INTERNATIONAL STANDARD

ISO 3821

Second edition
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Welding — Rubber hoses for welding, cutting and allied processes

Soudage — Tuyaux souples en caoutchouc pour le soudage, le coupage et techniques connexes

Reference number
ISO 3821:1992(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 3821 was prepared jointly by Technical Committees ISO/TC 44, *Welding and allied processes*, Sub-Committee SC 8, *Gas welding equipment* and ISO/TC 45, *Rubber and rubber products*, Sub-Committee SC 1, *Hoses (rubber and plastics)*.

This second edition cancels and replaces the first edition (ISO 3821:1977), of which it constitutes a technical revision.

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

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Welding — Rubber hoses for welding, cutting and allied processes

1 Scope

This International Standard specifies requirements for rubber hoses for welding, cutting and allied processes. The term "allied processes" means, in particular, heating, brazing and metallization.

This International Standard specifies requirements for rubber hoses for normal duty and light duty (limited to hoses for maximum working pressure up to 10 bar and with nominal bore less than or equal to 6,3 mm).

Requirements for plastics hoses are not within the scope of this International Standard.

Different colours and markings are specified for identification of the gas.

NOTES

1 If hoses for liquified petrol gases are used without regulators the use of light duty hoses is not allowed.

2 In the case of hoses for use with liquid flux dispensers fitted in the fuel gas supply line, the manufacturer should be consulted on the suitability of the hose for this application.

This International Standard applies to hoses used in:

— gas welding and cutting;

— arc welding under the protection of an inert or active gas;

— processes allied to welding and cutting.

This International Standard does not apply to hoses used for high pressure acetylene (more than 1,5 bar).

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 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

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

ISO 471:1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

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

ISO 1402:1984, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

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

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

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.*

ISO 4672:1988, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions.*

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

3 Materials

3.1 Construction

The hose shall consist of:

a) a rubber lining of a minimum thickness of 1,5 mm;

b) a rubber cover of a minimum thickness of 1,0 mm;

c) reinforcement applied by any suitable technique.

3.2 Manufacture

The lining and cover shall be of uniform thickness and free from air holes, porosity and other defects.

The hose may be mandrel- or non-mandrel-made and the finish may be smooth, fluted or fabric marked.

4 Dimensions and tolerances

4.1 Bore sizes

The bore of the hoses shall be in accordance with the nominal dimensions and tolerances shown in table 1.

Table 1 — Nominal bore, tolerances and concentricity

Dimensions in millimetres

Nominal bore	Tolerance	Concentricity
4,0 5,0 6,3	± 0,55	1,0 max.
8,0 10,0	± 0,65	1,25 max.
12,5 16,0	± 0,70	
20,0	± 0,75	1,50 max.

NOTES

1 The tolerances (excluding 20 mm nominal bore) do not comply with ISO 1307, table 1.

2 For intermediate dimensions, numbers should be chosen from the R 20 series of preferred numbers with tolerances as for the next larger bore size shown in table 1.

4.2 Concentricity (total indicated reading)

The concentricity of the hose, measured in accordance with ISO 4671, shall be in accordance with the values given in table 1.

4.3 Cut lengths and tolerances

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

5 Physical properties of lining and cover

5.1 Tensile strength and elongation at break

The rubber used in the lining and cover shall, when tested in accordance with ISO 37, have a strength and elongation at break not less than the values given in table 2.

Table 2 — Tensile strength and elongation at break

	Tensile strength (N/mm^2)	Elongation at break (%)
Lining	5,0	200
Cover	7,0	250

5.2 Accelerated ageing

After ageing for 7 days at a temperature of 70 °C as described in ISO 188, the tensile strength and elongation at break respectively of the lining and cover shall not decrease by more than 25 % and 50 % from the values given in table 2.

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 360 °C to 365 °C for 2 min without ignition.

If more than one of the samples show evidence of ignition in less than 2 min, the hose 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

5.4.1 Resistance to acetone and dimethylformamide [DMF] (for acetylene hoses only)

A sample of the lining, when immersed in the test solvent at standard laboratory temperature as defined in ISO 471 for 70 h, shall not increase in mass by more than 8 % when calculated in accordance with the method in ISO 1817.

5.4.2 Resistance to *n*-pentane (for LPG[1)] and MPS[2)] hoses only)

For a sample of the hose lining, when tested as described in annex B, the amount of *n*-pentane absorbed shall not exceed 15 % and the amount of *n*-pentane extractable matter shall not exceed 10 %.

6 Performance requirements

6.1 Hydrostatic requirements

The hose, when tested in accordance with ISO 1402, shall meet the requirements of table 3.

Table 3 — Hydrostatic requirements

Pressure values expressed in MPa (bar)

Rating	Light duty	Normal duty
Nominal bore	≤ 6,3 mm	All sizes
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 %	
Change in diameter at maximum design working pressure	± 10 %	

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 ten times the nominal bore (with a minimum of 80 mm), and a coefficient of deformation, K, of 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 8, at − 25 °C ± 3 °C, using a diameter of curvature of ten times the nominal bore (with a minimum of 80 mm), the hose shall show no signs of leaks when subjected to the proof pressure (carried out at ambient temperature) stated in table 3.

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 the test conditions given in annex C for 60 s without leaking.

6.6 Ozone resistance

When tested in accordance with ISO 7326, method 1, the cover shall show no evidence of cracking under two times magnification.

6.7 Permeability to gas (for LPG and MPS hoses only)

When tested in accordance with ISO 4080 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 per hour, irrespective of bore size.

7 Colour identification and marking

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

7.1 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 table 4.

