
Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — Safety requirements in high-pressure devices

Matériel de soudage aux gaz — Centrales de détente pour la distribution d'acétylène pour le soudage, le coupage et les techniques connexes — Exigences de sécurité pour les dispositifs haute pression

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15615 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Annex A forms a normative part of this International Standard.

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Foreword

This document (EN ISO 15615:2002) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

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of an identical text or by endorsement, at the latest by October 2002, and conflicting national standards shall be withdrawn at the latest by October 2002.

Annex A is normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This standard lays down the general specifications, requirements and tests of devices located on the high-pressure side of acetylene manifold systems as defined in EN ISO 14114. The standard does not cover the high-pressure piping, flexible hoses and the regulator.

NOTE The terms "upstream" and "downstream" refer to the normal direction of gas flow in the device.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 849, *Transportable gas cylinders — Cylinder valves — Specification and type testing.*

EN 13622:2001, *Gas welding equipment — Terminology — Terms used for gas welding equipment.*

EN 29090, *Gas tightness of equipment for gas welding and allied processes (ISO 9090:1989).*

EN 29539, *Materials for equipment used in gas welding, cutting and allied processes (ISO 9539:1988).*

EN ISO 2503:1998, *Gas welding equipment — Pressure regulators for gas cylinders used in welding, cutting and allied processes up to 300 bar (ISO 2503:1998).*

EN ISO 7291, *Gas welding equipment — Pressure regulators for manifold systems used in welding, cutting and allied processes up to 300 bar (ISO 7291:1999).*

EN ISO 14114, *Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — General requirements (ISO 14114:1999).*

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1

non-return valve

device which prevents passage of gas in the direction opposite to flow
[EN 13622:2001]

3.2

manual quick acting shut-off valve

manually activated device to quickly stop the gas flow
[EN 13622:2001]

3.3

automatic quick acting shut-off device

self-acting device which closes quickly e.g. when triggered by an acetylene explosion in the high pressure manifold pipework
[EN 13622:2001]

3.4

remote actuated shut-off valve

quick acting shut-off valve which quickly stops the gas flow when remotely triggered

**3.5
automatic pressure actuated shut-off valve**

device which automatically stops the gas supply to the regulator when the downstream pressure rises above the maximum operating pressure

**3.6
three way valve**

device which allows gas flow from one side of the high pressure manifold to enter the regulator while isolating flow from the second side. Its position can be reversed so that gas flows from the second side while the first side is isolated. It prevents simultaneous flow from both sides

**3.7
stop valve**

device to prevent, when closed, the flow of gas

**3.8
multifunctional safety device**

device which incorporates two or more of the safety functions
[EN 13622:2001]

4 Design and materials

4.1 Design

Components within the devices should be designed to remain at the same electrostatic potential as the body of the device during operation. All metal components in contact with gas should be electrically continuous to prevent static electricity discharges.

4.2 Materials

Materials used for devices shall be in accordance with EN 29539.

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5 Requirements

5.1 General

The general requirements (see 5.2) apply to all the devices defined in clause 3. The multifunctional safety devices shall meet the general and additional requirements corresponding to each function.

5.2 General requirements

5.2.1 External gas tightness

The general requirements on external gas tightness before acetylene decomposition shall be in accordance with EN 29090.

5.2.2 Internal gas tightness before decomposition test

Where internal gas tightness is required in this standard the leakage rate shall not exceed 50 cm³/h for devices with a connection internal bore (diameter) less than 11 mm or 0,41 d^2 for larger diameters. See 6.9 for test details.

The value 0,41 d^2 shall be the flow in cm³/h where d is the internal bore (diameter) in mm of the largest connection of the device.

5.2.3 Internal gas tightness after decomposition test

Where internal gas tightness is required after acetylene decomposition the leakage rate shall not exceed 50 l/h. See 6.9 for test details.

5.2.4 Pressure resistance

The housings of the devices shall withstand a pressure of 31,5 MPa (315 bar) for 5 min, without any leakage observation. After pressurisation there shall be no permanent deformation. See 6.5 for test details.

5.2.5 Acetylene decomposition

After the device has been tested in accordance with 6.4, there shall be no visible permanent deformation of the device. No escape of gas shall occur during the test.

5.3 Additional requirements to be met by specific types of devices

5.3.1 Non-return valve

Non-return valves shall not allow the reverse flow of gas greater than 150 cm³/h (0,15 l/h) when tested in accordance with 6.6.1 and 6.6.2, both before and after the 2 000 cycle fatigue test (see 6.6.3).

This requirement does not apply to the non-return valve after it has been subjected to the acetylene decomposition test.

5.3.2 Manual quick acting shut-off valve

Manual quick acting shut-off valves shall meet the requirements of 5.2.2 and 5.2.3 before and after a 500 cycle test. In the case of turn acting valves, they shall not require more than half of a turn to close. See 6.7 for endurance test details.

5.3.3 Automatic quick acting shut-off device

Automatic quick acting shut-off devices shall be triggered by an acetylene decomposition at 0,6 MPa (6 bar) and at 2,5 MPa (25 bar). After tripping the internal gas leakage shall meet the requirement of 5.2.3. See 6.10 for test details.

5.3.4 Remote actuated shut-off valve

The remote actuated shut-off valves, when in the closed condition, shall meet the internal gas leakage requirements of 5.2.2 and 5.2.3 before and after the acetylene decomposition test (see 6.4) as well as before and after a 500 cycle endurance test. See 6.7 for endurance test details.

