INTERNATIONAL STANDARD

ISO 5774

Fourth edition
2016-01-15

Plastics hoses — Textile-reinforced types for compressed-air applications — Specification

Tuyaux en plastique — Types armés de textile pour applications avec de l'air comprimé — Spécifications

Reference number
ISO 5774:2016(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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.

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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This fourth edition cancels and replaces the third edition (ISO 5774:2006), of which it constitutes a minor revision.

The minor changes are as follows:

— Clause 2 has been updated: ISO 1746, ISO 4672 and ISO 11758 have been deleted and replaced by ISO 10619-1, 10619-2 and ISO 30013.

— Pressures have been specified in MPa and bar (with the units stated) and Table 5 has been amended accordingly. Also Clause 10 (Marking) has been slightly modified to make the information more complete.

— The term "type approval" has been replaced by "type test".

— The error in Annex B, where, in the column "routine testing", the proof pressure test was marked N.A. has been corrected. Proof pressure testing for each length of finished hose supplied has become normative as standard for nearly all other hose product standards.

— Also Annex C (informative) has been amended (this annex is for guidance only) and the recommendation for production acceptance testing on tensile strength/elongation at break of lining and cover, change in length and diameter at proof pressure, adhesion, bending test has been changed from "N.A." to "X", in order to monitor the quality of manufacturer's production more efficiently.

Introduction

This International Standard has been prepared to provide minimum acceptable requirements for the satisfactory performance of flexible thermoplastics hoses, textile reinforced, for compressed-air applications.

Maximum working pressures of each hose type are specified with two operating temperatures.

Some hose materials will require a hydrolysis test (given in Annex A).

Plastics hoses — Textile-reinforced types for compressed-air applications — Specification

1 Scope

This International Standard specifies the requirements for four types of flexible thermoplastic hose, textile reinforced, for compressed-air applications in the temperature range from −10 °C to +60 °C.

The four types are classified as light service for a maximum working pressure of 7 bar at 23 °C and 4,5 bar at 60 °C, medium service for a maximum working pressure of 10 bar at 23 °C and 6,5 bar at 60 °C, heavy service for a maximum working pressure of 16 bar at 23 °C and 11 bar at 60 °C, and heavy service for use in mining for a maximum working pressure of 25 bar at 23 °C and 13 bar at 60 °C.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

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

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

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 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

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 — Guide to selection, storage, use and maintenance*

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

ISO 10619-2:2011, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 30013, *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 four types depending on their pressure rating at the specified temperature:

Type A: General industrial use — light service — for a maximum working pressure of 0,7 MPa (7 bar) at 23 °C and 0,45 MPa (4, 5 bar) at 60 °C.

Type B: General industrial use — medium service — for a maximum working pressure of 1 MPa (10 bar) at 23 °C and 0,65 MPa (6,5 bar) at 60 °C.

Type C: Heavy service — for a maximum working pressure of 1,6 MPa (16 bar) at 23 °C and 1,1 MPa (11 bar) at 60 °C.

Type D: Heavy service — for use in mining and outdoor work — for a maximum working pressure of 2,5 MPa (25 bar) bar at 23 °C and 1,3 MPa (13 bar) at 60 °C.

The hoses are not intended for the transport of oil. However, compressed air coming from a compressor may contain some oil in suspension.

5 Couplings and end fittings

Hoses may be fitted with the appropriate coupling type and end fitting to form hose assemblies.

NOTE Guidance on coupling type is given in Annex D and ISO/TR 17784.

6 Materials and construction

The hoses shall consist of:

a) a lining made of a flexible thermoplastics material;

b) a reinforcement made of a natural or synthetic textile material applied by any suitable technique;

c) a cover made of a flexible thermoplastics material.

The lining and the cover shall be of uniform thickness, concentric, fully gelled and free from visible cracks, porosity, foreign inclusions and any other defects which could cause the hose to be unserviceable.

7 Dimensions and tolerances

7.1 Inside diameter, tolerances and minimum wall thickness

When measured in accordance with ISO 4671, the inside diameter of hoses shall lie within the tolerance limits given in Table 1 and the wall thickness shall meet the minimum requirement given in Table 1.

