INTERNATIONAL STANDARD

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Second edition
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Plastics hoses and hose assemblies — Thermoplastics, textile-reinforced, hydraulic type — Specification

Tuyaux et flexibles en plastique — Type hydraulique en thermoplastiques à armature textile — Spécifications

Reference number
ISO 3949:1991(E)

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.

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.

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

This second edition cancels and replaces the first edition (ISO 3949:1980), of which it constitutes a technical revision.

Annex A forms an integral part of this International Standard.

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Plastics hoses and hose assemblies — Thermoplastics, textile-reinforced, hydraulic type — Specification

1 Scope

This International Standard specifies requirements for two types of thermoplastics hose with textile reinforcement, with design working pressures in the range 6,9 MPa to 34,5 MPa. The hoses are suitable for use with petroleum, water and synthetic-based hydraulic fluids within a temperature range of − 40 °C to + 100 °C.

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

NOTE 1 Operating temperatures in excess of 93 °C may reduce the life of the hose.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1307:1983, *Rubber and plastics hoses — Bore diameters and tolerances on length.*

ISO 1402:1984, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 4671:1984, *Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions.*

ISO 4672:1988, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 6803:1984, *Rubber or plastics hoses and hose assemblies — Hydraulic pressure impulse test without flexing.*

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

ISO 7751:—[1], *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to design working pressure.*

3 Types

Two types of hose are specified, type 1 and type 2, characterized by the design working pressures given in table 2.

4 Materials and construction

4.1 The hose shall consist of a seamless thermoplastics lining resistant to hydraulic fluids, with a suitable synthetic-fibre reinforcement and a thermoplastics cover resistant to hydraulic fluids and the weather.

4.2 The hose shall be uniformly constructed so that the measurement, in accordance with ISO 4671, of the wall thickness at different points shall not differ by more than the values given in table 1.

1) To be published. (Revision of ISO 7751:1983)

Table 1 — Maximum permitted variation in wall thickness

Values in millimetres

Nominal bore	Difference in thickness
Up to and including 6,3	0,8
Over 6,3 and up to and including 19	1,0
Over 19	1,3

5 Dimensions

The bore diameter of the hose shall comply with the requirements of table 2, when measured in accordance with ISO 4671.

Table 2 — Nominal bore, tolerances and maximum outside diameters

Dimensions in millimetres

Nominal bore	Diameter range				Maximum outside diameter	
	Type 1		Type 2			
	min.	max.	min.	max.	Type 1	Type 2
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	—	—	15,6	—
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	15,5	16,7	15,5	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	36,7	38,6

NOTE 2 ISO 1307 has not been followed for nominal bore or permitted range; the dimensions adopted in table 2 are to ensure compatibility with fittings which are in wide use throughout the world.

6 Hydrostatic requirements

6.1 The design working pressure, proof test pressure and minimum burst pressure of the hose shall comply with the requirements of table 3 in accordance with category 3 of ISO 7751, i.e. the proof pressure shall be twice the design working pressure, and the minimum burst pressure four times the design working pressure.

6.2 The hose shall withstand without damage a proof test pressure as shown in table 3, maintained for a period of 1 min by the method specified in ISO 1402.

Table 3 — Design working pressure, proof test pressure and minimum burst pressure

Pressures in megapascals

Nominal bore	Design working pressure		Proof test pressure		Minimum burst pressure	
mm	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2
5	20,5	34,5	41,0	69,0	82,0	138,0
6,3	19,0	34,5	38,0	69,0	76,0	138,0
8	17,0	—	34,0	—	68,0	—
10	15,5	27,5	31,0	55,0	62,0	110,0
12,5	13,5	24,0	27,0	48,0	54,0	96,0
16	10,0	19,0	20,0	38,0	40,0	76,0
19	8,6	15,5	17,2	31,0	34,4	62,0
25	6,9	13,8	13,8	27,5	27,6	55,0

7 Minimum bend radius and change in length at design working pressure

7.1 The hose shall be capable of performing at design working pressure when curved to a radius not less than that in table 4, measured on the inside of the bend. A hose shall not be installed for use at the design working pressure if a smaller bend radius is used than shown in table 4.

