BS EN 1360:2013

BSI Standards Publication

Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems — Specification

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1360:2013. It supersedes BS EN 1360:2005 which is withdrawn.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.

ISBN 978 0 580 76105 8

ICS 23.040.70; 75.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 June 2013.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1360

June 2013

ICS 23.040.70; 75.200

Supersedes EN 1360:2005

English Version

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

Tuyaux et flexibles en caoutchouc et en plastique pour distribution mesurée de carburant - Spécifications

Zapfstellenschläuche und -schlauchleitungen aus Gummi und Kunststoff - Anforderungen

This European Standard was approved by CEN on 25 April 2013.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 1360:2013) 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 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 December 2013, and conflicting national standards shall be withdrawn at the latest by December 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1360:2005.

Compared with EN 1360:2005, the following fundamental changes were made:

a) In Table 1 hoses with nominal bores of 35 and 50 have been included;

b) The normative references have been updated.

WARNING – Persons using this European Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies minimum requirements and test methods for verification for three types of hoses in two grades and two classes of hose assemblies used for measured fuel dispensing, including oxygenated fuels (up to a maximum of 15 % oxygenated compounds).

The assemblies are intended for use at ambient temperatures between –30 °C and +55 °C for normal temperature class and –40 °C and +55 °C for low temperature class at a working pressure ≤ 16 bar[1)].

As part of the certification of a new dispenser, testing of fuel samples in accordance with EN 228 and EN 590 should be carried out at least eight weeks after the first use of the equipment to avoid unrepresentative sulphur content results.

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 26801, *Rubber or plastics hoses — Determination of volumetric expansion (ISO 6801)*

EN ISO 1307*, Rubber and plastics hoses — Hose sizes, minimum and maximum inside diameters and tolerances on cut-to-length hoses (ISO 1307)*

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

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 8031:2009, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity (ISO 8031:2009)*

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

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

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

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 554, *Standard atmospheres for conditioning and/or testing — Specifications*

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

ISO 4649:2010, *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 8330:2008 apply.

1) 1 bar = 0,1 MPa

4 Classification

Hoses for this application shall be divided into three types:

— Type 1: textile reinforced;

— Type 2: textile and helical wire reinforced;

— Type 3: fine wire reinforced.

Each type of hose shall be divided into two grades:

— Grade M: electrically bonded;

— Grade Ω: electrically conductive.

Each type of hose shall be divided into two temperature classes:

— Normal temperature class with an ambient working temperature of −30 °C to +55 °C;

— Low temperature class (LT) with an ambient working temperature of −40 °C to +55 °C.

5 Materials and construction

The hose shall consist of the following:

a) a smooth, fuel resistant lining of rubber or thermoplastic elastomer (TPE);

b) a reinforcement; related to type;

c) a non-corrugated, fuel and weather-resistant rubber or TPE cover.

Hose assemblies shall be capable of conducting an electrical charge from coupling to coupling.

When this capability is provided by means of metallic bonding wires, not less than two (metallic) bonding wires shall be embedded in the hose and the metal used shall have a high resistance to fatigue and corrosion.

Hoses with metallic wires for electrical conductivity shall be designated 'M' and those using conductive compounds shall be designated 'Ω', the relevant mark being branded on the hose (see Clause 12).

6 Pressure requirements

For all types of hoses the following shall apply:

a) maximum working pressure: 16 bar;

b) proof pressure: 24 bar;

c) minimum bursting pressure: 48 bar.

7 Dimensions and tolerances

7.1 Internal diameters and bend radii

When measured in accordance with EN ISO 4671, the internal diameter of the hose shall comply with the values given in Table 1.

When measured in accordance with EN ISO 10619-1, the minimum bend radii for each diameter of hose shall be in accordance with Table 1.

Table 1 — Nominal bore, internal diameter, tolerance and bend radii

Nominal bore	Internal diameter mm	Tolerance mm	Bend radius mm
12	12,5	± 0,8	60
16	16,0		80
19	19,0		100
21	21,0	± 1,25	130
25	25,0		150
32	32,0		175
35	35,0		200
38	38,0		225
40	40,0		225
50	50,0		275

7.2 Minimum thickness of lining and cover

When measured in accordance with EN ISO 4671, the thickness of the lining shall not be less than 1,6 mm. The thickness of the cover shall not be less than 1,0 mm.

