BS EN 1762:2017

BSI Standards Publication

Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2,5 MPa) — Specification

bsi.

National foreword

This British Standard is the UK implementation of EN 1762:2017. It supersedes BS EN 1762:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/66, Rubber and plastics tubing, hoses and hose assemblies.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

Rubber hoses and hose assemblies for liquefied petroleum gas, LPG (liquid or gaseous phase), and natural gas up to 25 bar (2,5 MPa) - Specification

Tuyaux et flexibles en caoutchouc pour le gaz de pétrole liquéfié GPL (en phase liquide ou gazeuse) et le gaz naturel jusqu'à 25 bar (2,5 MPa) - Spécification

Gummischläuche und -schlauchleitungen für Flüssiggas LPG (flüssig oder gasförmig) und Erdgas bis 25 bar (2,5 MPa) - Spezifikation

This European Standard was approved by CEN on 11 December 2016.

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Contents

Page

European foreword

This document (EN 1762:2017) has been prepared by Technical Committee CEN/TC 218 “Rubber and plastic hoses and hose assemblies”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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This document supersedes EN 1762:2003.

Compared to EN 1762:2003 the following changes have been made:

a) Clause 2: The normative references have been updated;

b) Table 3 has been technically amended (property no. 5); in accordance with corrigendum EN 1762:2003/AC of November 2007.

c) Clause 8.4 has been divided into 8.4.1 and 8.4.2 to clarify the requirements for the 2 different grades of M and Ω hoses

d) Clause 9: The text has been amended editorially;

e) Clause 10: The text has been amended editorially;

f) Clause 11.1: The text has been amended editorially.

Annex A and B are normative. Annex C is informative.

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1 Scope

This European Standard specifies the requirements for rubber hoses and rubber hose assemblies used for the transfer of liquefied petroleum gas (LPG) in liquid or gaseous phase and natural gas with a maximum working pressure of 25 bar (2,5 MPa) and vacuum within the temperature range of −30 °C to +70 °C and, when designated -LT, −50 °C to +70 °C.

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 1360, *Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems - Specification*

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

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

EN ISO 10619-1, *Rubber and plastics hoses and tubing - Measurement of flexibility and stiffness - Part 1: Bending tests at ambient temperature (ISO 10619-1)*

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 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 7233, *Rubber and plastics hoses and hose assemblies - Determination of resistance to vacuum (ISO 7233)*

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

EN ISO 8031, *Rubber and plastics hoses and hose assemblies - Determination of electrical resistance and conductivity (ISO 8031)*

EN ISO 8330, *Rubber and plastics hoses and hose assemblies - Vocabulary (ISO 8330)*

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

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

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

3 Terms and definitions

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

3.1
electrically bonded hose/hose assembly
hose/hose assembly that uses a metallic wire connection to conduct static electricity

3.2
electrically conductive hose/hose assembly
hose/hose assembly that is capable of conducting static electrical charges, using a conductive rubber layer, without the use of a metallic wire

3.3
electrically discontinuous hose/hose assembly
hose /hose assembly that incorporates a metallic wire connection to one end coupling of the assembly only or is electrically insulated from both end-couplings

4 Classification

Hoses/hose assemblies for this application are classified into 5 types and 3 grades according to their use, construction, and electrical properties. The maximum WP for all hoses/hose assemblies is 25 bar.

