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

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

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6224 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This fourth edition cancels and replaces the third edition (ISO 6224:2005), which has been technically revised. The main changes are as follows:

- Table 1 includes four additional inside diameters (4 mm, 6 mm, 8 mm and 9 mm) for each type of hose;
- in Table 3, the requirement for the minimum adhesion between components has been raised from 1,5 kN/m to 2,0 kN/m;
- annexes giving schedules for type, routine and production testing have been added.

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

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard 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 ensure compliance with any national regulatory conditions.

1 Scope

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

Three types of hose are specified according to their operating duty requirements, i.e. their ambient and water temperature ranges:

- ambient temperatures: -10 °C to $+60\text{ °C}$;
- water temperature during operation: 0 °C to $+60\text{ °C}$.

NOTE At water temperatures above 23 °C and particularly above 40 °C , the maximum working pressure will be reduced.

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.

2 Normative references

The following referenced documents are indispensable for the application 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 3, *Preferred numbers — Series of preferred numbers*

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

ISO 188:2011, *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 8331, *Rubber and plastics hoses and hose assemblies — Guidelines for selection, storage, use and maintenance*

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

1) To be published. (Revision of ISO 1746:1998)

ISO 10619-2:—²⁾, *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.

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.

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

When measured in accordance with ISO 4671, the inside diameter and its tolerances shall conform to the values specified in Table 1.

2) To be published. (Revision of ISO 4672:1997)

Table 1 — Inside diameters, tolerances and minimum wall thicknesses

| Inside diameter mm | Tolerance on inside diameter mm | Minimum wall thickness 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 |
| 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

When determined 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

When measured in accordance with ISO 4671, the tolerance on cut lengths shall be as specified in ISO 1307.

6.4 Minimum wall thickness

When measured 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

When measured by 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: | | | |
| Change in tensile strength from original value (max.) | ±15 % | ±15 % | ISO 188:2011 (3 days at 70 °C ± 1 °C), method A or B; ISO 527-2 (dumb-bell test piece) |
| 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

When tested at 23 °C (standard laboratory temperature) and at 60 °C by the appropriate method specified in ISO 1402, the physical properties of finished hoses shall conform to the values specified in Table 3.

8 Type, routine and production testing

Type tests are those tests carried out to determine that the hose design and method of manufacture meet the full requirements of this International Standard.

Routine tests are those tests carried out on every manufactured length of finished hose.

The type tests and routine tests which shall be carried out are given in Annex A.

Production tests are those tests carried out on each batch. The tests recommended for production testing are given in Annex B, which is for guidance 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.

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 | 0,9 | 9 | 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 | 0,55 | 5,5 | 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 | 2,0 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 | <i>T/D</i> not less than 0,8 | | | | | | ISO 10619-1:—, 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:—, method B, at -10 °C ± 2 °C |

10 Marking

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

- the manufacturer's name or identification, e.g. MAN;
- the number and year of publication of this International Standard, i.e. ISO 6224:2011;
- the hose type, e.g. type 1;
- the inside diameter, in millimetres, e.g. 25;
- the maximum working pressure, in megapascals and in bars, or in either, with the units indicated, e.g. 0,6 MPa;
- the quarter and the last two digits of the year of manufacture, e.g. 2Q11.

EXAMPLE MAN/ISO 6224:2011/type 1/25/0,6 MPa/2Q11.

11 Recommendations for packaging and storage

These are given in ISO 8331.