

DfYa] bYd`]bg_Y^Y`Yb_YE`Dcbcj bc`dc`b`^j]j Uf^Yb]`j gYVb]`_jg`dfcglcfb]bc`bY
 j Y `c`_ch%\$`]fjcj `E`%XY`J Uf^YbY^Y`Yb_Y]n`Uj ghYb]hbY[UbYf^Uj bY[U^Y`Uz
]nXYUbYdc`Y_gdYf]a YbHJbc`dcf^Yb]a YtcX]

Transportable gas cylinders - Refillable welded receptacles of a capacity not exceeding 150 litres - Part 1: Welded austenitic stainless steel cylinders made to a design justified by experimental methods

Ortsbewegliche Gasflaschen - Wiederbefüllbare geschweißte Gefäße mit einem Fassungsraum von nicht mehr als 150 Liter - Teil 1: Flaschen aus geschweißtem, austenitischen, nichtrostendem Stahl, ausgelegt nach experimentellen Verfahren

SIST EN 14638-1:2006

Bouteilles a gaz transportables - Récipients soudés rechargeables d'une capacité inférieure ou égale a 150 litres - Partie 1: Bouteilles en acier inoxydable austénitique soudées conçues par des méthodes expérimentales

Ta slovenski standard je istoveten z: EN 14638-1:2006

ICS:

23.020.30	V æ } ^Å [• [å ^Å] å • \ ^ b\ ^ } \ ^	Pressure vessels, gas cylinders
-----------	---	---------------------------------

SIST EN 14638-1:2006 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 14638-1:2006

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97f3-2041668ed763/sist-en-14638-1-2006>

ICS 23.020.30

English Version

Transportable gas cylinders - Refillable welded receptacles of a capacity not exceeding 150 litres - Part 1: Welded austenitic stainless steel cylinders made to a design justified by experimental methods

Bouteilles à gaz transportables - Récipients soudés rechargeables d'une capacité inférieure ou égale à 150 litres - Partie 1: Bouteilles en acier inoxydable austénitique soudées, conçues selon des méthodes expérimentales

Ortsbewegliche Gasflaschen - Wiederbefüllbare geschweißte Gefäße mit einem Fassungsraum von nicht mehr als 150 Liter - Teil 1: Flaschen aus geschweißtem, austenitischen, nichtrostendem Stahl, ausgelegt nach experimentellen Verfahren

This European Standard was approved by CEN on 23 March 2006.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97b3-30816715712/belgium/14638-1-2006>

CEN members are the national standards bodies of Austria, Belgium, 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 and United Kingdom.



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

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

Contents	Page
Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms, definitions and symbols.....	6
4 Materials and heat treatment	8
5 Design	9
6 Construction and workmanship.....	10
7 New design tests	12
8 Marking.....	24
9 Conformity evaluation criteria.....	24
10 Records	24
Annex A (normative) Non destructive examination (NDE) of welds	25
Annex B (normative) Description, evaluation of manufacturing defects and conditions for rejection of welded stainless steel gas cylinders at time of final visual inspection by the manufacturer	27
Annex C (informative) Model - Production certificate	30
Annex D (informative) Recommendations to be applied in case of heat treatments on austenitic stainless steels	33
Bibliography	34

Foreword

This document (EN 14638-1:2006) 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 November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

This document 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 implement this European Standard: Austria, Belgium, 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 and United Kingdom.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 14638-1:2006

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97f3-2041668ed763/sist-en-14638-1-2006>

Introduction

The purpose of this European Standard is to provide a specification for the design, manufacture, inspection and approval of welded austenitic stainless steel gas cylinders for use in the countries of the CEN members.

The specifications given in the present standard establish the methodology to be adopted in order to demonstrate that a cylinder conforms to the functional requirements demanded, based on the experience about materials, design prescriptions, manufacturing processes and controls manufacturing.

This European Standard comprises experimental methods and appropriate stress analysis calculations. It does not cover methods exclusively by means of traditional calculation.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 14638-1:2006](https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97b3-2041668ed763/sist-en-14638-1-2006)

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97b3-2041668ed763/sist-en-14638-1-2006>

1 Scope

This European Standard gives minimum requirements concerning material, design, construction and workmanship, procedures and tests at manufacture of refillable transportable welded cylinders made of austenitic stainless steel, justified by experimental methods, of water capacities from 0,5 l up to and including 150 l for compressed or liquefied gases and of a test pressure up to 90 bar.

