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Entwurf

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Schläuche mit und ohne Einlage und Schlauchleitungen zur Verwendung mit Propan und Butan in der Gasphase – Spezifikation; Englische Fassung prEN 1763:2003

Flexible rubber and plastics hose, tubing, nozzles and assemblies for use with propane and butane in the vapour phase –
Specification; English version prEN 1763:2003

Tuyaux, tubes et flexibles utilisables avec le butane et le propane en phase vapeur –
Spécification; Version anglaise prEN 1763:2003

Anwendungswarnvermerk

Dieser Norm-Entwurf wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise als Datei per E-Mail an fakau@din.de in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/stellungnahme oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an den Normenausschuss Kautschuktechnik (FAKAU) im DIN , 60443 Frankfurt (Hausanschrift: Zeppelinallee 69, 60487 Frankfurt).

Gesamtumfang 24 Seiten

Normenausschuss Kautschuktechnik (FAKAU) im DIN
Normenausschuss Gastechnik (NAGas) im DIN

Nationales Vorwort

Dieser Norm-Entwurf ist die Deutsche Fassung des vom Technischen Komitee TC 218 „Gummi- und Kunststoffschläuche und -schlauchleitungen“ (Sekretariat: Vereinigtes Königreich) des Europäischen Komitees für Normung (CEN) ausgearbeiteten Norm-Entwurfes prEN 1763. Wenn aus diesem Norm-Entwurf eine Europäische Norm wird, sind die nationalen Normungsorganisationen verpflichtet, diese EN vollständig und unverändert in ihr nationales Normenwerk zu übernehmen

Die vorbereitenden Arbeiten wurden von der Arbeitsgruppe „Anforderungen an Gummi- und Kunststoffschläuche und -schlauchleitungen für industrielle, chemische und petrochemische Anwendungen“ (WG 1) des CEN/TC 218 durchgeführt, deren Federführung in Deutschland lag. Das zuständige deutsche Spiegelgremium wurde federführend vom Normenausschuss Kautschuktechnik (FAKAU) betreut.

Für die im Abschnitt 2 zitierten Internationalen Normen wird im Folgenden auf die entsprechenden Deutschen Normen hingewiesen:

ISO 37 siehe DIN 53504

ISO 188 siehe DIN 53508

Änderungen

Gegenüber DIN EN 1763-1:2001-04 wurden folgende Änderungen vorgenommen:

— unter Beibehaltung der wesentlichen Anforderungen und Eigenschaften wurden die Inhalte der Norm und des Entwurfs DIN EN 1763-2:1998-11 zusammengefasst.

Nationaler Anhang NA
(informativ)

Literaturhinweise

DIN 53504, *Prüfung von Kautschuk und Elastomeren – Bestimmung von Reißfestigkeit, Zugfestigkeit, Reißdehnung und Spannungswerten im Zugversuch.*

DIN 53508, *Prüfung von Elastomeren – Künstliche Alterung.*

— Entwurf —

CEN/TC 218

Date: 2003-04

prEN 1763

CEN/TC 218

Secretariat: BSI

Flexible rubber and plastics hose, tubing, nozzles and assemblies for use with propane and butane in the vapour phase — Specification

Gummi- und Kunststoffschläuche und -schlauchleitungen mit und ohne Einlagen zur Verwendung mit kommerziellem Propan, kommerziellem Butan und ihren Mischungen in der Gasphase — Spezifikation

Tubes, tuyaux et flexibles en caoutchouc et en plastique pour le propane commercial, le butane commercial et leurs mélanges en phase vapeur — Spécification

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Foreword

This document (prEN 1763) has been prepared by Technical Committee CEN/TC 218 “Rubber and plastics hoses and hose assemblies”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1763-1:2000.

1 Scope

This European Standard specifies:

- the properties and performance requirements for tubing, hoses and assemblies made of either rubber or plastics in sizes up to a nominal diameter of 12,5 mm for use with commercial propane and butane and mixtures thereof, in the vapour phase, for the connection of appliances (i.e. for instance, from a cylinder to a regulator, a regulator to an appliance or to a metal tube) in environments between a minimum ambient temperature of -30 °C and a maximum ambient temperature of + 60 °C.

