



SLOVENSKI STANDARD
SIST EN 1968:2002

01-november-2002

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Transportable gas cylinders - Periodic inspection and testing of seamless steel gas cylinders

Ortsbewegliche Gasflaschen - Wiederkehrende Prüfung von nahtlosen Gasflaschen aus Stahl

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Bouteilles a gaz transportables - Contrôles et essais périodiques des bouteilles a gaz sans soudure en acier

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Ta slovenski standard je istoveten z: EN 1968:2002

ICS:

23.020.30 V|æ} ^Á [• [å^ Æ |ã • \ ^ Pressure vessels, gas cylinders

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en

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English version

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This European Standard was approved by CEN on 9 November 2001.

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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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document EN 1968:2002 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of an identical text or by endorsement, at the latest by August 2002, and conflicting national standards shall be withdrawn at the latest by August 2002.

In this standard the annexes B, C, D, E, F and G are normative and the annexes A, H and I are informative.

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 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 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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

The principal aim of a periodic inspection and testing procedure is that at the completion of the test the cylinders may be reintroduced into service for a further period of time.

Experience of the inspection and testing of cylinders which is specified in this European Standard is an important factor when determining whether a cylinder should be returned into service.

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1 Scope

This European Standard specifies the requirements for periodic inspection and testing of seamless steel transportable gas cylinders (single or those from bundles) intended for compressed and liquefied gases under pressure, of water capacity from 0,5 l up to 150 l.

NOTE As far as practicable, this standard may also be applied to cylinders of less than 0,5 l water capacity.

This standard specifies the requirements for periodic inspection and testing to verify the integrity of such gas cylinders to be reintroduced into service for a further period of time. It also defines a procedure to qualify existing gas cylinders for free movement between member states of the European Union (see annex A).

This standard does not apply to periodic inspection and testing of acetylene cylinders or composite (fully wrapped or hoop-wrapped) steel cylinders.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place 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 473, *Non destructive testing - Qualification and certification of NDT personnel - General principles.*

EN 629-2, *Transportable gas cylinders — 25E taper thread for connection of valves to gas cylinders — Part 2: Gauge inspection.*

EN 837-1, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing.*

EN 837-3, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimension, metrology, requirements and testing.*

EN 1089-1, *Transportable gas cylinders — Gas cylinder identification (excluding LPG) — Part 1: Stampmarking.*

EN 1964-1, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of water capacities from 0,5 litre up to and including 150 litres — Part 1: Cylinders made of seamless steel with an R_m value of less than 1100 MPa.*

prEN 1964-2, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of water capacities from 0,5 litre up to and including 150 litres — Part 2: Cylinders made of seamless steel with an R_m value of 1100 MPa and above.*

EN 1964-3, *Transportable gas cylinders — Specification for the design and construction of refillable transportable seamless steel gas cylinders of water capacities from 0,5 litre up to and including 150 litres — Part 3: Cylinders made of seamless stainless steel with an R_m value of less than 1100 MPa.*

EN 1795, *Transportable gas cylinders (excluding LPG) — Procedures for change of gas service.*

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

EN ISO 11114-2, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials (ISO 11114-2:2000).*

EN ISO 13341, *Transportable gas cylinders — Fitting of valves to gas cylinders (ISO 13341:1997)*.

3 Intervals between periodic inspection and test

In order to ensure continued safe operation, cylinders shall be periodically submitted to inspection and test in accordance with annex B. A cylinder shall fall due for a periodic inspection and test on its first receipt by a filler after the expiry of the interval in annex B.

NOTE Table B.1 gives a list of the intervals between periodic inspections for some gases which complies with the current RID/ADR regulations and also gives recommendations which could be subsequently adopted by the RID/ADR regulations.

Provided the cylinder has been subjected to normal conditions of use and has not been subjected to abusive and abnormal conditions rendering the cylinder unsafe, there is no general requirement for the user to return a gas cylinder before the contents have been used even though the test interval may have lapsed. However it is recommended that cylinders are retested within a period not exceeding twice the time interval.

In the case of cylinders used for emergency purposes (e.g. fire extinguishers, breathing apparatus), it is the responsibility of the person in possession (owner or user) to submit it for a periodic inspection within the interval specified in annex B or as specified in the relevant cylinder design standard/regulation, if this is shorter.