NOTE This European Standard may also be used as a guideline for cylinders less than 0,5 litres water capacity.

This European Standard is primarily for industrial gases other than LPG but may also be applied for LPG. However for dedicated LPG cylinders, see EN 14140, *Transportable refillable welded steel cylinders for liquefied petroleum gas (LPG) – Alternative design and construction* prepared by CEN/TC 286 *Liquefied petroleum gas equipment and accessories*.

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.

EN 287-1, *Qualification test of welders - Fusion welding - Part 1: Steels*

EN 473, *Non destructive testing — Qualification and certification of NDT personnel — General principles*

EN 910, *Destructive tests on welds in metallic materials — Bend tests*

EN 962, *Transportable gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests*

EN 970, *Non-destructive examination of fusion welds — Visual examination*

EN 1435, *Non destructive examination of welds — Radiographic examination of welded joints*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10028-7, *Flat products made of steels for pressure purposes — Part 7: Stainless steels*

EN 10045-1, *Metallic materials — Charpy impact test — Part 1: Test method*

EN 10088-2, *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 13445-2, *Unfired pressure vessels — Part 2: Materials*

EN ISO 3651-2, *Determination of resistance to intergranular corrosion of stainless steels — Part 2: Ferritic, austenitic and ferritic-austenitic (duplex) stainless steels — Corrosion test in media containing sulfuric acid (ISO 3651-2:1998)*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003)*

EN ISO 7539-6, *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 7539-6:2003)*

EN ISO 10692-2, *Gas cylinders — Gas cylinder valve connections for use in the microelectronics industry — Part 2: Specification and type testing for valve to cylinder connections (ISO 10692-2:2001)*

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

prEN ISO 13769: 2005, *Gas cylinders — Stampmarking (ISO 13769:2002)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials — General rules (ISO 15607:2003)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*

ISO 2504:1973, *Radiography of welds and viewing conditions for films — Utilization of recommended patterns of image quality indicators (I.Q.I.)*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1

yield stress

either the 0,2 % proof stress, $R_{p0,2}$, – or the 1,0 % proof stress, $R_{p1,0}$ where there is no apparent definite value for $R_{p0,2}$, as for example, is the case for austenitic steels

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 14638-1:2006

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97f3-2041668ed763/sist-en-14638-1-2006>

3.1.2

solution annealing

heat treatment in which the steel is heated to a uniform temperature above the solid solubility temperature followed by rapid cooling

3.1.3

parent material

material corresponding to the cylinder after finishing its manufacturing process and ready for service/operation

NOTE The material characteristics may be variable at any point of the cylinder.

3.1.4

batch

consists of finished cylinders made consecutively during the same or consecutive days to the same design, size and material specifications and from the same material supplier for each pressure containing parts on the same automatic welding machines and, if applicable, heat-treated under the same conditions of temperature and duration

NOTE 1 In this context consecutively need not imply continuous production.

NOTE 2 This definition allows different suppliers to be used for the different pressure containing parts within a batch, e.g. one supplier for heads, another for bases.

3.1.5

cylinder

transportable pressure receptacle of a water capacity not exceeding 150 l

3.1.6**finished cylinder**

cylinder which is fully assembled and appropriately stampmarked, but without any external coatings

3.1.7**cryoforming**

process where the cylinder is subjected to a controlled low temperature deformation treatment that results in a permanent increase in strength

3.1.8**coldforming**

final deformation treatment at ambient temperature given to the prefabricated cylinder, known as the preform, which results in a permanent increase in the material strength

3.1.9**valve boss or pad**

connection between valve and cylinder

3.2 Symbols

a Minimum thickness, in millimetres, for calculation of weld clearance (see Figure 1);

a_{si} calculated minimum thickness, in millimetres, at a determined area " i " of the cylinder;

a_{bi} minimum thickness, in millimetres, at a determined area " i " of the cylinder (including any corrosion allowance) guaranteed by the manufacturer;