NOTE 3 Should any portion of the hose be curved to a radius less than the specified minimum bend radius, the performance capability of the hose will be reduced.

7.2 The change in length of the hose at the design working pressure shall not be greater than that specified in table 4.

Table 4 — Minimum bend radius and maximum permitted change in length

Nominal bore	Minimum bend radius	Change in length
mm	mm	%
5	90	± 3
6,3	100	± 3
8	115	± 3
10	125	± 3
12,5	180	± 3
16	205	± 3
19	240	± 3
25	300	± 3

8 Tolerance on length

The hose shall be supplied in lengths as specified by the purchaser, and the tolerances on length shall be in accordance with ISO 1307.

9 Impulse test requirements

9.1 Four unaged samples of hose with end fittings shall be tested in accordance with the method specified in ISO 6803.

9.2 Type 1 hoses, when tested at 125 % of the design working pressure at a temperature of 93 °C, shall withstand a minimum of 150 000 impulse cycles.

Type 2 hoses, when tested at 133 % of the design working pressure at a temperature of 93 °C, shall withstand a minimum of 200 000 impulse cycles.

Leakage at the end-fitting, fitting blow-off or rupture of the hose adjacent to the fitting shall be considered as failures in the performance of the assembly. Such failures do not necessarily demonstrate an inability of the hose to meet the specified requirements with an alternative fitting.

The mode and position of any failures shall be recorded.

10 Leakage test

Unaged hose assemblies on which the end fittings have been attached for not more than 30 days shall be subjected to a hydrostatic pressure equal to 70 % of the specified minimum burst pressure for a period of 5 min to 5,5 min and then reduced to zero, after which the 70 % of the minimum burst pressure shall be re-applied for another 5 min. There shall be no leakage or evidence of failure. This test is to be considered a destructive test and the sample shall be destroyed. Two samples shall be tested.

11 Cold flexibility requirements

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 (see 6.1) after regaining ambient temperature.

12 Oil resistance

The lining and the cover, when tested by the method specified in ISO 1817, immersed in oil No. 3 for 72 h at a temperature of 100 °C, shall show no shrinkage greater than 15 % or volume swelling greater than 35 %.

13 Ozone resistance

When tested in accordance with ISO 7326, no cracking or deterioration of the cover shall be visible at a magnification of × 2.

14 Electrical conductivity

Hoses other than those with a pin-pricked cover, when tested in accordance with annex A, shall not show a leakage greater than 50 µA.

15 Marking

Hoses and hose assemblies complying with this International Standard shall be marked with at least the following information:

a) the number and year of publication of this International Standard (ISO 3949:1991);

b) the hose type;

c) the nominal bore;

d) the manufacturer's name or trademark;

e) the date of manufacture, i.e. quarter and last two digits of year of manufacture.

EXAMPLE: ISO 3949:1991/type 2/16/XXXX/4.91

Other information as agreed between the purchaser and the manufacturer may be included if requested.

Annex A
(normative)

Method of test for electrical conductivity

WARNING — Care shall be taken whilst carrying out this test in view of the high electrical voltage applied to the specimen.

Hose assemblies having a free length of 150 mm ± 10 mm without fluid, and capped to prevent entry of moisture, shall be exposed to a minimum of 85 % relative humidity at 23 °C ± 3 °C for a period of 168 h. Surface moisture shall be removed prior to testing.

Conditioned assemblies shall have one end-fitting attached to the lead from a source of 50 Hz to 60 Hz sinusoidal, 37,5 kV (rms) electricity. This lead shall be suspended by dry fabric strings so that the hose hangs free at least 600 mm from any extraneous objects. The lower end of the hose shall be connected to earth through a known resistance between 1 kΩ and 1 MΩ, keeping the resistor near the end of the hose.

A suitable a.c. voltmeter shall be connected across the resistor, using a fully shielded cable with the shielding well earthed. 37,5 kV (equivalent to 250 kV/m) shall be applied to the test piece for 5 min and a current reading taken.

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