4 List of procedures for periodic inspection and test

The inspection and test shall be carried out only by competent persons who shall ensure that the cylinders are fit for continued safe use.

NOTE A competent person is a person who has the necessary technical knowledge, experience and authority to assess and approve materials for use with gases and to define any special conditions of use that are necessary. Such a person will also normally be formally qualified in an appropriate technical discipline.

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Each cylinder shall be submitted to periodic inspection and test. The following procedures form the requirements for such inspection and test, and are explained more fully in later clauses:

- identification of cylinder and preparation for inspection and test (clause 5);
- external visual inspection (clause 6);
- internal visual inspection (clause 7);
- supplementary tests (clause 8);
- inspection of cylinder neck (clause 9);
- pressure test or ultrasonic test (clause 10);
- inspection of valve (clause 11);
- final operations (clause 12);
- rejection and rendering cylinders unserviceable (clause 13).

Where cylinders are manufactured according to National Regulations and are intended to be qualified under the Transportable Pressure Equipment Directive (TPED) for free movement and use between member states of the European Union, additional requirements are specified in annex A.

It is recommended that the above listed tests are performed in the suggested sequence. In particular the internal visual examination (clause 7) should be carried out before the pressure test or ultrasonic test (clause 10).

Cylinders which fail the inspection or tests shall be rejected (see clause 13). When, after the above tests, doubts still exist as to the extent of a defect or the condition of a cylinder, then additional tests may be performed in accordance with clause 8, until such doubts are positively resolved or the cylinder shall be rendered unserviceable.

Some cylinders rejected during periodic inspection and test may be recovered in accordance with annex C.

5 Identification of cylinder and preparation for inspection and test

Before any work is carried out, the relevant cylinder data (e.g. see EN 1089-1) and its contents and ownership shall be identified.

If contents are identified as hydrogen or other embrittling gases only those cylinders manufactured or qualified as a hydrogen cylinder shall be used for that service. Such cylinders shall be checked that they are compatible with hydrogen service i.e. with respect to the maximum tensile strength and internal surface condition (e.g. cylinders stamp marked according to EN 1089-1 are stamped "H"). All other cylinders shall be withdrawn from hydrogen service and their suitability checked for their new intended service.

The cylinders shall be depressurized and emptied in a safe, controlled manner before proceeding. Particular attention shall be given to cylinders containing flammable, oxidizing and toxic gases to eliminate risks at the internal inspection stage.

Cylinders with incorrect markings, unknown gas contents, or those which cannot be safely emptied of gas, shall be set aside for special handling.

Cylinders with inoperative or blocked valves may be treated as outlined in annex D. Provided the requirements above have been complied with, and the cylinder has been depressurized safely, the valve shall be removed. Similarly in the case of cylinder bundles, not equipped with cylinder valves, the connecting tee junction shall also be checked to determine whether the gas is able to pass freely from the cylinder to atmosphere.

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6 External visual inspection

6.1 Preparation for external visual inspection

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Each cylinder shall be cleaned and have all loose coatings, corrosion products, tar, oil or other foreign matter removed from its external surface by a suitable method, e.g. by brushing, shot blasting (under closely controlled conditions), water jet abrasive cleaning, chemical cleaning or other suitable methods. Care shall be taken at all times to avoid damaging the cylinder, or removing excess amounts of cylinder wall.

If fused nylon, polyethylene or a similar coating has been applied and is seen to be damaged, or prevents a proper inspection, then the coating shall be removed. If the coating is removed by the application of heat, the temperature of the cylinder shall not exceed 300 °C.

6.2 Inspection procedure

The external surface of each cylinder shall then be inspected for:

- a) dents, cuts, gouges, bulges, cracks, laminations or excessive base wear.
- b) heat damage, torch or electric arc burns (as defined in Table C.1).
- c) corrosion (as defined in Table C.2).
- d) other defects such as illegible or unauthorized stamp markings, unauthorized additions or modifications.
- e) integrity of all permanent attachments.
- f) vertical stability (if relevant)(as defined in Table C.1).

For rejection criteria, see annex C. Cylinders no longer suitable for future service shall be rendered unserviceable (as defined in clause 13).

