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**Gasflaskor – Återfyllningsbara svetsade behållare med kapacitet mindre än 150 l –**
**Del 3: Svetsade behållare av kolstål tillverkade enligt konstruktion baserat på experimentella metoder**

**Transportable gas cylinders – Refillable welded receptacles of a capacity not exceeding 150 litres –**
**Part 3: Welded carbon steel cylinders made to a design justified by experimental methods**

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Denna standard är framtagen av kommitén för Gasflaskor, SIS/TK 296.

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# EUROPEAN STANDARD
# NORME EUROPÉENNE
# EUROPÄISCHE NORM

**EN 14638-3**

August 2010

ICS 23.020.30

English Version

# Transportable gas cylinders - Refillable welded receptacles of a capacity not exceeding 150 litres - Part 3: Welded carbon 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 3: Bouteilles en acier carbone soudées conçues par des méthodes expérimentales

Ortsbewegliche Gasflaschen - Wiederbefüllbare geschweißte Gefäße mit einem Fassungsraum von nicht mehr als 150 Liter - Teil 3: Flaschen aus geschweißtem Kohlenstoffstahl, ausgelegt nach experimentellen Verfahren

This European Standard was approved by CEN on 23 July 2010.

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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 Management Centre has the same status as the official versions.

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

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Ref. No. EN 14638-3:2010: E

# Contents

Page

## Foreword

This document (EN 14638-3:2010) 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of an identical text or by endorsement, at the latest by February 2011 and conflicting national standards shall be withdrawn at the latest by February 2011.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports the objectives of the framework Directives on Transport of Dangerous Goods [1] and [2].

This European Standard has been submitted for reference into the RID [3] and/or in the technical annexes of the ADR [4].

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# Introduction

The purpose of this European Standard is to provide a specification for the design, manufacture, inspection and approval of welded carbon 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 to demonstrate that a cylinder conforms to the functional requirements demanded, based on experience of materials, design prescriptions, manufacturing processes and controls manufacturing.

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

## 1 Scope

This European Standard specifies minimum requirements concerning material, design, construction and workmanship, procedures and tests at manufacture of refillable transportable welded cylinders made of carbon 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 l water capacity.

This European Standard is primarily intended for industrial gases other than LPG but may also be applied for LPG. However, for dedicated LPG cylinders see EN 14140 [5], prepared by CEN/TC 286.

## 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, *Approval testing of welders — Fusion welding — Part 1: Steels*

EN 462-1, *Non-destructive testing — Image quality of radiographs — Part 1: Image quality indicators (wire type) — Determination of image quality value*

EN 462-2, *Non-destructive testing — Image quality of radiographs — Part 2: Image quality indicators (step/hole type) — Determination of image quality value*

EN 473:2008, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

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

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

EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

EN 1435:1997, *Non destructive examination of welds — Radiographic examination of welded joints*

EN 1803, *Transportable gas cylinders — Periodic inspection and testing of welded carbon steel gas cylinders*

EN 10028-1, *Flat products made of steels for pressure purposes — Part 1: General requirements*

EN 10028-3, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-5, *Flat products made of steels for pressure purposes — Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 10045-1, *Metallic materials — Charpy impact test — Part1: Test method*

EN 10052, *Vocabulary of heat treatment terms for ferrous products*

EN 10083-1, *Steels for quenching and tempering — Part1: General technical delivery conditions*

EN 10084, *Case hardening steels — Technical delivery conditions*

EN 10120, *Steel sheet and strip for welded gas cylinders*

EN 10268, *Cold rolled steel flat products with high yield strength for cold forming — Technical delivery conditions*

EN 14784-1, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

EN 14784-2, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 2: General principles for testing of metallic materials using X-rays and gamma rays*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2003, corrected version:2005, including Technical Corrigendum 1:2006)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

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)*

EN ISO 11117:2008, *Gas cylinders — Valve protection caps and valve guards — Design, construction and tests (ISO 11117:2008)*

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

## 3 Terms, definitions and symbols

### 3.1 Terms and definitions

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

**3.1.1**
**yield strength**
stress value corresponding to the lower yield strength, $R_{eL}$, or 0,92 × the upper yield strength, $R_{eH}$, or for steels that do not exhibit a lower ($R_{eL}$) and an upper ($R_{eH}$) yield strength (sometimes named “lower and upper yield point” at tensile testing, the 0,2 % proof strength $R_{p0,2}$

**3.1.2**
**normalizing**
heat treatment in which the steel is heated to a uniform temperature above the upper critical point (Ac3) of the steel and then cooled in still air or in a controlled atmosphere

**3.1.3**
**stress relieving**
heat treatment given to the finished cylinder, the object of which is to reduce the residual stresses without altering the metallurgical structure of the steel, by heating to a uniform temperature below the critical point (Ac1, as defined in EN 10052) of the steel and cooling in a still atmosphere

**3.1.4**
**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.

**3.1.5**
**batch**
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.

**3.1.6**
**cylinder**
transportable pressure receptacle of a water capacity not exceeding 150 l

**3.1.7**
**finished cylinder**
cylinder which is fully assembled and appropriately stamp marked, but without any external coatings

**3.1.8**
**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 and a permanent decrease in elongation

**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 |