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EUROPEAN STANDARD

EN 13769

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English version

Transportable gas cylinders - Cylinder bundles - Design, manufacture, identification and testing

Bouteilles à gaz transportables - Cadres de bouteilles -
Conception, fabrication, identification et essai

Ortsbewegliche Gasflaschen - Flaschenbündel -
Konstruktion, Herstellung, Kennzeichnung und Prüfung

This European Standard was approved by CEN on 1 September 2003.

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 document (EN 13769:2003) 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of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

Annexes A and B are normative.

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

This European Standard has been submitted for reference into the RID and/or in 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: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

For some applications, the contents of an individual gas cylinder may not satisfy the gas demand, in which case assemblies of cylinders may be used to supply larger volumes of gas in a single unit. The single unit, which contains a number of cylinders, is known as a cylinder bundle.

A cylinder bundle is a portable assembly which is designed for being routinely lifted and which consists of a frame and two or more cylinders connected to a manifold by cylinder valves or fittings such that the cylinders are filled, transported and emptied without disassembly.

A cylinder bundle can be subjected to rough handling in the course of normal operations.

There are types of gas cylinder assemblies which use cylinder bundle components, but which are designed to be disassembled at each filling to enable the cylinders to be filled individually. These assemblies do not conform to the basic definition of a cylinder bundle, however, they are commonly referred to as bundles. Their special requirements are included in annex A.

Acetylene cylinder bundles are often filled without disassembly, however, in order to confirm their solvent content they are disassembled after a defined number of fillings.

Unless otherwise stated, individual cylinders within cylinder bundles should conform to applicable standards for single cylinders. This standard specifies the additional requirements that apply when individual cylinders are assembled into a bundle.

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1 Scope

This European Standard specifies the requirements for the design, manufacture, identification and testing of a cylinder bundle. It is applicable to cylinder bundles containing compressed gas, liquefied gas and mixtures thereof. It is also applicable to cylinder bundles for acetylene.

This European Standard does not apply to packages in which cylinders are manifolded together in a support frame which is designed to be fixed permanently to a road vehicle to a railway wagon or to the ground as a customer storage vessel. It does not apply to cylinder bundles which are designed for use in extreme environmental or operational conditions when additional and extraordinary requirements are imposed to maintain safety standards, reliability and performance. Offshore cylinder bundles are a specific example.

NOTE The specific requirements for acetylene are included in annex B.

This standard is primarily for industrial gases other than Liquefied Petroleum gases (LPG) but may also be used for LPG. However for dedicated LPG cylinders, see standards prepared by CEN/TC 286 *Liquefied petroleum gas equipment and accessories*.

2 Normative references

This European Standard incorporates by dated or undated references, 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).

- SIST EN 13769:2004
<http://standards.itec.ai/en/standards/sist-en-13769-2004-4c10-98ae-2c4f0076a566/sist-en-13769-2004>
- EN 287-1, *Approval testing of welders — Fusion welding — Part 1: Steels*.
- EN 288-1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding*.
- EN 1089-2, *Transportable gas cylinders — Gas cylinder identification (excluding LPG) — Part 2: Precautionary labels*.
- EN 1089-3, *Transportable gas cylinders — Cylinder identification (excluding LPG) — Part 3: Colour coding*.
- EN 1290, *Non destructive examination of welds — Magnetic particle examination of welds*.
- EN 1291, *Non destructive examination of welds — Magnetic particle testing of welds — Acceptance levels*.
- EN 12755, *Transportable gas cylinders — Filling conditions for acetylene bundles*.
- EN 13133, *Brazing — Brazer approval*.
- EN 13134, *Brazing — Procedure approval*.
- EN ISO 14113, *Gas welding equipment — Rubber and plastic hoses assembled for compressed or liquefied gases up to a maximum design pressure of 450 bar (ISO 14113 1997)*.
- ISO 13769, *Gas cylinders - Stamp marking*

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply. Definitions specific to acetylene are included in annex B.

