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Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification

Tuyaux et flexibles en plastique — Types hydrauliques avec armature textile — Spécifications

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This sixth edition cancels and replaces the fifth edition (ISO 3949:2018), which has been technically revised. The changes compared to the previous edition are as follows:

— the percentage change in the volume of the lining and cover in the test with water-based fluids has been changed from 0 % and +25 % to −15 % and +35 %;

— the percentage change in the volume of the lining and cover in the test with water has been changed from −10 % and +25 % to −15 % and +35 %.

This corrected version of ISO 3949:2020 incorporates the following correction:

— in Table 6, the header in the third column that repeated “R7 and R8” has been corrected to “R18”.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification

1 Scope

This document specifies requirements for three types of textile-reinforced thermoplastics hoses and hose assemblies of nominal size from 3,2 to 25. Each type is divided into two classes dependent on electrical conductivity requirements.

They are suitable for use with:

— oil-based hydraulic fluids HH, HL, HM, HR and HV as defined in ISO 6743-4 at temperatures ranging from −40 °C to +93 °C;

— water-based fluids HFC, HFAE, HFAS and HFB as defined in ISO 6743-4 at temperatures ranging from 0 °C to +60 °C

— water at temperatures ranging from 0 °C to +60 °C.

This document does not include any requirements for end fittings. It is limited to the performance of hoses and hose assemblies.

NOTE It is the responsibility of the user, in consultation with the hose manufacturer, to establish the compatibility of the hose with the fluid to be used.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

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

ISO 6803, *Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing*

ISO 7326:2016, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 10619-1:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 17165-1, *Hydraulic fluid power — Hose assemblies — Part 1: Dimensions and requirements*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Classification

Three types of hoses are specified, distinguished by their maximum working pressure:

a) Type R7: hoses with one or more layers of reinforcement;

b) Type R8: hoses with one or more layers of reinforcement, for operation at higher working pressures;

c) Type R18: hoses with one or more layers of reinforcement, 21,0 MPa (210 bar) working pressure based.

Each type of hose is divided into two classes according to its electrical properties:

— Class 1, no electrical requirements;

— Class 2, “non-conductive” (see 7.8).

5 Materials and construction

5.1 Hoses

Hoses shall consist of a seamless thermoplastic lining resistant to hydraulic fluids, with suitable textile yarn reinforcement and a thermoplastic cover resistant to hydraulic fluids, water and the weather.

For class 2 hoses, the cover shall not be perforated. The cover shall be orange (colour code RAL 2004).

5.2 Hose assemblies

Hose assemblies shall only be manufactured with those hose fittings whose functionality conforms to the requirements of 7.1, 7.4, 7.5 and, for class 2 only, 7.8.

6 Dimensions and tolerances

6.1 Diameters

When measured in accordance with ISO 4671, the diameters of the hoses shall conform to the values given in Table 1.

Table 1 — Dimensions of hoses

Nominal size	Inside diameter mm						Maximum outside diameter mm		
	Type R7		Type R8		Type R18		Type R7	Type R8	Type R18
	min.	max.	min.	max.	min.	max.			
3,2	3,4	4,0	3,4	4,0	3,4	4,0	9,5	10,5	9,5
5	4,6	5,4	4,6	5,4	4,6	5,4	11,4	14,6	10,8
6,3	6,2	7,0	6,2	7,0	6,2	7,0	13,7	16,8	13,5
8	7,7	8,5	7,7	8,5	7,7	8,5	15,6	18,6	16,6
10	9,3	10,3	9,3	10,3	9,3	10,3	18,4	20,3	18,4
12,5	12,3	13,5	12,3	13,5	12,3	13,5	22,5	24,6	22,8
16	15,5	16,7	15,5	16,7	15,5	16,7	25,8	29,8	27,2
19	18,6	19,8	18,6	19,8	18,6	19,8	28,6	33,0	31,5
25	25,0	26,4	25,0	26,4	25,0	26,4	36,7	38,6	40,4

6.2 Concentricity

When measured in accordance with ISO 4671, the concentricity of the hoses shall conform to Table 2.

