BS ISO 19013-2:2016

BSI Standards Publication

Rubber hoses and tubing for fuel circuits for internal combustion engines — Specification

Part 2: Gasoline fuels

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National foreword

This British Standard is the UK implementation of ISO 19013-2:2016. It supersedes BS ISO 19013-2:2005 which is withdrawn.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.

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INTERNATIONAL STANDARD

ISO 19013-2

Second edition
2016-01-15

Rubber hoses and tubing for fuel circuits for internal combustion engines — Specification —

Part 2: Gasoline fuels

Tuyaux de caoutchouc et flexibles pour les circuits de carburant pour les moteurs à combustion interne — Spécifications —

Partie 2: Essences

Reference number
ISO 19013-2:2016(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This second edition cancels and replaces the first edition (ISO 19013-2:2005), which has been technically revised.

ISO 19013 consists of the following parts, under the general title *Rubber hoses and tubing for fuel circuits for internal combustion engines — Specification*:

— *Part 1: Diesel fuels*

— *Part 2: Gasoline fuels*

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INTERNATIONAL STANDARD ISO 19013-2:2016(E)

Rubber hoses and tubing for fuel circuits for internal combustion engines — Specification —

Part 2: Gasoline fuels

WARNING — Persons using this part of ISO 19013 should be familiar with normal laboratory practice. This part of ISO 19013 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.

1 Scope

This part of ISO 19013 specifies the requirements for rubber tubing and hoses used in gasoline fuel circuits for internal combustion engines. The gasoline fuels covered include those containing oxygenates such as methanol and fuels that have become oxidized ("sour gas"). In addition, this part of ISO 19013 can also be applied as a classification system to enable original equipment manufacturers (OEMs) to detail a "line call-out" of tests for specific applications where these are not covered by the main types specified (see example in Annex G). In this case, the hose or tubing would not carry any marking showing the number of this part of ISO 19013, but may detail the OEM's own identification markings as shown on their part drawings.

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.

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

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

ISO 1629, *Rubber and latices — Nomenclature*

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

ISO 3302-1, *Rubber — Tolerances for products — Part 1: Dimensional tolerances*

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

ISO 4926, *Road vehicles — Hydraulic braking systems — Non-petroleum-base reference fluids*

ISO 6133, *Rubber and plastics — Analysis of multi-peak traces obtained in determinations of tear strength and adhesion strength*

ISO 7233:2006, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum*

ISO 7326:2006, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

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

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

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

ISO 10619-2:2011, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

ASTM D130, *Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test*

SAE J1737, *Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation*

SAE J2027:1998, *Standard for Protective Covers for Gasoline Fuel Line Tubing*

SAE J2044:2002, *Quick Connect Coupling Specification for Liquid Fuel and Vapor/Emissions Systems*

SAE J2260, *Nonmetallic Fuel System Tubing with One or More Layers*

3 Classification

The product shall consist of extruded rubber materials with or without an integral internal or external reinforcement which may or may not be pre-formed before final vulcanization. The product may also have a rubber or thermoplastic barrier layer, either as an internal layer or forming the inner liner, to impart improved fuel resistance and/or reduced fuel vapour permeability.

Seven hoses and tubings for specific applications are specified as follows.

Type 1 Class A = Pressurized [0,7 MPa (7 bar) working pressure] feed and return lines from the fuel tank to the engine compartment (−40 °C to +80 °C continuous).

Class B = Pressurized [0,2 MPa (2 bar) working pressure] feed and return lines from the fuel tank to the engine compartment (−40 °C to +80 °C continuous).

Type 2 Class A = Pressurized [0,7 MPa (7 bar) working pressure] feed and return lines in the engine compartment (−40 °C to +100 °C continuous).

Class B = Pressurized [0,2 MPa (2 bar) working pressure] feed and return lines in the engine compartment (−40 °C to +100 °C continuous).

Type 3 Class A = Pressurized [0,7 MPa (7 bar) working pressure] feed and return lines in the engine compartment (−40 °C to +125 °C continuous).

Class B = Pressurized [0,2 MPa (2 bar) working pressure] feed and return lines in the engine compartment (−40 °C to +125 °C continuous).

Type 4 Low pressure [0,12 Mpa (1,2 bar) working pressure] fuel filler, vent, and vapour handling (−40 °C to +80 °C continuous).

All types and classes can also be designated reduced fuel vapour permeable (RP), e.g. Type 1 Class A RP.

4 Sizes

4.1 Tubing

When determined by the methods described in ISO 4671, inside diameters and wall thicknesses shall be as specified in Table 1.

Tolerances shall be selected from the appropriate categories specified in ISO 3302-1; M3 for moulded hoses and E2 for extrusions.

