INTERNATIONAL STANDARD

ISO 25760

First edition
2009-06-15

Gas cylinders — Operational procedures for the safe removal of valves from gas cylinders

Bouteilles à gaz — Modes opératoires de dépose en toute sécurité des robinets de bouteilles à gaz

Reference number
ISO 25760:2009(E)

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Published in Switzerland

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Foreword

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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 25760 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 4, *Operational requirements for gas cylinders* and is based on EIGA Document 129/05 *Pressure receptacles with blocked or inoperable valves*. EIGA has granted permission to reproduce excerpts from their document.

Introduction

Cylinders are devalved for many purposes, such as periodic inspection and testing, cylinder cleaning, change of service, replacement of a damaged valve, installation of a new valve, preparation for filling or scrapping.

Occasionally, gas cylinder valves can become blocked by corrosion or foreign material or become inoperable due to external or internal damage. It is an essential safety requirement that such valved cylinders be identified and treated with special care as soon as practicable. The operation of removing a valve should only be carried out if the cylinder is made safe with respect to residual gas and pressure. It is recommended that gas suppliers be prepared with both the proper equipment and trained operators for dealing with such valved cylinders. Practical techniques that have been tried and tested over many years within the gas industry are described.

Valve removal activities can pose hazards to the life and physical safety of the operator, especially if the cylinder is under pressure.

Valves should only be removed after ensuring there is no residual pressure in the cylinder.

Gas cylinders — Operational procedures for the safe removal of valves from gas cylinders

1 Scope

This International Standard is intended for suppliers, operators in testing facilities, operators performing cylinder maintenance and any person authorized to remove valves from gas cylinders. It details procedures for the safe removal of valves from cylinders and includes techniques for the identification of inoperable valves.

Only the risks due to gas and gas mixtures under pressure are addressed; other technical issues relating to the removal of a valve from a cylinder are not covered.

Some specialized equipment and procedures are in use in parts of the gas industry to safely remove cylinder valves from low pressure gas cylinders while under pressure, e.g. liquefied petroleum gas (LPG); these techniques are not included in this International Standard.

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

ISO 11114-2, *Transportable gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials*

3 Terms and definitions

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

3.1
gas cylinder
pressure receptacle including individual cylinder, tube, pressure drum or manifold combination of these

3.2
valve
device that allows gas to enter or exit a gas cylinder and retains the pressure in the cylinder when in the closed position

NOTE This also includes the fittings of cylinders in bundles and battery vehicles.

3.3
inoperable valve
valve that is blocked, broken or malfunctioning or that in any way prevents gas from entering or exiting the gas cylinder

NOTE See Annex A.

3.4
operable valve
device that allows gas to enter or exit a gas cylinder

3.5
residual pressure valve
RPV
type of valve that prevents the gas cylinder from being totally depressurized by holding back a specific amount of residual pressure

NOTE 1 Requirements for this type of valve are specified in ISO 15996.

NOTE 2 This valve type is very often associated with a non-return function.

3.6
valve with integrated pressure regulator
VIPR
device intended to be permanently fitted to a gas cylinder connection and comprising a shut-off valve system and pressure reduction system

NOTE 1 Adapted from ISO 22435:2007, definition 3.3.

NOTE 2 Requirements for this type of valve are specified in ISO 15996.

3.7
pressure relief device
PRD
device that is fitted to the cylinder or cylinder valve and designed to relieve gas pressure in the event of abnormal conditions resulting in the development of excessive pressure inside the cylinder or when the cylinder is subjected to high temperatures

NOTE 1 This might be a pressure relief valve, a non-reclosing PRD or a non-reclosing PRD in combination with a pressure relief valve.

NOTE 2 The expression “pressure relief” is synonymous with “safety relief”, as used in various applicable regulations, codes, standards or specifications.

3.8
quick connect valve
clip-on valve
valve that does not contain an operating device, such as a handwheel

3.9
low pressure gas cylinder
gas cylinder with test pressures no higher than 60 bar[1)]

3.10
compressed gas
gas which, when packaged under pressure for transport, is entirely gaseous at all temperatures above −50 °C

NOTE This category includes all gases with a critical temperature less than or equal to −50 °C.

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1) 1 bar = 100 kPa (exactly)

4 General requirements

4.1 Application

This clause gives general information to be considered. Clause 5 gives a choice of methods for inoperable valves. Procedures to be followed are given in Clause 6.

