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EUROPEAN STANDARD

EN 12205

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English version

Transportable gas cylinders - Non refillable metallic gas cylinders

Bouteilles à gaz transportables - Bouteilles à gaz
métalliques non rechargeables

Ortsbewegliche Gasflaschen - Metallische Einwegflaschen

This European Standard was approved by CEN on 8 March 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 23 "Transportable gas cylinders", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by November 2001, and conflicting national standards shall be withdrawn at the latest by November 2001.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the Free Trade Association, and supports the objectives of the Framework Directives on Transport of Dangerous Goods.

This Standard has been submitted for reference into the RID and/or the technical annexes of the ADR. Therefore in this context the Standards listed in the normative references and covering basic requirements of the RID/ADR not addressed within the present Standard are normative only when the Standards themselves are referred to in the RID and/or in the technical annexes of the ADR.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

The purpose of this standard is to provide a specification for the design, manufacture, inspection and approval of non refillable metallic gas cylinders. The specifications given are based on knowledge of, and experience with, materials, design requirements, manufacturing processes and control during manufacture, of cylinders in common use in the countries of the CEN members.

Users of cylinders manufactured to this Standard should ensure that they are aware of all relevant regulations concerning the gases that may be filled into non-refillable cylinders (for example see common position 19/1999 of the Council of the EU which specifies that substances which are harmful to the ozone layer shall not be put on the market in disposable containers except for essential uses). Where a cylinder is used for a harmful gas care should be taken to ensure that it is disposed of in a manner that is in accordance with relevant regulations, is safe and meets environmental requirements.

1 Scope

This European Standard specifies minimum requirements for the material, design, construction and workmanship, manufacturing processes and tests at manufacture of non-refillable metallic gas cylinders of welded, brazed or seamless construction used for compressed, liquefied and dissolved gases.

This Standard is not applicable to cartridges/aerosol dispensers and spherical containers.

NOTE For cartridges, see EN 417

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2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 287-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

EN 287-2, *Approval testing of welders — Fusion welding — Part 2: Aluminium and aluminium alloys*

EN 288-1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding*

EN 1800: 1998, *Transportable gas cylinders — Acetylene cylinders — Basic requirements and definitions*

EN 1964-1: 1999, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of capacity from 0,5 litres up to and including 150 litres — Part 1: Seamless steel with a maximum R_m value of 1 100MPa*

prEN 1964-2: 1998, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of capacity from 0,5 litres up to and including 150 litres — Part 2: Tensile strength ($R_{m,max}$) $\geq 1 100N/mm^2$*

EN 1964-3: 2000, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of capacity from 0,5 litres up to 150 litres — Part 3: Stainless steel cylinders*

EN 1975: 1999, *Transportable gas cylinders — Specification and for the design and construction of refillable transportable seamless aluminium alloy gas cylinders of capacity from 0,5 litre up to 150 litre*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test (at ambient temperature)*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*

EN 10120, *Steel sheet and strip for welded gas cylinders*

EN 10130, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

EN 12862, *Transportable gas cylinders — Specification for the design and construction of refillable transportable welded aluminium alloy gas cylinders*

EN 13133, *Brazing — Brazer approval*

EN 13134, *Brazing — Procedure approval*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country Codes (ISO 3166-1:1997)*

EN ISO 11114-1: 1997, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials (ISO 11114-1:1997)*

EN ISO 11120: 1999, *Gas cylinders — Refillable seamless steel pressure vessels for compressed gas transport of water capacity between 150 L and 3000 L — Design and testing (ISO 11120:1999)*

EN ISO 13340, *Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing (ISO 13340:2001)*

ISO 4706, *Refillable welded steel gas cylinders* [SIST EN 12205:2002](#)

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3 Terms, definitions and symbols

For the purposes of this European Standard the following terms, definitions and symbols apply.

