FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/FDIS
1436**

ISO/TC **45**/SC **1**

Secretariat: DSM

Voting begins
on: **2015-07-08**

Voting terminates
on: **2015-09-08**

Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types for oil-based or water-based fluids — Specification

Tuyaux et flexibles en caoutchouc — Types hydrauliques avec armature de fils métalliques tressés pour fluides à base d'huile ou à base d'eau - Spécifications

Reference number
ISO/FDIS 1436:2015(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 Classification ... **2**

5 Materials and construction ... **2**
5.1 Hoses ... 2
5.2 Hose assemblies ... 2

6 Dimensions ... **2**
6.1 Hose diameters, cover thickness and hose concentricity ... 2
6.2 Length ... 3

7 Performance requirements ... **4**
7.1 General ... 4
7.2 Hydrostatic requirements ... 4
7.3 Minimum bend radius ... 4
7.4 Resistance to impulse ... 5
7.4.1 Oil-based fluid impulse test ... 5
7.4.2 Water-based fluid impulse test ... 5
7.4.3 Optional impulse test ... 6
7.5 Leakage of hose assemblies ... 6
7.6 Cold flexibility ... 6
7.7 Adhesion between components ... 6
7.8 Vacuum resistance ... 6
7.9 Fluid resistance ... 7
7.9.1 General ... 7
7.9.2 Oil resistance ... 7
7.9.3 Water resistance ... 7
7.10 Ozone resistance ... 7
7.11 Visual examination ... 7

8 Marking ... **8**
8.1 Hoses ... 8
8.2 Hose assemblies ... 8

Annex A (normative) **Type and routine testing of production hoses** ... **9**

Annex B (informative) **Production acceptance testing** ... **10**

Annex C (informative) **Recommendations for lengths of supplied hoses and tolerances on lengths of hose assemblies** ... **11**

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This fifth edition cancels and replaces the fourth edition (ISO 1436:2009), of which it constitutes a minor revision.

Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types for oil-based or water-based fluids — Specification

1 Scope

This International Standard specifies requirements for six types of wire-braid-reinforced hose and hose assembly of nominal size from 5 to 51 plus, for one of the five types (type R2ATS), nominal size 63. They are suitable for use with water-based hydraulic fluids HFC, HFAE, HFAS and HFB as defined in ISO 6743-4 at temperatures ranging from to −40 °C to +60 °C or oil-based hydraulic fluids HH, HL, HM, HR and HV as defined in ISO 6743-4 at temperatures ranging from −40 °C to +100 °C.

This International Standard does not include requirements for end fittings. It is limited to requirements for hoses and hose assemblies.

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 1307, *Rubber and plastics hoses — Hose sizes, minimum and maximum inside diameters, and tolerances on cut-to-length hoses*

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 6605, *Hydraulic fluid power — Hoses and hose assemblies — Test methods*

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 10619-2, *Rubber and plastics 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.

4 Classification

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

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

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

— Types 1SN and R1ATS: hoses with a single braid of wire reinforcement and having a thin cover.

— Types 2SN and R2ATS: hoses with two braids of wire reinforcement and having a thin cover.

NOTE Types 1SN and R1ATS and types 2SN and R2ATS have the same reinforcement dimensions as type 1ST and type 2ST, respectively, except that they have thinner covers designed to assemble with fittings without removal of the cover or a portion of the cover. SAE J 517, *Hydraulic Hose*, defines a type S as having the same dimensions and construction as the type R1AT and type R2AT which were specified in ISO 1436:2009, but at a higher maximum working pressure. This document uses type R1ATS and type R2ATS to represent these hose types.

5 Materials and construction

5.1 Hoses

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

5.2 Hose assemblies

Hose assemblies shall be manufactured using hoses conforming to the requirements of this International Standard.

Hose assemblies shall be manufactured only with those hose fittings whose correct functioning has been verified in accordance with 7.2, 7.4, 7.5 and 7.6 of this International Standard. The manufacturer's instructions shall be followed for the preparation and fabrication of hose assemblies.

6 Dimensions

6.1 Hose diameters, cover thickness and hose concentricity

When measured in accordance with ISO 4671, the hose diameters and the cover thickness (where appropriate) shall conform to the values given in Table 1.

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

Table 1 — Dimensions of hoses

Nominal size[a]	All types		Types R1ATS, 1SN, 1ST		Type 1ST		Types 1SN, R1ATS			Types R2ATS, 2SN, 2ST		Type 2ST		Types 2SN, R2ATS		
	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	6,1	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	0,8	1,5
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	1,3	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	1,3	2,5	62,3	64,7	68,2	71,4	68,6	1,3	2,5
63[b]	63,1	65,1								74,6	77,8			81,8	1,3	2,5

[a] The nominal sizes correspond to those given in ISO 1307.

