that there is no obstruction in the tube receptor. If there is debris present fully unscrew the gland to expose and remove seal to gain access.

2. Remove the detector tube from the packaging. Both ends of the tube must be broken prior to use. To break the tip ends, insert the tube into the tip breaker and rotate it 360° as shown in figure 3.2(a). Push the tube downwards to break the tip off as shown in figure 3.2(b).

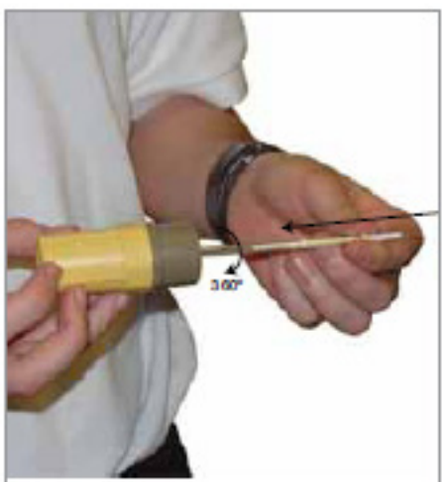


Figure 3.2(a)

Figure 3.2(b)

3. Insert the detection tube in the relevant tube receptor in the AIRQUAL-1. Refer to the legend on the top left of the back plate (11. Fig. 2, page 7).

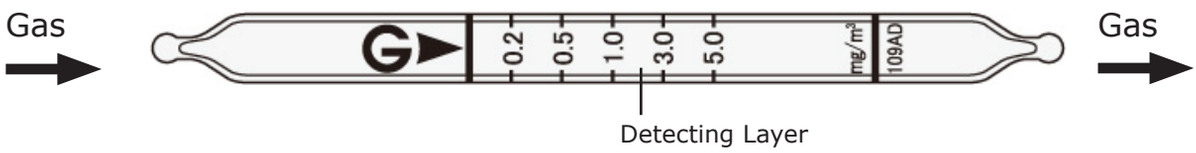
NB: The arrow marked on the side of the tube indicates the direction of flow of the sample gas.

KEEP THE TUBES AWAY FROM YOUR EYES WHILST BREAKING THE TIP ENDS
DO NOT TOUCH THE BROKEN GLASS OR THE REAGENT WITH YOUR BARE HANDS

7. INTERPRETING TUBE READINGS

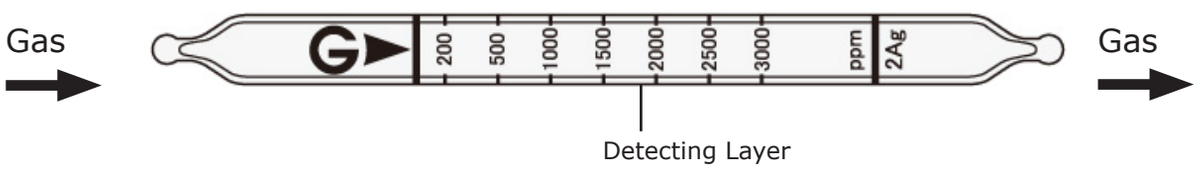
1. OIL MIST TEST:

The reading is obtained directly off the tube in mg/m^3. The reading should be taken on the boundary of the brown/dark green staining, ignoring the pale green discolouration.
NOTE: High water vapour levels can affect accuracy of reading (see note overleaf).



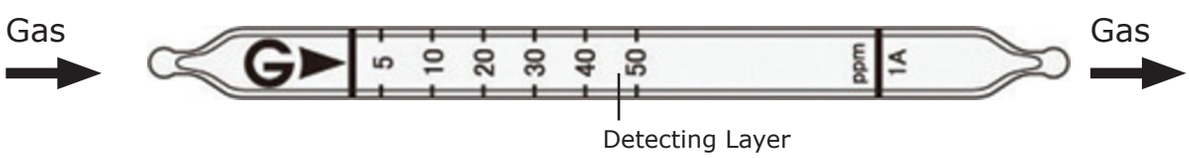
2. CARBON DIOXIDE TEST:

The reading is obtained directly off the tube in parts per million. The reading should be taken on the boundary of the pale orange staining.
NOTE: High water vapour levels can affect accuracy of reading (see note overleaf).



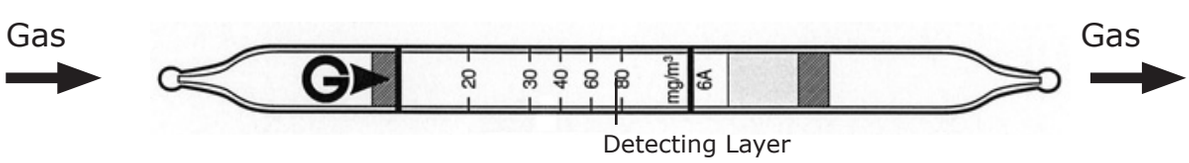
3. CARBON MONOXIDE TEST:

The reading is obtained directly off the tube in parts per million. The reading should be taken on the boundary of the dark brown staining.
NOTE: High water vapour levels can affect the accuracy of the reading (see note overleaf).



