



CARBON DIOXIDE CYLINDERS AT USERS' PREMISES

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EUROPEAN INDUSTRIAL GASES ASSOCIATION AISBL



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Prepared by WG-8 Carbon Dioxide and Food Gases

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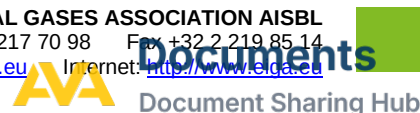


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Amendments from 67/08

Section	Change
	Editorial to align style with EIGA Style Manual
2	Scope clarification
3	Additions of publications terminology
4.2	Additional references to publications on material migration
7.6	Additional paragraph on bundles of cylinders
7.7	Additional information on high pressure tanks
8.1	New section on cylinder position, gas withdrawal
9.1	New section on cylinder position, liquid withdrawal
11.1	Additional paragraph on confined space entry
11.2	New section on mitigating measures
11.4	Additional information on segregation
12.3	Additional paragraph on vaporisers
19	New reference section added

NOTE Technical changes from the previous edition are underlined

1 Introduction

This publication gives information and recommendations for safe handling of carbon dioxide cylinders at customer sites.

The recommendations given in this publication are intended to be used as a guide for the safe handling of carbon dioxide cylinders at customer sites. It should be read in conjunction with any national legislation relevant to the safe use and storage of carbon dioxide cylinders. Carbon dioxide is supplied from cylinders containing liquefied carbon dioxide under pressure. Carbon dioxide is used in many applications such as:

- carbonation and beverage dispense;
- modified atmosphere packaging for food storage;
- water hardening;
- supercritical fluid extraction;
- refrigeration as refrigerant R744; or
- firefighting.

2 Scope

The publication covers the use of both gas and liquid (syphon) withdrawal cylinders and non-thermally insulated high pressure tanks of less than 1000 litres.

This publication does not cover the use of transportable vacuum insulated vessels.

This publication does not cover the near consumer use of carbon dioxide which is generally less than one kg of carbon dioxide. For guidance see EIGA Doc 201, *Near-Consumer Use – Risk Assessment Methodology* [1].¹

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May

Indicates that the procedure is optional.

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

3.1.4 Will

Is used only to indicate the future, not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Pressure

In this publication bar shall indicate gauge pressure unless otherwise noted i.e., (bar, abs) for absolute pressure and (bar, dif) for differential pressure.

4 Properties of carbon dioxide

Carbon dioxide can also called carbonic acid gas or CO₂.

A safety data sheet is available from the gas supplier. A summary of the properties of carbon dioxide is given below.

NOTE Carbon dioxide is excluded from the REACH regulations

4.1 Physical properties and handling

4.1.1 Gaseous state

At normal temperature (+15 °C) and atmospheric pressure carbon dioxide has a density of 1.87 kg/m³ and is 1.5 times heavier than air. It is a colourless and odourless gas, though with a slightly pungent odour at high concentrations. Carbon dioxide spreads along the ground collecting in low-lying areas such as pits and cellar.

Carbon dioxide is classified as a non-toxic gas, but it does start to affect breathing at concentrations of about 1%, with affects becoming more serious with increasing concentrations. For more information see Appendix A and EIGA Info 24, Carbon Dioxide Physiological Hazards - "Not just an Asphyxiant!" [2].

Carbon dioxide is a non-flammable gas.

4.1.2 Liquid state

Carbon dioxide can exist as a liquid below the critical temperature of 31 °C and above the triple point with a temperature of -56.6 °C and 4.18 bar. See Appendix B for the pressure and temperature diagram.

Carbon dioxide is transported, stored and handled in liquid form, either at ambient temperature (in cylinders or non-insulated storage tanks at a pressure of 45 to 65 bar) or refrigerated, insulated tankers and storage tanks, at a temperature range of -35 °C to +15°C and a pressure of 12 to 25 bar. The carbon dioxide in this state, is a liquid at equilibrium.

Below the triple point carbon dioxide can only exist in the solid and gas phase. Therefore, the liquid carbon dioxide cannot exist at atmospheric pressure. When the liquid carbon dioxide is depressurised below the triple point pressure of 4.18 bar to atmospheric pressure it is transformed to dry ice and gas. Consequently, when the liquid carbon dioxide is released to the atmosphere a dense white fog of powdery solid carbon dioxide particles and vapour is produced.