
**Gas cylinders — Refillable welded
stainless steel cylinders —**

**Part 2:
Test pressure greater than 6 MPa**

*Bouteilles à gaz — Bouteilles soudées en acier inoxydable
rechargeables —*

Partie 2: Pression d'épreuve supérieure à 6 MPa



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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.

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 18172-2 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 3, *Cylinder design*.

ISO 18172 consists of the following parts, under the general title *Gas cylinders — Refillable welded stainless steel cylinders*:

- *Part 1: Test pressure 6 MPa and below*
- *Part 2: Test pressure greater than 6 MPa*

Introduction

The purpose of this part of ISO 18172 is to provide a specification for the design, manufacture and testing of refillable, transportable, welded stainless steel gas cylinders with a test pressure above 6 MPa (60 bar).

The specifications given are based on knowledge of, and experience with, materials, design requirements, manufacturing processes and control during manufacture of cylinders in common use.

ISO 18172 has been prepared to address the general requirements in Section 6.2.1 of the UN model regulations for the transportation of dangerous goods ST/SG/AC.10/1/Rev.13. It is intended to be used under a variety of regulatory regimes, but has been written so that it is suitable for use with the conformity assessment system in paragraph 6.2.2.5 of the above-mentioned model regulations.

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Gas cylinders — Refillable welded stainless steel cylinders —

Part 2:

Test pressure greater than 6 MPa

1 Scope

This part of ISO 18172 specifies minimum requirements concerning material, design, construction and workmanship, manufacturing processes and testing of refillable transportable welded stainless steel gas cylinders, of water capacities from 0,5 l up to and including 150 l, for compressed and liquefied gases. This part of ISO 18172 is applicable only to cylinders manufactured from stainless steels with a maximum tensile strength of less than 1 100 MPa and a test pressure above 6 MPa (60 bar).

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

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

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

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

ISO 7438, *Metallic materials — Bend test*

ISO 9328-7:2004, *Steel flat products for pressure purposes — Technical delivery conditions — Part 7: Stainless steels*

ISO 9606-1, *Approval testing of welders — Fusion welding — Part 1: Steels*

ISO 9956-1, *Specification and approval of welding procedures for metallic materials — Part 1: General rules for fusion welding*

ISO 9956-3, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for arc welding of steels*

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

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

ISO 13769, *Gas cylinders — Stamp marking*

ISO 14556, *Steel — Charpy V-notch pendulum impact test — Instrumented test method*

ISO 14732, *Welding personnel — Approval testing of welding operators for fusion welding and of resistance weld setters for fully mechanized and automatic welding of metallic materials*

ISO 17636, *Non-destructive testing of welds — Radiographic testing of fusion-welded joints*

ISO 17637, *Non-destructive testing of welds — Visual testing of fusion-welded joints*

ISO 20807, *Non-destructive testing — Qualification of personnel for limited application of non-destructive testing*

3 Terms, definitions and symbols

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

3.1 Terms and definitions

3.1.1

yield stress

value corresponding to 0,2 % proof stress ($R_{p0,2}$) or, for austenitic steels in the solution annealed condition, 1 % proof stress ($R_{p1,0}$)

3.1.2

solution annealing

softening heat treatment for austenitic steels in which a cylinder is heated to a uniform temperature above the solid solution temperature, followed by rapid cooling

3.1.3

cryoforming

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

3.1.4

cold working

plastic deformation treatment given to sheet material at ambient temperature, with the aim of permanently increasing the material strength

3.1.5

cold forming

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

3.1.6

batch

quantity of cylinders made consecutively by the same manufacturer, using the same manufacturing techniques, to the same design, size and material, from the same cast on the same type of welding machines and welding procedures

3.1.7

design stress factor

F

ratio of equivalent wall stress at test pressure (p_H) to guaranteed minimum yield stress (R_e)