INTERNATIONAL STANDARD

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Third edition
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Gas cylinders — Acetylene cylinders — Filling conditions and filling inspection

Bouteilles à gaz — Bouteilles d'acétylène — Conditions de remplissage et de contrôle au 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 11372 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 4, *Operational requirements for gas cylinders*.

This third edition cancels and replaces the second edition (ISO 11372:2005), with the following main technical revisions:

a) ISO 11372:2005 was revised taking into account EN 12754 and EN 1801.

b) The clauses concerning filling inspection were restructured in order to better reflect the actual proceeding of the filling inspection.

c) A new subclause 3.3 with requirements and information regarding the solvent content was added.

d) A new Clause 4 concerning the specific filling inspection of solvent-free acetylene cylinders was added.

e) A new informative Annex A introducing the Safe operating diagram was added in order to improve the understanding of the importance of correct filling conditions for acetylene cylinders.

f) A new normative Annex B outlining the calculations necessary for determination of the solvent content was added.

Introduction

This International Standard aims at the harmonization of the different operating and filling conditions of individual acetylene cylinders and covers requirements that reflect current practice and experience regarding the inspection at the time of filling.

ISO 11372 is intended to be used under a variety of national regulatory regimes but has been written so that it is suitable for the application of the UN Model Regulations[1].

Where there is any conflict between this International Standard and any applicable regulation, the regulation always takes precedence.

In International Standards, weight is equivalent to a force, expressed in newtons. However, in common parlance (as used in terms defined in this International Standard), the word “weight” continues to be used to mean “mass”, but this practice is deprecated (see ISO 80000-4).

In this International Standard the unit bar is used, due to its universal use in the field of technical gases. It should, however, be noted that bar is not an SI unit, and that the corresponding SI unit for pressure is pascals (Pa).

Pressure values given in this International Standard are given as gauge pressure (pressure exceeding atmospheric pressure) unless noted otherwise.

Gas cylinders — Acetylene cylinders — Filling conditions and filling inspection

1 Scope

This International Standard specifies minimum requirements for the filling conditions and filling inspection of acetylene cylinders.

This International Standard is not applicable to an assembly of cylinders connected by a manifold, e.g. bundles (see ISO 13088).

2 Terms and definitions

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

2.1
acetylene cylinder
cylinder manufactured and suitable for the transport of acetylene, containing a porous material and solvent (where applicable) for acetylene, with a valve and other accessories affixed to the cylinder

NOTE 1 For solvent-free acetylene cylinders, see Clause 4.

NOTE 2 When there is no risk of ambiguity, the word "cylinder" is used.

2.2
cylinder shell
⟨acetylene cylinders⟩ empty cylinder manufactured and suitable for receiving and containing a porous material for use as part of an acetylene cylinder

2.3
filler
⟨gas cylinders⟩ trained person responsible for inspection prior to, during and immediately after filling

2.4
maximum acetylene content
⟨acetylene cylinders⟩ specified maximum weight of acetylene including saturation acetylene in the cylinder

2.5
maximum acetylene charge
⟨acetylene cylinders⟩ maximum acetylene content minus the saturation gas

2.6
porous material
⟨acetylene cylinders⟩ single- or multiple-component material introduced to or formed in the cylinder shell that, due to its porosity, allows the absorption of a solvent/acetylene solution

NOTE The porous material may be either:

— monolithic, consisting of a solid product obtained by reacting materials or by materials connected together with a binder, or

— non-monolithic, consisting of granular, fibrous or similar materials without the addition of a binder.

2.7
residual gas
⟨acetylene cylinders⟩ weight of acetylene including the saturation acetylene, contained in a cylinder returned for filling

2.8
saturation gas
⟨acetylene cylinders⟩ acetylene that remains dissolved in the solvent in the cylinder at atmospheric pressure (1,013 bar) and at a temperature of 15 °C

2.9
solvent
⟨acetylene cylinders⟩ liquid that is absorbed by the porous material and is capable of dissolving and releasing acetylene

NOTE The following abbreviations are used:

— "A" for acetone;

— "DMF" for dimethylformamide.

