INTERNATIONAL STANDARD

ISO 12170

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Gas welding equipment — Thermoplastic hoses for welding and allied processes

Matériel de soudage aux gaz — Tuyaux souples en matière thermoplastique pour le soudage et les techniques connexes

Reference number
ISO 12170:1996(E)

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.

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.

International Standard ISO 12170 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*.

Annexes A, B and C form an integral part of this International Standard.

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Gas welding equipment — Thermoplastic hoses for welding and allied processes

1 Scope

This International Standard specifies the requirements and relevant methods of measurement and testing of two types of thermoplastic hoses with maximum design working pressure of 1 MPa and of 2 MPa, used for flexible gas supply lines in specific fields of application as follows:

- small kits for brazing and welding in accordance with ISO 14112;
- air-aspirated blowpipes for welding and allied processes;
- miniature welding such as jewellery work, dental work excluding acetylene applications;
- arc welding with shielding gas.

NOTE 1 This International Standard does not exclude the use of rubber hoses in the same fields of application. Rubber hoses for these applications are covered by ISO 3821.

This standard does not apply to hoses for liquefied petroleum gases (LPG) in liquid phase or to acetylene. The hose manufacturer shall be consulted for compatibility of the hose to hydrogen application.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1994, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties.*

ISO 105-A02:1993, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour.*

ISO 176:1976, *Plastics — Determination of loss of plasticizers — Activated carbon method.*

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471:1995, *Rubber — Temperatures, humidities and times for conditioning and testing.*

ISO 1307:1992, *Rubber and plastics hoses for general-purpose industrial applications — Bore diameters, and tolerances on length.*

ISO 1402:1994, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1746:1983, *Rubber or plastics hoses and tubing — Bending tests.*

ISO 3821:1992, *Welding — Rubber hoses for welding, cutting and allied processes.*

ISO 4080:1991, *Rubber and plastics hoses and hose assemblies — Determination of permeability to gas.*

ISO 4671:1984, *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions.*

1) To be published. (Revision of ISO 4672:1988)

ISO 4672:—[1], *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 8033:1991, *Rubber and plastics hose — Determination of adhesion between components.*

ISO 11758:1995, *Rubber and plastics hoses — Exposure to a xenon arc lamp — Determination of changes in colour and appearance.*

ISO 14112:1996, *Gas welding equipment — Small kits for gas brazing and welding.*

3 Materials

3.1 Construction

The hose shall comprise:

a) an interior lining consisting of a thermoplastic composition;

b) reinforcement applied by any suitable method;

c) an external cover consisting of a thermoplastic composition.

The total wall thickness of the hose shall be not less than 2,5 mm.

3.2 Manufacture

The lining and cover shall be of uniform thickness, concentric and free from air bubbles, porosity and other imperfections.

4 Dimensions, tolerances and colours

4.1 Bore sizes and colours

The nominal internal diameters and colours shall comply with the values given in tables 1 and 2.

Table 1 — Bore sizes and colours of hoses for oxy-fuel gas blowpipes and air-fuel gas blowpipes

Dimensions in millimetres

Gases	Applications		Colour of cover
	Bore sizes for oxy-fuel gas blowpipes	**Bore sizes for air-fuel gas blowpipes**	
Hydrogen[1] or other combustible gases excluding acetylene	3,2 and 4		red
LPG[2] or MPS[3]	3,2 and 4	3,2; 4; 5	orange
Oxygen[4]	3,2 and 4		blue

1) The manufacturer shall be consulted for compatibility of the hose to hydrogen applications.

2) Liquefied petroleum gases.

3) Methylacetylene-propadiene-mixtures.

4) Also for air/oxygen mixtures with an additional oxygen content of more than 20 %.

Table 2 — Bore sizes and colours of hoses for arc welding applications

Dimensions in millimetres

Gases	Arc welding applications (with shielding gas)	Colour of cover
	Bore sizes	
Other non combustible gases and gas mixtures except oxygen[1]	3,2; 4; 5; 6,3; 8 and 10	black

1) e.g. mixtures argon/carbon dioxide.

4.2 Tolerances and concentricity

The concentricity of the hose measured according to ISO 4671 shall be in accordance with the values given in table 3.