4. WATER VAPOUR TEST:

If the stain length reaches the maximum calibration mark (80mg/m^3) during sampling, record the time taken to reach saturation and then remove the tube. The reading should be taken on the boundary of the purple staining.



Use the formula below to calculate the actual concentration.
Actual Concentration (mg/m^3) = Max Tube Reading x (Test Duration / Time Taken To Reach Saturation)
Example: For a maximum tube reading of 80mg/m^3 taken during 3 mins:-
Actual Concentration = 80mg/m^3 x (10 / 3) mins = 266mg/m^3 - refer to the graph in Section 9 for pressure dewpoint values.

Excessive water vapour (dewpoints wetter than -20 pdp) can often lead to false readings with this type of detection tube. The oil mist detection tube is particularly susceptible to poisoning by excessive water vapour. If the water vapour levels are higher than the international standards, the system should be investigated and the water vapour level reduced before further analysis.

WARNING

For maintaining the performance and reliability of the test results, adhere to the following:-

- Use these tubes within the temperature range of 0 - 40°C (32 - 104°F)
- Use the tube within the relative humidity range of 0 - 90% (Oil Mist only)
- Store the tubes in a cool dry place
- The shelf life of the tubes are clearly marked on the box

HINTS FOR DETECTOR TUBE READING

(a) When the end of the colour change layer is flat, read the value at the end of the layer. In this example, the reading should be 5%.

(b) When the end of the colour change layer is slanted, read the value in the middle of the slant. In this exaggerated example, the reading should be 5%.

(c) When the demarcation of the colour change layer is pale. Read the value in the middle between the dark layer end and the pale layer end. In this exaggerated example, the reading should be 5%.

8. O_2 DETECTOR

NB: THE O_2 DETECTOR HAS A LIFE SPAN OF 2 YEARS FROM START UP

GAS MONITORING SCREEN

This is the primary operating screen which displays concentration in percent volume.

Note: if the analyser is left inactive for 30 seconds then the display will revert back to the gas monitoring screen.

If a gas concentration exceeds the low or high level threshold the detector will enter into an alarm screen. If an alarm occurs in any of the analysers normal operating screens such as battery life, peak or initiate print screens then it will automatically default back to the gas monitoring screen. The alarms screen is indicated on the display by the alarms indicator and either the up or the down arrow indicator which determines a high or low alarm.

1. Alarm condition icon
2. Self-test status icon
3. Test reminder icon
4. Gas type icon
5. Battery indicator icon
6. Instrument life remaining icon
7. High & low alarm set point icons
8. Instrument life remaining icon
9. Infrared data transfer icon
10. Months/days/hours since last maximum exposure
11. Instrument life remaining indicator data and icon

BATTERY LIFE

The O_2 Detector is designed for zero maintenance and has an operational lifetime of two years. Three presses of the operation button will show you remaining battery life (displayed in months, then days).

When the detector reaches the end of its life, it will automatically shut down and won't restart.

a1-cbiss recommend that you return your AIRQUAL-1 to a1-cbiss for a replacement O_2 detector and fitting.

FUNCTION TEST

a1-cbiss recommends that a functional test be performed periodically on the oxygen detector based on instrument use, exposure to gas, and environmental conditions. The frequency is best determined by company policy or local regulatory agencies. To perform a function test, remove the calibration cap with the tube still attached to the oxygen detector and verify that, in an ambient atmosphere, the detector reads 20.9%.

If an instrument fails a functional test or it is dropped, submerged, or appears damaged, a full calibration is recommended.

HEALTHCHECK

a1-cbiss recommend that the AIRQUAL-1 is returned to the a1-cbiss service centre at least once per year for a full healthcheck.

The a1-cbiss healthcheck fully tests the AIRQUAL-1 kit including all regulators, flow meters and valves. a1-cbiss will also replace tubing as required.

