INTERNATIONAL STANDARD

ISO 18752

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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)*.

This second edition cancels and replaces the first edition, of which Clause 4.1, Tables 1, 3, 4 and 8, and Annexes C and D have been technically revised.

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

1 Scope

This International Standard 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. 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 — 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 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 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 10619-2:2011, *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.

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 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

NOTE 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 while 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**										
A	AS	X	X	X	X	X	X	X	X	N/A	N/A
	AC	X	X	X	X	X	X	X	X	N/A	N/A
B	BS	X	X	X	X	X	X	X	X	N/A	N/A
	BC	X	X	X	X	X	X	X	X	N/A	N/A
C	CS	N/A	N/A	N/A	X	X	X	X	X	N/A	N/A
	CC	N/A	N/A	N/A	X	X	X	X	X	X	X
D	DC	N/A	N/A	N/A	X	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.

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 490		Class 560	
	min.	max.	Standard	Compact	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	18	—	—	—	—
10	9,3	10,1	21	17	21	18	21	17	23	19	23	19	23	19	23	21	24	22	—	—	—	—
12,5	12,3	13,5	24	21	24	22	24	22	26	22	26	22	26	23	27	25	27	24	—	—	—	—
16	15,5	16,7	27	25	27	25	29	25	29	26	29	27	29	27	29	28	37	34	—	30	—	30
19	18,6	19,8	31	28	31	29	33	29	33	31	34	32	34	32	38	36	50	46	—	36	—	36
25	25,0	26,4	40	36	40	38	41	38	41	39	41	39	41	39	50	45	54	50	—	45	—	45
31,5	31,4	33,0	53	45	53	45	54	49	53	49	54	49	54	49	54	52	60	56	—	52	—	52
38	37,7	39,3	59	56	59	56	59	56	59	56	59	56	59	56	60	59	75	72	—	—	—	—
51	50,4	52,0	72	69	72	69	73	70	72	70	73	70	73	70	75	73	80	77	—	—	—	—
63	63,1	65,1	84	—	84	—	84	—	85	—	90	—	90	—	90	—	—	—	—	—	—	—
76	74,6	77,8	100	—	100	—	100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
102	100,0	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 mm	between internal diameter and reinforcement diameter 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 of 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	
	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
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 %.

7.2.3 Minimum bend radius

When determined in accordance with ISO 10619-1, the minimum bend radius shall conform to the values given in Table 8.

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

Table 8 — Minimum bend radius

Nominal size	Minimum bend radius mm																			
	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
5	90	60	90	60	90	60	90	60	90	75	90	75	90	75	90	75	—	—	—	—
6,3	100	75	100	75	100	75	100	75	100	75	100	75	100	75	150	75	—	—	—	—
8	115	85	115	85	115	85	115	85	115	85	115	85	115	85	165	120	—	—	—	—
10	130	90	130	90	130	90	130	90	130	90	130	90	180	150	180	150	—	—	—	—
12,5	180	130	180	130	180	130	180	130	180	130	180	130	230	180	230	180	—	—	—	—
16	200	150	200	150	200	170	200	170	200	200	200	200	250	210	265	220	—	250	—	250
19	240	180	240	180	240	200	240	200	240	240	240	240	310	250	330	280	—	280	—	260
25	300	230	300	230	300	250	340	300	340	300	340	300	360	300	460	400	—	350	—	330
31,5	420	280	420	280	460	420	460	420	460	460	460	460	560	460	560	480	—	450	—	460
38	500	500	500	500	560	500	560	560	560	560	560	560	630	560	630	560	—	—	—	—
51	630	630	630	630	660	630	700	700	630	630	630	630	700	630	700	650	—	—	—	—
63	760	—	760	—	760	—	760	—	760	—	760	—	820	—	—	—	—	—	—	—
76	840	—	840	—	840	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
102	1 000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

7.2.4 Resistance to impulse

7.2.4.1 The resistance to impulse shall be determined in accordance with ISO 6803. The test fluid temperature shall be 100 °C for grades A and B and 120 °C for grades C and D.

7.2.4.2 For grade A, 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.

For grade B, when tested at an impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 500 000 impulse cycles.

For grade C, when tested at an impulse pressure equal to 133 % of the maximum working pressure (classes 35 to 280) or 120 % of the maximum working pressure (classes 350, 420, 490 and 560), the hose shall withstand a minimum of 500 000 impulse cycles.

For grade D, when tested at an impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 1 000 000 impulse cycles.

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

7.2.4.4 This test shall be considered a destructive test and the test piece shall be destroyed after the test.

7.2.5 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 destroyed after the test.

