

Gasmeter™ FTIR application note

Compressed breathing air analysis

KEY WORDS

- Breathing air
- Diving
- Aircraft
- EN 12021, DEF STAN 68-284 issue 3

PRODUCTS

- [DX4040](#) Portable FTIR Gas Analyzer



OVERVIEW

Compressed breathing air is subject to strict limits of harmful contaminants defined in European standard EN 12021 and various defence standards such as DEF STAN 68-284 issue 3. The testing interval of breathing air compressors and associated equipment is 3 months and gases tested include carbon monoxide, carbon dioxide and oil vapour defined as hexane and heavier hydrocarbons. EN 12021 covers underwater applications including self-contained open circuit compressed gas breathing (SCUBA) and compressed gas line breathing (hard-helmet diving), respiratory equipment used on ground for escaping from toxic atmospheres and for working in contaminated atmospheres. It also covers breathing gas for hyperbaric operations and synthetic air. While EN 12021 does not cover aerospace applications, the British MOD publication DEF STAN 68-284 and its counterparts in other countries cover also the breathing gases used in aviation.

TESTED GASES

The tables below summarize gases with limit values in various applications. It should be kept in mind that in addition to these limits, the breathing air must comply with workplace health and safety regulations and typically the contaminant concentrations in compressed gas must be below 10% of the 8 hour time workplace exposure limit (WEL). EN 12021 and DEF STAN 68-284 list requirements for parameters such as dew point, odor, presence of oil mist and metal particles etc. which cannot be measured with FTIR and have been omitted from the tables. Also, the limit values and blending tolerance for Oxygen have not been shown as O₂ is not infrared active and cannot be measured by FTIR.

Typical tested gases and contaminant concentration limits in different applications

Compressed natural air

Heliox, Nitrox and Trimix

Gas	limit	unit	Gas	limit	unit
CO ₂	500	ppm	CO ₂	5	ppm
CO	3	ppm	CO	1	ppm
Total hydrocarbons	30	ppm (CH ₄)	Total hydrocarbons	30/25*	ppm (CH ₄)
CFC and HFC compounds	2	ppm			* applies to Trimix only

Note: Heliox = Helium-oxygen mix, Nitrox = Nitrogen-oxygen mix other than natural air, Trimix = Helium-oxygen-nitrogen mix

Breathing oxygen (distilled from liquid air or generated by low pressure electrolysis of water)

Gas	limit	unit
CO ₂	5	ppm
CO	1	ppm
Methane	30	ppm
Acetylene	0.05	ppm
Ethylene	0.2	ppm
Ethane and other hydrocarbons	3	ppm
Nitrous oxide	2	ppm
Refrigerants	1	ppm
Solvents	0.1	ppm

Molecular sieve oxygen concentration system (MSOCS) generated breathing gases (aviation)

Gas	limit	unit
CO ₂	250	ppm
CO	3	ppm
Total hydrocarbons	25	ppm
Oxides of Nitrogen	1	ppm
Acrolein	0.1	ppm
Aldehydes	0.5	ppm
Unsaturated hydrocarbons	0.2	ppm
Refrigerants	2	ppm
Solvents (halogenated)	0.2	ppm
Ozone	0.1	ppm

TESTING EQUIPMENT

As the testing of breathing gas compressors is a periodic routine, a portable gas analyser with short set-up time and capability of simultaneous measurement of as many contaminants as possible is required. The battery powered Gasmeter DX4040 portable FTIR multi-gas analyser is an ideal solution as it is capable of measuring the contaminants listed in the table above and also nearly any gas with a workplace exposure limit, which could be present as a contaminant in the cylinders or breathing air lines. The analyser does not require any consumables or span gases for calibration, has a short warm-up time and comes with an easy to use handheld computer with touch screen interface.



This application note is meant to be an informative example of typical application where Gasmeter analyzers could be used. This is not a technical specification sheet. Information in this document is subject to change without prior notice. Optimal product configuration is application dependent, and exact application details such as detection limits, components included in the application, etc depend on process and/or measurement site details and may vary. Please, contact your local Gasmeter sales representative to get information specific to your needs.