



SLOVENSKI STANDARD SIST EN ISO 11439:2002

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Gas cylinders - High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles (ISO 11439:2000)

Gasflaschen - Gasflaschen zur Mitführung von verdichtetem Erdgas als Treibstoff für Kraftfahrzeuge (ISO 11439:2000)

Bouteilles a gaz - Bouteilles haute pression pour le stockage de gaz naturel utilisé comme carburant a bord des véhicules automobiles (ISO 11439:2000)

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Ta slovenski standard je istoveten z: EN ISO 11439:2000

ICS:

23.020.30	V æ } ^A [• [å ^E] ã • \ ^ b\ ^ } \ ^	Pressure vessels, gas cylinders
43.060.40	Sistemi za gorivo	Fuel systems

SIST EN ISO 11439:2002

en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 11439

September 2000

ICS 43.060.40

English version

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of natural gas as a fuel for automotive vehicles (ISO
11439:2000)**

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11439:2000)

This European Standard was approved by CEN on 15 September 2000.

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.

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

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Page 2
EN ISO 11439:2000

Foreword

Corrected 2001-03-28

The text of the International Standard ISO 11439:2000 has been prepared by Technical Committee ISO/TC 58 "Gas cylinders" in collaboration with 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 2001, and conflicting national standards shall be withdrawn at the latest by March 2001.

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.

Endorsement notice

The text of the International Standard ISO 11439:2000 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

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Annex ZA (normative)
**Normative references to international publications
 with their relevant European publications**

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).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN</u>	<u>Year</u>
ISO 306	1994	Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)	EN ISO 306	1996
ISO 527-2	1993	Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics (including Corr 1:1994)	EN ISO 527-2	1996
ISO 2808	1997	Paints and varnishes - Determination of film thickness	EN ISO 2808	1999
ISO 4624	1978	Paints and varnishes - Pull-off test	EN 24624	1992
ISO 6506-1	1999	Metallic materials - Brinell hardness test - Part 1: Test method	EN ISO 6506-1	1999
ISO 6506-2	1999	Metallic materials - Brinell hardness test - Part 2: Verification and calibration of testing machines	EN ISO 6506-2	1999
ISO 6506-3	1999	Metallic materials - Brinell hardness test - Part 3: Calibration of reference blocks	EN ISO 6506-3	1999
ISO 14130	1997	Fibre-reinforced plastic composites - Determination of apparent interlaminar shear strength by short-beam method	EN ISO 14130	1997

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STANDARD

ISO
11439

First edition
2000-09-15

**Gas cylinders — High pressure cylinders
for the on-board storage of natural gas as a
fuel for automotive vehicles**

*Bouteilles à gaz — Bouteilles haute pression pour le stockage de gaz
naturel utilisé comme carburant à bord des véhicules automobiles*

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Reference number
ISO 11439:2000(E)

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Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
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ISO 11439:2000(E)**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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11439 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 3, *Cylinder design*.

Annexes A and B form a normative part of this International Standard. Annexes C to H are for information only.

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Introduction

Cylinders for the on-board storage of fuel for natural gas vehicle service are required to be light-weight, at the same time maintaining or improving on the level of safety currently existing for other pressure vessels. These requirements are achieved by:

- a) specifying service conditions precisely and comprehensively as a firm basis for both cylinder design and use;
- b) using an appropriate method to assess cyclic pressure fatigue life and to establish allowable defect sizes in metal cylinders or liners;
- c) requiring design qualification tests;
- d) requiring non-destructive testing and inspection of all production cylinders;
- e) requiring destructive tests on cylinders and cylinder material taken from each batch of cylinders produced;
- f) requiring manufacturers to have a comprehensive quality system documented and implemented;
- g) requiring periodic re-inspection and, if necessary, retesting in accordance with the manufacturer's instructions;
- h) requiring manufacturers to specify as part of their design, the safe service life of their cylinders.

Cylinder designs that meet the requirements of this International Standard:

- a) will have a fatigue life which exceeds the specified service life;
- b) when pressure cycled to failure, will leak but not rupture;
- c) when subject to hydrostatic burst tests, will have factors of "stress at burst pressure" over "stress at working pressure" that exceed the values specified for the type of design and the materials used.

Owners or users of cylinders designed to this International Standard should note that the cylinders are designed to operate safely if used in accordance with specified service conditions for a specified finite service life only. The expiry date is marked on each cylinder and it is the responsibility of owners and users to ensure that cylinders are not used after that date, and that they are inspected in accordance with the manufacturer's instructions.