3.1 Terms and definitions

3.1.1

non refillable cylinder

cylinder which may be filled only once

3.1.2

batch

quantity of completed and pressure tested cylinders of the same design, prototype design, water capacity, material, heat treatment (if any) and manufacturing process, made successively during one production shift of up to 12 hours

3.1.3

burst pressure

highest pressure reached in a cylinder during the burst test

3.1.4

material certificate

document, issued by the material manufacturer, which states the chemical analysis, mechanical properties, heat treatment, processing techniques or other properties/features if required

3.1.5

cylindrical shell

the portion of the cylinder, excluding the heads (ends), which is parallel to the centreline axis of the cylinder

3.1.6

heads (ends)

the portions of a cylinder which are not parallel to the centreline axis of the cylinder

3.1.7

maximum permissible operating pressure

highest pressure permitted to be developed during service. It is the developed pressure at 65 °C

3.1.8

test pressure

required pressure applied during the pressure test

3.1.9

working pressure

settled pressure at a uniform temperature of 288 K (15 °C) for a full gas cylinder

3.1.10

water capacity

the capacity of the empty cylinder when filled with water

3.1.11

design stress factor (F) (variable)

the ratio of equivalent wall stress at test pressure (p_h) to guaranteed minimum yield stress (R_e)

3.2 Symbols

- iTeh STANDARD PREVIEW*
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- a - Calculated minimum thickness in millimetres of the cylinder shell.
- D - Nominal outside diameter of the cylinder, in millimetres.
- F - Design stress factor (variable). [SIST EN 12205:2002
https://standards.iteh.ai/catalog/standards/sist/066abc9e-33d7-4c24-928f-836689003/sist-en-12205-2002](https://standards.iteh.ai/catalog/standards/sist/066abc9e-33d7-4c24-928f-836689003/sist-en-12205-2002)
- p_h - Test pressure, in bar¹⁾ above atmospheric pressure
- p_{ms} - Maximum permissible operating pressure, in bar¹⁾ above atmospheric pressure.
- R_e - Minimum guaranteed value of yield stress in megapascals for the finished cylinder in the cylindrical part of the cylinder.
- R_g - Minimum guaranteed value of the tensile strength in megapascals for the finished cylinder.
- V - Water capacity of the cylinder, in litres.

4 Requirements

4.1 General

Cylinders conforming to this Standard shall meet the following requirements:

- a) The maximum permissible operating pressure (p_{ms}) shall not exceed 250 bar;
- b) The product of the maximum permissible operating pressure (p_{ms}) and the water capacity (V) shall not exceed 1 000 bar-litres;
- c) Where the maximum permissible operating pressure (p_{ms}) exceeds 35 bar, the water capacity (V) shall not exceed 5 litres;

1) 1bar = 10⁵ Pa = 0,1MPa

d) Cylinders for service with toxic gases or toxic gas mixtures shall have water capacity (V) not exceeding 2 litres.

Cylinders having a maximum permissible operating pressure (p_{ms}) or water capacity (V) exceeding any of the limits given in a), b), c) or d) above shall not be manufactured in accordance with this standard.

NOTE For such cylinders, see the appropriate refillable cylinder standard (e.g. EN 1964-1: 1999, EN 1975: 1999)

Cylinders for service with dissolved acetylene shall incorporate an appropriate porous mass. The completed cylinder containing the porous mass shall meet the requirements of EN 1800: 1998.

4.2 Materials

4.2.1 General

4.2.1.1 Non-refillable gas cylinders shall be made of carbon or low alloy carbon steels, austenitic stainless steel, aluminium or aluminium alloys. The materials used are specified by type (see 4.2.2) and chemical compositions (see 4.2.3). Materials shall not present defects which are prejudicial to their use.

4.2.1.2 The cylinder manufacturer shall specify the chemical and mechanical requirements to the material supplier.

4.2.1.3 The cylinder manufacturer shall obtain a Material Certificate from the material supplier. The certificate shall confirm conformance to the material specification. In the case of steels, this shall include the Charpy value at $-20\text{ }^{\circ}\text{C}$ (or lower if specified). Charpy values shall correspond with those specified in the appropriate refillable standard, as follows:

- for seamless steel, EN 1964-1: 1999, prEN 1964-2: 1998, EN 1964-3: 2000 or EN ISO 11120: 1999.

NOTE Other Standards for the design and construction of cylinders are in preparation and should be conformed to, as appropriate, when published.

4.2.1.4 The cylinder manufacturer shall verify that the materials are in accordance with the cylinder manufacturer's specifications.

4.2.1.5 All materials used in the construction of the pressure containing parts of the cylinder shall be identified by the cast number/code.

4.2.1.6 The steels shall be suitable for use at the minimum operating temperature or $-20\text{ }^{\circ}\text{C}$, whichever is lower.

4.2.1.7 Materials used for cylinder manufacture shall be compatible with the intended gas service, e.g. corrosive gases, embrittling gases, as specified in EN ISO 11114-1: 1997.