1) LPG = Liquified petroleum gases.

2) MPS = Methylacetylene-propadiene mixtures.

7.2 Marking by lettering

The hose cover shall be continuously and durably marked at least every 1,0 m with the following information:

a) the number of this International Standard: ISO 3821;

b) the maximum design working pressure, in bar (megapascals);

c) the nominal bore size, in millimetres;

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

e) the year of manufacture.

EXAMPLE

ISO 3821 - 20 bar (2,0 MPa) - 10 - XYZ - 88

Table 4 — Colour coding and marking

Gas	Colour of cover
Acetylene and other combustible gases[1] (except LPG and MPS)	Red
Oxygen[2]	Blue
Air, nitrogen, argon, CO_2	Black
Liquified petroleum gases (LPG) and mixtures of methylacetylene and propadiene (MPS)	Orange

1) The manufacturer should be consulted on the suitability of the hose for use with hydrogen.

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

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 auto-transformer with continuously variable output voltage.

A.1.3 Calibrated flowmeter for oxygen, 0 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 from approximately 300 °C to 400 °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 auto-transformer so that a constant temperature of 360 °C to 365 °C is maintained with the oxygen flowing at 2 l/min ± 0,1 l/min.

Cut the sample of rubber lining for test, after cleaning by buffing, 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.

Retain the sample in the apparatus for at least 2 min and observe it carefully during this period, for evidence of ignition. Fumes can 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 can rise and it is then essential that time is allowed to permit the temperature to return to the appropriate testing temperature.

Test three samples consecutively.

Dimensions in millimetres

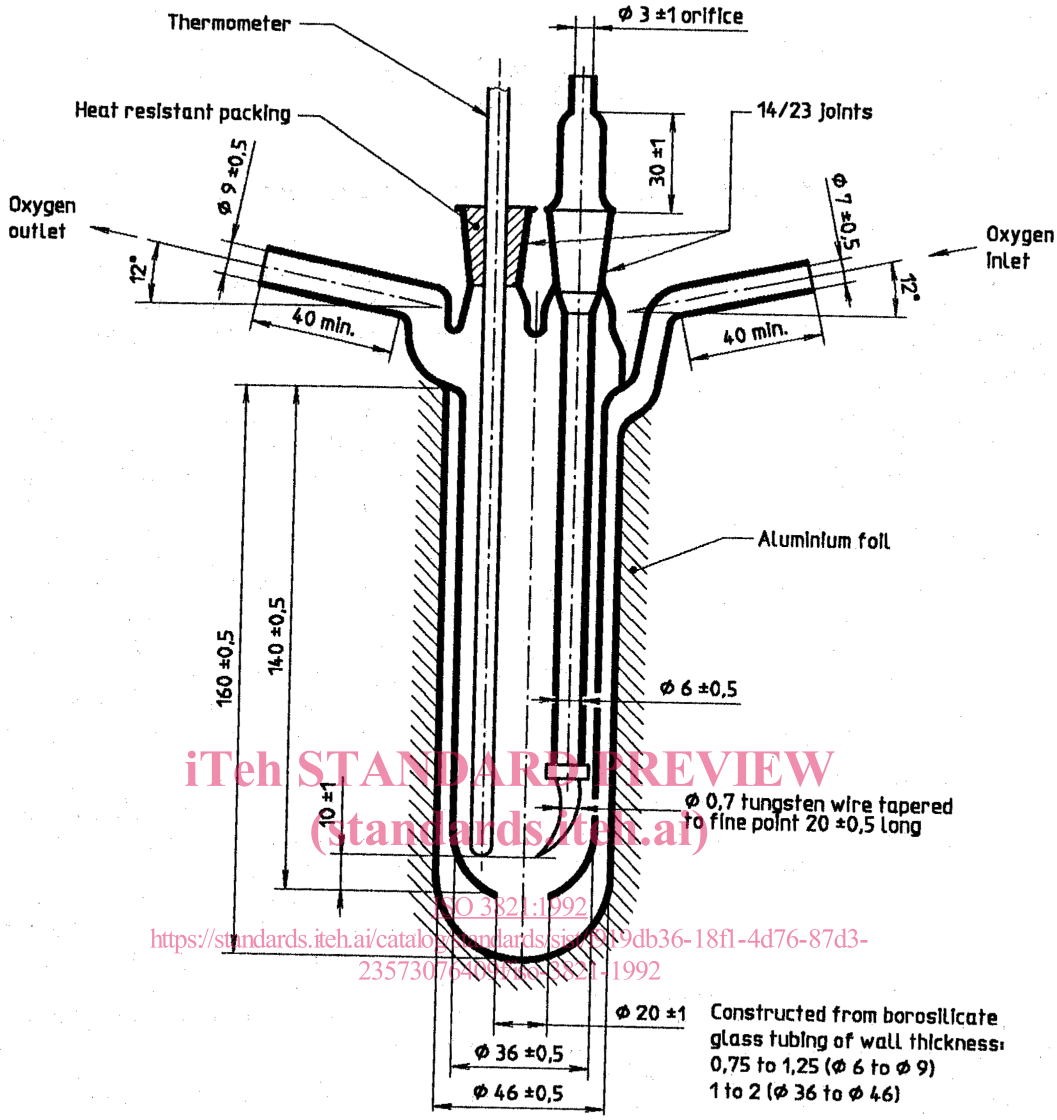

Figure A.1 — Apparatus for ignition tests on lining samples

Annex B
(normative)

Test method 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 amount of *n*-pentane absorbed, P_a, and the amount of *n*-pentane extractable matter, P_e, using the following expressions:

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

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

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.