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Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles

1 Scope

This International Standard specifies minimum requirements for serially produced light-weight refillable gas cylinders intended only for the on-board storage of high pressure compressed natural gas as a fuel for automotive vehicles to which the cylinders are to be fixed. The service conditions do not cover external loadings which may arise from vehicle collisions, etc.

This International Standard covers cylinders of any steel, aluminium or non-metallic material construction, using any design or method of manufacture suitable for the specified service conditions. This International Standard does not cover cylinders of stainless steel or of welded construction.

Cylinders covered by this International Standard are designated as follows:

CNG-1	Metal
CNG-2	Metal liner reinforced with resin impregnated continuous filament (hoop wrapped)
CNG-3	Metal liner reinforced with resin impregnated continuous filament (fully wrapped)
CNG-4	Resin impregnated continuous filament with a non-metallic liner (all composite)

NOTE Cylinders designed in accordance with ISO 9809-1, ISO 9809-2, ISO 9809-3 and ISO 7866 can be used for this service provided these designs meet additional requirements as specified in this International Standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 148:1983, *Steel — Charpy impact test (V-notch)*.

ISO 306:1994, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*.

ISO 527-2:1993, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (incorporating Technical Corrigendum 1:1994)*.

ISO 2808:1997, *Paints and varnishes — Determination of film thickness*.

ISO 11439:2000(E)

ISO 4624:—¹⁾, *Paints and varnishes — Pull-off test for adhesion.*

ISO 6506-1:1999, *Metallic materials — Brinell hardness test — Part 1: Test method.*

ISO 6892:1998, *Metallic materials — Tensile testing at ambient temperature.*

ISO 7225, *Gas cylinders — Precautionary labels.*

ISO 7866:1999, *Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 9712:1999, *Non-destructive testing — Qualification and certification of personnel.*

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:—²⁾, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.*

ISO 14130:1997, *Fibre-reinforced plastic composites — Determination of apparent interlaminar shear strength by short-beam method.*

ASTM D522-93a, *Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.*

ASTM D1308-87(1998), *Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.*

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ASTM D2794-93(1999)e1, *Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).*

ASTM D3170-87(1996)e1, *Standard Test Method for Chipping Resistance of Coatings.*

ASTM D3418-99, *Standard Test Method for Transition Temperatures of Polymers by Differential Scanning Calorimetry.*

ASTM G53-93³⁾, *Standard Practice for Operating Light and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.*

NACE TM0177-96⁴⁾, *Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H₂S Environments.*

3 Terms and definitions

For the purposes of this International Standard the following terms and definitions shall apply:

1) To be published. (Revision of ISO 4624:1978)

2) To be published

3) To be discontinued in 2000 and replaced by G154.

4) NACE standards are available from NACE International, PO Box 218340, Houston, Texas 77218-8340, U.S.A.

3.1**authorized inspection authority**

competent inspection authority, approved or recognized by the regulatory authority of the user country, for the supervision of construction and testing of cylinders

3.2**auto-frettage**

pressure application procedure used in manufacturing composite cylinders with metal liners, which strains the liner past its yield point sufficient to cause permanent plastic deformation

NOTE This results in the liner having compressive stresses and the fibres having tensile stresses at zero internal pressure.

3.3**auto-frettage pressure**

pressure within the over-wrapped cylinder at which the required distribution of stresses between the liner and the over-wrap is established

3.4**batch**

⟨composite cylinders⟩ group of not more than 200 cylinders plus cylinders for destructive testing, or if greater, one shift of successive production of cylinders, successively produced from qualified liners having the same size, design, specified materials of construction and process of manufacture

3.5**batch**

⟨of metal cylinders/liners⟩ group of not more than 200 cylinders/liners plus cylinders/liners for destructive testing, or if greater, one shift of successive production of metal cylinders/liners, successively produced having the same nominal diameter, wall thickness, design, specified material of construction, process of manufacture, equipment for manufacture and heat treatment, and conditions of time, temperature and atmosphere during heat treatment

3.6**batch**

⟨of non-metallic liners⟩ group of not more than 200 liners plus liners for destructive testing, or if greater, one shift of successive production of non-metallic liners, successively produced having the same nominal diameter, wall thickness, design, specified material of construction and process of manufacture

3.7**burst pressure**

highest pressure reached in a cylinder during a burst test

3.8**composite cylinder**

cylinder made of resin-impregnated continuous filament wound over a metallic or non-metallic liner

NOTE Composite cylinders using non-metallic liners are referred to as all-composite cylinders.

3.9**controlled tension winding**

process used in manufacturing hoop-wrapped composite cylinders with metal liners by which compressive stresses in the liner and tensile stresses in the over-wrap at zero internal pressure are obtained by winding the reinforcing filaments under significant high tension

3.10**filling pressure**

pressure to which a cylinder is filled