Table 1 — Nominal bores, inside diameters, tolerances and minimum wall thicknesses

Nominal bore	Inside diameter mm	Tolerance mm	Minimum wall thickness mm			
			Type A	Type B	Type C	Type D
4	4	±0,25	1,5	1,5	1,5	2,0
5	5	±0,25	1,5	1,5	1,5	2,0
6,3	6,3	±0,25	1,5	1,5	1,5	2,3
8	8	±0,25	1,5	1,5	1,5	2,3
9	8,5	±0,25	1,5	1,5	1,5	2,3
10	9,5	±0,35	1,5	1,5	1,8	2,3
12,5	12,5	±0,35	2,0	2,0	2,3	2,8
16	16	±0,5	2,4	2,4	2,8	3,0
19	19	±0,7	2,4	2,4	2,8	3,5
25	25	±1,2	2,7	3,0	3,3	4,0
31,5	31,5	±1,2	3,0	3,3	3,5	4,5
38	38	±1,2	3,0	3,5	3,8	4,5
40	40	±1,5	3,3	3,5	4,1	5,0
50	50	±1,5	3,5	3,8	4,5	5,0

7.2 Concentricity

When determined in accordance with ISO 4671, the concentricity, based on the difference in indicator reading between the inside surface of the lining and the outside surface of the cover, shall be no greater than 0,3 mm for hoses of minimum wall thickness from 1,5 mm up to and including 3,0 mm, no greater than 10 % of the wall thickness for hoses of minimum wall thickness over 3,0 mm and up to and including 5,0 mm, and no greater than 15 % of the wall thickness for hoses of minimum wall thickness over 5,0 mm as given in Table 2.

Table 2 — Concentricity

Minimum wall thickness mm	Concentricity
1,5 to 3,0	≤ 0,3 mm
over 3,0 to 5,0	≤ 10 % of wall thickness
over 5,0	≤ 15 % of wall thickness

7.3 Tolerances on length

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

8 Physical properties

8.1 Plastic compounds

8.1.1 Tensile strength and elongation at break of lining and cover

When determined in accordance with ISO 37, the tensile strength and elongation at break shall not be less than the values given in Table 3.

Table 3 — Tensile strength and elongation at break

Hose component	Minimum tensile strength MPa	Minimum elongation at break %
Lining	15,0	250
Cover	15,0	250

Testing shall be carried out either on test pieces taken from the hose wall or on test pieces taken from a sheet of hose material made using a laboratory press.

8.1.2 Resistance to ageing

After ageing for 7 days at a temperature of (70 ± 2) °C, as specified in ISO 188, the tensile strength and elongation at break of the lining and cover, as determined by ISO 37, shall not vary by more than the values given in Table 4 in comparison with the values of these properties before ageing.

Table 4 — Change in tensile strength and elongation from original value

Hose component	Change in tensile strength from original value %	Change in elongation at break from original value %
Lining	15	25
Cover	15	25

8.1.3 Loss in mass on heating

When tested in accordance with method B of ISO 176:2005, the materials of the lining and cover shall have a loss in mass not greater than 2 %.

8.1.4 Resistance to liquids

After immersion in oil No. 1 as described in ISO 1817 at (60 ± 1) °C for 72 h, the volume of a test piece shall not vary by more than 15 %.

8.1.5 Hydrolysis test

When materials are used in the lining and/or cover that are susceptible to hydrolysis, a hydrolysis test shall be carried out, using the method specified in Annex A, either on ISO 37 dumb-bell test pieces taken from the hose wall or on ISO 37 dumb-bell test pieces taken from a sheet of material made using a laboratory press.

After exposure to (95 ± 5) % relative humidity at (80 ± 2) °C for 500 h, neither the lining nor the cover shall show visible evidence of cracking, porosity or other defects.

The values of the tensile strength and the elongation at break of the ISO 37 dumb-bell test pieces after the hydrolysis test shall be more than 40 % of the original values.