[b] This nominal size is for type R2ATS only.

Table 2 — Concentricity of hoses

Nominal size	Maximum variation in wall thickness mm		
	Between inside diameter and outside diameter	Between inside diameter and reinforcement outside diameter	
	All types	Types 1ST, 1SN and R1ATS	Types 2ST, 2SN and R2ATS
Up to and including 6,3	0,8	0,4	0,5
Greater than 6,3 and up to and including 19	1,0	0,6	0,7
Greater than 19	1,3	0,8	0,9

6.2 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 C.

7 Performance requirements

7.1 General

The requirements for type and routine testing are given in Annex A and recommendations for production acceptance testing in Annex B.

7.2 Hydrostatic requirements

When determined in accordance with ISO 1402 or ISO 6605, the proof pressure and the minimum burst pressure of hoses and hose assemblies shall conform to the values given in Table 3.

When determined in accordance with ISO 1402 or ISO 6605, the change in length of hoses at the maximum working pressure shall not exceed +2 % or −4 %.

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

Nominal size	Maximum working pressure		Proof pressure		Minimum burst pressure	
	Types 1ST, 1SN and R1ATS	Types 2ST, 2SN and R2ATS	Types 1ST, 1SN and R1ATS	Types 2ST, 2SN and R2ATS	Types 1ST, 1SN and R1ATS	Types 2ST, 2SN and R2ATS
	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)	MPa (bar)
5	25,0 (250)	41,5 (415)	50,0 (500)	83,0 (830)	100,0 (1 000)	166,0 (1 660)
6	22,5 (225)	40,0 (400)	45,0 (450)	80,0 (800)	90,0 (900)	160,0 (1 600)
8	21,5 (215)	35,0 (350)	43,0 (430)	70,0 (700)	86,0 (860)	140,0 (1 400)
10	18,0 (180)	33,0 (330)	36,0 (360)	66,0 (660)	72,0 (720)	132,0 (1 320)
12,5	16,0 (160)	27,5 (275)	32,0 (320)	55,0 (550)	64,0 (640)	110,0 (1 100)
16	13,0 (130)	25,0 (250)	26,0 (260)	50,0 (500)	52,0 (520)	100,0 (1 000)
19	10,5 (105)	21,5 (215)	21,0 (210)	43,0 (430)	42,0 (420)	86,0 (860)
25	8,7 (87)	16,5 (165)	18,0 (180)	33,0 (330)	36,0 (360)	66,0 (660)
31,5	6,2 (62)	12,5 (125)	13,0 (130)	25,0 (250)	26,0 (260)	50,0 (500)
38	5,0 (50)	9,0 (90)	10,0 (100)	18,0 (180)	20,0 (200)	36,0 (360)
51	4,0 (40)	8,0 (80)	8,0 (80)	16,0 (160)	16,0 (160)	32,0 (320)
63[a]	—	7,0 (70)	—	14,0 (140)	—	28,0 (280)

[a] This nominal size is for type R2ATS only.

7.3 Minimum bend radius

Use a test piece having a length at least four times the minimum bend radius. Measure the hose outside diameter with callipers in the straight-lay position before bending the hose. Bend the hose through 180° to the minimum bend radius (see Table 4) and measure the flatness with the callipers.

When the hose is 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 size	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
63	760

7.4 Resistance to impulse

7.4.1 Oil-based fluid impulse test

The impulse test shall be in accordance with ISO 6803 or ISO 6605. The test fluid temperature shall be 100 °C.

For type 1ST and type 1SN and R1ATS hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure for hoses of nominal size 25 and smaller and at 100 % of the maximum working pressure for hoses of nominal size 31,5 and above, the hose shall withstand a minimum of 150 000 impulse cycles.

For type 2ST and type 2SN and R2ATS 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.

There shall be no leakage or other evidence of failure before reaching the specified number of cycles.

This test shall be considered a destructive test, and the test piece shall be discarded after the test.

7.4.2 Water-based fluid impulse test

The impulse test shall be in accordance with ISO 6803 or ISO 6605. The test fluid temperature shall be 60 °C. The test fluid used shall be HFC, HFAE, HFAS or HFB as defined in ISO 6743-4.

For type 1ST and type 1SN and R1ATS hoses, when tested at an impulse pressure equal to 125 % of the maximum working pressure for hoses of nominal size 25 and smaller and at 100 % of the maximum working pressure for nominal size 31,5 and above, the hoses shall withstand a minimum of 150 000 impulse cycles.

For type 2ST and type 2SN and R2ATS hoses, when tested at an impulse pressure equal to 133 % of the maximum working pressure, the hoses shall withstand a minimum of 200 000 impulse cycles.

There shall be no leakage or other evidence of failure before reaching the specified number of cycles.

This test shall be considered a destructive test, and the test piece shall be discarded after the test.