TECHNICAL SPECIFICATION

ISO/TS 11619

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Polyurethane tubing for use primarily in pneumatic installations — Dimensions and specification

Tubes en polyuréthanne utilisés principalement dans les installations pneumatiques — Dimensions et spécifications

Reference number
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Foreword

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

Introduction

This Technical Specification has been prepared to provide minimum acceptable requirements for the satisfactory performance of thermoplastic polyurethane tubing used mainly in pneumatic applications.

The tubing conveys compressed air which controls and powers pneumatic systems.

This Technical Specification will be revised to an International Standard when ISO 14743 has been revised and published in ISO/TC 131.

Polyurethane tubing for use primarily in pneumatic installations — Dimensions and specification

WARNING — Persons using this document should be familiar with normal laboratory practice. This document 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 Technical Specification specifies the requirements for flexible thermoplastic polyurethane tubing conveying compressed air, for use in the ambient temperature range from 23 °C to 60 °C, in sizes from 3 mm to 12 mm outside diameter. Working pressure depends on the tube size and the service temperature (see Table 4). Tubing may be used with push on connectors which are specified in ISO 14743.

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 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 10619-1:2011, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

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*

3 Terms and definitions

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

4 Materials and construction

The tubing shall be manufactured from polyester or polyether based polyurethane and shall be homogenous, and free from surface imperfections. The tubing is extruded and can be coloured to user requirements. For applications where there is moisture or water present above 40 °C, polyurethane materials with good hydrolysis resistance would be required. This must be specified by the user to the supplier of the tubing.

5 Dimensions and tolerances

5.1 Outside diameters, wall thickness and tolerances

The outside diameters and tolerances of tubing shall meet the requirements given in Table 1.

Table 1 — Outside diameters, wall thickness and tolerances

Outside diameter		Wall thickness	
Diameter mm	Tolerance mm	Thickness mm	Tolerance mm
3	±0,10	0,50	+ 0,10 - 0,05
4	±0,10	0,75	+ 0,10 - 0,05
5	±0,10	1,00	+ 0,10 - 0,05
6	±0,10	1,00	+ 0,10 - 0,05
8	±0,10	1,25	+ 0,10 - 0,05
8	±0,10	1,00	+ 0,10 - 0,05
10	±0,15	1,50	+ 0,15 - 0,07
10	±0,15	1,00	+ 0,15 - 0,05
12	±0,15	2,00	+ 0,15 - 0,07

5.2 Length tolerances

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

6 Performance requirements

6.1 Hydrostatic testing at 23 °C ± 2 °C

When subjected to the burst pressure test specified in ISO 1402 at 23 °C ± 2 °C, tubing shall meet the requirements specified in Table 2.

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

Outside diameter mm	Wall thickness mm	Minimum burst pressure MPa	Minimum burst pressure bar
3	0,5	5,40	54,0
4	0,75	6,23	62,3
5	1,0	6,75	67,5
6	1,0	5,40	54,0
8	1,25	5,00	50,0
8	1,0	3,84	38,4
10	1,5	4,76	47,6
10	1,0	3,00	30,0
12	2,0	5,40	54,0

6.2 Hydrostatic testing at 60 °C ± 2 °C

When subjected to the burst pressure test specified in ISO 1402 at 60 °C ± 2 °C, tubing shall meet the requirements given in Table 3. Tests shall be conducted at 60 °C in a proper temperature controlled cabinet, and compressed gas (either air or nitrogen) can be used as a burst test media.