Type	**Application**
D	delivery hose
D-LT	delivery hose, low temperature;
SD	suction and delivery hose, helix reinforced
SD-LTS	suction and delivery hose “smooth hose”, helix reinforced, low temperature
SD-LTR	suction and delivery hose, rough bore (having an internal, non-embedded helical wire of stainless steel), low temperature

Hoses for this application are divided into 3 grades according to their electrical properties:

Grade designation	**Electrical property**
M	Electrically bonded
Ω	Electrically conductive using a conductive rubber layer
Discontinuous	Electrically discontinuous

5 Materials and construction

5.1 Hose

The hose shall consist of the following:

— a lining of synthetic rubber resistant to n-pentane;

— a reinforcement of layers of woven, braided or spirally wound textile material or braided or spirally wound stainless steel wire,

— an embedded stainless steel metallic helix reinforcement (types SD, SD-LTS and SD-LTR only);

— two or more low resistance electrical bonding wires (grade “M” only);

— an outer cover of black or coloured synthetic rubber, resistant to abrasion and outdoor exposure, the cover being pricked to allow gas permeation;

— an internal, non-embedded stainless steel helical wire, suitable for use at –50 °C (type SD-LTR only).

5.2 Hose assemblies

Hose assemblies shall incorporate metallic couplings attached to the hose by the assembler or built in by the manufacturer. In order to produce the required electrical properties, the couplings should be attached in accordance with Clause 8.

Chlorinated materials shall not be used in contact with any stainless steel materials.

6 Dimensions

6.1 Nominal bore, internal diameters, outside diameters, tolerances, and minimum bend radius

For hoses without built-in couplings, and when measured in accordance with method A of EN ISO 4671, the internal diameter and outside diameter and their tolerances shall conform to Table 1 or Table 2, depending on the type.

For hoses with built-in couplings, the outside diameters in Tables 1 and 2 do not apply.

When tested by the method described in EN ISO 10619-1, the value of the minimum bend radius shall be as given in Table 1 or Table 2, depending on the type.

Table 1 — Dimensions and tolerances of hoses of types D and D-LT

Nominal bore	Internal diameter mm	Tolerance mm	Outside diameter mm	Tolerance mm	Design minimum bend radius* mm
12	12,7	±0,5	22,7	±1,0	100
15	15	±0,5	25	±1,0	120
16	15,9	±0,5	25,9	±1,0	125
19	19	±0,5	31	±1,0	160
25	25	±0,5	38	±1,0	200
32	32	±0,5	45	±1,0	250
38	38	±0,5	52	±1,0	320
50	50	±0,6	66	±1,2	400
51	51	±0,6	67	±1,2	400
63	63	±0,6	81	±1,2	550
75	75	±0,6	93	±1,2	650
76	76	±0,6	94	±1,2	650
80	80	±0,6	98	±1,2	725
100	100	±1,6	120	±1,6	800
150	150	±2,0	174	±2,0	1200
200	200	±2,0	224	±2,0	1600
250	254	±2,0	—	—	2000
300	305	±2,0	—	—	2500

*) The design minimum bend radius is measured to the surface of the hose on the inside of the bend.

Table 2 — Dimensions and tolerances of hoses of types SD, SD-LTS and SD-LTR

Nominal bore	Internal diameter mm	Tolerance mm	Outside diameter mm	Tolerance mm	Design minimum bend radius* mm
12	12,7	±0,5	22,7	±1,0	90
15	15	±0,5	25	±1,0	95
16	15,9	±0,5	25,9	±1,0	95
19	19	±0,5	31	±1,0	100
25	25	±0,5	38	±1,0	150
32	32	±0,5	45	±1,0	200
38	38	±0,5	52	±1,0	280
50	50	±0,6	66	±1,2	350
51	51	±0,6	67	±1,2	350
63	63	±0,6	81	±1,2	480
75	75	±0,6	93	±1,2	550
76	76	±0,6	94	±1,2	550
80	80	±0,6	98	±1,2	680
100	100	±1,6	120	±1,6	720
150	150	±2,0	174	±2,0	1000
200	200	±2,0	224	±2,0	1400
250	254	±2,0	—	—	1750
300	305	±2,0	—	—	2100
*) The design minimum bend radius is measured to the surface of the hose on the inside of the bend.					

NOTE Nominal bores 250 and 300 apply to hoses with built-in couplings only.