- the characteristics and performance requirements of the nozzles, hose connections and hose assemblies used with, or manufactured from rubber and plastic hoses and tubing at these temperatures.

One class of tubing and three classes of hoses are specified. The class 1, 2 and 3 can be used inside or outside; class 4 hoses are only for outdoor use since their level of permeation is not appropriate for indoor use.

NOTE Rubber and plastics tubing, hoses and assemblies conforming to this standard may be used where contact with appliances having a maximum surface temperature of 90 °C may occur.

This European Standard does not apply to hoses for welding purposes. Hoses for this application are given in EN 559.

2 Normative references

This European Standard incorporates by dated or undated references, 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.

EN 27326, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

EN 28033, *Rubber and plastics hose — Determination of adhesion between components*

EN ISO 176, Plastics — *Determination of loss of plasticizers — Activated carbon method (ISO 176:1976)*

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

EN ISO1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing* (ISO 1402:1994)

EN ISO 4080, *Rubber and plastics hoses and hose assemblies — Determination of permeability to gas* (ISO 4080:1995)

EN ISO 11758, *Rubber and plastics hoses —Exposure to a xenon arc lamp — Determination of changes in colour and appearance* (ISO 11758:1998)

EN ISO 4671, *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions (ISO 4671:2002)*

EN ISO 4672, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests (ISO 4672: 1999)*

ISO 37, *Rubber, vulcanised or thermoplastic — Determination of tensile stress-strain properties*

ISO 188, *Rubber, vulcanised or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 8331, *Rubber and plastics hoses and hose assemblies – Guide to selection, storage, use and maintenance*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply together with the terms and definitions given in ISO 8330:

3.1 commercial butane

C_2 to C_5 hydrocarbon product composed predominantly of butanes and/or butenes; the remaining part may consist mainly of propane/propene and pentane/pentene isomers

3.2 commercial propane

C_2 to C_5 hydrocarbon product composed predominantly of propane and/or propene; the remaining part may consist mainly of ethane/ethene and butane/butene isomers

3.3 tubing

a single core of plastic or rubber with no reinforcement or cover.

3.4 hose

hose comprises a rubber or plastic lining, a cover and a reinforcement of natural or synthetic fibres applied either spirally wound or braided.

3.5 assembly

a length of hose or tubing supplied with a coupling or nozzle attached to one or both ends

3.6 nozzle

a preformed hose or tubing insert that provides a gas tight connection

3.7 coupling (or connector)

any component permanently attached to a tubing or a hose that allows a gas-tight connection to another pipework, appliances, safety, regulating or gas controlling devices

4 Classification of tubing and hoses

One class of tubing and three classes of hose are specified, the characteristics being given in Table 1.

Table 1 — Classification of tubing and hoses

Class	Max. Working pressure Bar[1)]	Working Temperature °C		Reinforced	Permeability Requirements[2)] ml/(m.h)
		Minimum	Maximum		
1 (tubing)	0,2	-10	60	No	≤ 15
2 (hose)	10	-20	60	Yes	≤ 25
3 (hose)	20	-30	60	Yes	≤ 25
4 (hose, for outdoor use only)	20	-30	60	Yes	≤ 75

[1)] 1 bar = 0,1 MPa. [2)] See 8.9 for test conditions

5 Materials and construction of tubing and hoses

Class 1 tubing shall be of rubber or thermoplastic material.
Class 2, 3 and 4 hoses shall consist of a

- rubber or plastic lining,
- a reinforcement of natural or synthetic fibres applied either spirally wound or braided.
- a rubber or plastics cover; the cover may be pricked to allow for the gas to permeate through the cover.

6 Dimensions of tubing and hoses

6.1 Internal diameters and concentricity

When measured in accordance with B.1 of Annex B, the internal diameters, tolerances and concentricity shall conform to the values given in Table 2.

Table 2 - Internal diameter of hose or tubing

Dimensions in millimetres

Internal diameters	3,2	4,0	5,0	6,3	8,0	9,0	10,0	10,5	12,5
Tolerance	± 0,3	± 0,4	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5
Maximum variation in concentricity	0,3	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5

6.2 Tolerance on outside diameter

When two measurements at 90° to each other are made at both ends of all test pieces (see B.1 of annex B), the overall outside diameter of the tubing or hose shall be within ± 5 % of the nominal dimension stated by the manufacturer.

