
**Thermoplastic hoses and hose
assemblies — Wire or synthetic yarn
reinforced single-pressure types for
hydraulic applications — Specification**

*Tuyaux et flexibles en matière thermoplastique — Types hydrauliques
à pression unique, avec armature de fils métalliques ou synthétiques
— 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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

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

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This second edition cancels and replaces the first edition (ISO 23297:2008), of which it constitutes a minor revision. The changes compared to previous edition are as follows:

- the title of the document has been changed to refer to thermoplastic hoses and hose assemblies instead of thermoplastics hoses and hose assemblies, in keeping with the text of the document;
- the introduction has been amended to explain the current status of a new ISO standard for abrasion tests on rubber and plastic hose covers;
- Clause 2 has been updated: ISO 1746 and ISO 4672 have been cancelled and replaced by ISO 10619-1 and 10619-2, respectively; ISO 7326:2006 has been replaced by ISO 7326:2016;
- 7.2.3 and 7.2.6 have been amended to refer to the bend test standards ISO 10619-1 and ISO 10619-2;
- 7.2.9 has been amended to refer to ISO 7326:2016;
- 9.1 has been revised to stipulate that the hose manufacturer shall use the latest edition of this document, otherwise the year of publication shall be included in the marking;
- the bibliography has been amended by the deletion of ISO 6945 (standard withdrawn).

Introduction

The abrasion resistance tests for compound and plastic hose covers are not included in this document. ISO 20444¹⁾ is intended to specify abrasion tests on rubber and plastic hose covers.

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1) Under preparation, to replace ISO 6945 (withdrawn).

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Thermoplastic hoses and hose assemblies — Wire or synthetic yarn reinforced single-pressure types for hydraulic applications — Specification

1 Scope

This document specifies requirements for eight classes and two types (construction with adhesive bond between layers and construction without adhesive bond between layers) of wire or synthetic yarn reinforced hydraulic hoses and hose assemblies of nominal size from 3,2 to 31,5. Each class has a single maximum working pressure for all sizes. Such hoses are suitable for use with hydraulic fluids HH, HL, HM, HR, and HV as defined in ISO 6743-4 at temperatures ranging from –40 °C to +100 °C for grades A and B and –40 °C to +120 °C for grades C and D.

This document does not include requirements for end fittings. It is limited to the performance of hoses and hose assemblies. The hose assembly maximum working pressure is governed by the lowest maximum working pressure of the components.

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

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2 Normative references (standards.iteh.ai)

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 4892 (all parts), *Plastics — Methods of exposure to laboratory light sources*

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

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

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

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

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

ISO 8331, *Rubber and plastics hoses and hose assemblies — Guidelines for selection, storage, use and maintenance*

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

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

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Classification

4.1 Classes

Eight classes of hose are specified, distinguished by their maximum working pressure, as shown in Table 1. Each class may be manufactured in up to 10 nominal sizes.

Table 1 — Classes, nominal size and maximum working pressure

Class	35	70	140	210	280	350	420	560
MWPa (bar)	35	70	140	210	280	350	420	560
MWPa (MPa)	3,5	7	14	21	28	35	42	56
Nominal size								
3,2	X	X	X	X	X	X	X	X
5	X	X	X	X	X	X	X	X
6,3	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X
12,5	X	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X	X
31,5	X	X	X	X	X	X	X	X
X = applicable.								
^a Maximum working pressure.								

4.2 Types

Two types are specified according to their construction: type 1 with adhesion between the layers; and type 2 without adhesion between the layers. In type 1 hoses, the lining and cover are adhesively bonded (i.e. only separable by force) to the reinforcement; in type 2 hoses, these layers are not attached to the reinforcement.

4.3 Grades

Hoses are classified according to their resistance to impulse into four grades: A, B, C and D, as shown in Table 2.

Table 2 — Grades

Grade	Resistance to impulse		
	Temperature °C	Impulse pressure (% of MWP ^a)	Minimum number of cycles
A	100	133 %	200 000
B	100	133 %	500 000
C	120	133 % (classes 35, 70, 140, 210)	500 000
		120 % (classes 280, 350, 420, 560)	
D	120	133 % (classes 35, 70, 140, 210)	1 000 000
		120 % (classes 280, 350, 420, 560)	
^a Maximum working pressure.			

The maximum working pressure by class is shown in Table 3.

Table 3 — Maximum working pressure

Class	35	70	140	210	280	350	420	560
MWP ^a (bar)	35	70	140	210	280	350	420	560
MWP ^a (MPa)	3,5	7	14	21	28	35	42	56
Grade								
A	X	X	X	X	X	X	X	X
B	X	X	X	X	X	X	X	X
C	X	X	X	X	X	X	X	X
D	X	X	X	X	X	X	X	X
X = applicable.								
^a Maximum working pressure.								

