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Gas tightness of equipment for gas welding and allied processes

Étanchéité aux gaz des appareils pour soudage aux gaz et techniques connexes

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Foreword

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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).

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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*.

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Official interpretations of TC 44 documents, where they exist, are available from this page: https://committee.iso.org/sites/tc44/home/interpretation.html.

This second edition cancels and replaces the first edition (ISO 9090:1989), which has been technically revised. The main changes compared to the previous edition are as follows:

— the Scope has been clarified;

— Clause 2 has been updated;

— a leakage requirement for unconnected female elements of a quick-action coupling has been added;

— the term "hose" has been replaced by "hose assembly" and the value for the leakage has been added;

— various types of blowpipes have been covered;

— in 6.2.1, b) the lower test pressure has been updated;

— the test methods for blowpipes have been moved to new Annex B;

— hydrogen is not allowed anymore for leakage test; Table A.1 has been updated accordingly.

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Gas tightness of equipment for gas welding and allied processes

1 Scope

This document specifies the maximum external gas leakage rates which are acceptable for equipment used for welding, cutting and allied processes and provides the procedures of measurement.

It applies to individual components which are used in the gas supply to a blowpipe from the connecting point of the hose (outlet of the cylinder valve or connecting point to a gas supply plant). It does not apply to gas supply plant.

NOTE Specific requirements on the test method and conditions/procedure for measurement of the maximum external leakages can be given in individual standards, e.g. ISO 9012 for air-aspirated hand blowpipes. Concerning the method and the conditions to be applied, the individual standard takes precedence over this document. The maximum external leakages according to this document apply.

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.

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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)*

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ISO 15296, *Gas welding equipment — Vocabulary*

3 Terms and definitions

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

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

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

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

4 Expression of leakage

The maximum permissible external gas leakage rates, which are specified in this document, are total leakage rates for a complete component including inlet connections.

These rates shall be given in cubic centimetres per hour[1)] of the gas for which the equipment was designed, corrected to standard conditions[2)] measured at room temperature.

NOTE Connections that are necessary only for the test are excluded.

1) $1\ cm^3/h = 0{,}28 \times 10^{-9}\ m^3/s$.

2) Standards conditions: 23 °C, 1,013 bar (0,101 3 MPa).

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5 Gas to be used for the tests

5.1 General

If the tests are carried out with a gas other than the gas for which the equipment is designed, appropriate corrections shall be made as specified in Annex A.

5.2 Type tests

Devices to be used with helium and/or hydrogen shall be tested with helium.

Devices to be used with other gases shall be tested with dry oil free air or nitrogen.

5.3 Routine tests

Routine tests can be conducted with dry oil free air or nitrogen.

6 Test pressure

6.1 Regulators

Regulators shall be tested at pressure p_1 and p_2 as defined in ISO 2503.

6.2 Other equipment

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6.2.1 Type tests

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Other devices shall be tested at the following pressure:

a) maximum working pressure as given by the manufacturer;

b) 10 % of the maximum working pressure or 0,5 bar, whichever is lower.

6.2.2 Routine test

All devices shall be tested at one of the two pressures specified in 6.2.1, which gave the most unfavourable results during the type test.

7 Maximum permissible external gas leakage rates at the above defined pressures

7.1 Regulators

Regulator shall not have a total leakage rate greater than 10 cm^3/h.

7.2 Blowpipes

Blowpipes shall not have a total external leakage rate greater than 8 cm^3/h. The leakage rate through each valve shall not have a rate greater than 4 cm^3/h. The test methods shall be as described in Annex B.

These test methods enable total leakage and leakage through each valve to be tested. Under the 6 test conditions, respectively 3 for Welding/Heating blowpipes and 3 for Cutting blowpipes, defined in Annex B (plugged inlet and/or outlet, state of the valve and gas hose connected to an inlet as described), the leakage shall be limited to: 8 cm^3/h as per Figure B.1, Figure B.2 and Figure B.4, conditions and 4 cm^3/h as per Figure B.3, Figure B.5 and Figure B.6 conditions.

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7.3 Safety devices

Safety devices shall not have a total leakage rate greater than 8 cm^3/h.

7.4 Quick action couplings

When connected, quick action coupling shall not have a total leakage rate greater than 10 cm^3/h.

Unconnected female elements shall not have a total leakage rate greater than 10 cm^3/h.

7.5 Devices with combined functions

Devices with combined functions shall have a total leakage rate not exceeding the maximum rate applicable to any individual function.

7.6 Hose assembly

Hose assembly shall not have a total leakage rate greater than 4 cm^3/h.