6.3 Tolerance on length

The tolerances on length of tubing or hose shall be as given in EN ISO 1307.
Tolerances on assemblies shall be (-1%, + 2%).

7 Requirements of tubing and hoses

7.1 Preparation of test pieces

Test pieces of thickness (2 ± 0,2) mm shall be cut from sheets of the material for tensile testing and ageing and from the tubing or hose itself for resistance to pentane test.

Sheet materials shall be from the same compound formulation as that used in the tubing or hose. These sheet materials shall be produced under conditions that are comparable to those used in the production of the tubing or hose.

7.2 Properties of materials for lining and cover

7.2.1 Tensile strength and elongation at break

When tested in accordance with B.2 of Annex B, the materials used for tubing, lining and cover shall conform to the values given in Table 3.

Table 3 — Requirements for tensile strength and elongation at break

Class	**Component**	**Tensile strength (MPa), min.**	**Elongation at break, in %, min.**
1	tubing	7,0	250
2, 3, 4	lining	7,0	250
2, 3, 4	cover	7,0	250

7.2.2 Accelerated ageing

After ageing in accordance with ISO 188, using a normal air oven and conditions given in Table 4, materials used for tubing, lining and cover shall conform to the values given in Table 4.

Table 4 — Requirements for accelerated ageing

Class	Test duration, days	Test temperature, °C	Deviation from original values, max.	
			Tensile strength	Elongation at break
1	14	70 ± 2	± 25 %	± 50 %
2	14	70 ± 2	± 25 %	± 50 %
3	14	70 ± 2	± 25 %	± 50 %
4	14	70 ± 2	± 25 %	± 50 %

7.2.3 Resistance to n-pentane

When tested in accordance with B.3 of Annex B, samples of the lining or tubing shall have absorption of n-pentane not exceeding 10 % and an extraction of material by n-pentane not exceeding 8 % .

8 Performance requirements of tubing and hoses

8.1 Visible defects evaluation

When tested in accordance with B.4 of Annex B, no defect such as cracks, air bubbles and foreign particles, shall be observed.

8.2 Cleanliness

When tested in accordance with B.5 of Annex B, the bore of the tubing or hose shall be clean and free from loose particles which might be transported by the gas.

8.3 Pressure requirements

When tested in accordance with EN ISO 1402, using air or water for the working and proof pressure, and water as the fluid medium for the minimum burst pressure, the tubing or hose shall conform to the values given in Table 5.

Table 5 — Pressure requirements

Class	Working pressure, bar	Proof pressure, bar	Minimum burst pressure, bar		Change in length at working pressure, % max.	Change in outside diameter at working pressure, % max.
			23 °C (± 2 °C)	60 °C (± 2 °C)		
1	0,2	0,4	3,5	0,8	**NA**	**NA**
2	10	20	40	40	± 5	± 8
¾	20	40	80	80	± 5	± 8

8.4 Adhesion in hoses

When tested in accordance with EN ISO 8033 using type 2 test pieces, the minimum adhesion between the lining and the reinforcement and between the reinforcement and cover shall not be less than 1,5 N/mm in each case.

8.5 Resistance to kinking

When tested in accordance with B.6 of Annex B**,** the gas pressure shown on the manometer shall not drop by more than 10 mbar.

8.6 Resistance to crushing

When tested in accordance with B.7 of Annex B, at 23 °C and at 60 °C, after removal of the force, the tubing or hose shall show no deformation or collapse, and it shall not leak when subjected to an internal air pressure equal to the proof pressure given in Table 5.

8.7 Low temperature flexibility

When tested in accordance with B.8 of Annex B and then left at ambient temperature for at least 1 h, the tubing or hose shall show no signs of cracking or rupture and it shall not leak when subjected to an internal air pressure equal to the working pressure given in Table 5.

When tested in accordance with EN ISO 1402, the tubing or hose shall meet the minimum values of proof and burst pressure given in Table 5.

8.8 Flame propagation

When tested in accordance with B.9 of Annex B**,** the tubing or hose shall not burn to either of the outer marks.

