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Thermoplastics hoses, textile-reinforced, for general-purpose water applications — Specification

Tuyaux en matières thermoplastiques à armatures textile d'usage général pour l'eau — Spécifications

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Foreword

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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 document 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).

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This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 218, *Rubber and plastics hoses and hose assemblies,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 6224:2011), which has been technically revised. The main changes are as follows:

— the normative references have been updated;

— Table 3 has been moved to Clause 7;

— the explanation of type, routine and production tests have been updated in Clause 8;

— marking in Clause 10 has been updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Thermoplastics hoses, textile-reinforced, for general-purpose water applications — Specification

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to determine any national regulatory conditions applicable.

1 Scope

This document specifies the requirements for general-purpose textile-reinforced thermoplastics water-discharge hoses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 176:2005, *Plastics — Determination of loss of plasticizers — Activated carbon method*

ISO 188:2023, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

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 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies*

ISO 8033, *Rubber and plastics hoses — Determination of adhesion between components*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 10619-1:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2:2021, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 30013:2011, *Rubber and plastics hoses — Methods of exposure to laboratory light sources — Determination of changes in colour, appearance and other physical properties*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8330 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Classification

Hoses are designated as one of the following types, depending on their pressure rating:

Type 1: Low pressure — Designed for a maximum working pressure of 0,6 MPa (6 bar) at 23 °C and 0,36 MPa (3,6 bar) at 60 °C.

Type 2: Medium pressure — Designed for a maximum working pressure of 1,0 MPa (10 bar) at 23 °C and 0,65 MPa (6,5 bar) at 60 °C.

Type 3: High pressure — Designed for a maximum working pressure of 2,5 MPa (25 bar) at 23 °C and 1,6 MPa (16 bar) at 60 °C.

These hoses are not intended to be used for conveyance of potable (drinking) water, for washing-machine inlets, as fire-fighting hoses, for special agricultural machines or as gardening hoses for the consumer market.

5 Materials and construction

The hose shall consist of:

— a flexible thermoplastic lining;

— a reinforcement of natural or synthetic textile, applied by any suitable technique;

— a flexible thermoplastic cover.

The lining and the cover shall be of uniform thickness, concentric, fully gelled and free from visible cracks, porosity, foreign inclusions and other defects. The cover may have a smooth or fluted finish.

6 Dimensions

6.1 Inside diameters and tolerances on inside diameter

The test shall be carried out in accordance with ISO 4671, the inside diameter and its tolerances shall conform to the values specified in Table 1.

Table 1 — Inside diameters, tolerances and minimum wall thicknesses

Inside diameter	Tolerance on inside diameter	Minimum wall thickness		
		mm		
mm	mm	Type 1	Type 2	Type 3
4	±0,50	2,00	2,00	2,50
6	±0,50	2,00	2,00	2,50
8	±0,60	2,00	2,00	2,80
9	±0,60	2,00	2,00	2,80
10	±0,75	2,00	2,00	2,80
12,5	±0,75	2,00	2,50	3,00
16	±0,75	2,00	2,80	3,00
19	±0,75	2,20	3,00	3,50

NOTE 1 For smaller or larger diameters, it is recommended that values be chosen from the R10 series of preferred numbers (see ISO 3), with tolerances as specified in ISO 1307.

NOTE 2 For intermediate diameters, it is recommended that values be chosen from the R20 series of preferred numbers (see ISO 3).

Table 1 *(continued)*

Inside diameter	Tolerance on inside diameter	Minimum wall thickness		
		mm		
mm	mm	Type 1	Type 2	Type 3
25	±1,25	2,70	3,50	4,00
32	±1,25	3,40	4,00	—
38	±1,50	4,00	4,50	—
50	±1,50	5,00	5,50	—

NOTE 1 For smaller or larger diameters, it is recommended that values be chosen from the R10 series of preferred numbers (see ISO 3), with tolerances as specified in ISO 1307.

NOTE 2 For intermediate diameters, it is recommended that values be chosen from the R20 series of preferred numbers (see ISO 3).

6.2 Concentricity

The test shall be carried out in accordance with ISO 4671, the concentricity, based on a total indicator reading between the inside diameter and the outside surface of the cover, shall be no greater than 1,0 mm.

6.3 Tolerance on length

The test shall be carried out in accordance with ISO 4671, the tolerance on cut lengths shall be as specified in ISO 1307.

6.4 Minimum wall thickness

The test shall be carried out in accordance with ISO 4671, the minimum wall thickness of the hose shall conform to the values specified in Table 1. If the cover is fluted, the depth of the flutes shall not be greater than 50 % of the cover thickness.

7 Physical properties

7.1 Thermoplastic materials

The test shall be carried out with the methods listed in Table 2, the physical properties of the materials used for the lining and cover shall conform to the values specified in Table 2.

Tests shall be carried out on test pieces taken either from the hose or from separately gelled sheets, 2 mm in thickness.

Table 2 — Physical properties of thermoplastic materials

Property	Requirements		Test method
	Lining	Cover	
Minimum tensile strength	10,0 MPa	10,0 MPa	ISO 527-2 (dumb-bell test piece)
Minimum elongation at break	250 %	250 %	ISO 527-2 (dumb-bell test piece)
Resistance to ageing:			ISO 188:2023 (3 days at 70 °C ± 1 °C), method A or B; ISO 527-2 (dumb-bell test piece)
Change in tensile strength from original value (max.)	±15 %	±15 %	
Change in elongation at break from original value (max.)	±25 %	±25 %	
Loss in mass on heating (max.)	4 %	4 %	ISO 176:2005, method B

7.2 Finished hoses

The test shall be carried out in accordance with the methods listed in Table 3. The physical properties of finished hoses shall conform to the values specified in Table 3.

