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Gas cylinders — Refillable welded steel cylinders for liquified petroleum gas (LPG) — Procedures for checking before, during and after filling

Bouteilles à gaz — Bouteilles rechargeables soudées en acier pour gaz de pétrole liquéfié (GPL) — Modes opératoires de contrôle avant, pendant et après le remplissage

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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 10691 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 4, *Operational requirements for gas cylinders*.

Gas cylinders — Refillable welded steel cylinders for liquified petroleum gas (LPG) — Procedures for checking before, during and after filling

WARNING — This International Standard calls for the use of substances and procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligation relating to health and safety at any stage. It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people. Where judgments are called for it has been assumed that they will be made by competent persons who have been trained specifically for the task.

1 Scope

This International Standard specifies the procedures to be adopted when checking transportable refillable welded steel LPG cylinders before, during and after filling.

It applies to transportable refillable welded steel LPG cylinders of water capacity from 0,5 l up to and including 150 l.

It does not apply to cylinders permanently installed in vehicles, or to plant and filling equipment.

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 10464, *Gas cylinders — Refillable welded steel cylinders for liquefied petroleum gas (LPG) — Periodic inspection and testing*

3 Terms and definitions

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

3.1
competent authority
any national body or authority designated or otherwise recognized as such for any purpose in connection with this International Standard

3.2
competent body
person or corporate body, defined by the national or relevant authority, which by combination of appropriate qualification, training, experience and resources is able to make objective judgments on a subject

3.3
competent person
person who by a combination of training, experience and supervision is able to make objective judgments on a subject

3.4
cylinder
transportable, refillable container manufactured and marked to a national or international standard and with a water capacity not exceeding 150 l

3.5
filling ratio
ratio of the mass of gas introduced into a container to the mass of water at 15 °C that would fill the same container fitted ready for use

3.6
filling by volume
filling the cylinder with a fixed volume of LPG

3.7
filling to a level
filling the cylinder to a fixed level using an ullage gauge

3.8
filling by mass
filling the cylinder with LPG using a weighing machine

3.9
liquefied petroleum gas
LPG
mixture of predominantly butane or propane with traces of other hydrocarbon gases classified in accordance with UN number 1965, hydrocarbon gas mixture, liquefied, or NOS or UN number 1075, petroleum gases, liquefied

NOTE In some countries, UN number 1011 and UN number 1978 may also be used to designate LPG.

3.10
reconditioning
major repairs to cylinders, including hot work, welding or de-denting (as permitted by the competent authority), carried out by specialists away from the filling line

3.11
rejection
putting out of service until final disposition is determined

3.12
periodic inspection test station
place where cylinders are tested and periodically inspected

4 Segregation of cylinders prior to filling

4.1 General

Cylinders shall be checked and segregated into the categories specified in 4.2 to 4.4.

4.2 Cylinders suitable for filling

Cylinders shall be deemed suitable for filling if the following conditions apply:

a) the design code/specification is identifiable;

b) the tare mass or tare indication and water capacity are marked;

c) the product mass and product identification (LPG) are indicated when required;

d) the cylinder is within the test date as determined from the marked manufacturer's or periodic inspection dates;

e) the symbol of the periodic inspection test station or inspection body is indicated;

f) a visual inspection of visible areas shows that the cylinder (including foot ring) and valve are free of defects as described in 4.4;

g) the cylinder is not leaking.

4.3 Cylinders to be periodically inspected

When at least one of the following conditions apply, cylinders shall be set aside for periodic inspection in accordance with ISO 10464:

a) the cylinder is beyond its test date;

b) the cylinder cannot be confirmed to be within its test date;

c) the cylinder has markings that are obscured and not easily identified.

4.4 Cylinders requiring further assessment

Where the initial segregation checks reveal any of the following defects, cylinders shall be subjected to further assessment, resulting in e.g. taring, reconditioning or rejection, in accordance with Clause 5:

a) with cylinders intended to be filled by mass, the tare mass or indication of tare mass is missing or illegible;

b) the cylinder is defective or damaged, e.g. there is damage to shrouds, carrying handles or foot rings, or the cylinder is dented or fire-damaged;

c) the cylinder is found to have visible corrosion or, with cylinders with a welded foot ring, to exhibit corrosion at the weld;

d) the cylinder, valve or pressure relief devices (if fitted) are leaking or are damaged.

5 Reassessment of cylinders

Cylinders that have been set aside (see 4.4) shall be examined by a competent person who shall decide whether they are suitable for filling or shall be sent for reconditioning or rejected.

Where, in the case of cylinders that are intended to be filled by mass, the tare mass or indication of tare mass is missing or illegible, the cylinders shall be reassessed and have the tare mass or indication of the tare mass applied in accordance with the relevant marking requirements.

