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Rubber hoses and hose assemblies — Wire- or textile-reinforced single-pressure types for hydraulic applications — Specification

Tuyaux et flexibles en caoutchouc — Types hydrauliques avec armature de fils métalliques tressés — 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 18752 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

Rubber hoses and hose assemblies — Wire- or textile-reinforced single-pressure types for hydraulic applications — Specification

1 Scope

This International Standard specifies requirements for nine classes, four grades and seven types of wire- or textile-reinforced hydraulic hoses and hose assemblies of nominal sizes ranging from 5 to 102. 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 types AS, AC, BS and BC and – 40 °C to + 120 °C for types CS, CC and DC.

This International Standard does not include requirements for the connection ends. 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 the compatibility of the hose with the fluid to be used.

2 Normative references

The following referenced documents are indispensable for the application 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 1746, *Rubber or plastics hoses and tubing — Bending tests*

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

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

ISO 4672:1997, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests*

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

ISO 6945, *Rubber hoses — Determination of abrasion resistance of the outer cover*

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

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 8033:2006, *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*

3 Terms and definitions

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

4 Classification

4.1 Classes

Nine classes of hose are specified, distinguished by their maximum working pressure, as shown in Table 1. Each class may be manufactured in up to 14 nominal sizes.

Table 1 — Classes and nominal sizes

Class	**35**	**70**	**140**	**210**	**250**	**280**	**350**	**420**	**560**
MWP [a] (bar)	35	70	140	210	250	280	350	420	560
MWP [a] (MPa)	3,5	7	14	21	25	28	35	42	56
Nominal size									
5	X	X	X	X	X	X	X	X	N/A
6,3	X	X	X	X	X	X	X	X	N/A
8	X	X	X	X	X	X	X	X	N/A
10	X	X	X	X	X	X	X	X	N/A
12,5	X	X	X	X	X	X	X	X	N/A
16	X	X	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X	X	X
31,5	X	X	X	X	X	X	X	X	X
38	X	X	X	X	X	X	X	X	N/A
51	X	X	X	X	X	X	X	X	N/A
63	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A
76	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A
102	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTE X = Applicable; N/A = Not applicable.

[a] Maximum working pressure.

4.2 Grades and types

Hoses are classified according to their resistance to impulse into four grades: A, B, C and D. Each grade is classified by outside diameter into standard types (AS, BS and CS) and compact types (AC, BC, CC and DC), as shown in Table 2.

Table 2 — Grades and types

Grade	Type [a]	Resistance to impulse		
		Temperature °C	Impulse pressure (% of MWP [b])	Minimum number of cycles
A	AS	100	133 %	200 000
	AC			
B	BS	100	133 %	500 000
	BC			
C	CS	120	133 % and 120 % [c]	500 000
	CC			
D	DC	120	133 %	1 000 000

[a] Standard or compact, e.g. CS is grade C and standard type.

As shown in Table 4 and Table 8, standard types have larger outside diameters and larger bend radii and compact types have smaller outside diameters and smaller bend radii.

[b] Maximum working pressure.

[c] 120 % of the MWP shall be used for classes 350, 420 and 560 instead of 133 %.

Each class includes one of each type or both as shown in Table 3.

Table 3 — Type and maximum working pressure

Class		35	70	140	210	250	280	350	420	560
MWP [a] (bar)		35	70	140	210	250	280	350	420	560
MWP [a] (MPa)		3,5	7	14	21	25	28	35	42	56
Grade	**Type**									
A	AS	X	X	X	X	X	X	X	X	N/A
	AC	X	X	X	X	X	X	X	X	N/A
B	BS	X	X	X	X	X	X	X	X	N/A
	BC	X	X	X	X	X	X	X	X	N/A
C	CS	N/A	N/A	N/A	X	X	X	X	X	N/A
	CC	N/A	N/A	N/A	X	X	X	X	N/A	X
D	DC	N/A	N/A	N/A	X	X	X	X	N/A	N/A

NOTE X = Applicable; N/A = Not applicable.

[a] Maximum working pressure.

5 Materials and construction

5.1 Hoses

Hoses shall consist of a hydraulic-fluid-resistant rubber lining, one or multiple layers of steel wire or textile and an oil-, abrasion- and weather-resistant rubber cover. A layer of other materials on the rubber cover is allowed for improved resistance to abrasion or other.

5.2 Hose assemblies

Hose assemblies shall only be manufactured using hose fittings which conform to the requirements of 7.2.1, 7.2.4 and 7.2.5 of this International Standard.

