INTERNATIONAL STANDARD

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Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types — Specification —

Part 1: Oil-based fluid applications

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

Partie 1: Applications pour fluide à base d'huile

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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 3.

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 part of ISO 1436 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1436-1 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

Together with ISO 1436-2 (in preparation), this part of ISO 1436 cancels and replaces ISO 1436:1991, which has been technically revised.

ISO 1436 consists of the following parts, under the general title *Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types — Specification*:

— *Part 1: Oil-based fluid applications*

— *Part 2: Water-based fluid applications*

Annex A of this part of ISO 1436 is for information only.

Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types — Specification —

Part 1: Oil-based fluid applications

1 Scope

This part of ISO 1436 specifies requirements for eight types of wire-braid-reinforced hoses and hose assemblies of nominal bore from 5 to 51. They are suitable for use with hydraulic fluids HH, HL, HM, HR and HV in accordance with ISO 6743-4 at temperatures ranging from – 40 °C to + 100 °C.

This part of ISO 1436 does not include requirements for end fittings. It is limited to requirements for the performance of hoses and hose assemblies.

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.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 1436. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 1436 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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 hose 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 suction resistance*

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

ISO 8033:1991, *Rubber and plastics hose — Determination of adhesion between components*

3 Classification

Eight types of hose are specified, distinguished by their construction, working pressure and oil resistance:

— Types 1ST and R1A: hoses with a single braid of wire reinforcement and having a thick cover.

— Types 2ST and R2A: hoses with two braids of wire reinforcement and having a thick cover.

— Types 1SN and R1AT: hoses with a single braid of wire reinforcement and having a thin cover.

— Types 2SN and R2AT: hoses with two braids of wire reinforcement and having a thin cover.

NOTE 1 Types 1SN/R1AT and 2SN/R2AT have the same reinforcement dimensions as types 1ST/R1A and 2ST/R2A, respectively, except that they have thinner covers designed for assembly with fittings without removal of the cover or a portion of the cover.

NOTE 2 The pressure ratings of types 1ST and 1SN differ from those of types R1A and R1AT. Similarly, the pressure ratings of types 2ST and 2SN differ from those of types R2A and R2AT. See Table 3.

NOTE 3 Types R1A, R2A, R1AT and R2AT are not subjected to the vacuum resistance or abrasion resistance tests.

4 Materials and construction

4.1 Hoses

Hoses shall consist of a hydraulic-fluid-resistant rubber lining, one or two layers of high-tensile-steel wire and an oil- and weather-resistant rubber cover.

4.2 Hose assemblies

Hose assemblies shall be manufactured using hoses which conform to the requirements for hoses specified in this part of ISO 1436.

Hose assemblies shall be manufactured with only those hose fittings whose functionality has been verified in accordance with subclauses 6.1, 6.3, 6.4 and 6.5 of this part of ISO 1436.

The manufacturer's instructions for proper preparation and fabrication of hose assemblies shall be followed.