8.9 Permeability to propene

When tested in accordance with EN ISO 4080, at ambient temperature (23 ± 2 °C), using propene as the medium and:

a) Method 1, at a pressure of 10 bar, for hoses with a pricked cover; or

b) Method 2, at a pressure of 10 bar, for hoses with unpricked cover; or

c) Method 1, at a pressure of 0,2 bar, for Class 1 tubing,

the volume of propene collected shall not exceed 15 ml/(m.h) for class 1 tubing, 25 ml/(m.h) for class 2 and class 3 hoses, and 75 ml/(m.h) for class 4 hoses.

8.10 Resistance to ozone (for rubber materials only)

When tested in accordance with B.10 of Annex B, after exposure there shall be no cracks visible when the hose or tubing is viewed under ×2 magnification.

8.11 UV (xenon arc lamp) test (for plastics materials only)

Tubing and hoses with transparent plastic covers are tested in accordance with method A of EN ISO 11758 for 1000 h, there shall be no visible flaking or cracking of the cover or tubing when viewed under ×2 magnification.

8.12 Loss in mass on heating (for plastics materials only)

When tested in accordance with method B of ISO 176, the plastics material used in the construction shall have a loss in mass not greater than 4%.

9 General requirements of nozzles, couplings and assemblies

9.1 Materials

Nozzles and couplings shall be manufactured from fire resistant and corrosion resistant materials

NOTE Among suitable materials are brass conforming to ISO 197-1 and ISO 197-3, plated steel or stainless steel.

9.2 Securing of hose or tubing

The hose or tubing shall comply with the ‘pull-off’ requirements detailed in 10.3.4. In addition, the hose or tubing should be secured to the nozzle or coupling by means of swaging, crimping or the use of suitable clips according to national installation requirements.

9.3 Design of couplings for use in assemblies

The dimensions of the coupling shall be compatible with the dimensions of the hose or tubing. The method of attachment of the coupling shall be such that the hose or tubing assembly complies with 10.2.

Information related to the main types and dimensions of the couplings used are given in Annex A.

The design of the coupling shall be such that the assembly can be secured at one end without the necessity of turning the hose or tubing relative to its mating piece and without the use of additional fittings. This permits free rotation of the hose about its end fittings.

9.4 Utilization of class 1 tubing with nozzles or fittings

For low pressure applications below 0,2 bar, tubing of the appropriate dimensions shall be chosen to give a secure fit on nozzles or fittings manufactured according to the specifications in force in the country of destination.

Information related to the main types and dimensions of the nozzles used are given in Annex A.

The integrity of the connections shall meet the requirements of 10.1 and 10.3.4.

10 Performance requirements of nozzles, couplings and assemblies

10.1 Class 1 tubing nozzle coupling

The tubing, when connected to its nozzle or fitting, shall comply with the 'pull-off' requirements detailed in 10.3.4; it shall show no air leakage when tested in accordance with C.1, C.3 and C.4 of Annex C**,** both last tests without the aid of a securing clip in the case of a nozzle. The tolerance on the test nozzle, on all dimensions shall be ± 0,125 mm.

10.2 Class 2 hose nozzle coupling

The class 2 hose, when connected to its nozzle, shall comply with the 'pull-off' requirements detailed in 10.3.4; it shall show no leakage when tested in accordance with C.1, C.3 and C.4 of Annex C, both last tests without the aid of a securing clip in the case of a nozzle. The tolerance on the test nozzle, on all dimensions shall be ± 0,125 mm.

10.3 Class 2, 3 and 4 hose assembly

10.3.1 Integrity before ageing

There shall be no leakage or movement at the interface of the hose and the coupling, when tested in accordance with C.1 (proof pressure test) and C.4 (air leakage test) of Annex C.

10.3.2 Integrity after ageing

There shall be no leakage or movement at the interface of the hose and the coupling, when tested in accordance with C.1 (proof pressure test) and C.4 (air leakage test) of Annex C, after conducting the ageing test detailed in C.2 of Annex C.

10.3.3 Proof and burst pressure after ageing

When tested in accordance with ISO 1402, the assembly, shall comply with the requirements listed in table 5 after conducting the ageing test detailed in C.2 of Annex C.

10.3.4 Coupling pull-off requirements

The assembly shall show no rupture, breakage, distortion, leakage or relative movement of the end fitting to the hose, when tested in accordance with C.3 of Annex C.