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

6 Dimensions and tolerances

6.1 Diameters

When measured in accordance with ISO 4671, the diameters of 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																	
			Class 35		Class 70		Class 140		Class 210		Class 250		Class 280		Class 350		Class 420		Class 560	
	min.	max.	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact
5	4,6	5,4	14	11	14	11	14	11	14	11	17	15	17	15	17	15	17	15	—	—
6,3	6,1	7,0	17	14	17	14	17	14	17	14	19	15	19	15	19	15	19	15	—	—
8	7,7	8,5	19	15	19	15	19	15	19	16	20	16	20	16	20	16	20	—	—	—
10	9,3	10,1	21	17	21	18	21	17	23	19	23	19	23	19	23	21	24	—	—	—
12,5	12,3	13,5	24	21	24	22	24	22	26	22	26	22	26	23	27	25	27	—	—	—
16	15,5	16,7	27	25	27	25	29	25	29	26	29	27	29	27	29	28	37	—	—	30
19	18,6	19,8	31	28	31	29	33	29	33	31	34	32	34	32	38	36	50	—	—	36
25	25,0	26,4	40	36	40	38	41	38	41	39	41	39	41	39	50	45	54	—	—	45
31,5	31,4	33,0	53	45	53	45	54	49	53	49	54	49	54	49	54	52	60	—	—	52
38	37,7	39,3	59	56	59	56	59	56	59	56	59	56	59	56	60	59	75	—	—	—
51	50,4	52,0	72	69	72	69	73	70	72	70	73	70	73	70	75	73	80	—	—	—
63	63,1	65,1	84	—	84	—	84	—	—	—	—	—	—	—	—	—	—	—	—	—
76	74,6	77,8	100	—	100	—	100	—	—	—	—	—	—	—	—	—	—	—	—	—
102	100,0	103,2	130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

6.2 Cover thickness

When measured in accordance with ISO 4671, the outer cover thickness of hoses shall conform to the values given in Table 5. Standard types may be produced with either thick or thin covers, the tolerance limits for thin-cover standard types being the same as the tolerance limits for compact types.

Table 5 — Cover thickness

Nominal size	Cover thickness mm					
	Standard (thick cover)		Standard (thin cover)		Compact	
	min.	max.	min.	max.	min.	max.
5	1,5	3,2	0,8	1,5	0,8	1,5
6,3	1,5	3,2	0,8	1,5	0,8	1,5
8	1,5	3,2	0,8	1,5	0,8	1,5
10	1,5	3,2	0,8	1,5	0,8	1,5
12,5	1,5	3,2	0,8	1,5	0,8	1,5
16	1,5	3,2	0,8	1,5	0,8	1,5
19	1,5	3,2	0,8	1,5	0,8	1,5
25	1,5	4,6	1,0	2,0	1,0	2,0
31,5	1,8	4,6	1,0	2,0	1,0	2,0
38	1,8	4,6	1,3	2,5	1,3	2,5
51	1,8	4,6	1,3	2,5	1,3	2,5
63	1,8	5,0	—	—	—	—
76	1,8	5,0	—	—	—	—
102	1,8	5,0	—	—	—	—

6.3 Concentricity

When measured in accordance with ISO 4671, the concentricity of 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 reinforcement diameter
	mm	mm
5 and 6,3	0,8	0,5
Over 6,3 and up to and including 19	1,0	0,7
Over 19 and up to and including 63	1,3	0,9
Over 63	1,5	1,1

7 Physical properties

7.1 Fluid resistance of rubber compounds

7.1.1 Test pieces

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

7.1.2 Oil resistance

For all grades, when tested in accordance with ISO 1817 by immersion in IRM 903 oil for 168 h at a temperature of 100 °C, the percentage change in volume ΔV of the lining shall be between 0 % and + 25 % for braid-construction and textile-reinforced hoses and between 0 % and + 60 % for spiral-wire-reinforced hoses.

For all grades, when tested in accordance with ISO 1817 by immersion in IRM 903 oil for 168 h at a temperature of 70 °C, the percentage change in volume ΔV of the cover shall be between 0 % and + 100 %.

7.2 Performance requirements

7.2.1 Hydrostatic requirements

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

Table 7 — Maximum working pressure, proof pressure and minimum burst pressure

Class	Maximum working pressure		Proof pressure		Minimum burst pressure	
	bar	MPa	bar	MPa	bar	MPa
35	35	3,5	70	7	140	14
70	70	7	140	14	280	28
140	140	14	280	28	560	56
210	210	21	420	42	840	84
250	250	25	500	50	1 000	100
280	280	28	560	56	1 120	112
350	350	35	700	70	1 400	140
420	420	42	840	84	1 680	168
560	560	56	1 120	112	2 240	224

7.2.2 Change in length

When determined in accordance with ISO 1402, the change in length of hoses at the maximum working pressure shall not exceed + 2 % or – 4 %.

7.2.3 Minimum bend radius

When determined in accordance with ISO 1746, the minimum bend radius shall conform to the values given in Table 8.

When bent to the minimum bend radius given in Table 8, measured on the inside of the bend, the flatness shall not exceed 10 % of the original outside diameter.