6.2 Minimum thickness of lining and cover

When measured in accordance with EN ISO 4671, the minimum thickness of both the lining and cover of all hoses shall be 1,6 mm.

Not applicable to hose assemblies with built-in couplings

6.3 Concentricity

When measured in accordance with EN ISO 4671, the concentricity based on a total indicator reading shall be 1,0 mm for hoses of nominal bore 12–76 and 1,5 mm for hoses of nominal bore 80–200.

Not applicable to hose assemblies with built-in couplings

6.4 Tolerances on length

The tolerances on the measured length of hoses and hose assemblies shall be ± 1 %.

7 Physical properties

7.1 Rubber Compounds

The physical properties of the rubber compounds used for the lining and cover shall comply with the values given in Table 3, when tested by the methods listed in Table 3.

Tests shall be carried out either on samples taken from the hose or from separately vulcanized sheets, vulcanized to the same state as the hose.

Table 3 — Physical properties of compounds

Property	**Unit**	**Requirements**		**Method of test**
		Lining	**Cover**	
1. Min. tensile strength	MPa	10	10	ISO 37 (dumb-bell test piece)
2. Min. elongation at break	%	250	250	ISO 37 (dumb-bell test piece)
3.Max. abrasion resistance For black hoses For coloured hoses	mm^3		170 500[a]	ISO 4649, Method A
4. Ageing				ISO 188
Max. hardness change from original value	IRHD	+10	+10	(14 days at +70 °C, air-oven method)
Max. tensile strength change from original value	%	±30	±30	
Max. change in elongation at break from original value	%	−35	−35	
5.1 Immersion in n-pentane Max. mass increase	%	10	-	ISO 1817 7 days storing in n-pentane at +23 °C
5.2 Drying after immersion Variation of hardness Max. hardness value Max. mass reduction	IRHD IRHD % 	+10/-3 85 −5 −10(LT-Types)	- - 	ISO 1817 Drying for 70 h at + 40 °C

[a] only for hoses with a nominal bore of 13, 16 and 19 for LPG gas dispenser in accordance with EN 1360.

7.2 Finished hose and hose assemblies

When tested by the methods listed in Table 4, the physical properties of the finished hose and hose assemblies shall comply with the values given in Table 4.

Table 4 — Physical properties of finished hose and hose assemblies

Property	Unit	Requirements	Method of test
Hoses			
1. Proof test pressure, min.	bar	37,5 No leakage or other signs of weakness	EN ISO 1402
2. Change in length, max. at proof test pressure	%	types D and D-LT+5 types SD and SDLTR and SDLTS +10	EN ISO 1402
3. Change in twist at proof test pressure, max.	°/m	8	EN ISO 1402
4. Resistance to vacuum (types SD, SD-LTS and SD-LTR only) at vacuum 0,8 bar for 10 min	-	No structural damage No collapse	EN ISO 7233
5. Min. burst pressure	bar	100	EN ISO 1402
6. Min. adhesion between components	N/mm	2,4	EN ISO 8033
7. Ozone resistance at +40 °C of cover	-	No cracking observed under × 2 magnification	EN ISO 7326 Method 1 up to 25 nominal bore; Method 3 above 25 nominal bore; relative humidity 55 ± 10 % ozone concentration (50 ± 5) pphm; elongation 20 %
8. Low temperature flexibility at −30 °C types D and SD at −50 °C types D-LT and SD-LTR SD-LTS	-	No permanent deformation or visible structural damage, no increase in electrical resistance, no impairment of electrical continuity	EN ISO 10619-2
9. Electrical resistance	Ω	The electrical properties of the hose shall be such that the electrical requirement for the hose assemblies are met	EN ISO 8031
10. Flammability	-	Ceases to burn immediately or no glowing visible after 2 min	Annex A