Table 3 — Tolerances and concentricity

Dimensions in millimetres

Nominal bore	Tolerance	Concentricity
3,2	± 0,40	1,0 max.
4	± 0,40	1,0 max.
5	± 0,40	1,0 max.
6,3	± 0,40	1,0 max.
8	± 0,50	1,25 max.
10	± 0,50	1,25 max.

4.3 Cut lengths and tolerances

The tolerances for cut lengths shall be in accordance with values given in ISO 1307.

5 Physical properties of lining and cover

5.1 Tensile strength and elongation at rupture

The thermoplastics used in the lining and cover shall, when tested in accordance with ISO 37, have a tensile strength and elongation at rupture not less than the values given in table 4.

Table 4 — Tensile strength and elongation at rupture

Rating	Tensile strength N/mm^2	Elongation at rupture %
Lining	⩾ 5	⩾ 200
Cover	⩾ 7	⩾ 250

5.2 Accelerated ageing

After ageing for seven days at a temperature of 70 °C as described in ISO 188 the tensile strength and elongation at rupture of the lining and cover shall not decrease by more than 25 % and 50 % respectively from the values given in table 4.

5.3 Non-ignition requirement for oxygen hoses

When tested by the method described in annex A, three samples of the lining shall remain in the apparatus at a constant temperature of 180 °C to 185 °C for 2 min without ignition. The sample can change in shape, but shall not run and shall stay impaled on the sample holder.

If more than one of the samples show evidence of ignition in less than 2 min, the hoses shall be considered as not in compliance. If only one sample shows evidence of ignition in less than 2 min, three further samples shall be prepared and tested. If any of the three samples in this second series shows evidence of ignition in less than 2 min, the hose shall be deemed as not in compliance.

5.4 Resistance to liquids: Resistance of LPG and MPS hoses to *n*-pentane.

A sample of the hose lining, when tested according to annex B, shall show *n*-pentane absorbed not exceeding 15 % and *n*-pentane extractable matter not exceeding 10 %.

5.5 Loss in mass on heating

When tested in accordance with ISO 176, method B, materials of the lining and cover shall not have a loss in mass greater than 4 %.

6 Performance requirements

6.1 Hydrostatic requirements

The hose, when tested in accordance with ISO 1402, shall meet the requirements of table 5.

Table 5 — Hydrostatic requirements

Rating	MPa (bar)[1)]	MPa (bar)[1)]
Maximum design working pressure	1,0 (10)	2,0 (20)
Proof pressure	2,0 (20)	4,0 (40)
Minimum burst pressure	3,0 (30)	6,0 (60)
	%	%
Change in length at maximum design working pressure	± 5	± 5
Change in diameter at maximum design working pressure	±10	±10

1) Values are given for testing at 23 °C.

6.2 Adhesion

When tested in accordance with ISO 8033 using the type 2 or type 4 test piece the minimum adhesion between adjacent components shall be 1,5 kN/m.

6.3 Flexibility

When tested in accordance with ISO 1746 at standard laboratory temperature as defined in ISO 471 using a diameter of curvature (C) of 10 times the nominal bore (with a minimum of 80 mm) [2], and a coefficient of deformation (K) not less than 0,8, there shall be no kink in the curved portion of the hose.

6.4 Low temperature flexibility

When tested in accordance with ISO 4672, method B at −10 °C ± 2 °C using a diameter of curvature of 12 times the nominal bore (with a minimum of 80 mm) [2], the hose shall show no signs of leaks when subjected to the test pressure (carried out at ambient temperature) stated in table 5 (as in ISO 1402).

6.5 Resistance to incandescent particles and hot surfaces

The cover of the hose shall have sufficient resistance to contact with incandescent particles and hot surfaces. To meet this requirement, the test piece shall resist, for 60 s, the test conditions given in annex C without leaking.

6.6 Resistance to UV radiation (xenon arc-lamp)

When tested in accordance with ISO 11758 the cover shall show no evidence of cracking or change of colour. After testing, when comparing the samples to the grey scale (see ISO 105-A02), the minimum acceptable degree shall be 4.

