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**Plastics hoses — Helical-thermoplastic-  
reinforced thermoplastics hoses for  
suction and discharge of aqueous  
materials — Specification**

*Tuyaux en plastiques — Tuyaux thermoplastiques à renforcement  
thermoplastique en spirale pour aspiration et refoulement de matières  
aqueuses — Spécifications*

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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 3994 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 3994:1998), which has been technically revised.

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## Introduction

This International Standard has been prepared to provide minimum acceptable requirements for the satisfactory performance of polymer-reinforced thermoplastics hoses for suction and discharge applications, conveying water, weak aqueous chemical solutions and abrasive solids and slurries.

If there is a special requirement for resistance to deleterious chemicals, this shall be a matter for agreement between the supplier and the purchaser.

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# Plastics hoses — Helical-thermoplastic-reinforced thermoplastics hoses for suction and discharge of aqueous materials — Specification

**WARNING** — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of 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 three types of helical-thermoplastic-reinforced thermoplastics hoses for suction and discharge of water, weak aqueous chemical solutions and abrasive solids and slurries, for use in the ambient temperature range from  $-10\text{ }^{\circ}\text{C}$  to  $+55\text{ }^{\circ}\text{C}$ .

The three types of hose are for light-, medium- and heavy-duty applications.

The types of hoses covered in this International Standard are not intended for use with flammable or combustible materials, nor with aromatic solvents.

**NOTE** Hoses of a similar construction for suction and discharge for fire-fighting are specified in ISO 14557, *Fire-fighting hoses — Rubber and plastics suction hoses and hose assemblies*.

## 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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

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

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 1746, *Rubber or plastics hoses and tubing — Bending tests*

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

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 11758:1995, *Rubber and plastics hoses — Exposure to a xenon arc lamp — Determination of changes in colour and appearance*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

### 3 Terms and definitions

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

### 4 Classification

Three types of hoses are specified, related to the maximum working pressure and suction pressure (see Tables 4 and 5):

- type 1: light-duty service;
- type 2: medium-duty service;
- type 3: heavy-duty service.

All types are designed to operate in the ambient temperature range – 10 °C to + 55 °C.

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### 5 Materials and construction (standards.iteh.ai)

The hoses shall be as uniform as commercially practicable in colour and other physical properties. They shall consist of a flexible thermoplastic material supported within the material by a helix of thermoplastic material of a similar molecular structure. The reinforcing and flexible components of the wall shall be fused together and free from visible cracks, porosity, foreign inclusions or other defects such as are liable to cause failure of the hose in service.

### 6 Dimensions and tolerances

#### 6.1 Nominal bores, internal diameters and tolerances

The internal diameters and tolerances of hoses of different nominal bores shall meet the requirements given in Table 1.

#### 6.2 Length tolerances

The tolerances on cut lengths shall be in accordance with ISO 1307.



Table 1 — Nominal bores, internal diameters and tolerances

Nominal bore	Internal diameter	Tolerances for types 1 and 2	Tolerances for type 3
	mm	mm	mm
12,5	12,5	± 0,75	—
16	16	± 0,75	—
19	19	± 0,75	—
20	20	± 0,75	—
25	25	± 1,25	± 1,25
32	32	± 1,25	± 1,25
38	38	± 1,25	± 1,50
40	40	± 1,25	± 1,50
50	50	± 1,50	± 1,50
63	63	± 1,50	± 1,50
76	76	± 1,50	± 2,00
80	80	± 1,50	± 2,00
90	90	± 2,00	± 2,00
100	100	± 2,00	± 2,00
102	102	± 2,00	± 2,00
125	125	± 2,00	± 2,00
127	127	± 2,00	± 2,00
152	152	± 2,00	± 2,00
160	160	± 2,00	± 2,00
200	200	—	± 2,00
250	250	—	± 3,00
300	300	—	± 3,00
315	315	—	± 3,00

## 7 Performance requirements

### 7.1 Hydrostatic testing at 23 °C ± 2 °C

When subjected to the proof pressure test and the burst pressure test specified in ISO 1402 at 23 °C ± 2 °C, hoses shall meet the following requirements:

- at the proof pressure specified in Table 2 (i.e. 40 % of the minimum burst pressure), the hoses shall show no evidence of leakage, cracking, abrupt distortion (indicating irregularity in materials or manufacture) or other signs of failure;
- the minimum burst pressure shall be as specified in Table 2.

Table 2 — Hydrostatic testing at 23 °C ± 2 °C

Nominal bore	Type 1		Type 2		Type 3	
	Proof pressure bar	Minimum burst pressure bar	Proof pressure bar	Minimum burst pressure bar	Proof pressure bar	Minimum burst pressure bar
12,5 up to and including 25	6,8	17	8,8	22	11,2	28
32 up to and including 63	4,8	12	6	15	7,2	18
76 up to and including 90	3,6	9	4,8	12	6	15
100 up to and including 127	2,8	7	3,6	9	4,8	12
152 up to and including 250	2,4	6	3,2	8	3,6	9
300 and 315	—	—	—	—	3,2	8

7.2 Hydrostatic testing at 55 °C ± 2 °C

When subjected to the burst pressure test specified in ISO 1402 at 55 °C ± 2 °C, hoses shall meet the requirements given in Table 3.

Table 3 — Hydrostatic testing at 55 °C ± 2 °C

Nominal bore	Minimum burst pressure		
	Type 1 bar	Type 2 bar	Type 3 bar
12,5 up to and including 25	5	6,5	8
32 up to and including 63	4	4,5	6
76 up to and including 90	3	4	5
100 up to and including 127	2,5	3	4
152 up to and including 250	2	2,5	3
300 and 315	—	—	2,5

7.3 Maximum working pressure

The maximum working pressure shall be as specified in Table 4.

Table 4 — Maximum working pressures

Nominal bore	Maximum working pressure					
	bar					
	23 °C ± 2 °C			55 °C ± 2 °C		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
12,5 up to and including 25	5,6	7,3	9,3	1,6	2,1	2,6
32 up to and including 63	4	5	6	1,3	1,5	2
76 up to and including 90	3	4	5	1	1,3	1,6
100 up to and including 127	2,3	3	4	0,8	1	1,3
152 up to and including 250	2	2,6	3	0,6	0,8	1
300 up to and including 315	—	—	2,6	—	—	0,8

#### 7.4 Tensile adhesion test

When tested in accordance with the method specified in Annex A, test pieces taken from the hose wall shall have a minimum tensile strength of 50 % of the tensile strength of the flexible thermoplastic material (determined in accordance with ISO 37). The test piece shall be considered to have failed if it is below this value.

#### 7.5 Vacuum test

When tested in accordance with the method specified in Annex B, using the absolute pressure indicated in Table 5, hoses shall not fail due to collapse or fracture at a point that is more than one diameter distance from the end fittings. In the event of failure closer to an end fitting, the test shall be disregarded and a further test piece tested.

Table 5 — Pressures for the vacuum test

Nominal bore	Absolute pressure	
	bar	
	Type 1 and 2 hoses	Type 3 hoses
12,5 up to and including 160	0,35	—
25 up to and including 315	—	0,20

#### 7.6 Reinforcement fracture test

When tested in accordance with the method specified in Annex C, the reinforcement shall be capable of being bent back on itself without cracking after it has been extended for  $336 \text{ h} \pm 4 \text{ h}$  over the appropriate-size extension block given in Table 6.