Leaking cylinders and cylinders with damaged or leaking valves shall be safely vented. Leaking or damaged valves shall be repaired or replaced. Cylinder weld leaks shall be repaired as authorized by the competent authority. For cylinders leaking through the body other than at a weld, the cause of the leak shall be determined; such cylinders shall then be rejected.

Rejection criteria guidelines for physical and material defects on the cylinder shell are given in Tables 1, 2 and 3.

Table 1 — Physical defects in the cylinder wall

Defect	Description	Rejection limit
Bulge	Visible swelling of the cylinder	Rejection in all cases
Dent	A depression in the cylinder that has neither penetrated nor removed metal, and its width at any point is greater than 2 % of the external cylinder diameter	When the depth of the dent exceeds 25 % of its width at any point[a]
Cut or gouge	A sharp impression where metal has been removed or redistributed	Where the original calculated wall thickness is known: where depth of cut or gouge is such that the undamaged (remaining) wall is less than the minimum calculated wall thickness Where the original calculated wall thickness is not known: rejection in all cases
Intersecting cut or gouge	The point of intersection of two or more cuts or gouges	Rejection in all cases
Dent containing cut or gouge	A depression in the cylinder within which there is a cut or gouge	When the size of the dent or cut or gouge exceeds the dimensions for rejection as an individual defect
Crack	A split or rift in the cylinder shell	Rejection in all cases
Lamination	Layering of the material within the cylinder wall appearing as a discontinuity, crack, lap or bulge at the surface	Rejection in all cases

[a] Consideration of appearance and location also plays a part in the evaluation of dents.

Table 2 — Corrosion on the cylinder wall

Defect	Description	Rejection limit
Isolated corrosion pits	Pitting of metal occurring in isolated areas at a concentration not greater than 1 pit per 500 mm^2 of surface area	When the depth of discrete pits exceeds 0,6 mm (a greater depth can be accepted provided the depth of corrosion does not reduce the wall thickness below the minimum calculated wall thickness)
Area corrosion	Reduction in wall thickness over an area not exceeding 20 % of the cylinder surface, including the ends (top and bottom)	When the depth of penetration of any pit exceeds 0,4 mm (a greater depth can be accepted provided the depth of corrosion does not reduce the wall thickness below the minimum calculated wall thickness)
General corrosion	A reduction in wall thickness over an area exceeding 20 % of the cylinder surface	When the depth of penetration of any pit exceeds 0,2 mm (a greater depth can be accepted provided the depth of corrosion does not reduce the wall thickness below the minimum calculated wall thickness)
Chain pitting or line or channel corrosion	A series of pits or corroded cavities of limited width along the length or around the corrosion circumference	1) When the total length of corrosion in any direction exceeds 50 % of the circumference of the cylinder 2) When the depth of penetration exceeds 0,4 mm (a greater depth can be accepted provided the depth of corrosion does not reduce the wall thickness below the minimum calculated wall thickness) 3) When the depth of corrosion cannot be measured
Crevice corrosion	Crevice corrosion occurs in the area of the intersection of the foot ring or shroud with the cylinder	When the depth of penetration exceeds 0,4 mm or when the depth of corrosion cannot be measured

Table 3 — Other defects

Defect	Description	Rejection limit
Depressed bung	Damage to the bung which has altered the profile of the cylinder	Rejection in all cases, or a limited level of depression/alignment deviation may be accepted as agreed with the competent body
Arc or torch burns	Burning of the cylinder base metal, a hardened heat-affected zone, the addition of extraneous weld metal, or the removal of metal by scarfing or cratering	Rejection in all cases
Fire damage[a]	Excessive general or localized heating of a cylinder, usually indicated by: — charring or burning of paint — fire damage of the metal — distortion of the cylinder — melting of metallic valve parts — melting of any plastic components, e.g. date ring, plug or cap	Rejection in all cases

[a] If paint is only superficially charred, a cylinder may be accepted by a competent person.

6 Filling

6.1 Safe filling quantity

Proper filling procedures shall be in place to ensure that no overfilling can occur.

The maximum mass of contents per litre of water capacity (filling ratio) shall equal 0,95 times the density of the liquid phase at 50 °C, and the liquid phase shall not fill the cylinder at any temperature up to 60 °C.

For cylinders used only in a specific climatic area, the competent authority may specify a maximum filling ratio for each mixture for national use.

6.2 Safe filling mixture and composition

Cylinders shall be filled with the appropriate mixture and composition of LPG. Special care shall be taken to ensure that contaminants that could cause corrosion are not present.

6.3 Accuracy of weighing equipment

Filling and check-weigh scales shall have been checked for accuracy at least once per day.

6.4 Filling methods

Filling of cylinders may be by mass, volume or level. When filling is by mass, the correct tare mass of each individual cylinder shall be used for setting the filling scales. When filling is to a level, the fixed liquid level device shall be checked for operability.