6.7 Permeability to gas for LPG and MPS hoses

When tested in accordance with ISO 4080:1991 method 2 using a test gas of 95 % propylene at cylinder pressure approximately 0,6 MPa (6 bar) and standard laboratory temperature of 23 °C as defined in ISO 471 the gas permeance shall not exceed 25 cm^3/m/h, irrespective of bore size.

7 Colour identification and marking

7.1 General

The hose cover material shall be coloured throughout and marked as described below.

7.2 Colour identification

In order to identify the gas for which the hose is to be used, the hose cover shall be coloured as given in tables 1 and 2.

7.3 Marking

The hose cover shall be continuously and durably marked at least every metre with the designation (see clause 8).

8 Designation

A hose cover shall be designated by

a) reference to this International Standard;

b) maximum design working pressure in megapascals and in bar between parentheses;

c) nominal bore size in millimetres;

d) manufacturer's name or supplier's mark;

e) quarter (Q) and year of manufacture given by the two last digits.

EXAMPLE

Hose cover with a maximum design working pressure = 2 MPa, of nominal bore size = 6,3 mm manufactured by company XYZ in the first quarter of 1995 shall be designated as follows:

ISO 12170 - 2 MPa (20 bar) - 6,3 mm - XYZ - 1 Q 95

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2) C of 80 mm for bore sizes 3,2 mm to 6,3 mm;

C of 90 mm for bore size 8 mm;

C of 100 mm for bore size 10 mm.

Annex A
(normative)

Test method for non-ignition requirement

A.1 Apparatus

The apparatus shown in figure A.1 is required together with the following.

A.1.1 Heating furnace, 350 W, internal dimensions: 150 mm deep by 50 mm diameter.

A.1.2 Tubular sliding resistance, 190 Ω to 200 Ω, with screw movement or an autotransformer with continuously variable output voltage.

A.1.3 Calibrated flowmeter for oxygen, ranging from 0 l/min to 5 l/min at atmospheric pressure and 15 °C.

A.1.4 Nitrogen-filled mercury-in-glass thermometer, suitable for use at 150 mm immersion, graduated up to 200 °C in intervals of not more than 5 °C, the graduations to start not less than 200 mm above the bulb.

A.2 Procedure

Insert the ignition test apparatus, in its aluminium foil wrapping, into the electric furnace. The purpose of the aluminium foil is to minimize radiant heat and to obtain a more uniform temperature distribution. Adjust the energy supply to the electric furnace with the variable resistance or autotransformer so that a constant temperature of 180 °C to 185 °C is maintained with the oxygen flowing at 2 l/min ± 0,1l/min.

