

TEST REPORT

number 50/1/1/21-A/1

on compressed oxygen testing

Sample	Compressed <u>oxygen</u> in a container	
Date of analysis	24 & 25 March 2021	
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REGISTRATION

The company ANT d.o.o. is registered with the Commercial Court in Zagreb, Company Registration Number: 080301622, TIN: 67120058773, economic activity code: 71.2 - technical testing and analysis.

The company ANT d.o.o. is authorised to perform its professional services by the competent authorities:

- Ministry of Economy and Sustainable Development (Ministry of Environmental Protection and Energy);
- Ministry of Labour, Pension System, Family and Social Policy (Ministry of Labour and Pension System);
- Ministry of Health.

LIST OF AUTHORISATIONS

Based on the DECISION issued by the Ministry of Environmental Protection and Energy (CLASS: UP/I 351-02/18-08/15, REF.NO: 517-03-1-2-18-3, dated 15 October 2018), the company ANT d.o.o. is authorised to perform professional services related to environmental protection:

1. Preparing documentation required for the procedure of assessing the need for an environmental impact assessment and documentation required to determine the content of an environmental impact study
2. Preparing state of the environment reports,
3. Preparing environmental protection studies related to projects which are not subject to the obligation to assess environmental impact,
4. Preparing special studies and reports required to assess the condition of environmental compartments,
5. Performing professional services for the purpose of the Environmental Pollution Register.

Based on the DECISION issued by the Ministry of Labour and Pension System (CLASS: UP/I-115-01/19-01/19, REF. NO: 524-03-03-02/3-19-4 dated 22 May 2019), the company ANT d.o.o. is authorised to perform professional services related to safety at work:

1. performing services related to safety at work at the employer's premises,
2. testing chemical factors in the work environment.

Based on the DECISION issued by the Ministry of Health (CLASS: UP/I-542-04/93-03/01 REF. NO: 534-04-10-93-02 dated 10 January 1994), the company ANT d.o.o. is authorised to perform certain services under the Sanitary Inspection Act.

Director:

Zoran Mačkić

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1 INTRODUCTION

A container with a compressed sample declared as compressed oxygen was delivered by the Client to the address of the registered office of the company ANT d.o.o., Medarska street 69, 10090 Zagreb.

Testing of the compressed sample in the container was carried out in the premises of the company's laboratory on 24 & 25 March 2021. The container contents were tested with a Gaset DX-4000 analyzer operating on the principle of Fourier-transform infrared spectroscopy (FTIR) and a Dräger X-AM 7000 operating on the principle of electrochemical, catalytic and infrared (IR) sensors.

The container is labelled "airbreath® OXYGEN" and contains 7 litres of compressed oxygen with a declared purity of 99.5% (Figure 1).



Figure 1. The container with the compressed sample

2 TEST EQUIPMENT

The testing was performed using the Fourier-transform infrared spectroscopy (FTIR) method with the following instrument:

Title:	Gas analyser
Manufacturer:	Gasmet
Type:	FTIR gas analyser
Model:	DX-4000
Serial number:	071146
Calibrated/checked:	Calibration certificate No. 3-0007/20-02

The testing was performed by the method of electrochemical, catalytic and infrared (IR) sensors with the following instrument:

Title:	Instrument for detection of explosive and toxic gases
Manufacturer:	Dräger Safety
Model:	X-AM 7000
The instrument is used to test the following gases:	
CO ₂	0,00 – 100,00 %
CH ₄	0,0 – 100,0 %
O ₂	0,00 – 25,00 %
H ₂	0 – 1.000 ppm
H ₂ S	0,0 – 100,0 ppm
Calibrated/checked:	Final examination report No. EX-20-HR01911828

3 TEST PROCEDURE

In order to ensure the quality of the testing, the following procedures were performed before proceeding to the analysis of the compressed sample in the container:

Procedure	Accordant
Leak test of the testing line	YES
Zeroing the analyser Gaset DX-4000 with nitrogen (N ₂) of purity 5.0	YES

In order to ensure the operating flow of the Gaset DX-4000 analyser pump, a buffer in the form of a gas storage bag was used in the testing line. Prior to the application of the buffer, i.e. the said bag, it was successfully tested for impermeability, which proved that it was not mechanically damaged and that it was suitable for further analysis.

The testing line (pipes and buffer) was filled with nitrogen (N₂) of purity 5.0 (99.999%) and then completely emptied with the help of the Gaset DX-4000 analyser pump, in order to protect the entire testing line from possible external contaminants.

After the testing line was prepared in this way, the analysis of the container content was performed in such a way that a sample from the container was dosed simultaneously with the operation of the Gaset DX-4000 analyser. In order to further ensure that the ambient air did not enter the testing line, but only the sample from the container, the test results of the first litre of sample were not taken into account.

Prior to oxygen (O₂) testing, the delivered sample was diluted with nitrogen (N₂) of purity 5.0 in a known ratio, after which the oxygen concentration was measured with the Dräger X-AM 7000 instrument and the result was then multiplied by a known dilution factor.

The analysis was performed on the content of following gases:

- O₂ (oxygen)
- H₂O (vapour)
- CO₂ (carbon dioxide)
- CO (carbon monoxide)
- Total hydrocarbons
- NO_x (nitrogen oxides)
- SO₂ (sulphur dioxide).

4 TEST RESULTS

The results of the analysis were compared with the requirements of 'Grade E' category of Compressed Gas Association CGA G-7.1. – 2011 standard.

Table 1. Test results

Tested gas	Result	CGA G-7.1 Grade E 2011	Accordant
O ₂ (%)	> 99,5	Not applicable	
H ₂ O (vol %)	0,00	-	-
CO ₂ (ppm)	8	1000	YES
CO (ppm)	< 0,5	10	YES
Total hydrocarbons (ppm)	< 2	25	YES
NO _x (ppm) (NO + NO ₂ + N ₂ O)	< 1	-	-
SO ₂ (ppm)	< 1	-	-

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