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*



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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.

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*.



 

# 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<br>mm | Tolerance<br>mm | Thickness<br>mm | Tolerance<br>mm |
| 3 | ±0,10 | 0,50 | + 0,10<br>- 0,05 |
| 4 | ±0,10 | 0,75 | + 0,10<br>- 0,05 |
| 5 | ±0,10 | 1,00 | + 0,10<br>- 0,05 |
| 6 | ±0,10 | 1,00 | + 0,10<br>- 0,05 |
| 8 | ±0,10 | 1,25 | + 0,10<br>- 0,05 |
| 8 | ±0,10 | 1,00 | + 0,10<br>- 0,05 |
| 10 | ±0,15 | 1,50 | + 0,15<br>- 0,07 |
| 10 | ±0,15 | 1,00 | + 0,15<br>- 0,05 |
| 12 | ±0,15 | 2,00 | + 0,15<br>- 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<br>mm | Wall thickness<br>mm | Minimum burst pressure<br>MPa | Minimum burst pressure<br>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<br>mm | Wall thickness<br>mm | Minimum bend radius at 23 °C<br>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 | | |