A_i percentage elongation after fracture, at a determined area " i " of the cylinder;

i area of the cylinder used for the calculation under consideration;

L , original gauge length, in millimetres, in accordance with EN 10002-1;

n ratio of diameter of bend test former to the thickness of the test piece;

P_h test pressure, in bar, above atmospheric pressure;

P_b minimum burst pressure, in bar;

P_{ba} actual burst pressure, in bar;

$R_{pi1,0}$ minimum value of 1,0 % proof stress in MPa, guaranteed by the cylinder manufacturer for the finished cylinder, at a determined area " i " of the cylinder;

R_{gi} minimum value of tensile stress, in MPa, guaranteed by the cylinder manufacturer for the finished cylinder, at a determined area " i " of the cylinder;

R_{mi} actual value of tensile stress, in MPa, determined by tensile test specified in Clause 7, at a determined area " i " of the cylinder;

R_{ei} yield stress means the stress at which a permanent elongation of 1 % of the gauge length on the test-piece, has been produced, at a determined area " i " of the cylinder;

R_{eai} actual value of yield stress used for calculation, in MPa, at a determined area " i " of the cylinder;

s nominal butt weld thickness.

4 Materials and heat treatment

4.1 General

4.1.1 The cylinder materials subject to pressure shall be of austenitic stainless steel according to EN 10088 or EN 10028-7 or other austenitic stainless steels standards, provided that they satisfy the requirements of this European Standard.

NOTE These materials correspond to the materials received by the manufacturer, before having been submitted to any manufacturing process.

4.1.2 The welding consumables shall be such that they are capable of giving consistent welds. The material characteristics on the welds shall have to be considered by design.

4.1.3 Grades of steel used for the cylinder manufacture shall be compatible with the intended gas service, e.g. corrosive gases, embrittling gases according to EN ISO 11114-1.

4.1.4 There is a risk of sensitisation to inter-granular corrosion resulting from the hot processing of austenitic stainless steels. An inter-granular corrosion test in accordance with **7.5.4** shall be carried out on such stainless steels when intended to be used for corrosive applications. Corrosive gases are listed in EN 1968 and cylinders for such gases shall be marked as specified in prEN ISO 13769.

4.1.5 The manufacturer shall be able to guarantee cylinder steel casting traceability for each pressure retaining part.

4.1.6 All parts welded to, or in contact with, the cylinder shall be made of compatible material with the cylinder without harming its characteristics or favouring corrosion processes.

4.1.7 The cylinder manufacturer shall obtain and provide certificates of the ladle analysis of the steel supplied for the construction of the pressure retaining parts of the cylinder and of welding consumables.

4.1.8 The manufacturer shall demonstrate that the material is resistant to stress corrosion cracking. Where there is any doubt, tests shall be carried out on finished cylinders according to EN ISO 7539-6 or equivalent. The manufacturer shall assess the results according to the type of steel and the relevant environment under consideration.

4.2 Heat treatment

There is no obligation to perform heat treatments. When the manufacturer considers the necessity of a heat treatment, it should be in accordance with Annex D.

4.3 Test requirements

The material of the finished cylinders shall satisfy the requirements of Clause 7.

4.4 Failure to meet test requirements

4.4.1 In the event of failure to meet test requirements, retesting shall be carried out as given in **4.4.2** and **4.4.3**.

4.4.2 If there is evidence of a fault in carrying out a test or an error of measurement, a further test shall be performed. If the result of the test is satisfactory, the first test shall be ignored.

4.4.3 If the test has been carried out in a satisfactory manner, the cause of test failure shall be identified.

— If the failure is considered to be due to inappropriate heat treatment (if applied), the manufacturer may subject all the cylinders of the batch to a further heat treatment;

— if the failure is not due to inappropriate heat treatment (if applied), all the identified defective cylinders shall be rejected or repaired by an approved method. The remaining cylinders are then considered as a new batch.

In both cases the new batch shall be tested. All the relevant prototype or batch tests needed to prove the acceptability of the new batch shall be performed again and shall satisfy the requirements for batch or prototype testing.

If one or more tests prove even partially unsatisfactory, all the cylinders of the batch shall be rejected.

