INTERNATIONAL STANDARD

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Thermoplastic tubing and hoses for automotive use —

Part 1: Non-fuel applications

Tubes et tuyaux en thermoplastique pour l'industrie automobile —

Partie 1: Applications sans carburant

Reference number
ISO 13775-1:2000(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 13775 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13775-1 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

ISO 13775 consists of the following parts, under the general title *Thermoplastic tubing and hoses for automotive use*:

— *Part 1: Non-fuel applications*

— *Part 2: Petroleum-based-fuel applications*

Annexes A and B of this part of ISO 13775 are for information only.

Introduction

This specification defines the requirements of extruded thermoplastic tubing/hoses for non-fuel applications for automotive use. In addition, it may 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 four main types (see example in annex A). In this case, the tubing or hose would not carry any marking showing this ISO specification number, but may detail the OEM's own identification markings as shown on their part drawings.

Thermoplastic tubing and hoses for automotive use —

Part 1:
Non-fuel applications

WARNING — Persons using this part of ISO 13775 should be familiar with normal laboratory practice. This part of ISO 13775 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 13775 specifies the test requirements and the test methods for extruded thermoplastic tubing and hoses for use in vehicles powered by internal-combustion engines, excluding use in air braking systems (see ISO 7628-2), fuel lines (see ISO 13775-2) and high-pressure hydraulic systems. This specification is intended especially for use by original equipment manufacturers (OEMs).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 13775. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 13775 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

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

ISO 1746, *Rubber or plastics hoses and tubing — Bending tests.*

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

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials.*

ISO 3865:1997, *Rubber, vulcanized or thermoplastic — Methods of test for staining in contact with organic material.*

ISO 4639-3, *Rubber tubing and hoses for fuel circuits for internal-combustion engines — Specification — Part 3: Oxidized fuels.*

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

ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of suction resistance.*

ISO 7628-2:1998, *Road vehicles — Thermoplastics tubing for use in air braking systems — Part 2: Mounting on vehicle and test methods.*

ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance.*

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

ISO 11758, *Rubber and plastics hoses — Exposure to a xenon arc lamp — Determination of changes in colour and appearance.*

ISO 13775-2, *Thermoplastic tubing and hoses for automotive use — Part 2: Petroleum-based-fuel applications.*

3 Classification and materials

The product shall consist of an extruded thermoplastic material with or without an integral reinforcement. The product may also have an inner veneer to impart improved fluid resistance and/or heat resistance. It may also have an extruded outer cover to improve environmental resistance and/or flame resistance. The outer cover is not necessarily bonded to the tubing or hose.

Four types of tubing and hose for specific applications are specified as follows:

Type 1: tubing or hose for vacuum and electronic control;

Type 2: tubing or hose for coolant systems;

Type 3: tubing or hose for screen/headlamp wash systems;

Type 4: tubing or hose for exhaust gas recirculation systems.

4 Dimensions

Bore diameters and wall thicknesses shall be as given in Table 1.

The wall thickness shall be the sum of the individual thicknesses of the various elements in the construction of the tubing or hose. The thickness of each individual element shall be such that it is able to carry out its own function and the total function of the tubing or hose.

Table 1 — Nominal bores, internal diameters and wall thicknesses

Nominal bore	Internal diameter mm	Wall thickness (min.) mm
2	2 ± 0,1	0,9
4	4 ± 0,1	0,9
6	6 ± 0,1	0,9
6	6 ± 0,1	1,35
7,5	7,5 ± 0,1	1,12
8	8 ± 0,1	0,9
8	8 ± 0,1	1,35
9	9 ± 0,1	1,35
10	10 ± 0,1	1,8
12	12 ± 0,1	1,35
12	12 ± 0,1	1,8
14	14 ± 0,1	1,8

5 Requirements for approval of products

The following tests shall be selected for each application of the tubing or hose, based on the performance requirements of the finished product. The tests to be carried out for each type of tubing or hose classification in clause 3 are given in Table 2.