7 Internal visual inspection

Each cylinder shall be inspected internally, using adequate illumination to identify any defects such as those listed in 6.2 a) and 6.2 c). Precautions shall be taken to ensure that the method of illumination presents no hazards to the tester whilst performing the operation. Any internal liner or coating which can obstruct optimum internal visual inspection, shall be removed. Any cylinder showing presence of foreign matter or signs of more than light surface corrosion shall be cleaned internally under closely controlled conditions by shot blasting, water jet abrasive cleaning, flailing, steam jet, hot water jet, rumbling, chemical cleaning, or other suitable method. Care shall be taken to avoid damage to the cylinder. If cleaning is required, the cylinder shall be re-inspected after the cleaning operation.

For cylinders in non-corrosive gas service and less than 0,5 l water capacity with an internal neck diameter less than 9 mm, alternative methods can be substituted for the internal visual inspection.

These alternative methods are :

a) look for any free moisture at the time of degassing the cylinder whilst in an inverted position and prior to valve removal. If any moisture is present, the cylinder shall be rendered unserviceable;

and

b) look for contamination e.g. rust in the water used after the hydraulic test. If any contamination is found, the cylinder shall be rendered unserviceable.

8 Supplementary tests

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Where there is doubt concerning the type and/or severity of a defect found on visual inspection (see clauses 6 and 7), additional tests or methods of examination may be applied, e.g. ultrasonic techniques, check weighing or other non-destructive tests. Only when all doubts are eliminated may the cylinder be further processed (see annex C).

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9 Inspection of cylinder neck

9.1 Internal neck thread

The internal neck thread of the cylinder shall be examined to ensure that it is:

- clean and of full form;
- free of damage;
- free of burrs;
- free of cracks;
- free of other imperfections.

Cracks manifest themselves as lines which run vertically down the thread and across the thread faces. They should not be confused with tap marks (thread machining marks). Special attention should be paid to the area at the bottom of the thread.

9.2 Other neck surfaces

Other surfaces of the neck shall also be examined to ensure they are free of cracks or other defects (see annex C).

9.3 Damaged internal neck threads

Where necessary, and where the manufacturer or the competent person confirms that the design of the neck permits, threads may be re-tapped to provide the appropriate number of effective threads. After re-tapping, the threads shall be checked by the appropriate thread gauge, (e.g. for 25E threads, in accordance with EN 629-2).

9.4 Neck ring and collar attachment

When a neck ring/collar is attached, an examination to ensure that it is secure and free from thread damage shall be carried out. Neck rings shall only be changed using an approved procedure. If it is found that any significant damage to cylinder material has occurred by replacement of the neck ring/collar, the cylinder shall be rendered unserviceable. If the neck ring has been re-attached by welding or brazing, the cylinder shall be rendered unserviceable.

10 Pressure test or ultrasonic test

10.1 General

Each cylinder shall be subjected to a pressure test (see 10.2) or to an ultrasonic test (see 10.3).

10.2 Pressure test

10.2.1 General requirements

When carrying out a pressure test, a suitable fluid, normally water, shall be used as the test medium. The test may be a proof pressure test (see 10.2.2) or a volumetric expansion test (see 10.2.3), as appropriate to the design of the cylinder. Having decided to use one particular type of test, its result shall be final. No attempt shall be made to transfer from one type of test to the other. The test pressure shall be in accordance with the stamping on the cylinder.

The pressure in the cylinder shall be increased gradually until the test pressure is reached. The cylinder test pressure shall be held for at least 30 s with the cylinder isolated from the pressure source, during which time there shall be no decrease in the recorded pressure or any evidence of any leakage. Safety precautions shall be taken during the test.

10.2.2 Proof pressure test

Annex E specifies a typical method for carrying out the test.

NOTE A pneumatic pressure test can be substituted, provided approval from the relevant authority has been obtained. Measures should be taken to ensure safe operation and to contain any energy, which is considerably more than that in the hydraulic test, which can be released.

During the 30 s hold period the pressure as registered on the test gauge shall remain constant.

There shall be no visible leakage or visible permanent deformation on the entire surface of the cylinder. This check may be made either during the 30 s hold or immediately after the pressure has been released.