5 Design

5.1 General

For any new design, the concepts outlined in **5.2** and **5.3** shall be followed. It is recommended that an approximate calculation for the initial design be made. This initial calculated design may then be optimised if results from the experimental method exceed the minimum requirements.

5.2 Calculation

Where a calculation is to be used as the basis for the design, the following conditions shall be considered.

— the calculation of the wall thickness of the pressure containing parts “*t*” shall be related to the yield stress of the material, of the finished product in each area “*t*” to be considered;

— for calculation purposes, the value of the yield stress R_{eai} is limited to a maximum of $0,85 R_{\text{gi}}$;

— The internal pressure upon which the calculation of gas cylinders is based, shall be the test pressure P_{h} .

NOTE At the test pressure, the stress in the metal at the most severely stressed point of the cylinder shall not exceed 77 % of the guaranteed yield stress (R_{eai}). This can be verified by for example, studying the stress analysis.

5.3 Experimental method

An experimental method shall be used as the basis for the design. The following conditions shall be met.

— the actual wall thickness, mechanical properties and the geometry of the cylinders submitted to the prototype tests shall be recorded;

— the manufacturer shall take into account the requirements of **7.2** and ensure that the properties recorded represent the minimum values that would be used for production.

5.4 Openings

5.4.1 Each opening in the cylinder shall be reinforced, either by a valve boss or pad, of weldable and compatible steel, securely attached by welding and so designed as to be of adequate strength and to result in no harmful stress concentrations. This shall be confirmed by prototype testing.

5.4.2 When openings in the cylinder are reinforced, either by a valve boss or pad, they shall be of weldable and compatible steel, securely attached by welding and so designed as to be of adequate strength and to result in no harmful stress concentrations. This shall be confirmed by prototype test.

5.4.3 Openings shall be clear of longitudinal and circumferential joints by a distance not less than $3a$ (see Figure 1).

6 Construction and workmanship

6.1 Manufacturing methods

6.1.1 The essential characteristics of the manufacturing processes applied and the corresponding parameters shall be defined in the technical specification of the cylinder (see 7.1).

6.1.2 The manufacturer shall have the technical capability, have at his disposal all appropriate means, and qualified personnel to carry out the manufacture of cylinders.

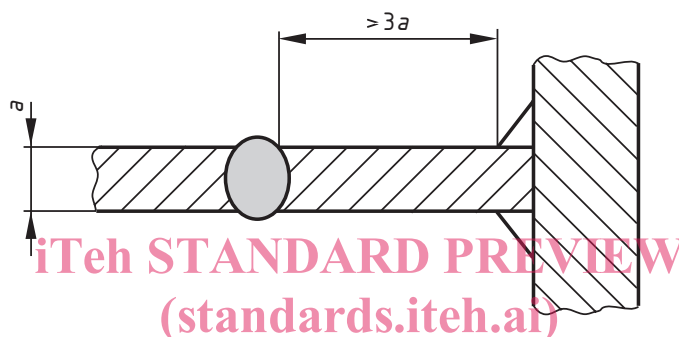


Figure 1 — Weld clearance

<https://standards.iteh.ai/catalog/standards/sist/29d64388-39e3-42a8-97f3-2041668ed763/sist-en-14638-1-2006>

6.2 Welding procedures

Each manufacturer, before proceeding with the production of a given design of cylinder, shall qualify the welding procedures and welders according to EN ISO 15614-1, EN ISO 15607 and EN 287-1. Records of such qualification shall be kept on file by the manufacturer.

The welding procedure approval shall include a sensitisation test performed according to EN ISO 3651-2.

6.3 Plates and pressed parts

Care shall be taken to avoid contamination from other manufacturing materials, e.g. potential of galvanic corrosion from carbon steel particles.

6.4 Welded pressure containing joints

With exception of welds for openings, all welded joints shall be butt welded or joggle welded. When designing the welds, the cylinder manufacturer shall take into account the intended service, e.g. corrosive gases according to EN ISO 11114-1.

6.5 Non-pressure-containing attachments

6.5.1 Non pressure containing parts such as footrings, handles and neckrings which are not submitted to pressure shall be made in accordance with 4.1.6.

6.5.2 Each attachment shall be designed to permit inspection of the welds, which shall be clear of longitudinal and circumferential joints, and so designed as to avoid trapping water.