SLOVENSKI STANDARD
SIST EN ISO 7866:2012

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Nadomešča:
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Plinske jeklenke - Ponovno polnljive plinske jeklenke iz celega iz aluminijevih zlitin - Konstruiranje, izdelava in preskušanje (ISO 7866:2012)

Gas cylinders - Refillable seamless aluminium alloy gas cylinders - Design, construction and testing (ISO 7866:2012)

Gasflaschen - Wiederbefüllbare nahtlose Gasflaschen aus Aluminiumlegierungen - Auslegung, Bau und Prüfung (ISO 7866:2012)

Bouteilles à gaz - Bouteilles à gaz sans soudure en alliage d'aluminium destinées à être rechargées - Conception, construction et essais (ISO 7866:2012)

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Gas cylinders - Refillable seamless aluminium alloy gas cylinders - Design, construction and testing (ISO 7866:2012)

Bouteilles à gaz - Bouteilles à gaz sans soudure en alliage d'aluminium destinées à être rechargées - Conception, construction et essais (ISO 7866:2012)

Gasflaschen - Wiederbefüllbare nahtlose Gasflaschen aus Aluminiumlegierungen - Auslegung, Bau und Prüfung (ISO 7866:2012)

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN ISO 7866:2012) 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of an identical text or by endorsement, at the latest by March 2013, and conflicting national standards shall be withdrawn at the latest by March 2013.

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The text of ISO 7866:2012 has been approved by CEN as a EN ISO 7866:2012 without any modification.

INTERNATIONAL STANDARD

ISO 7866

Second edition
2012-09-01

Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing

Bouteilles à gaz — Bouteilles à gaz sans soudure en alliage d'aluminium destinées à être rechargées — Conception, construction et essais

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

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ISO 7866 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 3, and by Technical Committee CEN/TC 23, *Transportable gas cylinders* in collaboration.

This second edition cancels and replaces the first edition (ISO 7866:1999), which has been technically revised.

The following significant technical changes have been carried out:

— a new subclause (11.7) has been added to address unacceptable manufacturing defects and unacceptable surface features at the time of manufacture and changes have been made to other subclauses to compliment the new subclause;

— terms and definitions and the symbols have been revised;

— terminology changes included: “stress” changed to “strength”;

— various editorial errors were corrected;

— equipment calibration requirements were added;

— defining "defect" as a feature caused by the manufacturing/manufacturer; and

— defining "imperfection" as damage or feature not caused by manufacturing/manufacturer.

Introduction

The purpose of this International Standard is to provide a specification for the design, manufacture, inspection and testing of a seamless aluminium alloy gas cylinder for worldwide usage. The objective is to balance design and economic efficiency against international acceptance and universal utility.

This International Standard aims to eliminate the concern about climate, duplicate inspections and restrictions currently existing because of lack of definitive International Standards. This International Standard should not be construed as reflecting on the suitability of the practice of any nation or region.

Following publication, this International Standard will be submitted for reference in the UN Recommendations on the Transport of Dangerous Goods – Model Regulations.

Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing

1 Scope

This International Standard specifies minimum requirements for the material, design, construction and workmanship, manufacturing processes and tests at time of manufacture of refillable seamless aluminium alloy gas cylinders of water capacities up to and including 150 litres for compressed, liquefied and dissolved gases for worldwide use (normally up to +65 °C).

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

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 7438, *Metallic materials — Bend test*

ISO 7539-6:2011, *Corrosion of metals and alloys — Stress corrosion testing — Part 6: Preparation and use of pre-cracked specimens for tests under constant load or constant displacement*

ISO 10461, *Gas cylinders — Seamless aluminium-alloy gas cylinders — Periodic inspection and testing*

ISO 11117, *Gas cylinders — Valve protection caps and valve guards — Design, construction and tests*

ISO 13341, *Gas cylinders — Fitting of valves to gas cylinders*

ISO 13769, *Gas cylinders — Stamp marking*

3 Terms and definitions

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

3.1
artificial ageing
heat treatment process in which the solute phase is precipitated to give an increased yield strength and tensile strength

3.2
bar·litres
product of the test pressure (in bars) and the water capacity (in litres)

3.3
batch
quantity of gas cylinders, plus gas cylinders for destructive testing, of the same nominal diameter, wall thickness, length and design, made successively from the same cast of aluminium alloy and subjected to the same heat treatment on the same equipment for the same duration of time

NOTE See Table G.1 for batch size requirements.

