

SLOVENSKI STANDARD
SIST EN 16436-1:2014+A1:2016
01-februar-2016

Gumeni in plastični priključki, cevovodi in cevi za propan, butan in njune zmesi v plinastem stanju - 1. del: Cevi in cevovodi

Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixture in the vapour phase - Part 1: Hoses and tubings

Gummi- und Kunststoffschläuche und -Schlauchleitungen mit und ohne Einlage zur Verwendung mit Propan, Butan und deren Gemischen in der Gasphase - Teil 1: Schläuche mit und ohne Einlage

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Tuyaux, tubes et flexibles en caoutchouc et en plastique pour utilisation avec le propane, le butane et leurs mélanges en phase vapeur - Partie 1: Tuyaux et tubes

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83.140.40 Gumene cevi Hoses

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EUROPEAN STANDARD

EN 16436-1:2014+A1

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Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixture in the vapour phase - Part 1: Hoses and tubings

Tuyaux, tubes et flexibles en caoutchouc et en plastique pour utilisation avec le propane, le butane et leurs mélanges en phase vapeur - Partie 1: Tuyaux et tubes

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This European Standard was approved by CEN on 6 March 2014 and includes Amendment 1 approved by CEN on 1 October 2015.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 16436-1:2014+A1:2015) has been prepared by Technical Committee CEN/TC 181 “Dedicated liquefied petroleum gas appliances”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by June 2016.

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This document includes Amendment 1 approved by CEN on 2015-10-01.

This document supersedes EN 16436-1:2014.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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EN 16436-1:2014+A1:2015 (E)**1 Scope**

This European Standard specifies the characteristics and performance requirements for tubing and hoses made of either rubber or plastics for use with commercial propane and commercial butane and mixtures thereof, in the vapour phase, for connection of appliances, from:

- pressurized gas container to a regulating device,
- pressurized gas container to an appliance,
- regulating device to an appliance, and
- regulating device to installation pipework,

in environments of a temperature range from $-30\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$. Working pressures are from 0 bar to 30 bar.

Three classes are defined in Table 1 according to the maximum working pressures and minimum ambient temperatures.

This European Standard only covers the tubing or hose part of assemblies. The assemblies themselves will be covered by EN 16436-2.

This European Standard does not apply to hoses for:

- welding purposes (see EN ISO 3821, EN 1327);
- propulsion purposes;
- LPG transfer purposes (see EN 1762).

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

EN ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies (ISO 4671)*

EN ISO 7326, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions (ISO 7326)*

EN ISO 8033, *Rubber and plastics hoses — Determination of adhesion between components (ISO 8033)*

EN ISO 8330:2008, *Rubber and plastics hoses and hose assemblies — Vocabulary (ISO 8330:2007)*

EN ISO 10619-2, *Rubber and plastics hoses and tubing - Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures (ISO 10619-2)*

EN ISO 30013, *Rubber and plastics hoses — Methods of exposure to laboratory light sources — Determination of changes in colour, appearance and other physical properties (ISO 30013)*

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

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 8330:2008 and the following apply.

3.1

commercial butane

hydrocarbon product composed predominantly of butanes and/or butenes

Note 1 to entry: The remaining part can consist mainly of propane/propene and pentane/pentene isomers.

[SOURCE: ISO 9162]

3.2

commercial propane

hydrocarbon product composed predominantly of propane and/or propene

Note 1 to entry: The remaining part can consist mainly of ethane/ethene and butane/butene isomers.

[SOURCE: ISO 9162]

3.3

tubing

single core of plastic or rubber with no reinforcement or cover

3.4

hose

rubber or flexible thermoplastic lining with a reinforcement made of natural or synthetic textile material applied either spirally wound or braided, and a flexible rubber or thermoplastic outer cover

4 Classification of tubing and hose

One class of tubing and two classes of hose are specified in Table 1 depending on the maximum working pressure and minimal ambient temperatures.

Table 1 — Classification of tubings and hoses

Class	Maximum working pressure bar	Minimum ambient temperature °C
1 (tubing)	0,2	-20
2 (hose)	10	-30
3 (hose)	30	

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NOTE Classes 1 and 2 are usually used downstream of a pressure regulating device.

5 Materials and construction of tubing and hoses

Class 1 tubing shall be made of rubber or thermoplastic material.

Class 2 and class 3 hoses shall comprise a

- rubber or thermoplastics lining;
- reinforcement of natural or synthetic fibres applied either spirally wound or braided;
- rubber or plastics cover. The outer cover may be pricked to allow any gas trapped between the inner lining and outer cover to be released.

The surface colour of the tubing or hose shall be:

- orange (see Figure 1a); or
- black with the marking above, on, or below a continuous orange line of 5 mm minimum width (see Figure 1b); or
- white for classes 1 and 2 with the marking above, on, or below a continuous orange line of 5 mm minimum width (see Figure 2).