Table 3 — Burst testing at 60 °C ± 2 °C

Outside diameter mm	Wall thickness mm	Minimum burst pressure MPa	Minimum burst pressure bar
3	0,5	3,46	34,6
4	0,75	3,98	39,8
5	1,0	4,32	43,2
6	1,0	3,45	34,5
8	1,25	3,20	32,0
8	1,0	2,47	24,7
10	1,5	3,04	30,4
10	1,0	1,92	19,2
12	2,0	3,45	34,5

6.3 Maximum working pressure

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

Table 4 — Maximum working pressures at 23 °C and 60 °C

Outside diameter mm	Wall thickness mm	Maximum working pressure at 23 °C MPa	Maximum working pressure at 23 °C bar	Maximum working pressure at 60 °C MPa	Maximum working pressure at 60 °C bar
3	0,5	1,35	13,5	0,86	8,6
4	0,75	1,55	15,5	0,99	9,9
5	1,0	1,68	16,8	1,08	10,8
6	1,0	1,35	13,5	0,86	8,6
8	1,25	1,25	12,5	0,80	8,0
8	1,0	0,96	9,6	0,61	6,1
10	1,5	1,19	11,9	0,76	7,6
10	1,0	0,75	7,5	0,48	4,8
12	2,0	1,35	13,5	0,86	8,6
NOTE Maximum working pressures are based on a factor of safety of 4:1 on minimum burst pressures because the main use of this tubing is for conveying compressed air.					

6.4 Minimum bend radius

When tested in accordance with ISO 10619-1:2011 method A1, the minimum bend radius shall be as specified in Table 5, and the value of T/D shall be greater than 0,9.

Table 5 — Minimum bending radius at 23 °C

Outside diameter mm	Wall thickness mm	Minimum bend radius at 23 °C mm
3	0,5	13
4	0,75	13
5	1,0	15
6	1,0	20
8	1,25	25
8	1,0	35
10	1,5	40
10	1,0	60
12	2,0	40

7 Type, routine and production testing

For type testing and routine testing, the tests specified in Annex A shall be carried out.

For production testing, the tests given in Annex B are recommended.

NOTE

— Type tests are those tests required to obtain product approval;

— Routine tests are those carried out on each length of tubing; and

— Production tests are those carried out on each production batch.

8 Marking

Tubing shall be marked in characters which can be easily seen with the naked eye, either using a contrasting indelible ink or as otherwise agreed between the supplier and the purchaser, with at least the following information:

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

b) the reference of this Technical Specification, i.e. ISO/TS 11619:2014;

c) the outside diameter and wall thickness, e.g. 6 mm × 1 mm;

d) the maximum working pressure at 23 °C in MPa and bar, e.g. 1,35 MPa (13,5 bar) at 23 °C; and

e) the quarter and the last two digits of the year of manufacture, e.g. 1Q14.

EXAMPLE XXX/ISO/TS 11619:2014/6 mm × 1 mm/MWP1,35 MPa (13,5 bar) at 23 °C/1Q14

9 Recommendations for packing and storage

The recommendations for packing and storage are given in ISO 8331.

Annex A
(normative)

Test frequency

A.1 Table A.1 gives the frequency of testing for routine tests and type tests.

A.2 Type tests are those carried out to verify that the tube meets all the requirements of this Technical Specification.

A.3 Routine tests are those tests to be carried out on every manufactured length of tube.

NOTE This type of tubing is normally produced with continuous outside diameter measurement and also wall thickness gauging.

Table A.1 — Frequency of testing for routine tests and type tests

Test	Routine test	Type test
5.1 Outside diameter	X	X
5.1 Wall thickness	X	X
6.1 Hydrostatic testing at 23 °C	N.A.	X
6.2 Hydrostatic testing at 60 °C	N.A.	X
6.4 Bend radius test	N.A.	X
NOTE N.A. = Not applicable		

Annex B
(informative)

Recommended tests for production testing

B.1 Table B.1 gives the recommended tests for production acceptance testing.

B.2 Production tests are those tests to be carried out on a manufactured batch of tubing or sample of tube from a manufactured batch.

B.3 A manufacturing batch is defined as a maximum of 6 000 m of tubing.

Table B.1 — Recommended tests for production acceptance testing

Test	Production test
5.1 Outside diameter	X
5.1 Wall thickness	X
6.1 Hydrostatic testing at 23 °C	X
6.2 Hydrostatic testing at 60 °C	N.A.
6.4 Bend radius test	N.A.
NOTE N.A. = Not applicable	

Bibliography

ISO 14743:2004, *Pneumatic fluid power — Push-in connectors for thermoplastic tubes*[1)]

1) Under revision.

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