11 Tests frequency

The minimum testing programme shall be as given in Annexe D.

Type approval tests are those tests required to obtain type approval.

Production acceptance tests are those carried out per batch. A batch is defined as either 500 m of tubing or hose Routine tests are those carried out in each finished length of tubing or hose, or for each assembly.

12 Type approval

or 500 kg of compounds.

Type approval is obtained by the manufacturer supplying evidence that all the requirements of this standard are met by his method of manufacture and design. Type approval tests shall be repeated a minimum of every five years or whenever a change in the method of manufacture or materials occurs.

13 Marking

13.1 Tubing and hoses

Each length of tubing or hose shall be clearly and durably marked in a contrasting colour at intervals of not more than 0,5 m with the information printed in characters at least 3 mm in height, and shall include at least the following information:

a) manufacturer's registered trade name/mark, e.g. XXX;

b) number of this European Standard, i.e. EN 1763; year of publication, i.e: 2003

c) the class, e.g. class 3;

d) ID nominal bore, e.g. 10;

e) maximum working pressure in bar, e.g. 20 bar;

f) the words 'Propane/Butane';

g) quarter and year of manufacture, e.g. 3Q/03;

h) for class 4 hoses the words 'OUTDOOR USE ONLY'.

Example (for class 4 hose):

XXX-EN 1763– 2002 - class 4 - 10 - 20 bar-Propane/Butane - 3 Q/03 - OUTDOOR USE ONLY.

NOTE The words 'Propane/Butane' and 'OUTDOOR USE ONLY' should be used irrespective of the language.

13.2 Couplings

A metallic or metallic/plastics element, being part of the coupling of the assembly, shall be permanently marked with the name of the manufacturer of the assembly or his identification, and either a date or batch code.

14 Storage

For storage, refer to ISO 8331.

To protect the coupling, and prevent damage to the lining, corrosion resistant protective end-caps should be fitted by the manufacturer of the assembly.

NOTE Once hose assemblies have been stored for 3 years with effect from the date of manufacture or the last test date, they may be subjected to a further test as detailed in this Standard.

Annex A
(Informative)

TYPES AND DIMENSIONS OF COUPLINGS

A.1 Types of couplings

Depending on the installation design and the regulations in force in the country of destination, the connection may be achieved :

— **Either through a nozzle :**

In this case, the connection is achieved by means of a tubing or class 2 hose fitted over the nozzle, with or without fixing device.

EXAMPLES: At the outlet of a regulator directely fitted to a LPG cylinder, at the inlet of an appliance.

Where they are fitted, fixing devices have a smooth inner surface, round and turned-up edges, and a diameter suitable for the outside diameter of the tubing or class 2 hose fitted over the nozzle.

When applicable, the fixing devices have a limited thightening torque, and are not re-usable.

- or through a threaded coupling :

Couplings are fitted with joints, which are compatible with the nature and the conditions of use of the gases, and are of an appropriate hardness. The nut is mounted in such a way that it can be moved back in order to completely clear the joint span.

If the connections at the inlet and at the outlet of the hose are different, appropriate provisions and/or marking should be taken to ensure that the coupling is performed safely and without ambiguity.

- or through a quick-action coupling :

In this case, the female element of the coupling incorporates an automatic shut-off system preventing the leakage of gas when the two elements are disconnected.

The male element complies with the specifications in Table 1, type F of EN 561 :1994.

A.2 Dimensions of the main types of nozzles and couplings

Hoses, tubing and assemblies should be compatible with the dimensions of the connections as given in the standards listed in Table A.1, with respect to the national rules in force.

NOTE Information of Table A.1 are given for information only, and correspond to the majority of the coupling designs in the field. However, it does not preclude other systems to being used, provided that all safety measures regarding interchangeability have being applied. When applicable, national standards of the country of destination should also be considered.

