

SLOVENSKI STANDARD

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Nadomešča:

SIST EN ISO 11114-1:1999

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**Plinske jeklenke - Združljivost materialov za ventil in jeklenko s plinom - 1. del:
Kovinski materiali (ISO 11114-1:2012)**

Gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 1:
Metallic materials (ISO 11114-1:2012)

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Gasflaschen - Verträglichkeit von Werkstoffen für Gasflaschen und Ventile mit den in
Berührung kommenden Gasen - Teil 1: Metallische Werkstoffe (ISO 11114-1:2012)

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Bouteilles à gaz - Compatibilité des matériaux des bouteilles et des robinets avec les
contenus gazeux - Partie 1: Matériaux métalliques (ISO 11114-1:2012)

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EUROPEAN STANDARD
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EUROPÄISCHE NORM

EN ISO 11114-1

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Supersedes EN ISO 11114-1:1997

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Gas cylinders - Compatibility of cylinder and valve materials with gas contents - Part 1: Metallic materials (ISO 11114-1:2012)

Bouteilles à gaz - Compatibilité des matériaux des bouteilles et des robinets avec les contenus gazeux - Partie 1: Matériaux métalliques (ISO 11114-1:2012)

Gasflaschen - Verträglichkeit von Werkstoffen für Gasflaschen und Ventile mit den in Berührung kommenden Gasen - Teil 1: Metallische Werkstoffe (ISO 11114-1:2012)

This European Standard was approved by CEN on 18 February 2012.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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Foreword

This document (EN ISO 11114-1:2012) 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 September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

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

This document supersedes EN ISO 11114-1:1997.

This European Standard has been submitted for reference into 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, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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The text of ISO 11114-1:2012 has been approved by CEN as a EN ISO 11114-1:2012 without any modification.

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INTERNATIONAL
STANDARD

ISO
11114-1

Second edition
2012-03-15

**Gas cylinders — Compatibility of cylinder
and valve materials with gas contents —**

Part 1:
Metallic materials

*Bouteilles à gaz — Compatibilité des matériaux des bouteilles et des
robinets avec les contenus gazeux —*

Partie 1: Matériaux métalliques

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ISO 11114-1:2012(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 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 11114-1 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 23, *Transportable gas cylinders*, in collaboration with ISO Technical Committee ISO/TC 58, *Gas cylinders*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 11114-1:1997), which has been technically revised. The main changes resulting from the revision of this part of ISO 11114 are

- the term “not recommended” has been replaced by “not acceptable”,
- the text has been clarified,
- a requirement for gas mixtures has been introduced.

ISO 11114 consists of the following parts, under the general title *Gas cylinders — Compatibility of cylinder and valve materials with gas contents*:

- *Part 1: Metallic materials*
- *Part 2: Non-metallic materials*
- *Part 3: Autogenous ignition test for non-metallic materials in oxygen atmosphere*
- *Part 4: Test methods for selecting metallic materials resistant to hydrogen embrittlement*

Introduction

Industrial, medical and special gases (e.g. high-purity gases, calibration gases) can be transported or stored in gas cylinders. An essential requirement of the material from which such gas cylinders and their valves are manufactured is compatibility with the gas content.

Compatibility of cylinder materials with gas content has been established over many years by practical application and experience. Existing national and international regulations and standards do not fully cover this aspect.

This part of ISO 11114 is based on current international experience and knowledge.

Where there is any conflict between this International Standard and any applicable regulation, the regulation always takes precedence.

This part of ISO 11114 has been written to be in conformity with the UN Recommendations on the Transport of Dangerous Goods: Model Regulations. When published it will be submitted to the UN Sub Committee of Experts on the Transport of Dangerous Goods with a request that it be included in the Model Regulations.

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Gas cylinders — Compatibility of cylinder and valve materials with gas contents —

Part 1: Metallic materials

1 Scope

This part of ISO 11114 provides requirements for the selection of safe combinations of metallic cylinder and valve materials and cylinder gas content.

The compatibility data given is related to single gases and to gas mixtures.