8.2 Performance requirements on finished hoses

8.2.1 Hydrostatic requirements

When tested in accordance with ISO 1402, hoses shall meet the requirements specified in Table 5.

Table 5 — Hydrostatic pressure requirements at 23 °C and 60 °C

Hose type	Maximum working pressure				Proof pressure		Minimum burst pressure				Change in dimensions at proof pressure 23 °C	
	MPa		Bar		MPa	Bar	MPa		Bar			
	23 °C	60 °C	23 °C	60 °C	23 °C	23 °C	23 °C	60 °C	23 °C	60 °C	Length %	Diameter %
A	0,7	0,45	7	4,5	1,4	14	2,8	1.8	28	18	±8	±10
B	1	0,65	10	6,5	2	20	4,0	2,6	40	26	±8	±10
C	1,6	1,1	16	11	3,2	32	6,4	4,5	64	45	±8	±10
D	2,5	1,3	25	13	5	50	10,0	5	100	50	±8	±10

During and after the proof pressure test, the hose shall be examined for evidence of leakage, cracking, abrupt distortion (indicating an irregularity in the construction) or any other faults. No such defects shall be observed.

8.2.2 Adhesion

When determined in accordance with ISO 8033, the adhesion between the lining and the cover shall not be less than 2,0 kN/m.

Use type 1 test pieces for hoses of inside diameter up to 32 mm, and type 2 test pieces for hoses of inside diameter of 38 mm and above.

8.2.3 Exposure to a xenon arc lamp

When tested in accordance with ISO 30013, preferably without water spray (see below), the cover shall show no evidence of cracking. Any change in colour caused by the exposure shall be determined by comparing the exposed test pieces with unexposed test pieces using the grey scale (as specified in ISO 105-A02). The grey-scale rating thus determined shall be more than 3.

Testing without spraying is recommended. By agreement between the interested parties, however, testing with spraying may be carried out (see ISO 30013).

8.2.4 Bending test

When bent to the minimum bend radius given in Table 6, in accordance with one of the methods specified in ISO 10619-1 (use the method most appropriate to the size of hose), hoses shall show no evidence, under visual examination, of kinking, breaking or peeling. The value of the coefficient of deformation *(Y/D)* shall not be lower than 0,8.

Table 6 — Minimum bend radius

Nominal bore	Minimum bend radius mm
4	24
5	30
6,3	40
8	50
9	55
10	60
12,5	75
16	96

Table 6 *(continued)*

Nominal bore	Minimum bend radius mm
19	115
25	175
31,5	220
38	310
40	320
50	400

8.2.5 Low-temperature flexibility

When tested at (–10 ± 2) °C in accordance with method B of ISO 10619-2:2011, hoses shall be capable of being bent around a mandrel having an outside diameter equal to twice the minimum bend radius specified in 8.2.4.

No cracks shall be detected and the hose shall subsequently pass the proof pressure test in 8.2.1.

9 Frequency of testing

Type and routine testing shall be as specified in Annex B.

Type tests are those tests required to confirm that a particular hose design, manufactured by a particular method, meets all the requirements of this International Standard. 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 C, which should preferably be carried out to control the quality of manufacture. The frequencies specified in Annex C are given as a guide only.

10 Marking

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

a) the manufacturer's name or trademark (XXXX);

b) the number and year of publication of this International Standard;

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

d) the nominal bore, e.g. 10;

e) the maximum working pressure in MPa and bar, with the units specified, and temperature;

f) the quarter and the year of manufacture, e.g. 1Q16.

EXAMPLE XXXX/ISO 5774:2016/TYPE A/10/0,7 MPa (7 bar)@ 23 °C/0,45 MPa (4,5 bar)@60 °C/1Q16

11 Recommendations for packaging and storage

These are given in ISO 8331.

12 Test report

If requested by the purchaser, a test report shall be supplied by the hose manufacturer or supplier.

Annex A
(normative)

Hydrolysis test

A.1 General

This test determines the susceptibility of hose materials to degradation due to the absorption of water at high temperatures and humidities.