5.3.5 Automatic pressure actuated shut-off valve

Automatic pressure actuated shut-off valves shall be triggered (stop gas flow on high pressure side) at a pressure on the low pressure signal port between 0,16 MPa to 0,20 MPa (1,6 bar to 2,0 bar) at both 0,1 MPa and 2,5 MPa (1 bar and 25 bar) inlet pressures. When triggered the internal gas leakage shall meet the requirement of 5.2.2. See 6.8.2.1 for test 1 and 6.8.2.2 for test 2 for details.

The valve shall not be triggered when a pressure of 0,145 MPa to 0,150 MPa (1,45 bar to 1,50 bar) is held on the low pressure signal port for 168 h. See 6.8.2.3 for test 3 for details.

Once actuated (closed) it shall not be possible for the valve to reset to an open condition without manual intervention.

In addition to the 31,5 MPa (315 bar) pressure test on high pressure chambers in 5.2.4 the internal chambers of the low pressure signal port shall withstand a pressure of 6,0 MPa (60 bar) for 5 min. During pressurisation, there shall be no permanent deformation or leakage to the atmosphere.

Automatic pressure actuated shut-off valves shall meet the requirements for internal gas tightness, external gas tightness and pressure actuation both before and after the acetylene decomposition test (see 6.4) as well as before and after a 500 cycle endurance test. See 6.7 for endurance test details.

5.3.6 Three way valve

Three way valves, when closed, shall meet requirements for internal gas tightness of 5.2.2 and 5.2.3 before and after the acetylene decomposition test (see 6.4) as well as before and after a 500 cycle endurance test. See 6.7 for endurance test details.

During the acetylene decomposition test the three way valve shall prevent the decomposition passing down stream of the valve.

5.3.7 Stop valve

Stop valves, when closed, shall meet the internal gas leakage requirement of 5.2.2 and 5.2.3 before and after the acetylene decomposition test (see 6.4) and after a 500 cycle endurance test. See 6.7 for endurance test details.

During the acetylene decomposition test the stop valve shall prevent the decomposition passing down stream of the valve.

6 Type tests

6.1 General

The type test methods of clause 6 are to be applied to sample devices to be tested for compliance with this standard. Tests shall be carried out on new devices.

6.2 Reference values and accuracy of instruments

Reference values and accuracy of instruments are as follows:

- flow-measuring equipment: ± 3 % of maximum reading;
- pressure-measuring equipment: ± 1 % of maximum reading.

All pressures are provided in megapascal (MPa) and in bar. Tests shall be carried out at a temperature of (20 ± 5) °C.

6.3 Test gases

The decomposition test shall be carried out with acetylene. All other tests shall be carried out either with industrial acetylene (with or without solvent) or nitrogen free from oil or grease.

6.4 Acetylene decomposition test

6.4.1 General

The test shall be carried out on three samples. The device shall be installed in the test equipment so the decomposition is initiated on the upstream side.

The device described in 3.1 shall be tested into the normal direction of gas flow. Devices described in 3.2, 3.3, 3.4 and 3.5 shall be tested in the open position. Devices described in 3.6 and 3.7 shall be tested in the closed position.

The test conditions for all types of devices and the number of samples are listed in Table 1.

Table 1 — Test conditions for acetylene decomposition test

Device	Test conditions	Test pressure	Acetylene decomposition test set-up
non-return valve (see 3.1)	Three samples shall be tested in the closed position at 2,5 MPa (25 bar).	2,5 MPa (25 bar)	Figure 1
manual quick acting shut-off valve (see 3.2)	Three samples shall be tested in the open position; after the test, the device shall be closed and checked that the internal gas leakage is below 50 l/h.	2,5 MPa (25 bar)	Figure 1
automatic quick acting shut-off device (see 3.3)	Three samples shall be tested in the open position at 0,6 MPa (6 bar), three samples ^a shall be tested in the open position at 2,5 MPa (25 bar).	0,6 MPa (6 bar) and 2,5 MPa (25 bar)	Figure 1
remote actuated shut-off valve (see 3.4)	Three samples shall be tested in the open position at 0,6 MPa (6 bar), three samples ^a shall be tested in the open position at 2,5 MPa (25 bar), and three more samples shall be tested in the closed position at 2,5 MPa (25 bar).	0,6 MPa (6 bar) and 2,5 MPa (25 bar)	Figure 1
automatic pressure actuated shut-off valve (see 3.5)	The test conditions shall conform to those specified for the manifold regulator according to EN ISO 7291.	—	—
three way valve (see 3.6)	Three samples shall be tested in the closed position.	2,5 MPa (25 bar)	Figure 2
stop valve ^b (see 3.7)	Three samples shall be tested in the closed position.	2,5 MPa (25 bar)	Figure 1
<p>^a These may be the same samples.</p> <p>^b Depending on the manufacturer's design, the stop valve can be a manual quick acting shut-off device. Therefore, it shall be tested under the stop valve conditions of use.</p>			

6.4.2 Test conditions

The devices shall be checked using a test set-up as shown in Figure 1 and Figure 2:

- Ignition tube length (l_1): 5 m;
- tube length (l_2): 1 m;
- for samples with outlet bore up to 10 mm: internal diameter of the tubes, $d_i = 10$ mm;
- for samples with outlet bore larger than 10 mm: d_i shall be equal the nominal outlet bore;
- industrial acetylene, static gas phase;
- the initial pressure of acetylene is as defined in Table 1 at a temperature of (20 ± 5) °C;
- ignition by fusible metal wire, ignition energy less than 100 J.