Table **A.1** — Compatibility of the dimensions of nozzles and couplings

Type of connection	End	References for compatibility	
		Class 1	Classes 2, 3 & 4
Nozzle [1)]	Tubing inlet	prEN 12864 Figures H.50 and followings (and Table H.2)	prEN 13785 Figures H.50 and followings (and Table H.2)
	Tubing outlet	Nozzle according to EN 449 Figure A.1 (and Table A.3)	Nozzle according to EN 461 Figure A.1 (and Table A.3)
Threaded coupling	Hose inlet	prEN 12864 Figures H.1 to H.49 (and Table H.1)	prEN 13785 Figures H.1 to H.49 (and Table H.1)
	Hose outlet	ISO 228-1 or ISO 7-1 dimensions 1/2, 3/8 or 1/4, or Union connector according to EN 449 Figure A.2 (and Table A.3)	prEN 13786 Figures G.1 to G.49 (and Table G.1)
Quick-action coupling	Hose inlet	The hose inlet incorporates the male element of the quick-action coupling as described in EN 561 :1994 (Table 1, type F)	
	Hose outlet	EN 449, Table A.3, Figures A.1 and A.2	prEN 13786 Figures G.1 to G.49 (and Table G.1)

1) When applicable, reference should be made to national specifications for the relevant dimensions of fixing devices

Annex B
(normative)

TEST METHODS FOR TUBING AND HOSES

B.1 Measurement of dimensions

Cut three pieces, each of length 10 cm, from both the ends and the middle of a 5 m long sample of tubing or hose. Measure the internal diameter and concentricity at both ends of all test pieces in accordance with EN ISO 4671.

B.2 Tensile strength and elongation at break

Carry out tensile strength and elongation at break measurements on six dumb-bell pieces of type 2, cut from 2 mm thick sheets of lining and cover materials, in accordance with ISO 37, at a test temperature of (23 ± 2) °C.

B.3 Resistance to n-pentane

Weigh three portions taken from tubing or the lining of the hose. Each portion shall be of minimum mass 2 g (m_o = mass of three portions). Immerse the test pieces in n-pentane (liquid) at a temperature of (23 ± 2) °C for $(168\ ^{0}_{-2})$ h. The volume of pentane used shall be at least equal to 50 times that of the test pieces.

Remove the test pieces from the n-pentane, condition for 5 min in air at ambient temperature and weigh (m_1).

Condition again in air for $(24^{0}_{-0,5})$ h at a temperature of (23 ± 2) °C and repeat the weighing (m_2).

$$\% \text{ Pentane absorbed} = \frac{(m_1 - m_0) \times 100}{m_0} \quad (1)$$

$$\% \text{ Extracted matter} = \frac{(m_0 - m_2) \times 100}{m_0} \quad (2)$$

Where:

m_0 is the mass of three test pieces prior to immersion in n-pentane;

m_1 is the mass of three test pieces following immersion and 5 min conditioning;

m_2 is the mass of three test pieces following immersion and 24 h conditioning.

B.4 Visible defects evaluation

The tests pieces to be used in 8.1 shall be sectioned longitudinally and judged for visible defects.

B.5 Cleanliness. Determination of loose particles

Connect one end of a straight length of 5 m of tubing or hose to a supply of air and the other to a tissue filter. Blow a stream of clean and filtered air at a velocity of 1 m/s for at least 1 min through the tubing or hose and check visually, by examination of the filter, for loose particles blown out from the tubing or hose.

B.6 Resistance to kinking

Connect one end of a straight length of tubing or hose to a supply of air at a flow rate of 0,20 m^3/h at 25 mbar and the other end to a water manometer, calibrated in mbar, in such a way that approximately 0,5 m of test piece lies horizontally on the bench. Adjust the pressure to read 25 mbar with the air flowing through the orifice. Place the ruler marked in millimetres on the bench alongside the tubing or hose under test. (BS3212). Add the sketch ant the text

Take in the fingers, two points along the length of the tubing or hose spaced according to the values given in Table B1 and bring the points together so that the test piece takes the form of a loop.

Record the pressure reading on the manometer and calculate the pressure drop.

Table B1 — Loop circumference

Dimensions in millimetres

Nominal internal diameter of tubing or hose	≤ 8	9	10; 10,5	12,5
Spacing	280	310	350	440

B.7 Resistance to crushing

Connect the tubing or hose to a supply of air maintained at a constant pressure of 30,0 mbar at the inlet to the test piece. Fit a variable control at the outlet end and adjust to give a flow rate of 0,30 m^3/h. Apply a force of 125 N for tubing (class 1) or 350 N for hose of classes 2, 3 and 4 evenly over a length of 25 mm of the tubing or hose and after 30 s, while the force is still maintained on the tubing or hose, ensure the flow rate is not less than 0,10 m^3/h.

