SLOVENSKI STANDARD
SIST EN 12021:2014

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Oprema za varovanje dihal - Stisnjeni plini za dihalne aparate

Respiratory protective devices - Compressed gases for breathing apparatus

Atemschutzgeräte - Druckgase für Atemschutzgeräte

Appareils de protection respiratoire - Gaz comprimés pour appareil de protection respiratoire isolant

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Respiratory equipment - Compressed gases for breathing apparatus

Appareils de protection respiratoire - Gaz comprimés pour appareil de protection respiratoire

Atemgeräte - Druckgase für Atemschutzgeräte

This European Standard was approved by CEN on 6 February 2014.

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Foreword

This document (EN 12021:2014) has been prepared by Technical Committee CEN/TC 79 “Respiratory protective devices”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2014, and conflicting national standards shall be withdrawn at the latest by October 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12021:1998.

Annex B provides details of significant technical changes between this European Standard and the previous edition.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies requirements for the quality of compressed gas supplied for mixing or use in respiratory protective devices and hyper- and hypobaric operations. Account is taken of the use of compressed gases for normal atmospheric pressure as well as for hyper- and hypobaric pressures.

This European Standard does not apply to compressed gases used for medical purposes or for aerospace applications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 132:1998, *Respiratory protective devices - Definitions of terms and pictograms*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 132:1998 and the following apply.

3.1
hydrocarbon
organic compound consisting of hydrogen and carbon

3.2
oil
mixture of hydrocarbons and other organic compounds composed of six or more carbon atoms (C6+)

3.3
trimix
gas comprising a specified mixture of oxygen, helium and nitrogen, capable of supporting human life under appropriate diving or hyperbaric conditions

Note 1 to entry: This includes manufactured gas mixtures made up from combinations of pure oxygen, pure helium and pure nitrogen, with or without compressed air.

3.4
heliox
gas comprising a specified mixture of oxygen and helium, capable of supporting human life under appropriate diving or hyperbaric conditions

3.5
oxygen and nitrogen gas mixture
gas comprising a specified mixture of oxygen and nitrogen, capable of supporting human life under appropriate diving or hyperbaric conditions

Note 1 to entry: Oxygen and nitrogen gas mixtures are also known as “nitrox”.

Note 2 to entry: This definition does not cover gas mixtures produced using oxygen compatible air or nitrogen depleted air.

3.6
oxygen compatible air
compressed natural breathing air where the level of impurities has been reduced to make it suitable for use in gas mixtures including those containing oxygen concentrations greater than 22 %

Note 1 to entry: Oxygen compatible air is also known in the diving industry as “oil free air”, “clean air” or “double filtered air”.

3.7
nitrogen depleted air
oxygen compatible air from which some nitrogen has been removed to make it suitable for use in, or as, a gas mixture containing oxygen concentrations greater than 22 %

Note 1 to entry: Nitrogen depleted air is also known as “nitrox”.

3.8
oxygen enriched air
compressed natural breathing air to which some oxygen has been added prior to compression and the level of some impurities reduced to make it suitable for use in or as a gas mixture containing oxygen concentrations greater than 22 %

Note 1 to entry: Oxygen enriched air is also known as “nitrox”.

3.9
dewpoint
at a specified pressure, the temperature at, or below which, condensation from the gas phase will occur

Note 1 to entry: This also includes frost point.

3.10
synthetic air
mixture of oxygen and nitrogen that has an oxygen content of (21 ± 1) %

Note 1 to entry: Synthetic air is also known as “nitrox”.

4 Units

General use of SI units (see ISO 80000) as given throughout this International Standard is recommended. However, in agreement with accepted practice, some non-preferred SI units accepted by ISO are also used.

EXAMPLE 100 kPa = 1,00 bar.

IMPORTANT — The acronym ‘ppm’ (parts per million) is used throughout the world to indicate the absolute content of a substance within a mixture. So in this case the ml m^{-3} equivalent notation “ppm” has been used in brackets in the tables. In this European Standard ppm is understood as concentration of a gas in parts per million per volume.

5 Reference conditions

All data given in the tables or required in this European Standard are valid for normal atmospheric pressure (1 013 mbar absolute, 20 °C). All percentage requirements are given in % by volume (dry gas).

All pressures in this European Standard are in bar absolute.

Typical composition of natural air is given in Annex A.

Maximum allowable concentrations of impurities for compressed gases are quoted as values calculated at normal atmospheric pressure.

6 Requirements

6.1 General

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 a level 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.

In the absence of more stringent national regulations, the values in Table 1 to Table 10 shall be applied.

6.2 Breathing air

Typical composition of natural air is given in Annex A.

Table 1 — Composition of breathing air

Component	Concentration at 1 013 mbar and 20 °C
Oxygen	(21 ± 1) %
Carbon dioxide	≤ 500 ml m^{-3} (ppm)
Carbon monoxide	≤ 5 ml m^{-3} (ppm)
Oil	≤ 0,5 mg m^{-3}

Compressed breathing air shall have a dew point sufficiently low to prevent condensation and freezing. Where the apparatus is used and stored at a known temperature the pressure dew point shall be at least 5 °C below the likely lowest temperature.

Where the conditions of usage and storage of any compressed air supply is not known the pressure dew point shall not exceed −11 °C.

Table 2 — Water content of high pressure breathing air

Nominal maximum supply pressure bar	Maximum water content of air at atmospheric pressure and 20 °C mg m^{-3}
40 to 200	≤ 50
> 200	≤ 35

The water content of the air supplied by the compressor for filling 200 bar or 300 bar cylinders should not exceed 25 mg m^{-3}.

Table 3 — Water content for supplied breathing air up to 40 bar

Nominal maximum supply pressure (bar)	Maximum water content of air at atmospheric pressure and 20 °C mg m^{-3}
5	290
10	160
15	110
20	80
25	65
30	55
40	50

6.3 Mixing of gases

6.3.1 General

Where any of the gases specified in Table 4 to Table 10 are mixed to produce a breathing gas, the resultant gas mixture shall be tested for oxygen content. The oxygen content shall conform to the relevant value as given for the particular gas mixture, as applicable.

Where any of the gases specified in Table 8 to Table 9 are mixed to create a diving breathing gas, the resultant gas mixture shall also be tested for helium content. The helium content shall conform to the relevant value as given for the particular gas mixture in Table 8 to Table 9, as applicable.

As the purity and contaminant levels of the gases used for mixing are specified in Table 4 to Table 9 it is only the ratio of the mixing that needs to be confirmed. Therefore, post mixing, only the oxygen and, where applicable, the helium content need to be tested to confirm that the correct mixture has been achieved.

6.3.2 Oxygen compatible air

Table 4 — Composition of oxygen compatible air

Component	Concentration at 1 013 mbar and 20 °C
Oxygen	(21 ± 1) %
Water	≤ 25 mg m^{-3}
Carbon dioxide	≤ 500 ml m^{-3} (ppm)
Carbon monoxide	≤ 5 ml m^{-3} (ppm)
Oil	≤ 0,1 mg m^{-3}