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Pneumatic fluid power — Polyurethane and polyamide tubings for use primarily in pneumatic installations — Dimensions and specification

Transmissions pneumatiques — Tubes en polyuréthane et en polyamide destinés à être utilisés principalement dans des installations pneumatiques — Dimensions et spécifications

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Foreword

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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 document 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).

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This document was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

This first edition cancels and replaces the first edition of ISO/TS 11619:2014, which has been technically revised.

The main changes are as follows:

— extension of the scope to polyamide tubings;

— addition of new sizes for polyurethane tubings.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

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

Pneumatic fluid power — Polyurethane and polyamide tubings for use primarily in pneumatic installations — Dimensions and specification

WARNING — Users of 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 document specifies the requirements for flexible thermoplastic polyurethane and polyamide tubing conveying compressed air, in sizes from 3 mm to 16 mm (1/8 inch to 1/2 inch) outside diameter.

Polyurethane tubings are dedicated for use in the temperature range from –20 °C to 60 °C, while polyamide tubings are dedicated for use in the temperature range from –20 °C to 80 °C. Working pressure depends on the tube size, the service temperature (see Table 13 and Table 14) and tubing material (see Table 15 and Table 16).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 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 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 10619-1:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Materials and construction

The polyurethane tubing shall be manufactured from polyester or polyether based. For applications where there is moisture or water present above 40 °C, polyurethane materials with good hydrolysis resistance are required. The user shall specify this to the supplier of the tubing.

The polyamide tubing shall be manufactured from polyamide such as but not limited to PA12, PA6, etc.

Tubing shall be homogenous and free from surface imperfections. The tubing is extruded and can be coloured to user requirements.

5 Dimensions and tolerances

5.1 Outside and inside diameters, wall thickness and tolerances

5.1.1 Polyurethane tubing

The outside diameter, inside diameter, wall thickness and tolerances of the tubing shall meet the requirements given in Table 1 and Table 2.

Table 1 — Metric outside and inside diameters, wall thickness and tolerances

Outside diameter		Inside diameter		Wall thickness
Diameter mm	Tolerance [a] mm	Diameter mm	Tolerance [a] mm	Minimum Thickness [a] mm
2	±0,10	1,20	±0,10	0,3
3	±0,10	1,8	±0,10	0,5
3	±0,10	2	±0,10	0,4
4	±0,10	2,5	±0,10	0,65
5	±0,10	3	±0,10	0,9
6	±0,10	4	+ 0,10 - 0,20	0,9
8	±0,10	5,5	+ 0,10 - 0,20	1,15
8	±0,10	5,7	+ 0,10 - 0,20	1,05
8	±0,10	6	+ 0,10 - 0,20	0,9
10	±0,15	7	+ 0,10 - 0,20	1,4
10	±0,15	8	+ 0,10 - 0,20	0,9
12	±0,15	8	+ 0,10 - 0,20	1,9
14	±0,15	9,5	+ 0,10 - 0,20	2,15
14	±0,15	9,8	+ 0,10 - 0,20	2,0
14	±0,15	10,0	+ 0,10 - 0,20	1,9
16	±0,15	11	+ 0,10 - 0,20	2,4

[a] Tolerance and limit specified for outside diameter, inside diameter and wall thickness cannot all be met and coaxiality ensured at the same time.

Table 2 — Inch outside and inside diameters, wall thickness and tolerances

Outside diameter		Inside diameter		Wall thickness
Diameter inch	**Tolerance** [a] inch	**Diameter** inch	**Tolerance** [a] inch	**Minimum Thickness** [a] inch
1/8	±0.004	0.065	±0.004	0.026
1/8	±0.004	0.083	±0.004	0.017
5/32	±0.005	0.098	±0.005	0.024
3/16	±0.005	0.108	±0.005	0.035
3/16	±0.005	0.121	±0.005	0.028
1/4	±0.005	0.157	±0.005	0.042
1/4	±0.005	0.160	±0.005	0.040
5/16	±0.005	0.217	±0.005	0.043
3/8	±0.006	0.250	±0.006	0.057
1/2	±0.006	0.330	±0.006	0.079
5/8	±0.006	0.421	±0.006	0.096

[a] Tolerance and limit specified for outside diameter, inside diameter and wall thickness cannot all be met and coaxiality ensured at the same time.

5.1.2 Polyamide tubings

The outside diameters, inside diameters and tolerances of the tubing shall meet the requirements given in Table 3 and Table 4.

Table 3 — Metric outside and inside diameters, wall thickness and tolerances

Outside diameter		Inside diameter		Wall thickness
Diameter mm	**Tolerance** [a] mm	**Diameter** mm	**Tolerance** [a] mm	**Minimum thickness** [a] mm
3	±0,10	1,80	±0,10	0,55
4	±0,10	2,50	±0,20	0,65
4	±0,10	2,70	±0,20	0,60
5	±0,10	3,00	±0,20	0,90
6	±0,10	4,00	±0,20	0,90
8	±0,10	6,00	±0,20	0,90
10	±0,15	7,50	±0,20	1,12
10	±0,15	8,00	±0,20	0,90
12	±0,15	9,00	±0,30	1,35
14	±0,15	10,00	±0,30	1,80
14	±0,15	11,00	±0,30	1,35
16	±0,15	12,00	±0,30	1,80
16	±0,15	13,00	±0,30	1,35

[a] Tolerance and limit specified for outside diameter, inside diameter and wall thickness cannot all be met and coaxiality ensured at the same time.

Table 4 — Inch outside and inside diameters, wall thickness and tolerances

Outside diameter		Inside diameter		Wall thickness
Diameter inch	Tolerance [a] inch	Diameter inch	Tolerance [a] inch	Minimum thickness [a] inch
1/8	±0.005	0.065	±0.005	0.022
5/32	±0.005	0.098	±0.005	0.026
3/16	±0.005	0.129	±0.005	0.026
1/4	±0.005	0.172	±0.005	0.036
5/16	±0.005	0.234	±0.005	0.036
3/8	±0.005	0.257	±0.006	0.053
1/2	±0.005	0.324	±0.007	0.082

[a] Tolerance and limit specified for outside diameter, inside diameter and wall thickness cannot all be met and coaxiality ensured at the same time.

5.1.3 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

6.1.1 General

Fittings that conform to ISO 14743 should be used for this hydrostatic testing. Tubing used for these hydrostatic tests should be pre-conditioned with regard to humidity as described in ISO 14743.

6.1.2 Polyurethane tubing hydrostatic testing

When subjected to the burst pressure test specified in ISO 1402 at 23 °C ± 2 °C, tubing shall meet the requirements specified in Table 5 and Table 6.

Table 5 — Burst testing at 23 °C ± 2 °C, metric size

Outside diameter mm	Wall thickness mm	Minimum burst pressure MPa
2	0,4	2,40
3	0,5	2,40
3	0,6	3,00
4	0,75	3,00
5	1,0	3,00
6	1,0	2,55
8	1,25	2,55
8	1,15	2,25
8	1,0	1,80
10	1,5	2,55
10	1,0	1,50
12	2,0	2,55
14	2,25	2,55