5 Dimensions

5.1 Diameters and concentricity

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

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

Table 1 — Dimensions of hoses

Nominal bore	All types		Types 1ST/R1A				Types 1SN/R1AT			Types 2ST/TR2A				Types 2SN/R2AT		
	Inside diameter		Diameter over reinforcement		Outside diameter of hose		Outside diameter of hose	Cover thickness		Diameter over reinforcement		Outside diameter of hose		Outside diameter of hose	Cover thickness	
	mm		mm		mm		mm	mm		mm		mm		mm	mm	
	min.	max.	min.	max.	min.	max	max.	min.	max.	min.	max.	min.	max.	max.	min.	max.
5	4,6	5,4	8,9	10,1	11,9	13,5	12,5	0,8	1,5	10,6	11,7	15,1	16,7	14,1	0,8	1,5
6,3	6,2	7,0	10,6	11,7	15,1	16,7	14,1	0,8	1,5	12,1	13,3	16,7	18,3	15,7	0,8	1,5
8	7,7	8,5	12,1	13,3	16,7	18,3	15,7	0,8	1,5	13,7	14,9	18,3	19,9	17,3	0,8	1,5
10	9,3	10,1	14,5	15,7	19,0	20,6	18,1	0,8	1,5	16,1	17,3	20,6	22,2	19,7	0,8	1,5
12,5	12,3	13,5	17,5	19,1	22,2	23,8	21,5	0,8	1,5	19,0	20,6	23,8	25,4	23,1	0,8	1,5
16	15,5	16,7	20,6	22,2	25,4	27,0	24,7	0,8	1,5	22,2	23,8	27,0	28,6	26,3	0,8	1,5
19	18,6	19,8	24,6	26,2	29,4	31,0	28,6	0,8	1,5	26,2	27,8	31,0	32,6	30,2	0,8	1,5
25	25,0	26,4	32,5	34,1	36,9	39,3	36,6	0,8	1,5	34,1	35,7	38,5	40,9	38,9	1,0	2,0
31,5	31,4	33,0	39,3	41,7	44,4	47,6	44,8	1,0	2,0	43,2	45,7	49,2	52,4	49,6	1,0	2,0
38	37,7	39,3	45,6	48,0	50,8	54,0	52,1	1,5	2,5	49,6	52,0	55,6	58,8	56,0	1,3	2,5
51	50,4	52,0	58,7	61,9	65,1	68,3	65,9	1,5	2,5	62,3	64,7	68,2	71,4	68,6	1,3	2,5

NOTE Nominal bores in this table and in Tables 2 to 5 are in accordance with ISO 4397.

Table 2 — Concentricity of hoses

Nominal bore	Maximum variation in wall thickness		
	Between inside diameter and outside diameter mm	Between inside diameter and reinforcement diameter mm	
	All types	Types 1ST, 1SN, R1A and R1AT	Types 2ST, 2SN, R2A and R2AT
Up to and including 6,3	0,8	0,4	0,5
Over 6,3 and up to and including 19	1,0	0,6	0,7
Over 19	1,3	0,8	0,9

5.2 Length

The length of supplied hoses and hose assemblies shall be the subject of agreement between the manufacturer and the purchaser.

NOTE Recommendations for supplied lengths of hoses and hose assemblies are given in annex A.

6 Requirements

6.1 Hydrostatic requirements

6.1.1 When tested 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 3.

6.1.2 When tested in accordance with ISO 1402, the change in length of hoses at the maximum working pressure shall be no greater than + 2 % and no less than – 4 %.

Table 3 — Maximum working pressure, proof pressure and minimum burst pressure

Nominal bore	Maximum working pressure bar		Proof pressure bar		Minimum burst pressure bar	
	Types 1ST and 1SN	Types 2ST and 2SN	Types 1ST and 1SN	Types 2ST and 2SN	Types 1ST and 1SN	Types 2ST and 2SN
5	250	415	500	830	1 000	1 650
6,3	225	400	450	800	900	1 600
8	215	350	430	700	850	1 400
10	180	330	360	660	720	1 320
12,5	160	275	320	550	640	1 100
16	130	250	260	500	520	1 000
19	105	215	210	430	420	860
25	88	165	175	325	350	650
31,5	63	125	125	250	250	500
38	50	90	100	180	200	360
51	40	80	80	160	160	320
	Types R1A and R1AT	Types R2A and R2AT	Types R1A and R1AT	Types R2A and R2AT	Types R1A and R1AT	Types R2A and R2AT
5	210	350	420	700	840	1 400
6,3	192	350	385	700	770	1 400
8	175	297	350	595	700	1 190
10	157	280	315	560	630	1 120
12,5	140	245	280	490	560	980
16	105	192	210	385	420	770
19	87	157	175	315	350	630
25	70	140	140	280	280	560
31,5	43	113	87	227	175	455
38	35	87	70	175	140	350
51	26	78	52	157	105	315

NOTE 1 bar = 0,1 MPa

6.2 Minimum bend radius

Use a test piece having a length at least four times the minimum bend radius. Measure the hose outside diameter with a pair of callipers in the straight-lay position before bending the hose. Bend the hose through 180° to the minimum bend radius and measure the flatness with the callipers.

When bent to the minimum bend radius given in Table 4, measured on the inside of the bend, the flatness shall not exceed 10 % of the original outside diameter.