Property	Unit	Requirements	Method of test
11. Max. deformation of external hose diameter at min. bend radius (at an internal pressure of 0,7 bar for type D and D-LT)	%	10	EN ISO 10619-1
Hose assemblies			
1. Proof pressure test (min.)	bar	37,5 No leakage or other signs of weakness	EN ISO 1402
2. Change in length (max.) at proof pressure	%	Types D and D-LT: +5 Types SD, SD-LTS and SD-LTR: +10	EN ISO 1402
3. Change in twist (max.) at proof pressure	°/m	8	EN ISO 1402
4. Resistance to vacuum (types SD, SD-LTS and SD-LTR) at 0,8 bar vacuum for 10 min	—	No structural damage No collapse	EN ISO 7233
5. Electrical resistance	Ω/ assembly	M-type: max. 10^2 Ω-type: max. 10^6 discontinuous type: min. $2,5 \times 10^4$.	EN ISO 8031

8 Electrical properties

8.1 General

Electrical resistance of hose and hose assemblies shall be obtained by one of the four following methods:

8.2 Textile reinforced hoses with bonding wires

Incorporating two low resistance bonding wires into the hose construction. These shall be spirally applied and shall be positioned in such a way to cross uniformly.

When attaching fittings to this hose, the bonding wires shall be folded into the hose bore, positioned between the lining and the fitting tail and extended approximately 1/3rd the length of the fitting tail into the bore.

When tested in accordance with EN ISO 8031 the resistance along the bonding wires, in the case of hose, or the resistance between fittings, in the case of hose assemblies, shall not exceed 1×10^2 Ω per length. When obtaining electrical continuity by this method the hose shall be marked with the symbol M.

8.3 Textile reinforced hoses with conducting materials

Incorporating electrically conducting materials in the hose construction. When attaching fittings to this hose, an adequate connection between the end-fittings and the conductive layer shall be obtained.

When tested in accordance with EN ISO 8031, the resistance along the conductive layer, in the case of hose or the resistance between the fittings, in the case of hose assemblies, shall not exceed 1×10^6 Ω per length. When obtaining electrical resistance by this method the hose shall be marked with the symbol Ω.

8.4 Wire helix reinforced hoses

8.4.1 Grade M-hoses (see 8.2)

All incorporated metal parts like steel braiding and steel wire helix shall be electrically connected with the fittings. Resistance between fittings shall not exceed 10^2 Ω per length, when tested in accordance with EN ISO 8031.

8.4.2 Grade Ω-hoses (see 8.3)

All incorporated metal parts shall not be connected with the fittings. Resistance between fittings shall not exceed 10^6 Ω per length, when tested in accordance with EN ISO 8031.

During and after subjection to the hydrostatic tests as described in EN ISO 1402, the electrical continuity of each hose shall be maintained from end to end and electrical continuity of each hose assembly shall be maintained from one coupling to the other.

Electrical conductivity in Types SD, SD-LTS and SD-LTR cannot be obtained by only connecting to the helix. Full-length anti-static wire should be spirally applied continuously

8.5 Hose assemblies that are required to be discontinuous

Hose assemblies for this application are required to have an insulating layer between the metallic reinforcement/helix and either one of both end-couplings. When tested in accordance with EN ISO 8031 the resistance between the end couplings shall > $2{,}5 \times 10^4$ ohms/Assembly:

9 Type testing

Type tests are carried out by the manufacturer to supply evidence that all the material, construction and test requirements of this standard, have been met by the method of manufacture and hose design. Type tests shall be carried out a minimum of every five years or whenever a change of design, manufacture or materials occurs.

10 Frequency of testing

Type and routine tests are specified in Annex B.

Type tests are those tests required to obtain proof that the design and materials meet all requirements of this document.

Routine tests are those tests that shall be carried out on all hoses or hose assemblies prior to despatch.

Production acceptance tests are those tests, specified in Annex C, which should be carried out by the manufacturer to control the quality of this manufacture. The frequency specified in Annex C is a guide being an informative Annex only.

