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Second edition
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Gas cylinders — Inspection and maintenance of valves

Bouteilles à gaz — Contrôle et maintenance des robinets

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 23, *Transportable 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 22434:2006), which has been technically revised. The main changes are as follows:

— the Scope has been revised;

— the Normative references have been updated;

— the Terms and definitions have been updated;

— subclauses 5.1, 5.2.2 and 5.3.2 have been modified;

— Clause 6 “Testing” has been moved to 5.4 and has been modified;

— marking requirements have been modified;

— the Bibliography has been updated.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document has been written so that it is suitable to be referenced in the UN Model Regulations[1].

Gas cylinders — Inspection and maintenance of valves

1 Scope

This document specifies requirements for the inspection and maintenance of valves [including ball valves and valves with integrated pressure regulator (VIPRs)] for:

a) refillable transportable gas cylinders;

b) cylinder bundles;

c) pressure drums and tubes;

which convey compressed, liquefied or dissolved gases.

This document does not apply to valves for liquefied petroleum gas (LPG).

NOTE Where there is no risk of ambiguity, gas cylinders, cylinder bundles, pressure drums and tubes are addressed with the collective term "gas cylinders" within this document.

This document is applicable to valves reused at the time of the periodic inspection of gas cylinders, cylinder bundles, pressure drums and tubes, and can be applied at any other time, e.g. at a change of gas service (see ISO 11621).

This document does not apply to the routine inspection of valves, e.g. carried out at the time of a gas cylinder filling.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10286, *Gas cylinders — Vocabulary*

ISO 14246, *Gas cylinders — Cylinder valves — Manufacturing tests and examinations*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10286 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
inspection
procedure to determine if a valve is suitable for further service

3.2
dismantling
separation of the valve into its component parts, such that the main pressure barrier of the valve is breached

3.3
removal
disconnection of the valve from the gas cylinder

3.4
maintenance
operations required to keep the valve in working condition

Note 1 to entry: This covers *minor repairs* (3.4.1), *major repairs* (3.4.2) and *refurbishment* (3.4.3).

3.4.1
minor repair
operation including cleaning and replacement of non-pressure-retaining components

EXAMPLE Handwheel, outlet flow restrictor.

3.4.2
major repair
operation including replacement of valve accessories which are incorporated within the pressure boundary, but do not require *dismantling* (3.2) of the valve

EXAMPLE Pressure relief device (PRD), pressure gauges, flowmeter, residual pressure device.

3.4.3
refurbishment
operation involving *dismantling* (3.2) of the valve, evaluation and re-use or replacement (if necessary) of its internal components, and reassembly to make it suitable for further service

4 General requirements

4.1 Frequency of inspection and maintenance

If a valve is deemed to require maintenance at any time, e.g. at the time of periodic inspection and testing of a gas cylinder, it shall either be subject to maintenance in accordance with 5.3 or scrapped in accordance with Clause 8.

4.2 Personnel

Valves shall be inspected, maintained and removed from gas cylinders by competent personnel only.

4.3 Safety concerns

Prior to removing the valve from a gas cylinder, it shall be verified that no pressure above atmospheric pressure remains in the cylinder.

NOTE ISO 25760 provides guidance for the safe removal of cylinder valves and assessment related to gas hazards.

Inspection and minor repairs may be carried out on valves while they are connected to a pressurized gas cylinder, but this requires special procedures.

Major repairs and refurbishment shall only be performed on a valve in a de-pressurized gas cylinder or on a removed valve.

5 Inspection and maintenance

5.1 General

Inspection will determine if a valve is suitable for continued service or if maintenance is required, and the level of that maintenance.

If the manufacturer has declared a service life for a valve and when that service life has expired, the valve shall:

a) not be put back in service, or

b) if the intention is to extend the service life of the valve for an additional period, the valve shall be inspected and maintained in accordance with this document and in accordance with a specification agreed with the manufacturer or successor.

NOTE Applicable regulations can affect an extension of the service life.

5.2 Inspection

5.2.1 General

Inspection of valves comprises external examination preceded by cleaning, if necessary.

5.2.2 Cleaning

WARNING — Used valves can contain hazardous substances (e.g. toxic). A safety assessment should be performed to address any hazards associated with cleaning the cylinder valves. A procedure should be in place to protect personnel from any hazards identified in the safety assessment before cleaning the valves. Disposal of contaminates from the cleaning process can be subject to local regulations.

The external parts of the valve shall be clean to facilitate inspection.

Contamination, foreign bodies and corrosion products shall be removed from the valve outlet taking care not to damage any sealing surfaces.

If any cleaning media are used, they shall be suitable for the intended gas service (e.g. medical, oxygen), the materials of construction of the valve, the gas cylinder and the associated downstream equipment. Cleaning media shall be completely removed.