Table 2 — Concentricity of hoses

Nominal size	Maximum variation in wall thickness between inside diameter and outside diameter mm
Up to and including 6,3	0,8
Over 6,3 and including 19	1,0
Over 19	1,3

7 Physical properties

7.1 Hydrostatic requirements

When tested in accordance with ISO 1402 at the relevant proof pressure given in Table 3 and the relevant minimum burst pressure given in Table 4, the hoses and hose assemblies shall not leak.

Table 3 — Proof pressure

Nominal size	Type		
	R7	R8	R18
	MPa (bar)	MPa (bar)	MPa (bar)
3,2	42,0 (420)	84,0 (840)	42,0 (420)
5	42,0 (420)	70,0 (700)	42,0 (420)
6,3	38,4 (384)	70,0 (700)	42,0 (420)
8	35,0 (350)	62,0 (620)	42,0 (420)
10	31,4 (314)	56,0 (560)	42,0 (420)
12,5	28,0 (280)	49,0 (490)	42,0 (420)
16	21,0 (210)	38,5 (385)	42,0 (420)
19	17,4 (174)	31,4 (314)	42,0 (420)
25	14,0 (140)	28,0 (280)	42,0 (420)

Table 4 — Minimum burst pressure

Nominal size	Type		
	R7	R8	R18
	MPa (bar)	MPa (bar)	MPa (bar)
3,2	84,0 (840)	168,0 (1 680)	84,0 (840)
5	84,0 (840)	140,0 (1 400)	84,0 (840)
6,3	76,8 (768)	140,0 (1 400)	84,0 (840)
8	70,0 (700)	124,0 (1 240)	84,0 (840)
10	62,8 (628)	112,0 (1 120)	84,0 (840)
12,5	56,0 (560)	98,0 (980)	84,0 (840)
16	42,0 (420)	77,0 (770)	84,0 (840)
19	34,8 (348)	62,8 (628)	84,0 (840)
25	28,0 (280)	56,0 (560)	84,0 (840)

7.2 Change in length

When tested in accordance with ISO 1402, the change in length of hose at the maximum working pressure (see Table 5) shall not exceed ±3 %.

Table 5 — Maximum working pressure

Nominal size	Type		
	R7	R8	R18
	MPa (bar)	MPa (bar)	MPa (bar)
3,2	21,0 (210)	42,0 (420)	21,0 (210)
5	21,0 (210)	35,0 (350)	21,0 (210)
6,3	19,2 (192)	35,0 (350)	21,0 (210)
8	17,5 (175)	31,0 (310)	21,0 (210)
10	15,7 (157)	28,0 (280)	21,0 (210)
12,5	14,0 (140)	24,5 (245)	21,0 (210)
16	10,5 (105)	19,2 (192)	21,0 (210)

Table 5 *(continued)*

Nominal size	Type		
	R7	R8	R18
	MPa (bar)	MPa (bar)	MPa (bar)
19	8,7 (87)	15,7 (157)	21,0 (210)
25	7,0 (70)	14,0 (140)	21,0 (210)

7.3 Minimum bend radius

When bent to the minimum bend radius in Table 6, measured unpressurized in accordance with method A1 of ISO 10619-1:2017, the value of T/D, as defined in ISO 10619-1, shall be not less than 0,9.

Table 6 — Minimum bend radius

Nominal size	Minimum bend radius mm	
	Type	
	R7 and R8	R18
3,2	25	25
5	90	30
6,3	100	45
8	115	50
10	125	75
12,5	180	90
16	205	125
19	240	165
25	300	250

7.4 Resistance to impulse

7.4.1 The impulse test shall be in accordance with ISO 6803. The test fluid temperature shall be 93 °C.

7.4.2 For type R7 hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure, the hose shall withstand a minimum of 150 000 impulse cycles.

For type R8 and R18 hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 200 000 impulse cycles.

7.4.3 There shall be no leakage or other malfunction before reaching the specified number of cycles.

7.4.4 This test shall be considered a destructive test and the test piece shall be disposed of in accordance with local environmental guidelines.

7.5 Leakage of hose assemblies

When tested in accordance with ISO 1402, there shall be no leakage or evidence of failure. This test shall be considered a destructive test and the test piece shall be disposed of in accordance with local environmental guidelines.