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The thickness of the barrier layer, where applicable, shall be included in the total nominal wall thickness shown in Table 1.

Table 1 — Tubing inside diameters and wall thicknesses

Inside diameter mm	Wall thickness mm
3,5	3,5
4	3,5
5	4
7	4,5
9	4,5
11	4,5
13	4,5
NOTE For information, the unions on which the tubing is to be fitted have the following diameters: 4 mm, 4,5 mm, 6 mm or 6,35 mm, 8 mm, 10 mm, 12 mm, and 14 mm.	

4.2 Hoses

When determined by the methods described in ISO 4671, the dimensions and concentricity of hoses shall comply with Tables 2 and 3.

The thickness of the barrier layer, where applicable, shall be included in the total nominal wall thickness shown in Table 2.

Table 2 — Hose dimensions

Dimensions in millimetres

Inside diameter	Tolerance	Wall thickness	Outside diameter	Tolerance
3,5	±0,3	3	9,5	±0,4
4	±0,3	3	10	±0,4
5	±0,3	3	11	±0,4
6	±0,3	3	12	±0,4
7	±0,3	3	13	±0,4
7,5	±0,3	3	13,5	±0,4
8	±0,3	3	14	±0,4
9	±0,3	3	15	±0,4
11	±0,3	3,5	18	±0,4
12	±0,3	3,5	19	±0,4
13	±0,4	3,5	20	±0,6
16	±0,4	4	24	±0,6
21	±0,4	4	29	±0,6
31,5	$^{+0,5}_{-1}$	4,25	40	±1
40	$^{+0,5}_{-1}$	5	50	±1

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Table 3 — Hose concentricity

Inside diameter mm	Maximum variation from concentricity mm
Up to and including 3,5	0,4
Over 3,5	0,8

5 Performance requirements for hose and tubing

Tests shall be selected from the following list for each application of hose or tubing based on the performance requirements for the finished product. Type tests (as defined in Clause 6) for each hose or tubing group are given in Annex H.

a) **Burst pressure**: When determined in accordance with ISO 1402, the minimum burst pressure for Types 1, 2, and 3, Class A shall be 3,0 MPa gauge (30 bar) and shall be 1,2 MPa gauge (12 bar) for Class B. Type 4 shall be 0,5 MPa gauge (5 bar). Additionally, after fuel resistance testing [test m)], hoses and tubing shall not have a burst pressure of less than 75 % of the original burst pressure.

b) **Proof pressure**: When determined in accordance with ISO 1402, the test pressure for Types 1, 2, and 3, Class A shall be 1,5 MPa gauge (15 bar) and shall be 0,6 MPa gauge (6 bar) for Class B. Type 4 shall be 0,25 MPa gauge (2,5 bar). The hose shall not burst or not fail by showing sign of leakage.

c) **Adhesion** (for all constructions with two or more bonded layers only): When determined by the appropriate procedure in ISO 8033, the adhesion between each pair of bonded layers shall not be less than 1,5 kN/m.

d) **Low-temperature flexibility**: When tested in accordance with ISO 10619-2:2011, method B, a length of hose or tubing which has been previously kept filled with ISO 1817 liquid C for 72 h ± 2 h at 21 °C ± 2 °C and then kept cooled at −40 °C ± 2 °C for 72 h ± 2 h shall not exhibit any cracking when examined under ×2 magnification after bending around a similarly cooled mandrel, the radius of which is 12 times the nominal size of the hose or 25 times the nominal size of the tubing. The hose or tubing shall then conform to the burst strength requirement of test a).

e) **Internal cleanliness**: When determined in accordance with Annex A, the insoluble impurities shall not exceed 5 g/m^2 and the fuel-soluble impurities shall not exceed 3 g/m^2.

f) **Extractable waxy materials**: When determined in accordance with Annex A, the extractable waxy materials shall not exceed 2,5 g/m^2.

g) **Tear resistance** (applicable to tubing only): When determined in accordance to Annex B, the minimum tear resistance shall be 4,5 kN/m.

h) **Ozone resistance**: When tested in accordance with ISO 7326:2006, method 1 under the following conditions, the hose or tubing shall not show cracking when examined under ×2 magnification:

Partial pressure of ozone	50 mPa ± 3 mPa
Duration	72 h ± 2 h
Temperature	40 °C ± 2 °C
Elongation	20 %

i) **Heat ageing resistance**: After ageing for one or more of the following times and temperatures in accordance with ISO 188, all constructions shall meet the adhesion requirements of test b), the low-temperature flexibility requirements of test c), and the ozone resistance requirements of test g).

1) 1 000 h at 80 °C.

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