email: rtw@a1-cbiss.com
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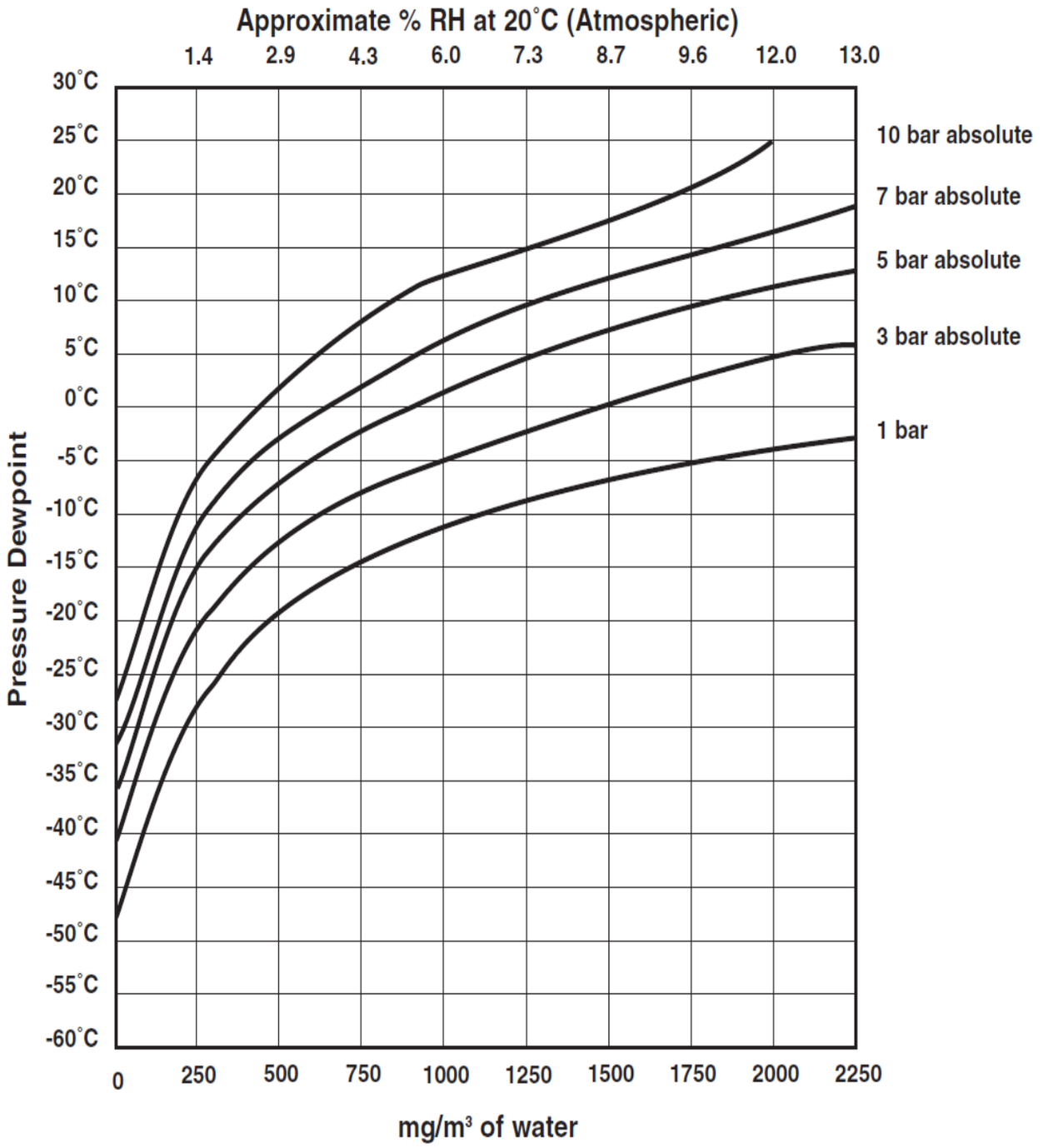
9. PRESSURE DEWPOINT



To establish pressure dewpoint, take the point where the water tube reading in mg/m^3 intersects system pressure and read off pressure dewpoint from vertical scale.

NOTE: Pressure dewpoint is the temperature at which free water is likely to occur at system pressure, therefore this will be the minimum operating temperature of the system.

NOTE: The above graph is for a guide only and can be used to estimate dewpoint from reasonably high water level readings. These dewpoints are normally obtained in systems with little or no drying capability. Refrigeration dryers normally produce dewpoints around +3^{o}C at 7 bar g. For desiccant systems dewpoints of better than -40^{o}C can be obtained and the above graph should not be for calculating water at these low levels <250 mg/m^3.

10. TEST RESULTS

11. ORDERING INFORMATION

Gastec Tubes

Gas	Tube	Range	Part Number	List Price
Carbon Monoxide	**1A**	**5 - 50 ppm**	**GAS1A**	**£33.45**
Carbon Dioxide	2A	250 - 3000 ppm	GAS2A	£33.45
Carbon Dioxide	**2AG**	**200 - 3000 ppm**	**GAS2AG**	**£33.45**
Water Vapour	6AH	500 - 5000 ppm	GAS6AH	£33.45
Water Vapour	6A	30 - 80 mg/m^3	GAS6A	£33.45
Water Vapour	**6AG**	**150 - 3000 mg/m^3**	**GAS6AG**	**£33.45**
Nitrogen Oxides	11A	0.06 - 2 ppm 0.02 - 0.7 ppm	GAS11A	£33.45
Oil Mist	**109AD**	**0.2 - 5.0 mg/m^3**	**GAS109AD**	**£33.45**
Oil Mist	109A	0.3 - 1.5 mg/m^3	GAS109A	£33.45

KIT COMES AS STANDARD WITH HIGHLIGHTED TUBES - Please contact us if you require an alternative to the standard supplied tubes

Accessories

Description	Part No.
O_2 Detector	2025939
Tube Tip Cutter	GAS722
Test Results Pad	PRINTPAD4/50/50LF/A5
Stopwatch	FASTTIME01
Screwdriver	450-3575
Temperature & Humidity Sensor	810/180

Prices correct at time of printing, a1-cbiss reserve the right to change prices in line with price inflation

For all enquiries please contact Aquagas
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