2.10
specified solvent content
⟨acetylene cylinders⟩ weight of solvent that the acetylene cylinder shall contain in accordance with the type approval

2.11
tare
⟨acetylene cylinders⟩ reference weight of the acetylene cylinder including the specified solvent content

NOTE 1 The tare is further specified in accordance with definitions 2.11.1 to 2.11.3.

NOTE 2 For cylinders with solvent, the tare is expressed by indicating either tare S or both, tare A and tare S. For solvent-free acetylene cylinders, the tare is expressed by indicating tare F. For the tare used for cylinders in bundles, see ISO 13088.

2.11.1
tare A
⟨acetylene cylinders⟩ sum of the weights of the empty cylinder shell, the porous material, the specified solvent content, the valve, the coating, where applicable, and all other parts which are permanently attached (e.g. by clamping or bolting) to the cylinder when it is presented to be filled

2.11.2
tare S
⟨acetylene cylinders⟩ tare A plus the weight of the saturation gas

2.11.3
tare F
⟨acetylene cylinders⟩ tare A minus the specified solvent content

2.12
total weight
⟨acetylene cylinders⟩ tare A plus the maximum acetylene content or tare S plus the maximum acetylene charge, respectively

NOTE 1 For solvent-free cylinders, the total weight is tare F plus the maximum acetylene content.

NOTE 2 The stamped value can be less than the approved value.

2.13
working pressure
⟨acetylene cylinders⟩ settled pressure at a uniform reference temperature of 15 °C in a cylinder containing the specified solvent content and the maximum acetylene content

3 Filling inspection

3.1 General

Each cylinder shall be submitted to an inspection prior to, during and immediately after filling. Filling of an acetylene cylinder includes determination of its solvent content and replenishment of its solvent, where applicable. The items described in 3.2 to 3.5 shall be covered by a filling inspection.

Cylinders not fulfilling these requirements shall be clearly identified for further treatment according to the written procedures of the filling station.

Cylinder owners may request that their authorization be obtained prior to their cylinders being filled. Such ownership shall be established and this authorization obtained before filling the cylinders.

The filling conditions of acetylene cylinders are established based on type testing according to ISO 3807 or other applicable regulations/standards. Filling conditions for acetylene cylinders are shown in the Safe operating diagram in Annex A, for information.

3.2 Pre-fill inspection

3.2.1 Verification of stamp-marking and necessary documentation

The information required in the following lists shall be made available to the filler, for example, by providing him with appropriate documentation and by training.

Before filling an acetylene cylinder, it shall be identified that:

a) the cylinder is permitted for filling in the country of the filling station;

b) the cylinder has not exceeded its due date for periodic inspection;

c) the cylinder does not have a current history of problems;

d) the stamp marking (in accordance with regional regulatory requirements and/or ISO 13769) and labelling (in accordance with regional regulatory requirements and/or ISO 7225) are appropriate to acetylene;

NOTE For sovent-free acetylene cylinders, additional marking elements according to 4.1 need to be verified.

e) the colour coding (in accordance with regional regulatory requirements and/or regional industry practice), where applicable, is appropriate to acetylene.

Before filling an acetylene cylinder, the following information shall be made available:

1) identification of the porous material;

2) type of solvent;

3) specified solvent content;

4) tare (with information whether tare A or tare S is used);

5) total weight and/or its maximum acetylene content (if tare A is used) or its maximum acetylene charge (if tare S is used).

3.2.2 Verification of serviceable condition

It shall be established that each cylinder is in a serviceable condition before filling. It shall therefore be established that the cylinder is clean and free from foreign material, so that the cylinder can be assessed for mechanical damage that would otherwise prevent it from being filled safely, that it does not exhibit any abnormalities that could impair the safety, including arc burns, severe corrosion, heat/fire damage, or have any other significant mechanical damage.

Any fusible plug, if fitted, shall be inspected to ensure that it is in a satisfactory condition.

Cylinders that have been found to be unserviceable shall be clearly identified and segregated in accordance with the written procedures of the filling organization, and shall not be filled.

3.2.3 Verification of integrity of permanent attachments

Before filling a cylinder, it shall be established that the neck ring/threaded boss is fit for its intended use and that the neck ring, if one exists, is not loose. If there is a permanent valve guard, it shall be checked to ensure that it is in good condition and properly attached. Similarly, the integrity of the foot ring, if fitted, shall be checked for its intended use.