Any cylinder failing to comply with the requirements of this test shall be rendered unserviceable.

10.2.3 Volumetric expansion test

Annex F specifies a typical method for carrying out the test and gives details for determining the volumetric expansion of seamless steel gas cylinders by the preferred water jacket method or the non-water jacket method.

The permanent volumetric expansion of the cylinder expressed as a percentage of the total expansion at test pressure shall not exceed the percentage given in the design specification after the cylinder has been held at test

pressure for a minimum period of 30 s. If this figure for permanent expansion is exceeded the cylinder shall be rendered unserviceable.

10.3 Ultrasonic test

Ultrasonic testing may be used in place of the pressure test in the procedures of periodic inspection, with the agreement of the competent person. Ultrasonic testing, if carried out, shall be in accordance with the method specified in annex G.

11 Inspection of valve

If it is to be re-introduced into service, each valve (or tee junction for bundles) shall be inspected to verify that it will perform satisfactorily and ensure gas tightness. An example of a suitable method is given in annex H.

12 Final operations

12.1 Drying, cleaning and painting

12.1.1 Drying and cleaning

The interior of each cylinder shall be thoroughly dried by a suitable method at a temperature not exceeding 300 °C, immediately after hydraulic pressure testing such that there is no trace of free water. The interior of the cylinder shall be inspected to ensure that it is dry and free from other contaminants.

12.1.2 Painting

Cylinders are sometimes re-painted, using paints which require stoving. Plastics coatings may also be reapplied. Painting or coating shall be applied such that all markings stamped on the cylinder are legible.

In no case shall the temperature of the cylinder exceed 300 °C.

12.2 Re-valving of the cylinder

The valve shall be fitted to the cylinder using a suitable sealing material. An optimum torque necessary to ensure both a seal between the valve and the cylinder and prevent over-stressing the neck shall be used in accordance with EN ISO 13341.

The torque applied shall take into consideration the size and form of the threads, the material of the valve, and the type of sealing material used according to the manufacturer's recommendations. Where the use of lubricants/sealing material is permitted, only those approved for the gas service shall be used, taking particular care for oxygen service in accordance with EN ISO 11114-2.

12.3 Check on cylinder tare

This requirement applies only to cylinders for liquefied gases. The tare of the cylinders shall be obtained by weighing on a machine regularly checked for accuracy. The capacity of the weighing machine shall be suitable for the tare weight of the cylinders.

The tare shall include the mass of the cylinder, valve(s) and all permanent fittings. If the tare of the cylinder differs from the stamped tare by more than the value shown in Table 1 and is not due to reasons of damage, the original tare shall be cancelled and the correct tare shall be marked in a permanent and legible fashion in accordance with EN 1089-1.

Table 1 — Maximum allowable deviation in cylinder tare weight

Cylinder water capacity (V) l	Maximum allowable deviation in tare weight g
$0,5 \leq V < 5,0$	± 50
$5,0 \leq V \leq 20$	± 200
> 20	± 400

12.4 Stampmarking

After satisfactory completion of the periodic inspection and test, each cylinder shall be permanently marked according to EN 1089-1 with the present test date followed by the symbol of the inspection body or test station.

12.5 Reference to next test date

The next test date shall be shown in a clearly visible manner by an appropriate method such as a label or a disc fitted between the valve and the cylinder, indicating the year of the next periodic inspection or periodic inspection and test.

12.6 Identification of contents

Before the cylinder is reintroduced into service, the cylinder shall be marked according to the intended contents (see e.g. EN 1089-2 and EN 1089-3). If painting is required, care shall be exercised in accordance with 12.1.2. If a change of gas service is involved the requirements of EN 1795 shall be followed.

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12.7 Records

Details of the present test shall be recorded by the test station and the following information shall be available:

- owner's name;
- manufacturer's or owner's serial number;
- cylinder tare, where applicable;
- test pressure;
- result of test (pass or fail);
- present test date;
- identification symbol of the inspection body or the test station;
- identification of inspector;
- details of any modifications made to the cylinder by the inspector.

Additionally, it shall be possible to obtain the following items of information from records, which need not necessarily be kept on a single file, but will enable a particular cylinder to be traced. These items are:

- cylinder manufacturer;
- manufacturer's serial number;