7.3 Concentricity

When determined in accordance with EN ISO 4671, the concentricity, based on a total indicator reading between the internal diameter and the outside surface of the cover, shall not exceed 1,0 mm.

7.4 Tolerance on cut lengths

For cut lengths, the tolerances on length shall be in accordance with EN ISO 1307. The length of a hose assembly shall be measured from sealing face to sealing face of the end fittings with a tolerance from the nominal length of ± 1%.

8 Physical properties

8.1 Compounds

When tested in accordance with the methods specified in Table 2, the physical properties of the compounds used for the lining and cover shall comply with the values specified in Table 2. Tests shall be performed either on samples taken from the hose or from moulded vulcanised sheets at a thickness of 2 mm or moulded test pieces, vulcanised to the same cured state as the production hoses.

Table 2 — Physical properties of compounds

Property	Unit	Requirement		Test piece[a]	Test method
		Rubber	TPE		
Tensile strength Lining and cover, min.	MPa	9	12	Test piece cut from hose or from test sheet	ISO 37
Elongation at break Lining and cover, min.	%	250	350		
Accelerated ageing - Tensile strength change max. Lining and cover,	%	20	10		ISO 188 (air oven method) 14 days at (70 ± 1) °C
- Elongation at break change max. Lining and cover,	%	−35	−20		
Resistance to liquids					
Lining swell max.	%	+70		Test piece cut from hose or from test sheet	ISO 1817 70 h at 40 °C in oxygenated fuel type 3
		+25			ISO 1817 70 h at 100 °C in oil No 3
Lining extracted matter Normal temperature class max.		+10			ISO 1817 70 h at 40 °C in oxygenated fuel type 3 then dry 24 h at 100 °C
Lining extracted matter Low temperature class max.		+15			
Cover swell max.		+100			ISO 1817 70 h at 23 °C in Liquid B
Low temperature resistance of lining and cover at –30 °C (or at LT –40 °C if required)	–	No cracks under × 10 magnification			Annex A
Abrasion resistance Cover compound max.	mm^3	500		Test piece from moulded test sheet of cover compound	ISO 4649:2010, Method A

[a] It is necessary that the test report indicates the source of the test piece.

8.2 Finished hose

When tested in accordance with the methods specified in Table 3, the physical properties of the finished hose shall comply with the values specified in Table 3.

Table 3 — Physical properties of hoses

Property	Unit	Requirement	Test piece	Test method
Proof pressure at 24 bar	–	No leakage or other signs of weakness nor abrupt twisting	Full length of hose	EN ISO 1402 Proof test pressure
Burst pressure, min.	bar	48	Short length cut from hose	EN ISO 1402 Burst pressure
Volumetric expansion, max. Type 1 and Type 2	%	2	At least 1 m cut from hose	EN 26801 Test pressure 3 bar
Type 3		1		
Adhesion between components on Un-aged hose, min.	N/mm		Short length cut from hose	Annex B
Aged hose, min.		2,4		
		1,8		
Ambient temperature bending	–	$\frac{T}{D} \geq 0{,}8$		EN ISO 10619-1 Nominal diameter $C = 10 \times$ nominal bore
Low temperature flexibility		No cracks or breaks Maximum bending force 180 N	Annex C, Test piece to be taken from a hose with nominal bore of either 16, 19 or 21	Annex C
Change in length at proof pressure	%	0 to +5	Full length of hose	EN ISO 1402
Ozone resistance of cover	–	No cracks under X 2 magnification	Short length cut from hose	EN ISO 7326 168 h at 40 °C, 50 ppmh, relative humidity (55 ± 10) % and elongation 20 %
Fuel permeation of hose max. Normal temperature class	ml/(m·day)	12	2 m test piece cut from hose. Test Piece to be taken from a hose with nominal bore of either 16,19 or 21	Annex D
Low temperature class		18		
Electrical resistance max. Grade Ω	Ω	1×10^{6}	Equivalent to the length of hose assembly	EN ISO 8031:2009 4.5, 4.6, 4.7
Grade M		1×10^{2}		EN ISO 8031:2009 4.8

Table 3 (continued)

Property	Unit	Requirement	Test piece	Test method
Flammability	—	a) Burning with a naked flame to cease within 20 s of removal of the burner; b) no further glowing visible 2 min after removal of the burner; c) hose shall show no sign of leakage	Length of assembly to suit test rig. Test piece to be taken from a hose with nominal bore of either 16, 19 or 21	Annex E

8.3 Hose assembly

When tested in accordance with the methods specified in Table 4, the physical properties of the hose assembly shall comply with the values specified in Table 4.