Table 4 — Minimum bend radius

Nominal bore	Minimum bend radius mm
5	90
6,3	100
8	115
10	130
12,5	180
16	200
19	240
25	300
31,5	420
38	500
51	630

6.3 Resistance to impulse

6.3.1 The impulse test shall be in accordance with ISO 6803. The test fluid temperature shall be 100 °C.

6.3.2 For type 1ST/R1A and type 1SN/R1AT hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure for hoses of nominal bore 25 and smaller, and at 100 % of the maximum working pressure for nominal bore 31 and above, the hose shall withstand a minimum of 150 000 impulse cycles.

For type 2ST/R2A and type R2AT/2SN 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.

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

6.3.4 This test shall be considered a destructive test and the test piece shall be discarded afterwards.

6.4 Leakage of hose assemblies

When tested in accordance with ISO 1402, there shall be no leakage or other evidence of failure. This test shall be considered a destructive test and the test piece shall be discarded afterwards.

6.5 Cold flexibility

When tested in accordance with method B of ISO 4672:1997 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.

6.6 Adhesion between components

When determined in accordance with ISO 8033, the adhesion between lining and reinforcement, and between cover and reinforcement, shall be no less than 2,5 kN/m for hose types 1ST, 2ST, 1SN and 2SN, and no less than 1,8 kN/m for hose types R1A, R2A, R1AT and R2AT.

Test pieces shall be type 5 for lining and reinforcement and type 2 or type 6 for cover and reinforcement as described in Table 1 of ISO 8033:1991.

6.7 Vacuum resistance

When tested in accordance with ISO 7233, hoses and hose assemblies shall conform to the values given in Table 5.

Table 5 — Degree of vacuum

Nominal bore	Negative gauge pressure (max.) bar	
	Types 1ST and 1SN	Types 2ST and 2SN
5 6,3 8 10 12,5 16	– 0,80	– 0,95
19 25	—	– 0,80
31,5 38 51	– 0,60	
NOTE There is no vacuum resistance requirement for hoses of types R1A, R2A, R1AT and R2AT.		

6.8 Abrasion resistance

For hose types 1ST and 2ST, when tested in accordance with ISO 6945 with a vertical force of (50 ± 0,5) N, the loss in mass after 2 000 cycles shall be no greater than 1 g.

For hose types 1SN and 2SN, when tested in accordance with ISO 6945 with a vertical force of (25 ± 0,5) N, the loss of mass after 2 000 cycles shall be no greater than 0,5 g.

NOTE There is no abrasion resistance requirement for hoses of types R1A, R2A, R1AT and R2AT.

6.9 Fluid resistance

6.9.1 Test pieces

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

6.9.2 Oil resistance

When determined 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_{100} of the lining shall be between 0 % and + 25 % for type S hoses and between 0 % and + 100 % for type R hoses (i.e. shrinkage is not permissible).

When determined 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_{100} of the cover shall be between 0 % and + 100 % (i.e. shrinkage is not permissible).

6.10 Ozone resistance

When tested in accordance with method 1 or 2 of ISO 7326:1991, depending on the nominal bore of the hose, no cracking or deterioration of the cover shall be visible under × 2 magnification.

7 Designation

Hoses shall be designated in accordance with the following example for a type 1ST hydraulic hose with wire braid reinforcement and a nominal bore of 10:

EXAMPLE ISO 1436-1/1ST/10

8 Marking

8.1 Hoses

Hoses shall be marked with at least the following information, and the marking shall be repeated at least once every 760 mm:

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

b) a reference to this part of ISO 1436, i.e. ISO 1436-1;

c) the type, e.g. 2ST;

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

e) the quarter and last two digits of the year of manufacture, e.g. 4Q01.

EXAMPLE Man/ISO 1436-1/2ST/16/4Q01

8.2 Hose assemblies

Hose assemblies shall be marked with at least the following information:

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

b) the maximum working pressure of the assembly in bars, with the units, e.g. 250 bar;[1)]

c) the last two digits of the month and year of assembly, e.g. 10/01.

EXAMPLE Man/250 bar/10/01

1) The maximum working pressure of a hose assembly is equal to the maximum working pressure of that one of its components having the lowest maximum working pressure.