EN 13769:2003 (E)**3.1****cylinder bundle (bundle)**

portable assembly which consists of a frame and two or more cylinders each of capacity up to 150 litres and with a combined capacity of not more than 3 000 litres, or 1 000 litres in the case of toxic gases, connected to a manifold by cylinder valves or fittings such that the cylinders are filled, transported and emptied without disassembly

3.2**frame**

structural and non-structural members of a bundle which combine all other components together, whilst providing protection for the bundle's cylinders, valves and manifold and which enable the bundle to be transported

3.3**cylinder valve**

valve which is fitted into a cylinder and to which a manifold is connected in a bundle

3.4**cylinder fitting**

device with no gas shut-off capability which serves as a method for connecting a bundle's manifold to its individual cylinders when cylinder valves are not fitted to the cylinders

3.5**manifold**

system for connecting a bundle's cylinder valves or cylinder fittings to the main valve(s) or main connection(s)

3.6**main valve**

valve which is fitted to a bundle's manifold isolating it from the main connection(s)

3.7**main connection**

means of making a gas connection to a bundle

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3.8**sundry items**

those parts other than cylinders, frame, manifold, cylinder valves, cylinder fittings and main connections which make up a complete bundle

NOTE Sundry items typically include labels, cylinder neck rings, data plates, fasteners, clamps, dip tubes, pressure gauges and protective caps.

3.9**tare weight**

weight of the bundle when empty of gas product

3.10**maximum gross weight**

tare weight of the bundle plus the maximum weight of the gas product contained within the bundle

3.11**compressed gas**

gas which when packaged under pressure for transport is entirely gaseous at $-50\text{ }^{\circ}\text{C}$, this category includes all gases with a critical temperature less than or equal to $-50\text{ }^{\circ}\text{C}$

3.12**liquefied gas**

gas which when packaged under pressure for transport is partially liquid at temperatures above $-50\text{ }^{\circ}\text{C}$.

A distinction is made between:

high pressure liquefied gas; a gas with a critical temperature between $-50\text{ }^{\circ}\text{C}$ and $+65\text{ }^{\circ}\text{C}$ and

low pressure liquefied gas; a gas with a critical temperature above $+65\text{ }^{\circ}\text{C}$

3.13**proof test pressure**

hydraulic or pneumatically applied pressure which demonstrates the structural integrity of the manifold

3.14**working pressure**

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

3.15**design pressure**

value of pressure which is used to perform stress calculations of gas retaining components, other than cylinders, within the bundle

3.16**maximum permissible operating pressure**

highest pressure permitted to be developed during service

3.17**helium test gas**

leak testing gas mixture containing not less than 2% helium

3.18**maximum permissible filling weight**

product of the minimum guaranteed water capacity of the cylinders of the bundle and the filling ratio of the gas contained

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3.19**home station of the bundle**

location (name of the company, address and telephone number) where the documentation is kept

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3.20**competent body**

authority or authorities or any other body designated as such in each state and in each specific case in accordance with domestic law

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3.21**toxic gases**

gases with a LC₅₀ not exceeding 5 000 ml/m³

4 Design**4.1 General**

The design of the bundle shall take into consideration its construction and inspection as well as its operation. All pressurized components shall be designed to operate safely in the temperature range of – 20 °C to + 65 °C. They should also be designed to withstand local temperature conditions outside this range.

Bundles which are filled by weight shall not feature component parts which are de-mountable without the use of tools, with the exception of the main valve outlet protection cap.

4.2 Frame

4.2.1 The frame shall retain securely all the components of the bundle and shall protect them from damage which might cause leaks. Such damage can be caused by vibration, impact loads or handling loads which can be experienced in normal operation. The method of cylinder restraint shall prevent any vertical or horizontal movement or rotation of the cylinder which would impose undue strain on the manifold (see **7.2.2**). The total assembly shall be capable of withstanding rough handling, including being dropped or toppled.

Additionally no leakage of gas shall be caused during the lifting of the bundle (see **4.2.2**).

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4.2.2 The frame shall include features designed for the handling and transportation of the bundle. Bundles can be lifted typically by fork-lift, lift-jack trolley or overhead crane.

The lifting eyes shall be designed to withstand a design load of 2 x maximum gross weight. Bundles with more than one lifting eye shall be designed such that a minimum sling leg angle of 45° to the horizontal can be achieved during lifting using the lifting eyes.

Where four lifting eyes are used their design shall be such that they are strong enough to allow the bundle to be lifted by only two.

Where two or four lifting eyes are used, diametrically opposite lifting eyes shall be aligned with each other to allow for correct lifting using shackle pins.

Where a bundle is moved by fork-lift truck it shall feature two fork apertures on each side it is to be lifted from. The fork apertures shall be positioned symmetrically about the centre of gravity and their size shall be appropriate to the forks which are to be used to move the bundle. The fork apertures shall be designed such that the bundle cannot accidentally disengage from the forks.

