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

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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 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 fourth edition cancels and replaces the third edition (ISO 18752:2014), which has been technically revised.

The main changes compared to the previous edition are as follows:

- Scope is extended to water-based fluid, in order to align the standard with ISO 1436, ISO 3861 and ISO 4079

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.

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

1 Scope

This document specifies requirements for ten 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.

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 $+100\text{ °C}$ for types AS, AC, BS and BC hoses and from -40 °C to $+120\text{ °C}$ for types CS, CC and DC hoses;
- water-based fluids HFC, HFAE, HFAS and HFB as defined in ISO 6743-4 at temperatures ranging from -40 °C to $+70\text{ °C}$;
- water at temperatures ranging from 0 °C to $+70\text{ °C}$;

This document 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 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 6743-4, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*

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 7326:2006, *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 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 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

4.1 Classes

Ten 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	490	560
MWP ^a (MPa)	3,5	7	14	21	25	28	35	42	49	56
MWP ^a (bar)	35	70	140	210	250	280	350	420	490	560
Nominal size										
5	X	X	X	X	X	X	X	X	N/A	N/A
6,3	X	X	X	X	X	X	X	X	N/A	N/A
8	X	X	X	X	X	X	X	X	N/A	N/A
10	X	X	X	X	X	X	X	X	N/A	N/A
12,5	X	X	X	X	X	X	X	X	N/A	N/A
16	X	X	X	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X	X	X	X
31,5	X	X	X	X	X	X	X	X	X	X
38	X	X	X	X	X	X	X	X	N/A	N/A
51	X	X	X	X	X	X	X	X	N/A	N/A
63	X	X	X	X	X	X	X	N/A	N/A	N/A
76	X	X	X	N/A	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	N/A

X = Applicable; N/A = Not applicable.

^a Maximum working pressure.

4.2 Grades and types

Hoses are classified into four grades according to their resistance to impulse: 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, 490 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	490	560	
MWP ^a (MPa)	3,5	7	14	21	25	28	35	42	49	56	
MWP ^a (bar)	35	70	140	210	250	280	350	420	490	560	
Grade	Type	ISO/DIS 18752									
A	AS	X	X	X	X	X	X	X	N/A	N/A	
	AC	X	X	X	X	X	X	X	N/A	N/A	
B	BS	X	X	X	X	X	X	X	N/A	N/A	
	BC	X	X	X	X	X	X	X	N/A	N/A	
C	CS	N/A	N/A	N/A	X	X	X	X	N/A	N/A	
	CC	N/A	N/A	N/A	X	X	X	X	X	X	
D	DC	N/A	N/A	N/A	X	X	X	X	N/A	N/A	

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](#).

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](#).

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Table 4 — Diameters of hoses

Nominal size	Inside diameter (all classes)		Maximum outside diameter of hose mm																				
	min.	max.	Class 35		Class 70		Class 140		Class 210		Class 250		Class 280		Class 350		Class 420		Class 490		Class 560		
			Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard	Compact	Standard
5	4,6	5,4	14	11	14	11	14	11	14	11	17	15	17	15	17	15	17	15	17	15	—	—	—
6,3	6,1	7	17	14	17	14	17	14	17	14	19	15	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	16	20	18	—	—	—
10	9,3	10,1	21	17	21	17	21	17	23	19	23	19	23	19	23	21	23	21	24	22	—	—	—
12,5	12,3	13,5	24	21	24	22	24	22	26	22	26	22	26	23	26	24	27	24	27	25	—	—	—
16	15,5	16,7	27	25	27	25	29	25	29	26	29	27	29	27	29	28	29	28	37	34	—	—	30
19	18,6	19,8	31	29	33	29	33	29	33	31	34	32	34	32	34	36	36	36	50	46	—	—	36
25	25	26,4	40	38	41	38	41	38	41	39	41	39	41	39	41	45	45	45	54	50	—	—	45
31,5	31,4	33	53	45	54	49	54	49	53	49	54	49	54	49	54	52	52	52	60	56	—	—	52
38	37,7	39,3	59	56	59	56	59	56	59	56	59	56	59	56	59	59	59	59	75	72	—	—	—
51	50,4	52	72	69	73	70	73	70	72	70	73	70	73	70	73	73	73	73	80	77	—	—	—
63	63,1	65,1	84	—	84	—	84	—	85	—	90	—	90	—	90	—	—	—	—	—	—	—	—
76	74,6	77,8	100	—	100	—	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
102	100	103,2	130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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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](#).

6.4 Length

The tolerances on the lengths of hose assemblies should conform to ISO 17165-1:2007, 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

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 %.

7.1.3 Water resistance

For all types of hose, when tested in accordance with ISO 1817 by immersion in distilled water for 168 h at a temperature of 70 °C, the percentage change in volume of the lining shall be between 0 % and +25 % and the percentage change in volume of the cover shall be between 0 % and +100 % (i.e. shrinkage is not permissible).

7.2 Performance requirements

7.2.1 Hydrostatic requirements

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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	
	MPa	bar	MPa	bar	MPa	bar
35	3,5	35	7	70	14	140
70	7	70	14	140	28	280
140	14	140	28	280	56	560
210	21	210	42	420	84	840
250	25	250	50	500	100	1 000
280	28	280	56	560	112	1 120
350	35	350	70	700	140	1 400
420	42	420	84	840	168	1 680
490	49	490	98	980	196	1 960
560	56	560	112	1 120	224	2 240

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 %.