4.2.2 Type

4.2.2.1 Carbon and low-alloy carbon steels

4.2.2.1.1 The steel used for the fabrication of gas cylinders shall be made in an electric furnace or by the basic oxygen process, shall have non-ageing properties and shall be killed.

4.2.2.1.2 Carbon steel for cold deep drawn welded cylinders shall be in accordance with EN 10120 or EN 10130 having non-ageing properties, drawing quality, processed free of stretcher strain and shall have an aluminium content in excess of 0,01 %. The chemical composition shall meet the requirements of 4.2.3.1.1.

4.2.2.1.3 Carbon steel for welded cylinders other than cold deep drawn shall have a chemical composition which meets the requirements of 4.2.3.1.2. The maximum tensile strength shall not exceed 700 MPa.

4.2.2.1.4 Carbon steel for cylinders made of seamless steel tubing with integrally formed ends, hot drawn and finished shall have a chemical composition which meets the requirements of 4.2.3.1.3.

4.2.2.1.5 Low alloy carbon steels shall conform to EN 1964-1: 1999 or ISO 4706.

4.2.2.2 Aluminium and aluminium alloy

4.2.2.2.1 Aluminium alloys with a minimum guaranteed value of the tensile strength greater than 500 MPa shall not be used.

4.2.2.2.2 Aluminium and aluminium alloys shall have a chemical composition which meets the requirements of 4.2.3.2.

4.2.2.2.3 Aluminium and aluminium alloys for welded cylinders shall meet the requirements of EN 12862.

4.2.2.2.4 Aluminium and aluminium alloys for seamless cylinders shall meet the requirements of EN 1975: 1999.

4.2.2.3 Austenitic stainless steels

4.2.2.3.1 For austenitic stainless steels, the maximum tensile strength shall not exceed 800 MPa.

4.2.2.3.2 The cylinder manufacturer shall take into consideration the loss of material strength within the heat affected zone of any weld.

4.2.2.3.3 Austenitic stainless steels for all types of cylinder shall be in accordance with EN 10088-1.

4.2.2.3.4 The chemical composition shall meet the requirements of 4.2.3.3.

4.2.3 Chemical compositions

4.2.3.1 Carbon and low-alloy carbon steels

4.2.3.1.1 Carbon steels to EN 10120 and EN 10130, having non-ageing properties, drawing quality for cold deep drawn welded cylinders, shall have the following chemical composition limits:

	Mass %	
Carbon	0,12	Maximum
Manganese	0,50	Maximum
Phosphorous	0,025	Maximum
Sulphur	0,025	Maximum

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4.2.3.1.2 Carbon steel for welded cylinders other than cold deep drawn shall have the following chemical composition limits:

	<u>Mass %</u>	
Carbon	0,25	Maximum
Manganese	0,50	Maximum
Phosphorus	0,025	Maximum
Sulphur	0,025	Maximum

4.2.3.1.3 Carbon steel for cylinders made of seamless steel tubing with integrally formed ends, hot drawn and finished shall have the following chemical composition limits:

	<u>Mass %</u>	
Carbon	0,55	Maximum
Manganese	1,2	Maximum
Phosphorus	0,025	Maximum
Sulphur	0,025	Maximum

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4.2.3.1.4 Low alloy carbon steels shall conform to 4.2.2.1.5.205-2002

4.2.3.2 Aluminium and aluminium alloys

Aluminium and aluminium alloys may be used to produce gas cylinders provided that they meet all requirements of this standard and have maximum lead and bismuth contents not exceeding 30 ppm.

NOTE A list of registered alloys is maintained by the Aluminium Association Inc¹⁾ entitled 'Registration Record of International Alloy Designations and Chemical Composition Limits for Wrought Aluminium and Wrought Aluminium Alloys'.

4.2.3.3 Austenitic stainless steels

Austenitic stainless steel shall meet the requirements of EN 10088-1.

5 Design

5.1 General provisions

5.1.1 The calculation of the cylindrical wall thickness of the pressure containing parts shall be related to the yield stress (R_e) of the material to ensure elastic behaviour.

5.1.2 The internal pressure upon which the calculation of the cylindrical wall thickness is based shall be the test pressure (p_n).

¹⁾ Aluminium Association Inc., 900 19th Street N.W., Washington D.C., 20006-2168, U.S.A.