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Gas welding equipment — Safety devices —

Part 2: Devices not incorporating a flame (flashback) arrestor

Matériel de soudage au gaz — Dispositifs de sécurité —

Partie 2: Dispositifs sans arrêt de flamme

Reference number
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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*.

This first edition of ISO 5175-2, together with ISO 5175-1, cancels and replaces ISO 5175:1987, which has been technically revised. It also incorporates the Amendment ISO 5175:1987/Amd 1:2015.

A list of all parts in the ISO 5175 series can be found on the ISO website.

Requests for official interpretations of any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 8 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

This corrected version of ISO 5175-2:2017 incorporates list item h) in Clause 8.

Gas welding equipment — Safety devices —

Part 2: Devices not incorporating a flame (flashback) arrestor

1 Scope

This document specifies the general requirements and tests for safety devices for fuel gases and oxygen or compressed air which do not incorporate a flame (flashback) arrestor used downstream of manifold, cylinder and/or pipeline outlet regulators, and upstream of blowpipes for welding, cutting and allied processes.

This document does not specify the location of these devices in the gas system.

This document is not applicable to safety devices which incorporate a flame arrestor, covered by ISO 5175-1.

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 554, *Standard atmospheres for conditioning and/or testing — Specifications*

ISO 2503, *Gas welding equipment — Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa)*

ISO 5175-1:2017, *Gas welding equipment — Safety devices — Part 1: Incorporating a flame (flashback) arrestor*

ISO 7289, *Gas welding equipment — Quick-action couplings with shut-off valves for welding, cutting and allied processes*

ISO 7291, *Gas welding equipment — Pressure regulators for manifold systems used in welding, cutting and allied processes up to 30 MPa (300 bar)*

ISO 9090, *Gas tightness of equipment for gas welding and allied processes*

ISO 9539, *Gas welding equipment — Materials for equipment used in gas welding, cutting and allied processes*

ISO 10225, *Gas welding equipment — Marking for equipment used for gas welding, cutting and allied processes*

ISO 15296, *Gas welding equipment —Vocabulary*

EN 560, *Gas welding equipment — Hose connections for equipment for welding, cutting and allied processes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15296 and the following apply.

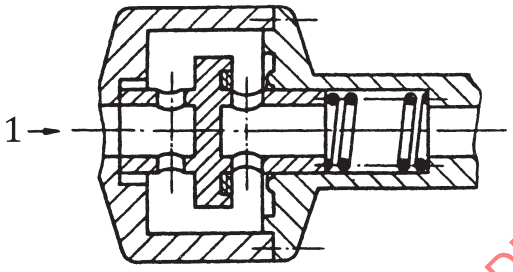
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

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

3.1
excess flow cut-off valve
device which stops the gas flow in the event of flow exceeding a predetermined value

EXAMPLE A valve is held open by a spring; it closes when the force caused by the dynamic pressure becomes greater than the force of the spring. A resetting device is necessary. An example is given in Figure 1.



Key
1 normal direction of gas flow

Figure 1 — Excess flow cut-off valve (example)

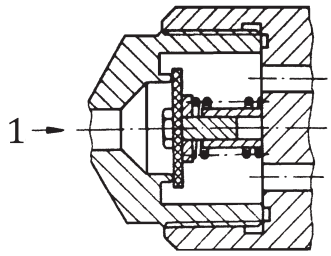
3.2
maximum operating pressure
maximum pressure to which the equipment may be subjected in service

3.3
multifunctional safety device
device which incorporates two or more of the safety functions

EXAMPLE *Non-return valve* (3.4) and excess flow cut-off valve.

3.4
non-return valve
device which prevents passage of gas in the direction opposite to flow

EXAMPLE A valve is held open by energy in gas stream and closes when downstream pressure is approximately equal to or greater than that in normal direction of flow. An example is given in Figure 2.



Key

1 normal direction of gas flow

Figure 2 — Non-return valve (example)

3.5
pressure relief valve
device which automatically vents gas when the pressure exceeds some predetermined value and seals again when the pressure returns to within specified limits of that value

EXAMPLE A valve is held closed by a spring; it opens when force caused by internal pressure rise exceeds the spring load. An example is given in Figure 3.

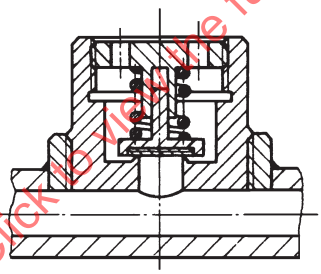


Figure 3 — Pressure relief valve (example)

3.6
safety device
device for welding equipment which averts risk in case of misuse or malfunction of the downstream gas welding equipment

4 Design and materials

4.1 Connections

Threaded connections up to G1 shall be in accordance with EN 560. Quick release connections shall be in accordance with ISO 7289.

