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**Gas cylinders — Seamless steel CO<sub>2</sub>  
cylinders for fixed fire-fighting  
installations on ships**

*Bouteilles à gaz — Bouteilles à CO<sub>2</sub> en acier, sans soudure, pour  
installations fixes de lutte contre l'incendie à bord des navires*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 3500 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 3, *Cylinder design*.

This third edition cancels and replaces the second edition (ISO 3500:1990), which has been technically revised.

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# Gas cylinders — Seamless steel CO<sub>2</sub> cylinders for fixed fire-fighting installations on ships

## 1 Scope

This International Standard specifies the principal external dimensions, accessories, filling ratio, and marking for seamless steel CO<sub>2</sub> cylinders used in fixed fire-fighting installations on cargo ships, passenger ships, salvage vessels, heavy lift vessels, tug barge combinations and off shore drilling and production platforms, any of which can be serviced in port or in drydock, in order to facilitate the interchangeability of such cylinders.

## 2 Normative references

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

ISO 9809-1:1999, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa*

ISO 9809-2:2000, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa*

ISO 9809-3:2000, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders*

ISO 10920:1997, *Gas cylinders — 25E taper thread for connection of valves to gas cylinders — Specification*

ISO 13769, *Gas cylinders — Stamp marking*

DIN 477-1, *Gas cylinder valves rated for test pressures up to 300 bar; types, sizes and outlets*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 3.1

#### **tare**

combined mass, expressed in kilograms, of the empty cylinder (including the mass of any paint), neck collar, valve and siphon tube when presented for filling

### 3.2

#### **permissible filling ratio**

maximum permissible mass of carbon dioxide in kilograms per litre of cylinder water capacity

## 4 General characteristics

### 4.1 Cylinder

4.1.1 The external dimensions of the cylinder, illustrated in Figure 1, shall be in accordance with the values given in Table 1.

4.1.2 The cylinder shall be designed for a minimum test pressure of 25 MPa and shall conform to the requirements of ISO 9809-1, ISO 9809-2 or ISO 9809-3, as appropriate.

NOTE 25 MPa = 250 bar.

### 4.2 Valve

The valve inlet connection shall be 25E in accordance with ISO 10920. The valve outlet connection shall be W 21,8 mm × 1/14" ext. right hand / DIN 477 Outlet No. 6 (see Figure 2).

The internal diameter of the valve inlet and outlet opening shall be such that 85 % of the CO<sub>2</sub> contents can be discharged into the fire location within 2 min. Siphon tubes shall be durably fitted to the valve stem's internal threading.

The distance between the upper part of the neck collar and the centreline of the valve outlet (*H* in Figure 1) shall be in the range 25 mm to 40 mm.

NOTE The valve outlet connection meets the Whitworth thread form specifications.

### 4.3 Pressure-relief devices

A pressure-relief device shall be fitted to prevent the cylinder gas pressure rising above 22,5 MPa. The relief pressure shall be indicated on the valve.

NOTE 1 22,5 MPa = 225 bar.

NOTE 2 Commonly used safety devices consist of a bursting disc with tolerances ± 10 %.

**Table 1 — General characteristics**

Reference size	Minimum volume L	Maximum permissible mass of CO <sub>2</sub> <sup>b</sup> kg	Outside diameter, <i>D</i> mm	Length, <i>L</i> mm
A	45	30	227 to 235	1 263 to 1 420
B <sup>a</sup>	67,5	45	265 to 273	1 395 to 1 562
C	80 to 87	53 to 58	260 to 290	1 680 to 1 800

In order to obtain the minimum specified volume, it is necessary to give ranges for both outside diameter and length because of the possible variations in the different manufacturing processes and steel types involved. Suppliers shall provide manufacturing certificates specifying the correct minimum internal volume (water capacity) per cylinder.

<sup>a</sup> Reference size B is preferred for maximum interchangeability.

<sup>b</sup> The maximum permissible filling ratio is 0,667 kg of CO<sub>2</sub> per litre cylinder water capacity or two-thirds of the cylinder's minimum water capacity.

## 5 Identification of content

### 5.1 Colour

The cylinder (shoulder) shall be finished in safety red (RAL-3000 / PMS – 185) with the gas identification in white, horizontally applied, stencil text:

**CARBON DIOXIDE**

or

**CO<sub>2</sub>**

The CO<sub>2</sub> filling mass may be stencilled as well.

Siphon tube identification by means of painted, vertical lines on the cylinder shall not be used, because the majority of cylinders will be grouped in banks and lines can be masked.