4.2.3 Frame structural members shall be designed for a vertical load of 2 x the maximum gross weight of the bundle. Design stress levels shall not exceed 0,9 x the yield strength of the material.

4.2.4 The frame design shall ensure that there are no protrusions from the exterior frame structure which could cause hazards.

4.2.5 There shall be no features in which water and debris can collect to increase the tare weight of bundles filled by weight.

4.2.6 The floor of the bundle frame shall not buckle during normal operational conditions and shall facilitate the drainage of water and debris from around the base of the cylinders.

4.2.7 The design shall ensure stability under normal operating conditions.

4.2.8 If the frame design includes any movable doors or covers then these shall be capable of being secured in position with latches, which shall not be capable of being dislodged by operational impact loads.

4.2.9 Access shall be maintained to all valves which need to be operated in normal service or in an emergency.

4.2.10 Each frame shall include a unique identification number which shall be permanently marked.

4.3 Cylinders

Cylinders within a bundle shall be suitable for the gas type. They shall all have the same test pressure and shall conform to the appropriate standards covering individual cylinders.

4.4 Cylinder valves/cylinder fittings

4.4.1 Either a cylinder valve or a cylinder fitting shall be fitted into the necks of cylinders within the bundle, the choice of item being determined by the gas product within the bundle and operational requirements.

For acetylene see annex B.

4.4.2 Cylinder valves and cylinder fittings shall be compatible with the gas and pressure for which the bundle is intended.

4.4.3 Cylinder valves and cylinder fittings shall be compatible with the neck of the cylinder.

4.4.4 A cylinder valve shall be used where the bundle contains toxic gas or gas mixture with an LC₅₀ of less than 200 ppm (ml/m³), pyrophoric gas, or flammable mixtures with more than 1% of pyrophoric components. A cylinder valve shall not be used for non toxic liquefied gases, unless the valve is permanently locked open.

4.4.5 If the gas is a toxic liquefied gas, then to ensure that individual cylinders are not overfilled, the individual cylinders shall be removed from the frame for filling in accordance with annex A.

4.4.6 When cylinder valves are fitted, their outlet connections shall be of a form appropriate to the product within the bundle, or of a form which cannot lead to the incorrect connection to equipment designed for other products.

4.5 Manifold

4.5.1 The manifold shall be compatible with the gas and the pressure for which the bundle is intended.

For acetylene see annex B.

4.5.2 The manifold shall be designed to be capable of withstanding, as a minimum, the design pressure requirements of the cylinders.

4.5.3 For compressed gases the design pressure shall be not less than 1,5 x working pressure. For liquefied gases the design pressure shall be not less than test pressure of the cylinder. The maximum stress of the manifolding arrangement at the test pressure shall not exceed 75% of the guaranteed yield strength of the material.

4.5.4 The proof test pressure shall be a minimum of 1,0 x design pressure.

4.5.5 No part of the manifold shall bear against other components in the bundle except at cylinder valve/fitting interfaces or at defined attachment points to the frame.

4.5.6 Where the manifold is made of metal, the necessary flexibility shall be achieved by the use of bends or coils. Flexible hoses or non-metallic pipework should only be used as part of the fixed pipework on the bundle after trials have proved their acceptability, and the length of such hoses and pipework shall be kept to a minimum.

4.6 Main connection(s)

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The main connection(s) shall be compatible with the gas and the pressure for which the bundle is intended and shall be protected by the frame; i.e. the valve shall not protrude.

5 Manufacturing

A bundle shall be manufactured in accordance with the design criteria listed in clause 4.

For this condition to be satisfied the manufacturer shall:

- use welding procedures in accordance with EN 288-1;
- use approved welders in accordance with EN 287-1;
- use brazing procedures in accordance with EN 13134;
- use approved brazers in accordance with EN 13133.

6 Identification

6.1 General

A bundle design can include components which protect the manifold and which can cause an obstruction to the view of the shoulders of the cylinders. Therefore the requirements for labelling and colour coding as defined in EN 1089-2 and EN 1089-3 do not apply to bundles, except for acetylene see annex B.

Additionally, markings on the individual cylinders can also be obscured, therefore certain information which requires to be checked at the time of filling shall be duplicated on the outside of the bundle, see **6.3**. For bundles