4.2 Materials

Materials used for safety devices shall conform to the requirements laid down in ISO 9539.

5 Requirements

5.1 General

A summary of the requirements and test sequence for each device is given in Table 1.

Table 1 — Summary of requirements and test sequence for safety devices

Safety device function(s)	Requirements (Subclause no.)	Tests (in test order) (Subclause no.)	Number of devices required for each test	Total number of devices required
Non-return valve	5.2.1 5.2.2 5.3 5.4	6.4 External gas tightness 6.5 Pressure resistance 6.6 Reverse flow 6.9 Internal leakage	5 1[a] 5 5	6
Pressure relief valve	5.2.1 5.3 5.5	6.4 External gas tightness 6.5 Pressure resistance 6.7 Relief pressure and flow	5 1[a] 5	6
Excess flow cut-off valve	5.2.1 5.2.2 5.3 5.6	6.4 External gas tightness 6.5 Pressure resistance 6.8 Excess flow cut-off 6.9 Internal leakage	5 1[a] 5 5	6

[a] Use a new device for this test. Do not use for any other test.

NOTE In the following subclauses, the terms "upstream" and "downstream" refer to the normal direction of gas flow in the device.

5.2 Gas tightness

5.2.1 External gas tightness

The general requirements on external gas tightness and the test procedures shall be in accordance with ISO 9090.

5.2.2 Internal gas tightness

Where internal gas tightness is required in this document the leakage rate shall not exceed 50 cm^3/h for devices with a connection internal bore (diameter) less than 11 mm or 0,41 d^2 for larger diameters (for tests, see 6.6 and/or 6.9).

NOTE The value 0,41 d^2 is the flow in cm^3/h where d is the internal bore (diameter) in mm of the largest connection of the device.

5.3 Pressure resistance

The housings of the safety devices shall resist a pressure equal to ten times the maximum operating pressure, with the test pressure in all cases not less than 6 MPa (60 bar).

NOTE 1 bar = 0,1 MPa = 10^5 Pa. 1 Pa = 1 N/m^2. All pressures are gauge pressure.

When the device is tested in accordance with 6.5, no permanent deformation of the pressure retaining components shall occur after a test duration of at least 5 min.

5.4 Non-return valve

Non-return valve shall not allow the reverse flow of gases when tested in accordance with 6.6.

5.5 Pressure relief valves

The opening pressure of the pressure relief valve shall be between 1,3 and 2 times the maximum operating pressure specified by the manufacturer and the valve shall close at a pressure between 1 and 2 times this pressure. They shall be leak-proof to the requirements of 5.2.1 at all pressures up to and including the maximum operating pressure. They shall be checked in accordance with 6.7.

The manufacturer shall state the flow capacity to atmosphere as measured at twice the operating pressure.

If a pressure relief valve is incorporated in a regulator, it shall be in accordance with ISO 2503 or ISO 7291 as applicable and does not belong anymore to the scope of this document.

5.6 Excess flow cut-off valves

Excess flow cut-off devices shall stop the gas flow when the flow reaches between 1,1 and 2 times the nominal flow rate specified by the manufacture when tested in accordance with 6.8.

5.7 Flashback resistance

Safety devices used in applications where flashback may occur shall conform to the requirements of this document after exposure to flame arrestor test performed according to ISO 5175-1:2017, 6.7, where the flame arrestor is replaced by the safety device to be tested.

6 Methods for type testing

6.1 General

The test methods in this clause are not intended as production inspection tests, but are to be applied to sample devices to be tested for compliance with this document. Tests shall be carried out on new devices with all safety functions operational as designed.

Third party conformity testing is not a requirement of this document. See Annex B for information relating to third party conformity testing if required.

6.2 Accuracy of pressure and flow measurements

The allowable total error of the measured values are as follows:

— flow: ±10 %;

— pressure: ±3 %.

All flows and pressures shall be expressed in standard atmospheric conditions in accordance with ISO 554. All pressure values are given as gauge pressure, expressed in bars.

6.3 Test gases

Unless otherwise stated, tests shall be carried out at ambient pressure conditions and at (20 ± 5) °C with air or nitrogen free from oil and grease.