7.2.6 Cold flexibility

When tested in accordance with method B of ISO 10619-2:2011 at a temperature of – 40 °C, there shall be no cracking of the lining or cover. The test piece shall not leak or crack when subjected to a proof pressure test in accordance with ISO 1402, after regaining ambient temperature.

7.2.7 Adhesion between components

When tested in accordance with ISO 8033, the adhesion between lining and reinforcement, and between cover and reinforcement shall not be less than 2,5 kN/m.

Test pieces shall be type 5 for lining and reinforcement and type 2, 6 or 8 for cover and reinforcement as described in Table 1 of ISO 8033:2006.

7.2.8 Vacuum resistance

When tested in accordance with ISO 7233, hoses and hose assemblies shall conform to the values given in Table 9. This requirement is only applicable to classes 35, 70, 140 and 210.

Table 9 — Degree of vacuum

Nominal size	Negative gauge pressure (classes 35, 70, 140 and 210 only) max.	
	kPa	bar
5 to 25	– 80	– 0,8
31,5 and over	– 60	– 0,6

7.2.9 Ozone resistance

When tested in accordance with method 1 or 2 of ISO 7326:2006, no cracking or deterioration of the cover shall be visible under ×2 magnification.

8 Frequency of testing

Type testing and routine testing shall be carried out as specified in Annex A.

Type tests are those tests required to confirm that a particular hose design, manufactured by a particular method, meets all the requirements of this International Standard. The tests shall be repeated at a maximum of five-year intervals, or whenever a change in the method of manufacture or materials used occurs. They shall be performed on all sizes, and on all classes and types except those of the same size and construction.

Routine tests are tests required to be carried out on each length of finished hose prior to dispatch.

Production acceptance tests are tests, specified in Annex B, which should preferably be carried out to control the quality of manufacture. The frequencies specified in Annex B are given as a guide only.

9 Marking

9.1 Hoses

Hoses meeting the requirements of this International Standard shall be marked at least once every 760 mm with at least the following information:

a) the manufacturer's name or identification, e.g. MAN;

b) the number of this International Standard, i.e. ISO 18752;

c) the type, e.g. AS[1)];

d) the nominal size, e.g. 16;

e) the maximum working pressure, in megapascals and in bars, or in ether, with the units indicated, e.g. 28 MPa (280 bar);

f) the quarter and last two digits of the year of manufacture, e.g. 3Q12.

EXAMPLE MAN/ISO 18752/AS/16/28 MPa (280 bar)/3Q12.

9.2 Hose assemblies

Hose assemblies using hose in accordance with this International Standard shall be manufactured and marked in accordance with ISO 17165-1.

10 Recommendations for packaging and storage

These are given in ISO 8331.

11 Test report

When requested by the purchaser, the manufacturer or supplier shall supply a test report with each length or batch of hoses supplied to the purchaser.

1) If the thin-cover variant is concerned, add "T", e.g. AST.

Annex A
(normative)

Type tests and routine tests

Table A.1 gives the tests to be carried out for type testing and routine testing as defined in Clause 8.

Table A.1

Property	Type testing	Routine testing
Compound tests		
Oil resistance test for cover	X	N/A
Oil resistance test for lining	X	N/A
Hose tests		
Visual examination (inside and outside)	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of outer cover thickness	X	X
Measurement of concentricity	X	X
Minimum bend radius test	X	N/A
Proof test	X	X
Burst test	X	N/A
Change in length test	X	N/A
Impulse test	X	N/A
Leakage test	X	N/A
Cold bend test	X	N/A
Adhesion test	X	N/A
Vacuum test	X	N/A
Ozone resistance test	X	N/A
NOTE X = Test to be carried out; N/A = Not applicable.		

Annex B
(informative)

Production acceptance tests

Table B.1 gives the suggested frequency for production tests (see Clause 8), to be carried out per batch or per 10 batches as indicated in the table. A batch is defined as 3 000 m of hose.

Table B.1 — Recommended test frequency

Property	Production test	
	Per batch	Per 10 batches
Compound tests		
Oil resistance test for cover	N/A	N/A
Oil resistance test for lining	N/A	X
Hose tests		
Visual examination (inside and outside)	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of outer cover thickness	X	X
Measurement of concentricity	X	X
Minimum bend radius test	N/A	N/A
Proof test	X	X
Burst test	X	X
Change in length test	X	X
Impulse test	N/A	N/A
Leakage test	X	X
Cold bend test	N/A	N/A
Adhesion	X	X
Vacuum test	N/A	N/A
Ozone resistance test	N/A	N/A

NOTE X = Test to be carried out; N/A = Not applicable.