Table 4 — Physical properties of hose assembly

Property	Unit	Requirement	Test piece	Test method
Pull-off test	–	No movement of end fitting after removal of force	Short length of hose assembly	Annex F
Proof pressure at 24 bar	–	No leakage or other signs of weakness	Full length of hose assembly	EN ISO 1402 Proof test pressure
Electrical resistance max. Grade M	Ω/assembly	1×10^2		EN ISO 8031:2009, 4.8
Grade Ω		1×10^6		EN ISO 8031, 4.5, 4.6, 4.7
Leak test	-	No leakage		Annex G
Flex test	–	No defects after 18 000 cycles. No leakage after 50 000 cycles max. electrical resistance. The electrical resistance shall meet the requirements given above.		Annex H

9 End fittings

The following requirements shall be fulfilled:

— end fittings shall be designed for the pressure ratings in accordance with Clause 6;

— end fittings shall be designed so that, where used for their intended purpose, they do not adversely affect in-service reliability of the hose due to sharp edges or burrs;

— end fittings shall be designed with a parallel thread

— end fittings with thread sealing (e.g. with Polytetrafluorethylene (PTFE)-band) are not permitted;

— the materials of the thread-bearing parts shall be manufactured from a corrosion-resistant metallic material; control screw threads shall not be made from aluminium;

— surfaces that come into contact with the conductive layers of the fuel hose shall be metallically conductive; anodised surfaces and surfaces with insulating layer are not permitted; end fitting components that are in contact with the lining or the cover of the fuel hose shall have secure, electrically conductive, metallic contact when assembled.

NOTE There are two types of end fittings that can be used, reusable and non-reusable. The use of non-reusable fittings is mandatory in the U.K.

10 Type tests

Type tests shall be performed to supply evidence that all the material, construction and test requirements of this European Standard have been conformed to the method of manufacture and hose design.

Type tests shall be performed a minimum of every five years or whenever a change of manufacture or material occurs.

11 Frequency of testing

The minimum frequency of type tests and routine tests shall be in accordance with normative Annex I.

The frequency of test for production acceptance tests should follow the recommendations of informative Annex J.

12 Marking

12.1 Hoses

The hose shall be marked legibly and indelibly during the manufacturing process. Marking shall be repeated at least at 2 m intervals, and shall include, at least, the following information:

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

b) number and date of this European Standard, i.e. EN 1360:2013;

c) type of hose (1, 2 or 3);

d) grade of hose, i.e. M or Ω;

e) temperature class e.g. LT (low temperature)[2)]

f) nominal bore, e.g. 19;

g) maximum working pressure, in bar, e.g. 16;

h) quarter and year of manufacture, e.g. 3Q12

EXAMPLE xxx/EN 1360:2013/1/M/LT/19/16/3Q12

12.2 End fittings

The fittings shall be marked with the manufacturer’s trademark and according to their purpose with the wording “reusable” (alternatively “R“) or "non-reusable” (alternatively “NR”) respectively.

2) For hoses for normal temperature class no special marking is required.

12.3 Hose assemblies

The information detailed in 12.1 shall appear in full at least once on each hose assembly. The fitting shall be marked with the name or the trademark of the assembler and the date of the assembling, e.g. 3Q11. In case of re-assembly, the fitting shall be marked with the name or trademark of the re-assembler and date of the assembling, e.g. 3Q12.

Annex A
(normative)

Test method for determination of low temperature resistance at –30 °C (for normal temperature class) and –40 °C (for low temperature class)

A.1 Test piece

A dumb-bell of Type 2 in accordance with ISO 37.

A.2 Apparatus

A.2.1 Two moving plates able to reciprocate between (50 ± 1) mm and (25 ± 1) mm apart.

A.2.2 A cabinet maintained at (–30 ± 2) °C or at LT (–40 ± 2) °C, in which the plates can be moved.