After the crush test, submit the tubing or hose to the proof test in accordance with EN ISO 1402 with the proof pressure given in Table 5.

B.8 Low temperature flexibility

Test a length of tubing or hose in accordance with EN ISO 4672, method B at the minimum working temperature given in Table 1 under a diameter of curvature of 10 times the nominal bore (minimum of 80 mm).

B.9 Flame propagation

Support a length of not less than 150 mm of the tubing or hose horizontally. Make three marks on the tubing or hose, the middle one approximately midway along its length with one on either side, 50 mm from the middle mark.

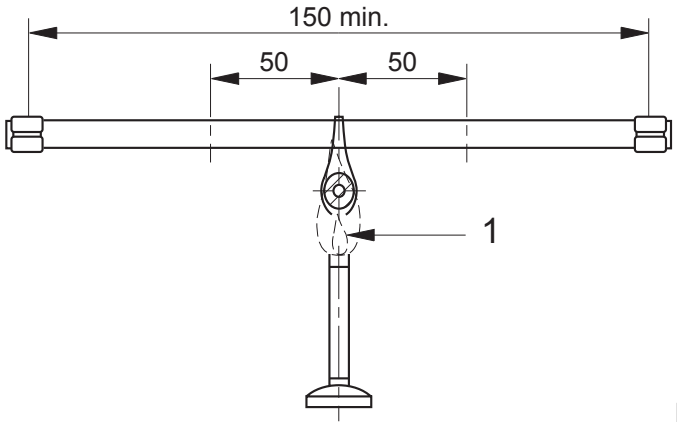
Apply a lighted Bunsen burner of approximately 25 mm diameter, giving approximately 1800 kJ/h, vertically below the middle mark on the test piece, so that the top of the ‘blue’ part of the flame is approximately 10 mm from the lower surface of the test piece (see Figure 1) for 5 s and then remove the flame for 1 s.

Repeat this cycle seven more times, i.e. a total test period of 48 s.

After the test period, observe whether the test piece continues to burn to the outer marks within 50 s of the commencement of the test.

A break in the test piece, before completion of the test period constitutes a failure.

Propagation of burning past the marking constitutes a failure.



Dimensions in millimetres

Figure B1 - Test for flammability

B.10 Resistance to ozone

Place the assembly in a test chamber as described in EN 27326, method 1, with an ozone concentration of (50 ± 5) parts per hundred million (pphm) for $\left(120\ {}^{0}_{-2}\right)$ h at (40 ± 2) °C.

Annex C
(normative)

TEST METHODS FOR NOZZLES, COUPLING AND ASSEMBLIES

C.1 Pressure tests

Test pieces to be in accordance with ISO 1402, using air or water for the proof pressure, given in table 5 for the appropriate class of tubing or hose.

C.2 Ageing tests

Tests shall be carried out in accordance with ISO 188 under the conditions given in table 7 using a cabinet oven.

Table C 1 — Conditions for the Ageing test

Class	Test Temperature (^{O}C)	Duration (days)
1 (tubing)	93	14
2/3/4 (hose)	70	14

A new assembly shall be aged for each of the requirements detailed in 10.3.2, 10.3.3 and 10.3.4.

All classes tubing and hoses assemblies shall be assembled using those couplings with which they are intended for end use.

C.3 Coupling pull-off test

Following the ageing test in C.2, one end of the assembly shall be secured and a longitudinal tensile force applied to the other end. The force shall be applied at a rate of elongation of (75 ±5) mm per min and the final force held for 30 s at ambient temperature. For Class 1 tubing on nozzle, this force shall be 70 N (without the aid of a securing clip); for coupling made of class 2 hose on nozzle it will be 100 N (without the aid of a securing clip) and for Class 2, 3 and 4 assemblies it shall be 800 N.

Following this test the assembly shall be inspected for rupture or for movement of the end fitting or nozzle relative to the hose or tubing. If there is no rupture or movement the hose or tubing assembly shall be tested for leakage at the proof pressure given in table 5.