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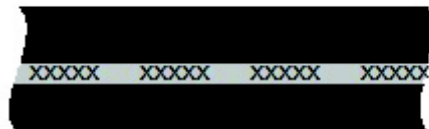
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a) option 1



b) option 2

Key

	orange colour
	black colour

Figure 1 — Possible marking for classes 1, 2 or 3

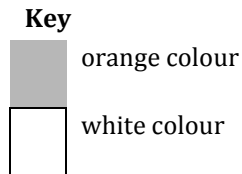
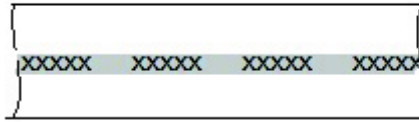


Figure 2 — Possible marking for classes 1 or 2

6 Dimensions of tubing and hoses

6.1 Inside diameters, wall thicknesses and concentricity

When measured in accordance with EN ISO 4671 the inside diameters, tolerances and concentricity shall conform to the values given in Table 2.

Table 2 — Dimensions of hoses or tubing

Dimensions in millimetres

Inside diameters	3,2	4,0	5,0	6,3	8,0	9,0	10,0	10,5	12,5
Tolerance of inside diameter	± 0,3	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,6	± 0,6	± 0,6
Maximum variation in concentricity	0,3	0,4	0,4	0,4	0,5	0,5	0,5	0,5	0,5
Wall thickness class 1 and class 2	2,5	3,5	3,5	3,5	3,5	3,5	5,0	5,0	5,0
Wall thickness class 3	3,5	4,0	4,0	5,0	5,0	5,0	5,0	5,0	6,0
Tolerance of wall thickness	± 0,4	± 0,4	± 0,4	± 0,4	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5

6.2 Measurement of ovality

When measuring on a hose cross section, the minimum diameter D_{\min} and the maximum diameter D_{\max} , the ratio D_{\min}/D_{\max} shall not be less than 0,80.

7 Properties of materials for tubing, lining and cover of hoses

7.1 Tensile strength and elongation at break

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

Table 3 — Requirements for tensile strength and elongation at break

Class	Component	Tensile strength	Elongation at break
		min. MPa	min. %
1	Tubing	7,0	250
2, 3	Lining and cover		

7.2 Accelerated ageing

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

Table 4 — Requirements for accelerated ageing

Class	Test duration days	Test temperature °C	Minimum residual value from origin	Deviation from original values max
			Tensile strength	Elongation at break
1,	14	90 ± 2	75 %	± 50 %
2, 3	28			

7.3 Resistance to n-pentane

When tested in accordance with A.3, samples of the lining of hoses or tubing shall have absorption of n-pentane (α) not exceeding 10 % and an extraction of material by n-pentane (β) not exceeding 8 %.

8 Performance requirements of tubing and hoses

8.1 Visible defects evaluation

No defect such as cracks, air bubbles or foreign particles shall be observed by normal corrected vision prior to testing.

8.2 Cleanliness

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

Table 5 — Pressure requirements

Class	Maximum working pressure	Proof-pressure	Max. twist at proof pressure	Minimum burst pressure		Change in length at working pressure	Change in outside diameter at working pressure
				(23 ± 2)° C	(70 ± 2)° C		
	bar	bar	°/m	bar	bar	max. %	max. %
1	0,2	0,4	N.A.	3,5	3,5	N.A.	N.A.
2	10	20	5 °	30	25	± 5	± 8
3	30	60	5 °	90	75	± 5	± 8

In preparation of the burst pressure test at 70 °C, the sample shall be conditioned in a water bath at 70 °C for minimum 4 h and maximum 6 h before pressure is applied.

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 kN/m in each case.

8.5 Resistance to kinking

When tested in accordance with A.6, the gas pressure shown on the manometer shall not drop by more than 15 mbar.

8.6 Resistance to crushing

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When tested in accordance with A.7, after removal of the force, the tubing or hose shall show no deformation and it shall not leak when subjected to the proof pressure given in Table 5.

8.7 Low temperature flexibility

When tested in accordance with A.8 and then left at ambient temperature for at least 1 h, the tubing or hose shall show no signs of cracking or rupture and 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 A.9, the tubing or hose shall not burn to either of the outer marks.

8.9 Permeability to propane

When tested in accordance with EN ISO 4080, at (35 ± 2) °C, using propane (at least 98 % propane) as the medium, and after a saturation period of at least 72 h at test pressure and test temperature and:

- Method 1, at a pressure of 10 bar, for classes 2 and 3 hoses with a pricked cover, or
- Method 2, at a pressure of 10 bar, for classes 2 and 3 hoses with an un-pricked cover, or
- Method 1, at a pressure of 0,2 bar at a temperature of (23 ± 2) °C, for class 1 tubing,