A.3 Test method

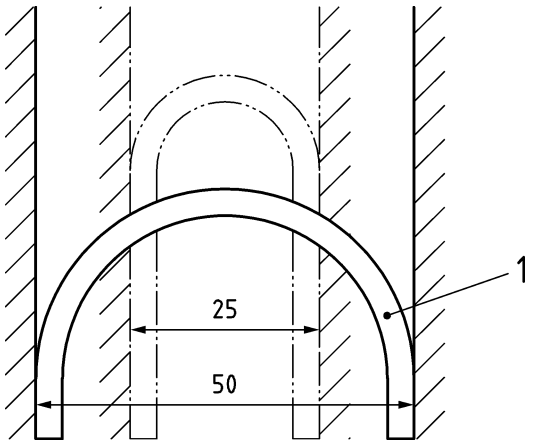
The test piece shall be placed between the plates in accordance with Figure A.1, separated at (50 ± 1) mm and at the test temperature.

After 30 min, the plates shall be pressed to (25 ± 1) mm apart during 5 s. Hold for 5 s and then release to (50 ± 1) mm within 5 s.

This cycle shall be repeated a further nine times, i.e. for a period of approximately 5 h.

Any appearance of cracking shall be reported.

Dimensions in millimetres



Key

1 dumb bell test piece

Figure A.1 — Arrangement for low temperature resistance test

Annex B
(normative)

Method for the determination of adhesion between components

B.1 Dry adhesion

The hose shall be subjected to the adhesion test in accordance with EN ISO 8033 and the minimum value in N/mm for adhesion shall be determined:

a) between lining and reinforcement;

b) between reinforcement and cover;

c) between reinforcement layers.

B.2 Adhesion after contact with fuel

A sample shall be cut from the hose that is to be tested approximately 300 mm in length and sealed at one end. The hose shall be filled with liquid B in accordance with ISO 1817 and the top lightly capped. The sample shall be conditioned at (20 ± 5) °C for $\left(168_{0}^{+2}\right)\mathrm{h}$. The sample shall be emptied and the minimum adhesion between components as stated in B.1 shall be determined.

Annex C
(normative)

Test method for the determination of low temperature flexibility

C.1 Test piece

The test hose length shall be (265 ± 2) mm.

C.2 Apparatus

The test arrangement shall be in accordance with Figure C.1. The diameter of the mandrel and the lever shall be the same as the bore diameter of the hose.

Plug mandrel and lever into the hose at a depth as shown in Figure C.1.

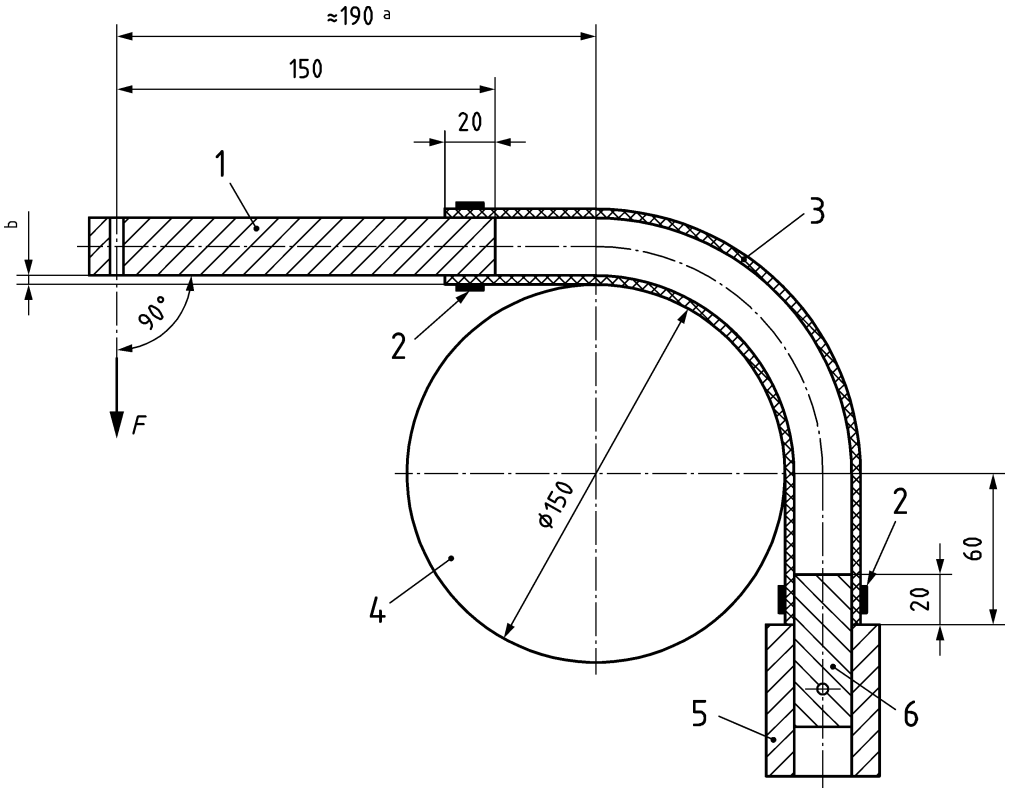
C.3 Test method

The un-aged hose and the test apparatus shall be conditioned at a temperature of (−30 ± 2) °C for a period of 24 h prior to the testing. A suitable measuring instrument (spring balance, ring dynamometer) shall be fixed to the end of the lever to determine force F.