a) Burst pressure: When determined in accordance with ISO 1402, the minimum burst pressure for all constructions shall be 20 bar gauge (2 MPa).

b) Cold impact resistance: After cold impact testing at − 40 °C in accordance with subclause 7.4 of ISO 7628-2:1998, all constructions shall show no evidence of external fracture or cracking and shall meet the burst pressure requirements of a).

c) Heat ageing resistance: After ageing at one or more of the following sets of conditions in accordance with ISO 188, all constructions shall meet the cold impact requirements of b):

   1) 1 000 h at 70 °C

   2) 1 000 h at 100 °C

   3) 1 000 h at 125 °C

   4) 1 000 h at 135 °C

   5) 168 h at 100 °C

   6) 168 h at 125 °C

   7) 168 h at 140 °C

   8) 168 h at 150 °C

d) Resistance to light: All constructions shall meet the cold impact requirements of b) after 1 000 kJ/m^2 xenon-arc exposure in accordance with ISO 11758.

NOTE This test is for applications that require exposure to daylight either during normal vehicle usage or on chassis that may be stored in the open prior to final assembly of the vehicle.

e) Resistance to surface contamination by fuels: When tested in accordance with annex B using the following test fuels as specified, all constructions shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable:

   1) A mixture of 85 % by volume of liquid C (ISO 1817) and 15 % by volume of methanol.

   2) A mixture of 15 % by volume of liquid C (ISO 1817) and 85 % by volume of methanol.

   3) A mixture of 85 % by volume of liquid C (ISO 1817) and 15 % by volume of methyl tertiary-butyl ether (MTBE).

   4) Liquid F (ISO 1817) (simulated diesel fuel).

f) Resistance to engine coolant

   1) Surface contamination: When tested in accordance with annex B, using a mixture of 50 % by volume of water and 50 % by volume of ethane-1,2-diol, all constructions shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable.

   2) Long-term resistance: When filled with a mixture of 50 % by volume of water and 50 % by volume of ethane-1,2-diol and aged for 1 000 h at the temperature selected for the 1 000 h heat resistance test c), all constructions shall meet the cold impact resistance of b) and the adhesion requirements of k) where applicable.

g) Resistance to stress cracking: When tested in accordance with subclause 7.9 of ISO 7628-2:1998, all constructions shall show no evidence of stress cracking and shall meet the cold impact requirements of b).

h) Resistance to battery acid: When tested in accordance with subclause 7.11 of ISO 7628-2:1998, all constructions shall show no evidence of cracking or degradation and shall meet the cold impact requirements of b).

i) Resistance to engine oil and petroleum-based hydraulic fluid.

   1) Surface contamination: When tested in accordance with annex B, using ISO 1817 Oil 3, all constructions shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable.

   2) Long-term resistance: When filled with ISO 1817 Oil 3 and aged for 1 000 h at the temperature selected for the 1 000 h heat resistance test c), all constructions shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable.

j) Resistance to non-petroleum hydraulic (brake/clutch) fluid.

   1) Surface contamination: When tested in accordance with annex B, using ISO 4926 compatibility fluid, all constructions shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable.

   2) Long-term resistance: When filled with non-petroleum hydraulic fluid to ISO 4926 and aged for 1 000 h at the temperature selected for the 1 000 h heat resistance test c), the tubing shall meet the cold impact requirements of b) and the adhesion requirements of k) where applicable.

k) Adhesion: For any constructions with two or more bonded layers only: When determined in accordance with the appropriate procedure of ISO 8033, the separation force between bonded layers shall not be less than 1,5 kN/m.

l) Flammability: When tested in accordance with ISO 3795, no construction shall burn at a rate exceeding 100 mm/min.

m) Internal cleanliness: When determined in accordance with annex B of ISO 4639-3:1995, the insoluble impurities shall not exceed 5 g/m^2.