NOTE If a permanent valve guard is exchanged, this might affect the tare of the cylinder.

3.2.4 Verification of valve integrity and suitability

Before filling a cylinder, it shall be established that the installed valve is suitable for acetylene and is in a satisfactory condition. As a minimum, it shall be established that:

a) the valve outlet is suitable for the intended use;

b) the valve is easy to operate;

c) the valve is free from contaminants;

d) the valve operating mechanism is operable (handwheel or key operated); if the valve is suspected to be blocked, isolate and identify the acetylene cylinder and rectify the blockage in accordance with an appropriate procedure, e.g. as described in ISO 25760;

e) the fusible plug, where present, is undamaged;

f) the outlet thread and body are undamaged;

g) the filling connector attaches securely to the valve.

3.3 Solvent content

3.3.1 Determination of solvent content

Before filling an acetylene cylinder with acetylene, its actual solvent content shall be determined by measuring the pressure, temperature and weight of the cylinder in conjunction with the appropriate documentation. Calibrated weighing scales, manometers and other instruments which have a working range and measuring accuracy appropriate for the cylinder size to be filled shall be used.

Acetylene cylinders take time to reach temperature equilibrium. Special care should be taken if the temperature of the cylinder is very low and/or the pressure is very high or if the cylinder has been exposed to a significant environmental temperature change in the preceding 3 h.

Since the determination of the solvent content is not accurate for acetylene cylinders that contain high amounts of residual gas, cylinders should be emptied until a low amount of residual gas has been reached.

Typically, this would amount to a pressure of less than 7 bar for cylinders with a working pressure of 17 bar or higher and to less than 4 bar for cylinders with a working pressure below 17 bar.

Emptying of the cylinder should be carried out slowly; a typical rate would be 1/8 of the maximum acetylene content per hour. The determination of the solvent content should not be done immediately afterwards as the cylinder will cool down considerably during emptying and will need time to reach temperature equilibrium again.

Calculation of the actual solvent content in cylinders shall be in accordance with Annex B.

NOTE The result of these calculations normally is made available to the filler, e.g. in the form of a table or a chart indicating the residual acetylene content.

If the weight of the acetylene cylinder after deduction of the residual gas is below the appropriate tare stamped on the cylinder, the solvent loss shall be replenished. The type of solvent shall not be changed for a given acetylene cylinder.

The uncertainty of the method for determining the solvent loss is influenced by several factors including the accuracy of the balance and the accuracy of temperature measurement, etc. These factors should be taken into account for solvent replenishment.

If the weight of the acetylene cylinder after deduction of the residual gas exceeds the appropriate tare stamped on the cylinder, the cylinder shall be examined and the reason for the excess weight shall be determined before further handling.

3.3.2 Solvent replenishment

For solvent replenishment, it shall be checked that:

a) the valve is not blocked/obstructed and that the operation is progressing satisfactorily;

b) the valve does not leak when in the open position; if leakage is suspected, a leak check shall be performed, including around the valve gland nut. The filling process of the cylinder shall be stopped and only recommenced after the leak has been rectified.

During replenishment of solvent, it shall be ensured that the porous material is not damaged by the pressure with which the solvent is pumped into the cylinder. If no reliable information is available, it is recommended to limit the pressure to a pressure a few bar above the pressure to which cylinders are supposed to be emptied, in accordance with 3.3.1.

3.4 Inspection during filling

3.4.1 General

During the filling cycle of an acetylene cylinder, which includes the solvent-replenishment stage, the filler shall verify that:

a) the valve is not blocked/obstructed by checking that the cylinder is filled normally (e.g. by checking its surface temperature);

b) the valve and fusible plugs, where fitted, do not leak (external leak tightness). If leakage is suspected, a leak check, including around the valve gland nut, shall be performed. The filling process of the cylinder shall be stopped and only recommenced after the leak has been rectified in a safe manner.

3.4.2 Simultaneous filling of acetylene cylinders

Acetylene cylinders which are to be filled simultaneously shall have the same type of solvent if the backflow of solvent cannot be prevented by an appropriate technical device.