The hose shall be bent, at (−30 ± 2) °C, through 90° around the bending device, against any curvature that may arise during manufacturing, by means of the tensile force on the measuring instrument, during 2 s to 4 s.

The maximum force F applied shall be recorded.

Dimensions in millimetres



Key

a length, depending on hose outer diameter
b parallel
1 lever
2 clamp
3 hose
4 bending device, ∅ = 150 mm
5 holding device for mandrel
6 mandrel

Figure C.1 — Test arrangement for low temperature flexibility test

Annex D
(normative)

Test method for the determination of fuel permeation

D.1 Test piece

Two metre sample of hose.

D.2 Apparatus

D.2.1 Graduated pipette with minimum capacity of 100 ml.

D.3 Test method

A 2 m sample of fuel hose, closed at one end, shall be fitted with a graduated pipette with a minimum capacity of 100 ml and shall be filled without bubbles with test fuel liquid C in accordance with ISO 1817. The sample shall be conditioned for a period of 48 h (for swelling) suspended vertically at standard atmosphere 23/50 in accordance with ISO 554. The fuel hose shall be drained and refilled with fresh test fuel liquid C in accordance with ISO 1817 up to a gauge mark. This value shall be recorded.

The amount of fuel diffusing through the fuel hose after a period of (72 ± 2) h at standard atmosphere 23/50 and without adding fuel in the meantime shall be determined by noting the reduction in volume in the pipette.

The amount evaporated through the pipette opening during the test period shall be determined by carrying out a blank test under the same conditions, deducting this loss of volume from that recorded for the test sample.

The rate of permeation shall be determined as:

$$X = \text{corrected loss of test fuel ml}/(2\ \text{m} \times 3\ \text{d})$$

where

X permeation per length and time in ml/m per day.

Annex E
(normative)

Test method for flammability

E.1 Test pieces

Hose assembly with both ends capped.

E.2 Apparatus

E.2.1 Bunsen Burner

E.2.2 Stopwatch

E.2.3 Suitable clamps to hold test assembly

E.3 Test method

The hose test piece shall be bent into a U-shape of radius specified in Figure E.1. The test piece shall be filled with liquid F in accordance with ISO 1817. The test piece shall be exposed 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 shall be in accordance with Figure E.1.

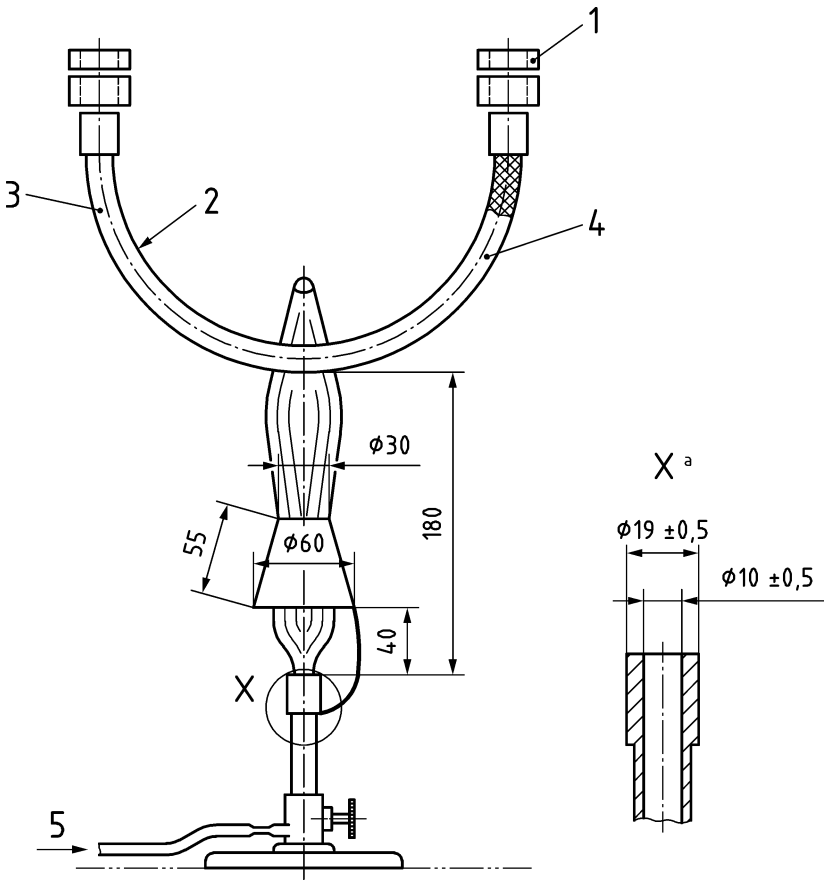
The hose sample shall be deemed to be non-flammable if;