The cleaning agent shall be compatible with the materials of the valve. For example, for brass components, the cleaning agent shall not contain ammonia or amine radicals, which could lead to stress corrosion cracking.

5.2.3 External examination — Valve remaining in the gas cylinder

Valves shall be examined for defects including the following:

a) the spindle does not move smoothly or is difficult to turn;

NOTE This verification is also carried out under pressure during the first filling checks.

b) bent, deformed, corroded, illegibly marked and scored bodies or those with cracks;

c) bent or damaged spindles;

d) cross-threaded, damaged, worn, corroded or stripped valve outlet and filling connections;

e) damaged, corroded or worn outlet sealing surfaces and/or any non-metallic sealing element;

f) any indication of having been subjected to excessive heat or having been in a fire;

g) foreign matter obstructing or blocking ports;

h) distorted wrenching flats on key operated valves;

i) evidence of abuse or tampering;

j) evidence of damaged gauges;

k) damage to handwheels;

l) missing or potentially damaged residual pressure device;

m) incorrect rating of the PRD;

n) inappropriate valve for the gas service;

o) contamination or suspect improper lubrication or sealant at the valve to gas cylinder interface;

p) loose gland nuts.

5.2.4 Additional external examination — Valve removed from gas cylinder

In addition to the above requirements, if the valve has been removed from the gas cylinder, it shall be visually examined for the following additional defects after all residual jointing compound has been removed from the valve inlet connection:

a) contamination, foreign bodies and corrosion products in the valve stem bore;

b) cross-threaded, damaged, worn, deformed or stripped inlet connection;

c) damaged dip tube, eductor tube or retaining threads;

d) damaged inlet filter;

e) damaged liquid or pressure level indicating device;

f) damaged overfill prevention device;

g) damaged excess flow prevention device.

5.2.5 Acceptance criteria

Valves not exhibiting the defects listed in 5.2.3 (and 5.2.4 if applicable) may re-enter service.

Valves with any of the defects listed above shall either be subject to maintenance in accordance with 5.3 or scrapped in accordance with Clause 8.

5.3 Maintenance

5.3.1 Minor repairs

Handwheels and other non-pressure retaining parts (e.g. outlet flow restrictor) shall be assessed for reuse, repair or replacement as appropriate.

5.3.2 Major repairs

If the design of the gland nut requires re-torquing, gland nuts shall be re-torqued to the original manufacturing value and using the recommended procedures.

For valves equipped with PRDs, if the PRD is to be replaced, it shall be replaced by items to the manufacturer's original specification and in accordance with their instructions.

Other accessories requiring replacement without dismantling the valve (e.g. residual pressure devices) shall meet the original valve manufacturer's specification and shall be replaced according to their instructions.

5.3.3 Refurbishment

5.3.3.1 General

Valves may only be refurbished if they are designed to be dismantled and reassembled.

Refurbishment shall be carried out after decontamination, as appropriate. Where replacement parts are used, they shall be in accordance with the valve manufacturer's specification for the intended gas service.

Valves shall be dismantled in accordance with the original manufacturer's specifications, using appropriate tools and in a work area specially set aside for this activity.

5.3.3.2 Component examination and evaluation

The inlet connection of each valve shall be visually examined to assess whether it has been subjected to excessive damage, deformation or wear.

The outlet connection(s) of each valve shall be visually examined to confirm freedom from corrosion, damage or excessive wear.

Internal passageways shall be examined to ensure that they are free of foreign matter.

The valve outlet sealing face shall be examined for damage, wear and corrosion. Any outlet non-metallic sealing element shall be replaced by a new one in accordance with the valve manufacturer's specification.

If the design of the valve allows, any of the above defects may be corrected, provided the dimensions remain within the original design standard, otherwise the valve shall be scrapped in accordance with Clause 8.

All internal component parts of the valve shall be visually inspected to assess suitability for re-use (absence of excessive wear, damage or contamination). All non-metallic sealing materials shall be examined as to their suitability for further service and replaced as necessary in accordance with the manufacturer's recommendations.

Valves or components that are unsuitable for further service shall be scrapped in accordance with Clause 8.

All re-used components of the valve shall be clean to the original manufacturer's specification.

Valves intended for oxygen service or other highly oxidizing gases (see ISO 10156) shall be clean for oxygen service (see ISO 15001 for typical cleaning procedures).

5.3.3.3 Re-assembly

Valves shall be reassembled using appropriate tools and using torques and assembly procedures in accordance with the valve manufacturer's specification. The valve shall be operated "open to closed" to ensure that the operating mechanism is smooth and satisfactory.