Seamless metallic, welded metallic and composite gas cylinders and their valves, used to contain compressed, liquefied and dissolved gases, are considered.

NOTE In this part of ISO 11114 the term “cylinder” refers to transportable pressure receptacles, which also include tubes and pressure drums.

Aspects such as the quality of delivered gas product are not considered.

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, *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 10156, *Gases and gas mixtures — Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*

ISO 10297, *Transportable gas cylinders — Cylinder valves — Specification and type testing*

ISO 11114-2, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

ISO 11114-3, *Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 3: Autogenous ignition test for non-metallic materials in oxygen atmosphere*

ISO 11120, *Gas cylinders — Refillable seamless steel tubes for compressed gas transport of water capacity between 150 l and 3 000 l — Design, construction and testing*

ISO 11114-1:2012(E)

3 Terms and definitions

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

3.1
competent person
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

3.2
acceptable
A
material/gas combination that is safe under normal conditions of use, provided that any indicated non-compatibility risks are taken into account

NOTE Low levels of impurities can affect the acceptability of some single gases or gas mixtures.

3.3
not acceptable
N
material/single gas combination that is not safe under all normal conditions of use

NOTE For gas mixtures special conditions may apply (see 6.2 and Table 1).

3.4
dry
state in which there is no free water in a cylinder under any service conditions, including at the highest expected operating pressure and at the lowest expected operating temperature

NOTE For compressed gases at, for example, 200 bar and -20°C , the maximum moisture content is not to exceed 5 ppmV, to avoid condensation of free water. For other temperatures and pressures, the maximum moisture content needed to avoid condensation of water will be different.

3.5
wet
state in which the conditions as defined for **dry** (3.4) are not met

3.6
gas mixture
combination of different single gases deliberately mixed in specified proportions

3.7
single gas
gas which does not contain deliberately added content of another gas or gases

4 Materials

4.1 General

The compatibility of most materials used to manufacture gas cylinders and valves is identified in this part of ISO 11114.

Other materials whose compatibility is not identified in this part of ISO 11114 may be used if all compatibility aspects have been considered and validated by a competent person.

4.2 Cylinder materials

The most commonly used metallic materials for cylinders are (among others) carbon manganese steel, chromium molybdenum steel, chromium molybdenum nickel steel, stainless steel and aluminium alloys, as specified in the following International Standards:

- aluminium, ISO 7866 and ISO 11118;
- steel, ISO 4706, ISO 9328-5, ISO 9809-1, ISO 9809-2, ISO 9809-3, ISO 9809-4, ISO 11118 and ISO 11120;
- aluminium alloys and stainless steel, ISO 6361-2 and ISO 15510.

4.3 Valve materials

4.3.1 General

The most commonly used metallic materials for valve bodies and internal gas wetted parts are brass and other similar copper-based alloys, carbon steel, stainless steel, nickel and nickel alloys, Cu–Be (2 %) and aluminium alloys.

4.3.2 Particular considerations

4.3.2.1 In special cases, non-compatible materials may be used for non-oxidizing gases if suitably plated, protected or coated. This may only be done if all compatibility aspects have been considered and validated by a competent person for the entire life of the valve.

4.3.2.2 Special precautions, in accordance with ISO 11114-3 (which addresses testing, not precautions per se), shall be taken for oxidizing gases as specified in ISO 10156. In this case, non-compatible materials are *not acceptable* (see 3.3) for use in valves, even if plated, protected or coated.

4.3.2.3 For cylinder valves, compatibility in wet conditions shall be considered because of the high risk of contamination by atmospheric moisture and an airborne contaminant.

NOTE Reference is made in this part of ISO 11114 to stainless steels by their commonly used AISI identification numbers, e.g. 304. For information, the equivalent grades according to EN 10088-1 are as follows:

304	1.4301
304L	1.4306 and 1.4307
316	1.4401
316L	1.4404

5 Compatibility criteria

5.1 General

Compatibility between a gas and the cylinder/valve material is affected by chemical reactions and physical influences, which can be classified into five categories:

- corrosion;
- stress corrosion cracking;
- hydrogen embrittlement;