— it ceases to burn with a naked flame within 20 s of removal of the burner, and

— there is no further glowing visible 2 min after removing the burner flame.

On completion of the test, the hose test piece shall show no sign of leakage with the test fluids.

Dimensions in millimetres



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) ≈ 50 mbar
[a] cross section of detail

Figure E.1 — Arrangement for flammability test

Annex F
(normative)

End-fitting pull-off test

F.1 Test piece

The test sample shall be a hose assembly of a length to fit the test equipment, prepared under the same manufacturing conditions and by the same manufacturing processes as used for actual assemblies. The test samples shall be prepared at the beginning and end of a batch of assemblies and, in addition, when the 100th assembly is made if the batch is larger than 100 units. This test frequency of 100 units only applies for non-reusable fittings.

F.2 Apparatus

F.2.1 Test rig capable of producing and holding a tensile force of 2 000 N for at least 30 s with a jaw speed of (75 $\pm$ 5) mm/min.

F.3 Test method

The test sample shall be mounted in a test rig and a tensile force of 2 000 N shall be applied at the extremities of the assembly and held for 30 s. The force shall be built up by moving apart the jaws of the test rig at a rate of (75 $\pm$ 5) mm/min.

Each test assembly shall be discarded on completion of the test.

If a sample fails this test, the preceding 100 hose assemblies shall be deemed as not complying with this standard and subject to further investigation.

Annex G
(normative)

Test method for the determination of leakage (leak test)

Each hose assembly shall be subjected to an air pressure of 3,5 bar. The ends of the hose assembly which include the fittings and 100 mm of the hose shall be immersed in container of water at ambient temperature for a minimum period of 30 s.

Observe any leakage (bubbles) at the interface of the hose and fitting.

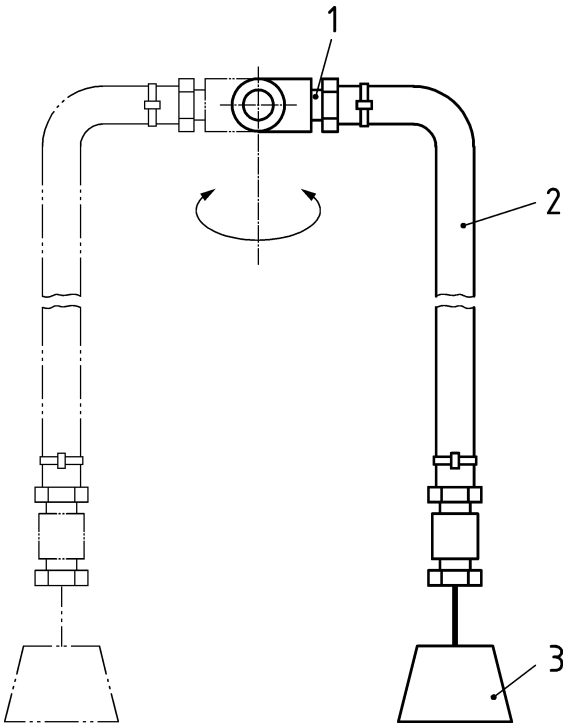
Annex H
(normative)

Test method for fatigue strength under reversed bending stress (flex test)

H.1 Apparatus and test pieces

H.1.1 Testing rig in accordance with Figure H.1.

If found necessary, the dead weight may be guided to prevent swinging. The length of the hose assembly shall be approximately 1 m.