4.2 Hazards

Especially if the cylinder is under pressure, valve removal methods pose certain hazards to the operator, such as:

— stored energy from residual pressure (particularly important if the cylinder is not in a vertical position);

— residual gas hazards, including

  — fire resulting from flammable gas ignitions

    NOTE Oxidizing gases in the presence of contamination can also cause severe ignition.

  — asphyxiation,

  — oxidation,

  — toxicity/corrosivity,

  — projection of pieces under pressure,

  — cold burns due to vaporization of liquefied gases, and

— operating devalving machinery and equipment, such as pinch points, rotation and powered machines.

4.3 Operator safety and protection

When an operator is removing a blocked or inoperable valve, other individuals should be on site and able to respond in case of an emergency.

A risk assessment shall be performed in order to avoid the exposure of the operator and other persons who could be affected by hazards. The minimum hazards to take into account for this risk analysis are listed in 4.2.

After the risk assessment is completed, risks shall be eliminated or minimized as far as reasonably practicable by engineering or process changes, such as shields or bunkers. The required or appropriate personnel protective equipment shall be chosen.

4.4 Operator qualifications

4.4.1 General

All operators shall have

— appropriate training,

— understanding of the cylinder content, when known, and the precautions which might be necessary to prevent the release or exposure to the gas (see 4.2, 4.3 and 5.2), and

— good practical understanding of the cylinder valve and the method of fitment to the cylinder.

4.4.2 Specific process qualifications

Due to additional hazards that are present, operators shall receive specific training for the processes outlined in this International Standard.

Such processes can include

— the pressure check,

— the devalving process,

— the inoperable valve process.

Proper precautions shall be taken in the work area to protect operators from gas and particle discharges.

Appropriate personal protection equipment shall be worn, and emergency equipment shall be readily available.

Personal protection during devalving shall be adopted according to the hazards that may be present, such as those indicated in 4.2.

4.5 Operator errors

As a minimum, the following possibilities shall be considered in the context of operator errors.

— Incorrectly assuming that a cylinder has no pressure (e.g. placing valved cylinders that have been checked with valved cylinders that have not been checked).

— Incorrectly assuming that a cylinder has been checked for pressure (e.g. devalving more than one cylinder at the same time could lead to this error).

— Incorrectly assuming that a cylinder is empty of a liquefied gas, based upon the marked tare weight.

— Incorrectly assuming that a cylinder with a valve in the open position is no longer under pressure and proceeding to remove the valve.

NOTE The primary risk in this situation is the possibility that the valve is broken or blocked, although the valve appears to be in the open position and the cylinder is still under pressure.

— Relying on a pressure gauge (the operator might incorrectly assume, due to a malfunctioning pressure gauge, that there is no or little pressure in the cylinder). Such malfunction can occur if gauges are

  — obstructed,

  — broken,

  — damaged,

  — out of calibration,

  — designed for only high pressure measurements, or

  — otherwise defective.

4.6 Special valve designs

4.6.1 Valves (e.g. RPV, VIPR) with residual pressure device

All valves with a residual pressure device have a particular risk that the residual pressure has not been discharged before devalving. It is for this reason that the residual pressure from cylinders equipped with such a device shall be safely discharged using the appropriate equipment. If the device is unknown or if the operator is unsure, obtain information from a knowledgeable source.

4.6.2 Quick connect valves (clip-on valve)

Cylinders equipped with such valves shall be safely discharged by using appropriate equipment to release the pressure before being devalved.

4.6.3 Other valves

Valves with a special operating mechanism, such as

— valves without handwheels,

— internal valves (inside the cylinder), and

— solenoid operated valves

need special handling.

5 Methods for inoperable valves

5.1 Summary of methods

There are several methods to release the pressure from a cylinder with an inoperable valve. Some methods are as follows.

— Careful loosening or removal of the cylinder valve or the PRD.

— Creation of an additional vent in the cylinder valve.

— Creation of an additional vent in the cylinder wall.

— Dismantling of the cylinder valve.

Examples of methods for depressurizing gas cylinders with inoperable valves are given in Annex B.

Application of the preceding methods results in one of two modes of cylinder depressurization:

a) where the gas is directly released to atmosphere. This mode is recommended for inert gases permitted for release to the atmosphere by relevant environmental regulations, or

b) where the gas is not directly released to the atmosphere, but transferred from the original gas cylinder into a secondary gas containment area until disposed (see Figure B.2). This mode is recommended particularly for gases that pose a human and/or environmental hazard (such as toxic, corrosive, flammable or pyrophoric gases) as regulated by the relevant authority.