3.4
design stress factor (variable)
F
ratio of equivalent wall stress at test pressure, p_h, to the guaranteed minimum yield strength, R_{eg}

3.5
IAA
registration record of international alloy designations and chemical composition limits for wrought aluminium and wrought aluminium alloys as published by the Aluminum Association[1)]

NOTE Such aluminium alloys are designated by the prefix “AA”.

3.6
mass of a gas cylinder
combined mass of the gas cylinder and all permanently attached parts (e.g. foot ring, neck ring), but without the valve

NOTE Mass is expressed in kilograms.

3.7
quenching
controlled rapid cooling in a suitable medium to retain the solute phase in solid solution

3.8
solution heat treatment
thermal treatment which consists of heating products to a suitable temperature and holding them at that temperature long enough to allow constituents to enter into solid solution

3.9
stabilizing heat treatment
non-ageing heat treatment applied to 5 000-series aluminium alloys in order to minimize changes in mechanical properties and structure under service conditions

3.10
yield strength
value corresponding to the 0,2 % proof strength (0,2% non-proportional elongation), $R_{p0,2}$, for aluminium alloys

4 Symbols

a calculated minimum wall thickness, in millimetres, of the cylindrical shell (see Figure 1)

a' guaranteed minimum wall thickness, in millimetres, of the cylindrical shell

A percentage elongation after fracture

b guaranteed minimum thickness, in millimetres, at the centre of a convex base (see Figure 1)

1) Aluminum Association Inc., 900, 19th Street N.W., Washington D.C., 20006-2168, USA.

d' positive circular development of fracture

d'' negative circular development of fracture

D nominal outside diameter, in millimetres, of the cylinder (see Figure 1 and Figure 2)

D_1 nominal outside diameter, in millimeters, of the cylinder neck (see Figure 2)".

D_f diameter, in millimetres, of the bend test former (see Figure 5)

E modulus of elasticity

F design stress factor (variable) (see 3.4)

H outside height, in millimetres, of the domed part (convex head or base end) (see Figure 1)

L' length of short branch of fracture, in millimeters

L'' length of long branch of fracture, in millimeters

L_o original gauge length, in millimetres, as defined in ISO 6892-1 (see Figure 4)

n ratio of the diameter of the bend test former to the actual thickness of the test specimen, t

p_b actual burst pressure, in bars above atmospheric pressure

p_f failure pressure, in bars

p_h hydraulic test pressure, in bars above atmospheric pressure

p_u upper cycling pressure, in bars

p_y observed pressure when gas cylinder starts yielding during hydraulic bursting test, in bars above atmospheric pressure

r inside knuckle radius, in millimetres (see Figure 1)

r_c tip radius, in millimeters

r_i inside crown radius, in millimetres (see Figure 1)

R maximum stress value, in MPa

R_{ea} actual value of the yield strength, in megapascals, as determined by the tensile test specified in 10.2 for the finished gas cylinder

R_{eg} minimum guaranteed value of the yield strength (see 3.10), in megapascals, for the finished gas cylinder

R_{ma} actual value of the tensile strength, in megapascals, as determined by the tensile test specified in 10.2 for the finished gas cylinder

R_{mg} minimum guaranteed value of the tensile strength, in megapascals, for the finished gas cylinder

$R_{p0,2}$ 0,2 % proof strength (0,2% non-proportional elongation), for aluminium alloys

S_o original cross-sectional area, in square millimetres, of the tensile test specimen in accordance with ISO 6892-1

t actual wall thickness, in millimetres, of the test specimen