Air is considered as oil-free if it comprises

— a mass fraction of oil vapour of less than 5×10^{-6}, and

— less than 1 mg/m^3 of suspended droplets.

In all cases, tests shall be carried out with dry gas with a maximum moisture content corresponding to a dew point of 0 °C.

Safety devices for hydrogen shall be tested with hydrogen or helium for the gas tightness test only.

6.4 Gas tightness test

Conformity with the requirements of 5.2.1 shall be checked on five samples in accordance with ISO 9090.

6.5 Pressure resistance test

Conformity with the requirements of 5.3 shall be checked by means of a hydraulic pressure test on one sample. No other tests shall be carried out on the sample either before or after this test, nor shall the sample tested be used for any other purposes.

6.6 Non-return valve test

6.6.1 General

Conformity with the requirements of 5.4 shall be checked on five samples as follows. Before proceeding with this test, pass the test gas through the device in the normal direction of flow for 5 s to operate the valve. Connect the downstream side of the device under test to a gas source, with the upstream side at atmospheric pressure and connected to a leak detection device. Proceed to pressurize in the reverse direction according to 6.6.2. For the tests, the samples shall be installed in the most disadvantageous position (gravity acting to open the valve).

6.6.2 Tests with reverse flow of gas

Pressurize the device in the reverse direction as follows:

a) increase the back-pressure at a rate of 600 Pa/min (6 mbar/min) up to 3 000 Pa (30 mbar);

b) increase the back-pressure within 1 s from 0 to maximum operating pressure.

The maximum reverse flow during the period of reverse pressure application and for 1 min afterwards shall meet the requirements of 5.2.2.

6.7 Pressure relief valves

The requirements specified in 5.5 shall be checked on five samples by progressively increasing and then decreasing pressure. Measure the flow through the device when the upstream pressure is equal to twice the maximum operating pressure.

6.8 Excess flow cut-off valve

This test shall be carried out using the actual gas the device is designed to operate on. If it is designed for use with more than one gas, it shall be tested for each gas.

For each gas, the requirements specified in 5.6 shall be checked on five samples as follows. Connect the device to a pipeline at the maximum operating pressure specified by the manufacturer; see Figure 4. Progressively increase the flow rate in the normal direction by opening valve "A" until the device operates. After the device has operated (cut-off the flow) the device shall be tested in accordance with 6.9 to test for internal leakage.

Key

1 p_{max}
2 samples
3 valve "A"
4 flow meter

Figure 4 — Test equipment excess flow cut-off valve

6.9 Internal leakage test for cut-off valves

With the device under test in the tripped condition, connect the upstream side to a gas source at the maximum operating pressure, with the downstream side open to atmosphere. Check that internal leaks at the device outlet meet the requirement of 5.2.2.

7 Manufacturer's instructions

When distributed, the safety device shall be accompanied by the manufacturer's instructions which shall contain, as a minimum, the following information:

a) the function of the safety device;

b) operational and performance data [maximum working pressure, gas flow characteristics (see Annex A)];

c) permissible types of gas;

d) an explanation of the abbreviations marked on the device;

e) instruction for installation of equipment [The method of installing these devices (e.g. types selected, order of installation, etc.) varies with operating conditions. It is essential to follow the manufacturer's instructions regarding installation and operation to ensure that the overall pressure drop due to the combination is as low as possible.];

f) procedures to be carried out prior to operation;

g) procedures for safe operation;

h) instructions in case of malfunction;

i) recommendations for inspection, testing and maintenance;

j) explanation of the marking.

8 Marking

All marking shall be legible and durable. The following information shall be included:

a) reference to this document (i.e. ISO 5175-2);

b) the name or trade mark of the manufacturer and/or distributor;

c) the model designation or code number relating to the manufacturer's installation instructions;

d) the direction of normal gas flow (arrow);

e) the name of gas or its abbreviation;

f) the maximum working pressure, p_{max}, expressed in bar;

g) the maximum flow rate, only for excess flow cut-off valve (see 5.6);

h) indication of the safety functions incorporated in the device as shown below.

Abbreviations for the safety functions shall be marked as follows:

— non return valve: NV;

— pressure relief valve: RV;

— excess flow cut-off valve: EV.

The appropriate letters shall be enclosed in a square as in the following example:

— non-return valve

NV

— non-return valve +
– excess flow cut-off valve

NV	EV

If the full name or the chemical symbol of the gas cannot be marked, the letter codes according to ISO 10225 shall be used for marking of equipment. If in addition, a colour coding is used, red shall be used for fuel gases, blue for oxygen, black for compressed air.