NOTE The test can be carried out using, in addition, reference test pieces taken from the hose wall and/or from a sheet of TPU (thermoplastic polyurethane) or PA (polyamide).

It is preferable that any metal clips on the test piece holders in the exposure chamber be covered with aluminium foil or a polytetrafluoroethylene coating or protected in some other way so that they do not contact the test pieces directly.

A.2 Procedure

A.2.1 Tests on plastic compounds

In the case of compounds, prepare a sufficient number of ISO 37 dumb-bell test pieces using a laboratory press.

Prior to hydrolysis testing, dry the test pieces for 2 h in a circulating-air oven at (100 ± 2) °C. After drying, remove the test pieces from the oven and allow them to cool to (23 ± 2) °C in a desiccator.

Using half of the test pieces, measure, in accordance with ISO 37, the original values of the tensile strength and the elongation at break.

Expose the remaining test pieces to (95 ± 5) % relative humidity for 500 h at (80 ± 2) °C (the use of a thermostatically controlled environmental test chamber is recommended).

Following exposure, remove the test pieces from the chamber and carry out a visual examination (see A.3.1).

Condition the exposed test pieces in the desiccator for 24 h at (23 ± 2) °C to allow all traces of moisture to disappear.

Measure, in accordance with ISO 37, the tensile strength and the elongation at break of the exposed test pieces.

A.2.2 Tests on finished hoses

In the case of finished hoses, prepare ten ISO 37 dumb-bell test pieces, each at least 150 mm in length.

Prior to hydrolysis testing, dry the test pieces for 2 h in a circulating-air oven at (100 ± 2) °C. After drying, remove the test pieces from the oven and allow them to cool to (23 ± 2) °C in a desiccator.

Using five of the test pieces, measure, in accordance with ISO 37, the original values of the tensile strength and the elongation at break.

Expose the remaining five test pieces to (95 ± 5) % relative humidity for 500 h at (80 ± 2) °C (the use of a thermostatically controlled environmental test chamber is recommended).

Following exposure, remove the test pieces from the chamber and carry out a visual examination (see A.3.2).

Condition the exposed test pieces in the desiccator for 24 h at (23 ± 2) °C to allow all traces of moisture to disappear.

Measure, in accordance with ISO 37, the tensile strength and the elongation at break of the exposed test pieces.

A.3 Assessment

A.3.1 Tests on plastic compounds

Examination of the exposed test pieces shall not reveal any visible signs of cracking, porosity or other defects. The values of the tensile strength and elongation at break measured after exposure shall be more than 40 % of the original values.

A.3.2 Tests on finished hoses

Examination of the exposed test pieces shall not reveal any visible signs of cracking, porosity or other defects in the lining and/or cover. The values of the tensile strength and elongation at break measured after exposure shall be more than 40 % of the original values.

Annex B
(normative)

Type and routine tests

Table B.1 gives the tests to be carried out for type and routine testing as defined in Clause 9.

Table B.1

Dimension/property under test (with reference to relevant sub-clause)	**Type testing**	**Routine testing**
Inside diameter/tolerances/minimum wall thickness (7.1)	X [a]	X
Concentricity (7.2)	X	X
Tolerances on length (7.3)	X	X
Tensile strength and elongation at break of lining and cover (8.1.1)	X	N.A. [b]
Resistance to ageing (8.1.2)	X	N.A.
Loss in mass on heating (8.1.3)	X	N.A.
Resistance to liquids (8.1.4)	X	N.A.
Hydrolysis test (8.1.5)	X	N.A.
Proof pressure (8.2.1)	X	X
Burst pressure at 23 °C and 60 °C (8.2.1)	X	N.A.
Change in length and diameter at proof pressure (8.2.1)	X	N.A.
Adhesion (8.2.2)	X	N.A.
Exposure to xenon arc lamp (8.2.3)	X	N.A.
Bending test (8.2.4)	X	N.A.
Low-temperature flexibility (8.2.5)	X	N.A.

[a] X = Test required.

[b] N.A. = Not applicable.