Key

1 centre of rotation of coupling
2 hose assembly, pressurised
3 dead weight

Figure H.1 — Testing rig

H.2 Test method

The test specimen shall be fitted to the testing rig in accordance with Figure H.1. A dead weight having a mass of 5 kg shall be attached to the free end of the assembly. A pressure of 2 bar using fuel liquid C in accordance with ISO 1817 shall be applied. The testing rig shall be moved to and fro at room temperature, thereby the hose shall be flexed through 180° relative to the coupling. One complete cycle is two rotations through 180°. The minimum flexing rate shall be two complete cycles per minute. The number of cycles to be

carried out shall be in accordance with Table 4. The test specimen shall be emptied after the test and the electrical resistance shall be measured within 30 min in accordance with EN ISO 8031.

H.3 Test observations and report

The test report shall, in addition to the number of cycles achieved, include the following information:

a) temperature of the test medium before and after the test, if that temperature deviates from the room temperature;

b) any leakage between the hose and the end fittings;

c) any visible defects, such as any splitting of the hose cover, any bubbling of the cover, any separation of the cover or of the reinforcing plies, or any damage to the lining;

d) any loosening of the hose from the end fittings;

e) the value of the electrical resistance.

Annex I
(normative)

Test frequency for type tests and routine tests

The minimum frequency of test for type tests and routine tests shall be as specified in Table I.1.

Table I.1 – Test frequency for type tests and routine tests

Property	Type test	Routine test
Compound		
Tensile strength and elongation at break, lining and cover	X	N.A.
Accelerated ageing	X	N.A.
Swelling in fuel, lining and cover	X	N.A.
Extracted matter from lining fuel hose	X	N.A.
Low temperature resistance	X	N.A.
Abrasion of the cover	X	N.A.
Hose		
Adhesion between components	X	N.A.
Ambient temperature bending	X	N.A.
Low temperature flexibility	X	N.A.
Measurement of internal diameter	X	X
Measurement of thickness (lining and cover)	X	X
Proof pressure	X	X
Change in length (at proof pressure)	X	N.A.
Burst pressure	X	N.A.
Ozone resistance of cover	X	N.A.
Electrical resistance	X	X
Flammability	X	N.A.
Fuel permeation	X	N.A.
Volumetric expansion	X	N.A.

Table I.1 *(continued)*

Property	Type test	Routine test
Hose		
Bend radius	X	N.A.
Hose assembly		
Proof pressure	X	N.A.
Leak test	X	X
Electrical resistance	X	X
Pull-off test	X	See Annex F
Flex test	X	N.A.
X = test to be performed N.A. = not applicable		

Annex J
(informative)

Test frequency for production acceptance tests

The frequency of test for production acceptance tests should be as specified in Table J.1. It should be noted that this is only a recommendation. These tests are carried out per batch or 10 batches as indicated in Table J.1. A batch is defined as either 5 000 m of hose or 2 000 kg of lining and/or cover compound or 1 000 hoses assemblies.

Table J.1 - Test frequency for production acceptance tests

Property	Production acceptance tests	
	Per batch	Per 10 batches
Compound		
Tensile strength and elongation at break, lining and cover	X	X
Accelerated ageing	N.A.	X
Swelling in fuel, lining and cover	N.A.	X
Extracted matter from lining fuel hose	N.A.	X
Low temperature resistance	N.A.	X
Abrasion of the cover	N.A.	X
Hose		
Adhesion between components	X	X
Ambient temperature bending	N.A.	X
Low temperature flexibility	N.A.	X
Measurement of internal diameter	X	X
Measurement of thickness (lining and cover)	X	X
Proof pressure	X	X
Change in length (at proof pressure)	N.A.	X
Burst pressure	N.A.	X
Ozone resistance of cover	N.A.	X
Electrical resistance	X	X

Table J.1 *(continued)*

Property	Production acceptance tests	
	Per batch	**Per 10 batches**
Hose		
Flammability	N.A.	X
Fuel permeation	N.A.	X
Volumetric expansion	N.A.	X
Bend radius	N.A.	N.A.
Hose assembly		
Leak test	X	X
Proof pressure	N.A.	X
Electrical resistance	X	X
Pull-off test	N.A.	N.A.
Flex test	N.A.	N.A.
X = test to be performed N.A. = not applicable		

Bibliography

[1] EN 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

[2] EN 590, *Automotive fuels — Diesel — Requirements and test methods*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™