11 Marking

11.1 Hoses

Each length of hose shall be legibly and durably marked continuously along its length on the outer cover, with the following information in lettering at least 5 mm high:

a) a manufacturer's name or identification e.g. XXXX;

b) number and year of this European Standard, EN 1762:2017;

c) type e.g. D;

d) nominal bore, e.g. 38;

e) maximum working pressure in bar e.g. 25;

f) symbol for the electrical conductivity, e.g. M; (grade)

g) quarter and year of manufacture, e.g. 3Q-16.

EXAMPLE: XXXX – EN 1762:2017 Type D-38 - 25 - M-3Q-16.

11.2 Hose assemblies

When the coupling is not built in, i.e. not an integral part of the hose, it shall be marked with the assembler’s name or identifier and the date of the assembly.

Annex A
(normative)

Flammability test

A.1 Method

Bend the hose test piece into a U-shape of radius as indicated in Figure A.1. Fill the test piece with liquid F in accordance with ISO 1817. Expose the test piece to a naked flame from a Bunsen burner of 10 mm pipe diameter for a period of 3 min, with the airflow to the burner shut off. The distance between the burner and test piece is indicated in Figure A.1.

A.2 Assessment

The hose sample is deemed to be non-flammable if:

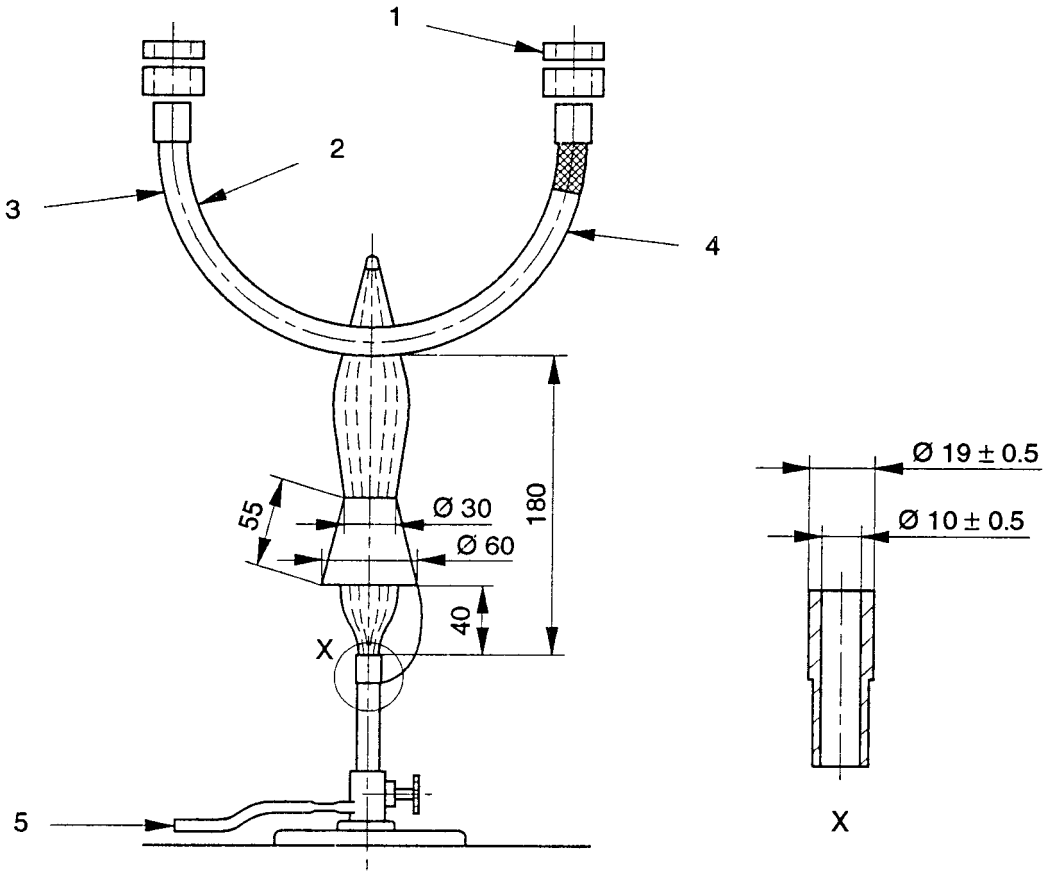
a) it ceases to burn immediately on removal of the burner flame; or,

b) there are no glowing visible 2 min after removal of the burner flame.