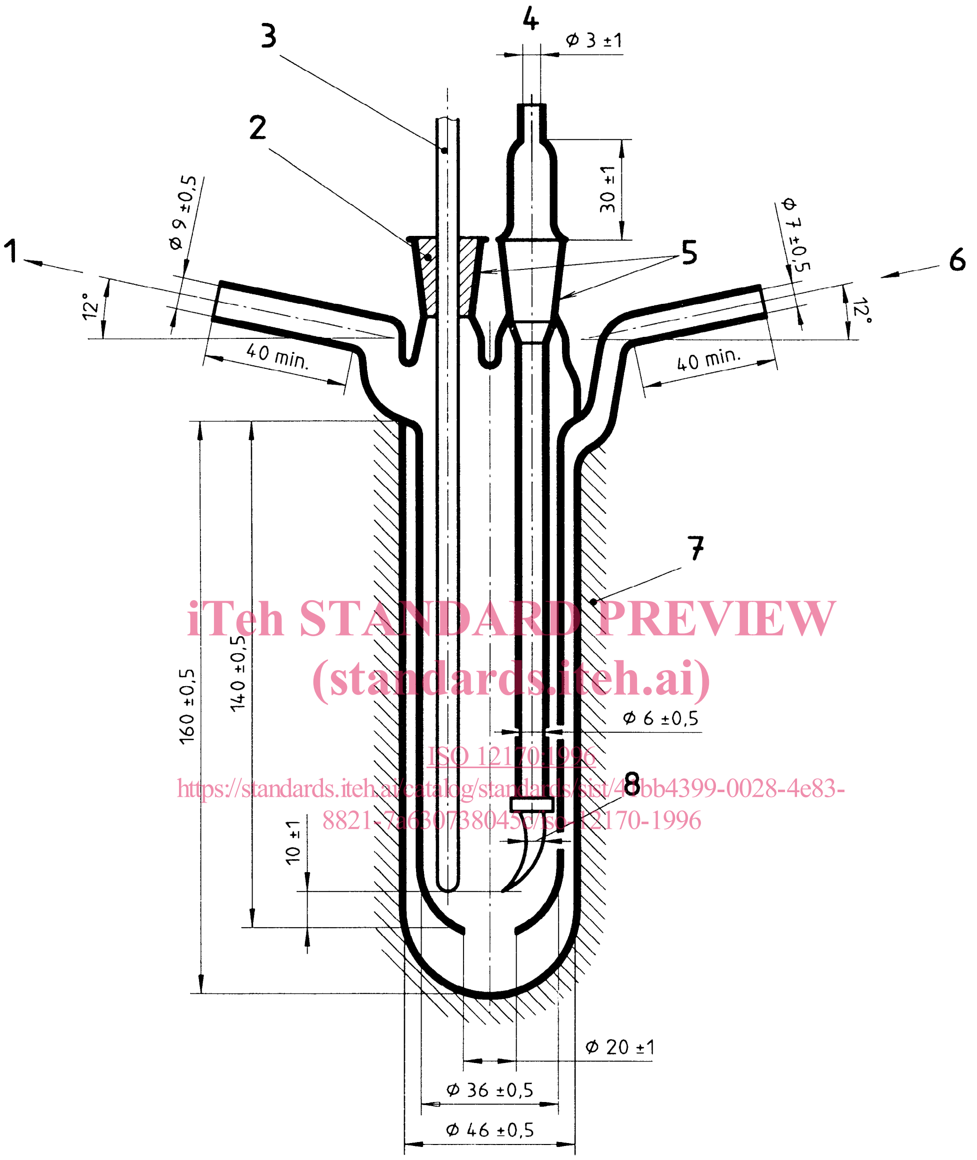
After cleaning by buffing cut the sample of rubber lining test into blocks of 8 mm^3 to 10 mm^3 of which no side shall be less than 1,3 mm nor greater than 2,5 mm.

When the furnace is at constant temperature, remove the sample holder, impale a sample block of the rubber lining under test on the tungsten point and replace the sample holder in the apparatus. It is necessary for this operation to be carried out quickly, so that cooling is reduced to a minimum. The tungsten point should be kept clean and sharp.

Maintain the sample in the apparatus for at least 2 min and observe it carefully during this period for evidence of ignition. Fumes may be observed but this shall not constitute evidence of ignition, which is normally accompanied by a flash and sometimes by a small explosion. When ignition of a sample occurs, the temperature of the apparatus may rise and it is then essential that time be allowed in order to permit the temperature to return to the appropriate testing level.

Test three samples consecutively.

Dimensions in millimetres



Constructed from borosilicate glass, tubing of wall thickness:

— 0,75 to 1,25 (for ø 6 to ø 9)

— 1 to 2 (for ø 36 to ø 46)

Key

1) Oxygen outlet
2) Heat-resistant packing
3) Thermometer
4) Orifice
5) 14/23 joints
6) Oxygen inlet
7) Aluminium foil
8) 7 mm ø tungsten wire tapered to fine point (20 ± 0,5) mm long

Figure A.1 — Apparatus for ignition test on lining samples

Annex B
(normative)

Method of test for resistance to *n*-pentane

B.1 Weigh a portion of the hose lining and then immerse it in *n*-pentane at standard laboratory temperature for 72 h. The volume of the *n*-pentane shall be at least 50 times the volume of the test piece.

B.2 Following immersion reweigh the test piece after 5 min conditioning in air at room temperature and reweigh again after 24 h further conditioning under these conditions.

B.3 Calculate the *n*-pentane absorbed, P_a, in percent and the *n*-pentane-extractable, P_e, in percent matter using the following formulae:

$$P_a = \frac{(M_1 - M_2)}{M_0} \times 100$$

$$P_e = \frac{(M_0 - M_2)}{M_0} \times 100$$

where:

M_0 is the initial mass of the test piece;

M_1 is the mass of the test piece after immersion and 5 min conditioning;

M_2 is the mass of the test piece after 24 h further conditioning.