n) Resistance to screen washing fluid: When filled with a mixture of 50 % by volume of water and 50 % by volume of propan-2-ol and aged for 1 000 h at the temperature selected for the 1 000 h heat resistance test c), all constructions shall meet the cold impact resistance requirements of b) and the adhesion requirements of k) where applicable.

o) Staining of paint surfaces by material extraction by screen wash fluid: When tested in accordance with method B of ISO 3865:1997, except using screen wash fluid as given in n) in place of distilled water, there shall be no staining of the painted metal surface.

p) Electrical resistance: When determined in accordance with ISO 8031, the electrical resistance shall not exceed 10 MΩ .

q) Resistance to kinking: When determined in accordance with ISO 1746, the maximum coefficient of deformation (T/D) shall not exceed 0,7.

   The mandrel diameter shall be 140 mm for tubing or hoses up to nominal bore 10; 220 mm for nominal bore 10 and up to and including nominal bore 12; and 300 mm for nominal bore 14.

r) Resistance to reduction of internal air pressure: When tested in accordance with ISO 7233 at 0,3 bar absolute (0,03 MPa) pressure and 100 °C, the hose or tubing shall not collapse by more than 50 % after 10 min.

Table 2 — Requirements for the most frequent applications for non-fuel-line tubing and hoses

Test (clause 5)	Type 1	Type 2	Type 3	Type 4
a	X	X	X	X
b	X	X	X	X
c1	NA	NA	X	NA
c2	NA	NA	NA	NA
c3	X	X	NA	NA
c4	NA	NA	NA	X
c5	NA	NA	X	NA
c6	NA	X	NA	NA
c7	X	NA	NA	NA
c8	NA	NA	NA	X
d	NA	NA	NA	NA
e1	X	X	X	X
e2	X	X	NA	X
e3	X	X	NA	X
e4	X	X	NA	X
f1	X	NA	NA	X
f2	NA	X	NA	NA
g	X	X	X	X
h	X	X	X	X
i1	X	X	X	NA
i2	NA	NA	NA	X
j1	X	X	X	X
j2	NA	NA	NA	NA
k	NA	NA	NA	NA
l	X	X	X	X
m	X	NA	X	NA
n	NA	NA	X	NA
o	NA	NA	X	NA
p	NA	NA	NA	NA
q	X	X	X	X
r	X	X	X	X

X = test shall be carried out; NA = test is not applicable.

6 Marking

All constructions shall be continuously marked with at least the following information:

a) the manufacturer's name or trade mark;

b) the number of this part of ISO 13775;

c) the type number;

d) the nominal bore;

e) the medium carried;

f) the month and year of manufacture.

EXAMPLE MN, ISO 13775-1, Type 1, 6, Vacuum, 06/1999

NOTE Parts made from short cut lengths may not be long enough to show the entire marking sequence.

Annex A
(informative)

Example of how a non-standard type of hose or tubing could be specified using a matrix

Material: ISO 13775-1, clause 5

Burst pressure 30 bar	X	a
	X	b
		c1
1 500 h at 100 °C	X	c2
		c3
		c4
		c5
		c6
		c7
	X	c8
		d
	X	e1
		e2
	X	e3
	X	e4
	X	f1
	X	f2
	X	g
	X	h
	X	i1
	X	i2
	X	j1
	X	j2
	X	k
Flammability 0 mm/min max.	X	l
	X	m
	X	n
		o
		p
		q
		r
Colour red	X	z1

Annex B
(informative)

Method for determining the resistance to surface-contaminating fluids

Tightly plug the ends of sufficient specimens of tubing or hose to enable the cold impact test b) to be carried out. Fully immerse each specimen in the specified contaminating fluid for 2 h at 60 °C. At the end of the immersion period, wipe the fluid from the surface of the specimens and test as required.

ICS 43.040.01; 83.140.30; 83.140.40

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