On completion of the test the hose test piece shall be impervious to fluids, when visually examined.

The test may be carried out on a reference nominal bore hose, preferably 12 mm or 25 mm. The result is applicable to the reference size and larger diameters, where materials of construction are the same for all of the sizes.

Dimensions in mm



Key

1 Cap

2 Bending radius = 10 to 15 times of outside diameter

3 Hose assembly

4 Liquid F in accordance with ISO 1817

5 Propane (LPG) approximately 50 m bar

X Detail

Figure A.1 — Arrangement for flammability test

Annex B
(normative)

Test frequency

Table B.1 gives the frequency of testing for type and routine tests

Table B.1 — Type and routine tests

Property	Type tests	Routine tests
Compound tests		
Tensile strength and elongation	x	N.A.
Abrasion resistance	x	N.A.
Tensile strength and elongation after ageing	x	N.A.
Mass increase and mass reduction	x	N.A.
Hose tests		
Adhesion, dry	x	N.A.
Ozone resistance	x	N.A.
Low temperature flexibility at −30 °C or −50 °C, as appropriate	x	N.A.
Measurement of internal and external diameters	x	x
Measurement of thickness lining and cover	x	x
Resistance to vacuum (types SD, SD-LTS and SD-LTR only)	x	N.A.
Electrical resistance	x	x
Proof pressure and change in length and twist	x	x
Burst pressure	x	N.A.
Bending test	x	N.A.
Flammability	x	N.A.

Property	**Type tests**	**Routine tests**
Hose assembly tests		
Electrical resistance	x	x
Proof pressure	x	x
Burst pressure	x	N.A.
Change in length and twist	x	x
Vacuum (types SD, SD-LTS and SD-LTR only)	x	x
N.A. = not applicable; x = Test applied		

Annex C
(informative)

Test frequency

Production acceptance tests are those carried out per batch or per 10 batches as indicated in Table C.1. A batch is defined as either 1 000m of hose or 2 000 Kilograms of lining and/or cover compound.

Table C.1 — Recommended test frequency (Production acceptance tests)

Property	**Production acceptance tests**	
	per batch*)	**per 10 batches**
Compound tests		
Tensile strength and elongation	x	N.A.
Abrasion resistance	N.A.	x
Tensile strength and elongation after ageing	N.A.	x
Mass increase and mass reduction	N.A.	x
Hose tests		
Adhesion, dry	x	N.A.
Ozone resistance	N.A.	x
Low temperature flexibility at −30 °C or −50 °C, as appropriate	N.A.	x
Measurement of internal and external diameters	x	x
Measurement of thickness lining and cover	x	x
Resistance to vacuum (types SD, SD-LTS and SD-LTR only)	N.A.	x
Electrical resistance	x	x
Proof pressure and change in length and twist	x	x
Burst pressure	N.A.	N.A.
Bending test	N.A.	x
Flammability	N.A.	N.A.

Property	**Production acceptance tests**	
	per batch*)	**per 10 batches**
Hose assembly tests		
Electrical resistance	N.A.	N.A.
Proof pressure	N.A.	N.A.
Burst pressure	N.A.	N.A.
Change in length and twist	N.A.	N.A.
Vacuum (types SD, SD-LTS and SD-LTR only)	x	x
N.A. = not applicable; x = Test applied		

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