7.7 Other equipment

Other equipment that may be used on an installation for gas welding and allied processes shall not have an overall leakage rate greater than 8 cm^3/h.

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8 Measurement of the leakage rate

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8.1 General

The following method is used to determine the leakage rate of device. It is a type test method, which determines whether a device conforms to the requirements specified in Clause 7.

For routine purposes, manufacturers may use whatever method is most suited to their requirements.

8.2 Principle of the method

Immersion of the device to be tested in water, with the device connected to a gas source throughout the test; collection of the gas leaking from the device in a graduated cylinder initially full of water.

Other test methods are permitted, provided that it can be shown that these give results as accurate as those available from the method given in this clause.

8.3 Test apparatus for immersion method

8.3.1 Water-bath, having suitable dimensions for complete immersion of the device to be tested.

8.3.2 Gas-supply, allowing pressurization of the device throughout the test.

8.3.3 Graduated cylinder, initially full of water, mounted above the device to be tested.

The size and scale graduations of the graduated cylinder shall be such that the volume can be read to an accuracy of 0,5 cm^3.

8.3.4 Funnel, allowing the escaping gas to be collected.

The funnel shall be suitable to collect all the gas which may escape from the device, but not that which escapes from the connections with the gas supply pipe.

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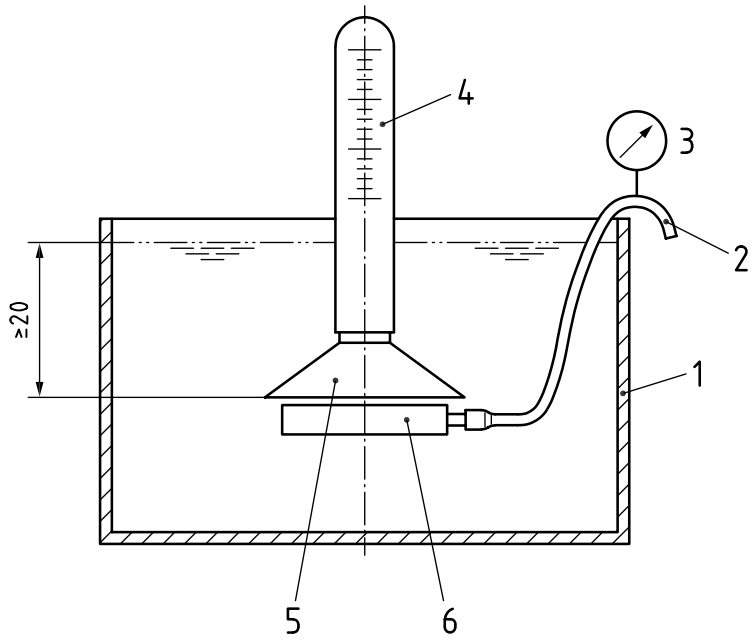
The test apparatus shall be as defined in Figure 1.

Dimensions in centimetres



Key

1 water-bath (8.3.1)
2 gas supply (8.3.2)
3 test pressure
4 graduated cylinder (8.3.3)
5 funnel (8.3.4)
6 device to be tested

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Figure 1 — Test apparatus

8.4 Procedure

8.4.1 Connect the device to be tested to the gas supply (8.3.2). All other possible openings shall be closed so that the leakage can be determined.

8.4.2 Immerse the device in the water-bath (8.3.1) to a depth of at least 20 cm and supply the device with gas at a pressure equal to the test pressure as given in Clause 6, plus the pressure, Δp, due to the immersion depth.

8.4.3 Wait 10 min to allow the trapped air adhering to the outside surfaces of the device to escape, then place the graduated cylinder (8.3.3) and the funnel (8.3.4) in position and maintain the device under pressure for 1 h.

8.4.4 At the end of the test, raise or lower the graduated cylinder to equalize the levels of the water in the cylinder and in the bath. Measure the volume of collected gas by reading the graduation on the cylinder.

8.4.5 Correct the measured volume as specified in Clauses 4 and 5, to take into account the gas and the standard temperature and pressure conditions.

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Annex A
(normative)

Correction of measurements

If the tests are not carried out with the gas for which the device is designed, the measured leakage rate shall be multiplied by the appropriate correction factor given in Table A.1

Table A.1 — Correction factor for the leakage rate measured assuming a molecular flow

Gas used for the test	Correction factor for the leakage rate measured						
	Air	Oxygen	Nitrogen	Argon	Hydrogen	Helium	Acetylene
Air	1	0,950	1,02	0,852	—	—	1,05
Nitrogen	0,983	0,930	1	0,837	—	—	1,03
Helium	—	—	—	—	1,431	1	—

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