Table 3 — Physical properties of finished hoses

Property	Requirements						Test method
	Type 1		Type 2		Type 3		
	MPa	bar	MPa	bar	MPa	bar	
Proof pressure at 23 °C	Not applicable due to low working pressure ratings of the hose		1,5	15	5,0	50	ISO 1402
Minimum burst pressure at 23 °C	1,8	18	3,0	30	10,0	100	ISO 1402
Proof pressure at 60 °C	Not applicable due to low working pressure ratings of the hose		0,975	9,75	2,5	25	ISO 1402
Minimum burst pressure at 60 °C	1,1	11	1,95	19,5	5,0	50	ISO 1402
Change in length at maximum working pressure at 23 °C	±8 %						ISO 1402
Adhesion between components	1,5 kN/m (min.)						ISO 8033
UV resistance (xenon-arc lamp)	The cover shall show no cracking or change in colour which would cause the hose to be unserviceable. When comparing the test pieces with the grey scale, the minimum acceptable degree of contrast shall be as determined between the interested parties.						ISO 30013:2011, method A
Flexibility at 23 °C	T/D not less than 0,8						ISO 10619-1:2017, method A1
Low-temperature flexibility	No cracks shall be detected and the hose shall pass the proof pressure test specified above at 23 °C.						ISO 10619-2:2021, method B, at −10 °C ± 2 °C

8 Type, routine and production testing

Type testing and routine testing shall be 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 document. 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 those tests required to be carried out on each length of finished hose prior to dispatch.

Production acceptance tests are those 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 Test certificate/report

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

10 Marking

The hose shall be continuously and durably marked with at least the following information:

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

b) a reference to this document, i.e. ISO 6224;

c) the hose type, e.g. type 1;

d) the inside diameter, in millimetres, e.g. 25;

e) the maximum working pressure, in megapascals and in bars, or in either, with the units indicated, e.g. 0,6 MPa;

f) the quarter and the last two digits of the year of manufacture, e.g. 2Q23.

EXAMPLE XXX/ISO 6224/type 1/25/0,6 MPa/2Q23.

For b), the hose manufacturer shall use the latest publication of this document, otherwise the year of the publication of the standard used shall be included in the marking.

11 Packaging and storage

Thermoplastics hoses should be packed and stored according to ISO 8331.

Annex A
(normative)

Type testing and routine testing

Table A.1 gives the tests which shall be carried out for type tests and routine tests as specified in Clause 8.

Table A.1 — Type tests and routine tests

Dimension/property under test (with reference to relevant subclause)	Type testing	Routine testing
Inside diameter and tolerances (6.1)	X	X
Concentricity (6.2)	X	X
Tolerance on length (6.3)	X	X
Minimum wall thickness (6.4)	X	X
Minimum tensile strength and minimum elongation at break (7.1)	X	N.A.
Resistance to ageing: Change in tensile strength from original value (max.) (7.1) Change in elongation at break from original value (max.) (7.1)	X	N.A.
Loss in mass on heating (max.) (7.1)	X	N.A.
Proof pressure at 23 °C (7.2)	X	X
Minimum burst pressure at 23 °C (7.2)	X	N.A.
Proof pressure at 60 °C (7.2)	X	N.A.
Minimum burst pressure at 60 °C (7.2)	X	N.A.
Change in length at maximum working pressure at 23 °C (7.2)	X	N.A.
Adhesion between components (7.2)	X	N.A.
UV resistance (xenon-arc lamp) (7.2)	X	N.A.
Flexibility at 23 °C (7.2)	X	N.A.
Low-temperature flexibility (7.2)	X	N.A.
X = test required. N.A. = test not applicable.		

Annex B
(informative)

Recommended tests for production testing

Table B.1 gives the tests recommended for production testing. Production tests are carried out on a hose or a sample of hose from each batch manufactured.

A batch is defined as, at the most, either 30 000 m of hose or 10 000 kg of lining and/or cover compound (plastic).

Table B.1 — Recommended tests for production testing

Dimension/property under test (with reference to relevant subclause)	Production testing
Inside diameter and tolerances (6.1)	X
Concentricity (6.2)	X
Tolerance on length (6.3)	X
Minimum wall thickness (6.4)	X
Minimum tensile strength and minimum elongation at break (7.1)	N.A.
Resistance to ageing: Change in tensile strength from original value (max.) (7.1) Change in elongation at break from original value (max.) (7.1)	N.A.
Loss in mass on heating (max.) (7.1)	N.A.
Proof pressure at 23 °C (7.2)	X
Minimum burst pressure at 23 °C (7.2)	X
Proof pressure at 60 °C (7.2)	N.A.
Minimum burst pressure at 60 °C (7.2)	N.A.
Change in length at maximum working pressure at 23 °C (7.2)	N.A.
Adhesion between components (7.2)	X
UV resistance (xenon-arc lamp) (7.2)	N.A.
Flexibility at 23 °C (7.2)	N.A.
Low-temperature flexibility (7.2)	N.A.
X = test required. N.A. = test not applicable.	