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Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification

[Revision of second edition (ISO 3949:1991)]

Tuyaux et flexibles en plastique — Types hydrauliques avec armature de textile — Spécifications

ICS 23.100.40; 83.140.40

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Contents

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

International Standard ISO 3949 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This third edition cancels and replaces the second edition (ISO 3949:1991), which has been technically revised.

Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification

1 Scope

This International Standard specifies requirements for two types of textile-reinforced thermoplastics hose and hose assembly of nominal bore from 5 to 25. Each type is divided into two classes dependent on electrical conductivity requirements. They are suitable for use with:

— petroleum and synthetic-based hydraulic fluids HH,HL, HM, HR, and HV in accordance with ISO 6743-4 at temperatures ranging from –40 °C to +100 °C;

— water-based hydraulic fluids at temperatures ranging from 0 °C to +70 °C

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

NOTE Operating temperatures in excess of 100 °C may materially reduce the life of the hose.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this international standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 4397, *Fluid power systems and components — Connectors and associated components — Nominal outside diameters and nominal inside diameters of hoses*.

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

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

ISO 6743-4, *Lubricants, industrial oils and related products (class L). Classification. Family H (hydraulic systems)*

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

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

3 Classification

Two types of hose are specified, distinguished by their maximum working pressure.

a) Type R7, hoses with one or more layers of reinforcement.

b) Type R8, hoses with one or more layers of reinforcement, for operation at higher working pressures.

Each type of hose is divided into two classes according to its electrical properties.

1) Class 1, no electrical requirements.

2) Class 2, “non-conductive” (see 6.8).

4 Materials and construction

4.1 Hoses

Hoses shall consist of a seamless thermoplastics lining resistant to hydraulic fluids, with a suitable textile yarn reinforcement and a thermoplastics cover resistant to hydraulic fluids, water and the weather.

For Class 2 hoses, the cover shall not be perforated. The cover shall be orange (colour code RAL 2004). Hose assemblies

Hose assemblies shall only be manufactured with those hose fittings whose functionality conform to the requirements in accordance with paragraphs 6.1. 6.3, 6.4, 6.5 and 6.8 for Class 2 only.

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

5 Dimensions

5.1 Diameters and concentricity

When measured in accordance with ISO 4671and ISO 4397, the diameters of the hose shall conform to Table 1.

Table 1 — Dimensions of hoses

Nominal bore	Inside diameter mm				Maximum outside diameter mm	
	Type R7		Type R8		Type R7	Type R8
	min.	max.	min.	max.		
5	4,6	5,4	4,6	5,4	11,4	14,6
6,3	6,2	7,0	6,2	7,0	13,7	16,8
8	7,7	8,5	7,7	8,5	15,6	18,6
10	9,3	10,3	9,3	10,3	18,4	20,3
12,5	12,3	13,5	12,3	13,5	22,5	24,6
16	15,6	16,7	15,6	16,7	25,8	29,8
19	18,6	19,8	18,6	19,8	28,6	33,0
25	25,0	26,4	25,0	26,4	34,7	38,6

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

Table 2 — Concentricity of hoses

Nominal bore	Maximum variation in wall thickness between inside diameter and outside diameter mm
Up to and including 6,3	0,8
Over 6,3 and including 19	1,0
Over 19	1,3

6 Hose requirements

6.1 Hydrostatic requirements

6.1.1 When tested in accordance with ISO 1402, the maximum working pressure, the proof pressure and minimum burst pressure of the hose or hose assembly shall conform to Table 3.

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

Nominal bore	Maximum working pressure		Proof pressure		Minimum burst pressure	
	bar [a]		bar		bar	
	Type		Type		Type	
	R7	R8	R7	R8	R7	R8
5	210	350	420	700	840	1400
6,3	192	350	385	700	770	1400
8	175	—	350	—	700	—
10	158	280	315	560	630	1120
12,5	140	245	280	490	560	980
16	105	192	210	385	420	770
19	88	158	175	315	350	630
25	70	140	140	280	280	560

[a] 1 bar = 0,1 MPa

6.1.2 When tested in accordance with ISO 1402, the change in length of hose at the maximum working pressure shall not exceed ± 3 %.

6.2 Minimum bend radius

Use test pieces having a length at least 4 times the minimum bend radius. Measure the hose outside diameter with a calliper 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 calliper.

When bent to the minimum bend radius 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	125
12,5	180
16	205
19	240
25	300

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 R7 hose, when tested at an impulse pressure equal to 125 % of the maximum working pressure, the hose shall withstand a minimum of 150 000 impulse cycles.

For type R8 hose, 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 pieces shall be destroyed.

6.4 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.

6.5 Cold flexibility

When tested in accordance with method B of ISO 4672 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 Fluid resistance

6.6.1 Oil resistance

When tested in accordance with ISO 1817 by immersion in IRM 903 oil for $72^{\,0}_{-2}$ h at a temperature of 100 °C ±3 °C, the percentage change in volume of the lining and cover ΔV_{100} shall be between –15 % and +35 %.

6.6.2 Water based fluid resistance

When tested in accordance with ISO 1817, the lining and cover immersed in a test liquid made up of equal volumes of 1,2-ethanediol and distilled water for 168^{0}_{-2} h at a temperature of 70 °C ±1 °C shall show no shrinkage. The volume swelling shall be not greater than 25 % for the lining and for the cover.

6.6.3 Water resistance

When tested in accordance with ISO 1817 by immersion in water for 168^{0}_{-2} h at a temperature of 70 C ±1 °C, the percentage change in volume ΔV_{100} shall be not greater than 25 % for the lining and 100% for the cover.

6.7 Ozone resistance

When tested in accordance with Method 1 or 2 of ISO 7326, depending on the nominal bore of the hose, no cracking or deterioration of the cover shall be visible under X2 magnification.

6.8 Electrical conductivity

This test applies to Class 2 hoses only (this test shall not be applied to hoses with a perforated cover).

When tested in accordance with annex A, the current reading shall be no greater than 50 µA.

7 Designation

Hoses shall be designated as in the following example.

EXAMPLE Designation of a Type R7 thermoplastics textile-reinforced hydraulic hose, Class 1 with a nominal bore of 10:

ISO 3949-R7-1/10

8 Marking

8.1 Hoses

Marking shall be repeated every 760 mm or less with at least the following information:

c) the manufacturer's name or identification, i.e. XXX;

d) the number of this International Standard e.g. ISO 3949;

e) type and class, e.g. R7-1, Class 1;

f) for class 2 hoses the words ”non-conductive” shall appear in each marking;

g) nominal bore, e.g. 16;

h) quarter and last two digits of year of manufacture,

i.e. 1Q02.

EXAMPLE 1 XXX/ISO 3949/R7-1/16/1Q02

EXAMPLE 2 XXX/ISO 3949/R7-2 NON-CONDUCTIVE/16/1Q02