5 Materials and construction

5.1 Hoses

Hoses shall consist of a hydraulic-fluid-resistant thermoplastic lining, one or multiple layers of steel wire or synthetic yarn and an oil- and weather-resistant thermoplastic cover. Other protective materials over the thermoplastic cover are allowed for improved abrasion or other resistance.

5.2 Hose assemblies

Hose assemblies shall only be manufactured with those hose fittings which conform to the requirements of 7.2.1, 7.2.4 and 7.2.5 of this document.

Follow the manufacturer's instructions for proper preparation and fabrication of hose assemblies.

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 4.

Table 4 — Diameters of hoses

Nominal size	Inside diameter (all classes) mm		Maximum outside diameter of hose mm							
	min.	max.	Class 35	Class 70	Class 140	Class 210	Class 280	Class 350	Class 420	Class 560
3,2	3,1	4,0	8	8	9	9,5	9,5	9,5	10,5	10,5
5	4,6	5,4	10	10	11	12	12	12	14	15
6,3	6,1	7,0	12	12	14	14	14	14	16	16
8	7,7	8,5	13	13	15,5	15,5 (16,6 ^a)	16	16	17	17
10	9,3	10,3	16	16	17,5	18,5	19	19	20	21
12,5	12,3	13,5	20	20	21	23	23	23	24	25
16	15,5	16,8	23	23	25	27 (28 ^a)	28	28	28	29
19	18,6	19,8	27	28	29	32	32	33	33	34
25	25,0	26,4	34	36	36	39 (40,4 ^a)	39	40,5	40,5	43,5
31,5	31,4	33,0	45	45	46	48	49	50	50	51,5

^a These dimensions are allowable for textile yarn braided reinforcement only; for metal wire braided reinforcement of other classes and sizes, the standard dimensions apply.

6.2 Lengths of supplied hoses and hose assemblies

Recommendations for lengths of supplied hoses and hose assemblies are given in Annex C.

6.3 Outer cover thickness

When measured in accordance with ISO 4671, the outer cover thickness of the hoses shall conform to the values given in Table 5.

Table 5 — Outer cover thickness

Nominal size	Outer cover thickness mm	
	min.	max.
3,2	0,1	1,4
5	0,1	1,4
6,3	0,1	1,4
8	0,1	1,4
10	0,1	1,4
12,5	0,2	1,5
16	0,2	1,5
19	0,2	1,5
25	0,2	1,5
31,5	0,4	1,7

6.4 Concentricity

When measured in accordance with ISO 4671, the concentricity of the hoses shall conform to the values given in Table 6.

Table 6 — Concentricity of hoses

Nominal size	Maximum variation in wall thickness	
	Between internal diameter and outside diameter	Between internal diameter and outside diameter of the tubing
	mm	
	Wire	Textile
3,2, 5 and 6,3	0,5	0,8
over 6,3 and up to and including 19	0,8	1,0
25	1,1	1,3
31,5	1,2	1,3

7 Physical properties

7.1 Fluid and UV resistance of thermoplastic compounds

7.1.1 Fluid resistance

7.1.1.1 Test pieces

The fluid resistance tests shall be carried out on extruded sheets of lining and cover compound having minimum thickness 2 mm and an extruded state equivalent to that of the hose.

7.1.1.2 Oil resistance

For grades A and B, when tested in accordance with ISO 1817 by immersion in oil No. 3 for 168 h at a temperature of 100 °C, the percentage change in volume of the lining, ΔV_{100} , shall be between -10 % and +35 %.

For grades C and D, when tested in accordance with ISO 1817 by immersion in oil No. 3 for 168 h at a temperature of 120 °C, the percentage change in volume of the lining, ΔV_{100} , shall be between -10 % and +35 %.

For all grades, when tested in accordance with ISO 1817 by immersion in oil No. 3 for 168 h at a temperature of 70 °C, the percentage change in volume of the cover, ΔV_{100} , shall be between -10 % and +35 %.

7.1.2 UV resistance

When tested in accordance with ISO 4892 (e.g. accelerated in a Xenotester capable of generating wavelengths 300 nm to 800 nm and 45 W/m², exposure time 400 h), the samples shall show no crack or other defects at visual examination (without magnification) when bent over 180° at the smallest possible radius.

7.2 Performance requirements

7.2.1 Hydrostatic requirements

When tested in accordance with ISO 1402, the maximum working pressure, the proof pressure and the minimum burst pressure of the hoses and hose assemblies shall conform to the values given in Table 7.