C.4 Leakage test

The assembly shall be connected to an air source under pressure (0,2 bar for class 1, and 3 bar for classes 2, 3 and 4), the other end being closed. The end fitting or nozzle connection will be immersed in water, at room temperature.

No leakage will be assumed if there is no appearance of bubbles from the end fitting or nozzle over a period of 5 minutes, excluding the first 15 seconds of observation, during which time it is permissible to remove any trapped or entrained bubbles around the coupling. Alternative methods of leak measurement may be used provided they offer at least the same level of sensitivity and accuracy.

Annex D
(normative)

TEST LIST

Property	Clause	Type approval tests	Production acceptance test	Routine tests
Material tests				
Tensile strength and elongation at break				
Lining	**7.2.1**	**X**	**X**	N.A.
Cover	**7.2.1**	**X**	**X**	N.A.
Accelerated ageing	**7.2.2**	**X**	**X**	N.A.
Resistance to n-pentane	**7.2.3**	**X**	N.A.	N.A.
Tubing / hose tests				
Internal diameter	**6.1**	**X**	**X**	N.A.
Concentricity	**6.1**	**X**	**X**	N.A.
Outside diameter	**6.1**	**X**	**X**	N.A.
Proof pressure	**8.3**	**X**	N.A.	**X**
Burst pressure	**8.3**	**X**	N.A.	N.A.
Change of length at working pressure	**8.3**	**X**	**X**	N.A.
Change of outside diameter at working pressure	**8.3**	**X**	**X**	N.A.
Adhesion	**8.4**	**X**	**X**	N.A.
Resistance to kinking	**8.5**	**X**	**X**	N.A.
Resistance to crushing	**8.6**	**X**	N.A.	N.A.
Low temp. flexibility	**8.7**	**X**	N.A.	N.A.
Flame propagation	**8.8**	**X**	N.A.	N.A.
Permeability to propene	**8.9**	**X**	N.A.	N.A.
Resistance to ozone	**8.10**	**X**	N.A.	N.A.
Loss of mass (plastics hoses only)	**8.12**	**X**	N.A.	N.A.
UV test	**8.11**	**X**	N.A.	N.A.
Visible Defects	**8.1**	**X**	N.A	N.A
Cleanliness	**8. 2**	**X**	N.A.	N.A.

TEST LIST (continued)

Property	Clause	Type approval tests	Production acceptance	Routine tests
Nozzle, coupling and assembly tests				
Class 1				
Pressure test, nozzle coupling pull-off test and leakage test	**10.1**	**X**	**X**	**X**
Class 2 with nozzle	**10.2**	**X**	**X**	**X**
Pressure test, nozzle coupling pull-off test and leakage test				
Classes 2,3 and 4				
Integrity before ageing	**10.3.1**	**X**	**X**	**X**
Integrity after ageing	**10.3.2**	**X**	**X**	N.A
Proof and burst pressure after ageing	**10.3.3**	**X**	**X**	N.A.
Coupling pull-off test and leakage test	**10.3.4**	**X**	**X**	N.A.
X = test applied; N.A. = not applicable.				

Bibliography

EN 449, *Specification for dedicated liquefied petroleum gas appliances – Domestic flueless space heaters (including diffusive catalytic combustion heaters)*

EN 461, *Specification for dedicated liquefied petroleum gas appliances - Flueless non-domestic heaters not exceeding 10 kW*

EN 559, *Rubber hoses for welding, cutting and processes*

EN 561*, Gas welding-equipment – Quick-action couplings with shut-off valves for welding, cutting and allied processes.*

EN 12864, *Low pressure, non-adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar with a capacity of less than or equal to 4kg/l and their associated safety devices for butane, propane or their mixtures.*

pr EN 13785, *Regulators with a capacity not greater than 100 kg/h, having an outlet pressure of not greater than 4 bar, other than those which are subject of EN 12864, and their associated safety devices for butane, propane or their mixtures.*

pr EN 13786, *Automatic change-over devices with a capacity not greater than 100 kg/h, having an outlet pressure of not greater than 4 bar, and their associated safety devices for butane, propane or their mixtures.*

ISO 197-1, *Copper an copper alloys – Part 1, Terms and definitions,*

ISO 197-1, *Copper an copper alloys – Part 1, Wrought products,*