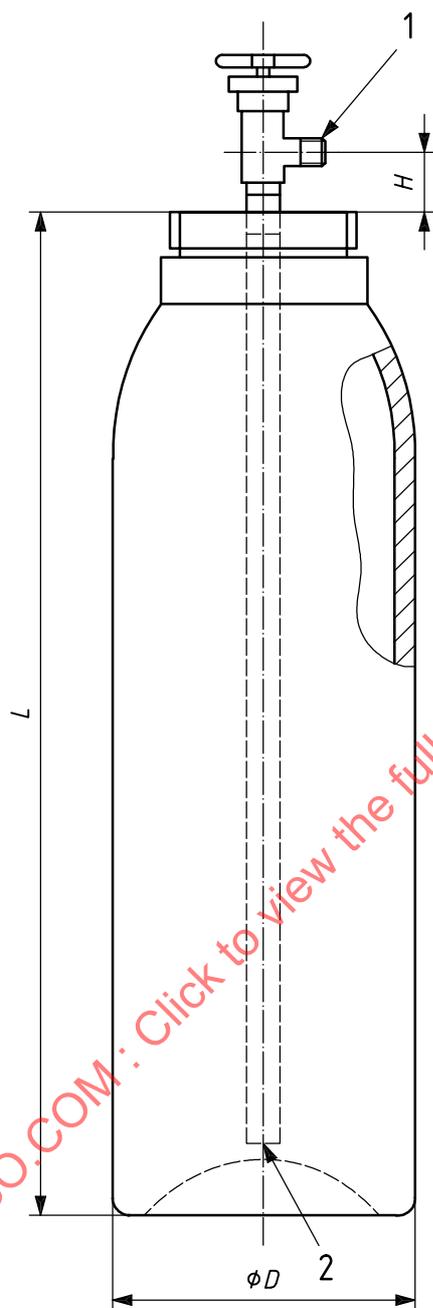
### 5.2 Marking

The cylinder shall be marked in accordance with ISO 13769. The cylinder shall be permanently stamp marked on the shoulder with the chemical symbol CO<sub>2</sub> and the maximum filling mass, e.g. 45KG CO<sub>2</sub>, and the tare, e.g. TARE55,4KG, in accordance with ISO 13769.

NOTE 1 Tare is defined in 3.1.

NOTE 2 The mass of CO<sub>2</sub> corresponds to the permissible filling ratio, as defined in 3.2 and specified in Table 1.

The presence of the siphon tube, as fitted to the valve, shall be indicated by means of a corrosion-resistant ring between the valve and the cylinder.



**Key**

1 valve outlet connecting thread (see 4.2 and Figure 2)

2 siphon tube inlet

*L* length

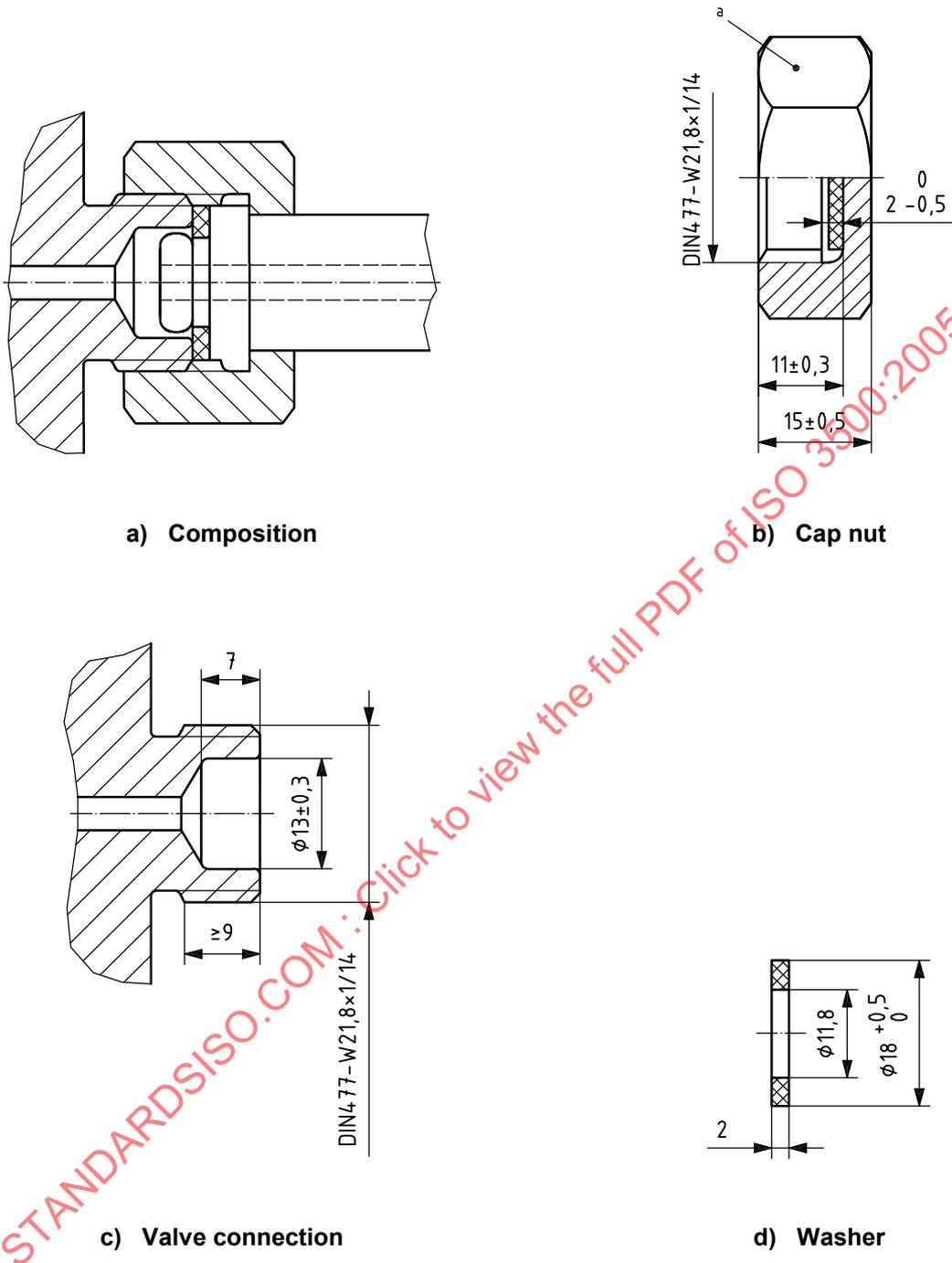
*D* outside diameter

*H* distance between upper part of neck collar and centreline of valve outlet (25 mm to 40 mm)

NOTE The valve need not correspond to the illustration.

**Figure 1 — Cylinder dimensions with valve and siphon tube**

Dimensions in millimetres



<sup>a</sup> Width across flats: 30h13.

Figure 2 — Valve outlet (DIN 477 Outlet No. 6)