INTERNATIONAL STANDARD

ISO 16030

First edition
2001-12-15

AMENDMENT 1
2005-04-01

Pneumatic fluid power — Connections — Ports and stud ends

AMENDMENT 1

Transmissions pneumatiques — Raccordements — Orifices et éléments mâles

AMENDEMENT 1

Reference number
ISO 16030:2001/Amd.1:2005(E)

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Amendment 1 to ISO 16030:2001 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

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Pneumatic fluid power — Connections — Ports and stud ends

AMENDMENT 1

Page 1

2 Normative references

The reference to ISO 8778, published in 2003 becomes the following:

ISO 8778, *Pneumatic fluid power — Standard reference atmosphere*

Delete the note 2) at the bottom of the page.

Page 7

Table 1

The dimension L_2 min. for the thread M3 changes from 4 mm to 3,5 mm.

Page 8

Table 2

The dimension L_4 nom. for the thread M3 changes from 3,5 mm to 3 mm.

Page 13

Bibliography

Reference [7] changes to the following:

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

Delete the note 3) at the bottom of the page.

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ISO 16030 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*.

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Introduction

In pneumatic fluid power systems, power is transmitted and controlled through air under pressure within a circuit.

Components are connected through their threaded ports by means of connectors to tubes and pipes or to hose fittings and hoses. Ports are an integral part of fluid power components, such as valves, cylinders and filters.

In the past, various thread and port systems (for example ISO 7-1 and ISO 1179:1981) have been used in pneumatic fluid power systems. See the scope of this International Standard for further information on the relationship between those standards and this International Standard. Where ISO 7-1 tapered external threads are intended to connect to pneumatic components with internal threads, the ports in those components should conform to ISO 1179:1981.

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Pneumatic fluid power — Connections — Ports and stud ends

1 Scope

This International Standard specifies dimensions and performance requirements for ports and stud ends with parallel threads for pneumatic fluid power applications.

It specifies reusable, positively retained seals for leak-free connections, for use at pressures from – 0,09 MPa (– 0,9 bar [1]) up to 1,6 MPa (16 bar).

Only this International Standard is applicable for threaded ports and stud ends specified in new designs in pneumatic fluid power applications.

Ports and stud ends conforming to this International Standard are not intended to connect with ports and stud ends that conform to ISO 1179 or threads that conform to ISO 7-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 261, *ISO general-purpose metric screw threads — General plan*

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification*

ISO 5598, *Fluid power systems and components — Vocabulary*

ISO 8778[2], *Pneumatic fluid power — Standard reference atmosphere*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 5598 apply.

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1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2

2) To be published. (Revision of ISO 8778:1990)

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4 Dimensional requirements

4.1 Ports shall conform to the dimensions shown in Figure 1 and given in Table 1.

4.2 Stud ends shall conform to the dimensions shown in Figure 2 and given in Table 2. The sealing device is an integral part of the stud end. Examples of sealing types are shown in annex A.

5 Performance requirements

5.1 Rated pressure range

Ports, stud ends and sealing devices shall be designed for use within a rated pressure range from – 0,09 MPa (– 0,9 bar) up to 1,6 MPa (16 bar), unless otherwise specified by the manufacturer because of the requirements of the materials from which the ports, stud ends and sealing devices are made.

It is important to ensure that there is sufficient material around the port to maintain the pressure.

5.2 Rated temperature range

Ports, stud ends and sealing devices shall be designed for use within a rated temperature range from – 20 °C to + 80 °C, unless otherwise specified by the manufacturer because of the requirements of the materials from which the ports, stud ends and sealing devices are made.

5.3 Performance verification

Ports, stud ends and sealing devices shall meet or exceed all of the requirements specified in clause 6.

5.4 Sealing devices

Sealing devices shall be positively retained, reusable and capable of providing long-term performance.

6 Test methods

6.1 General

6.1.1 Basic principles

The tests in clause 6 are type tests to qualify port and stud end design and materials. Type tests are usually conducted only once, but retesting is necessary if there are changes in the material from which the port and stud ends are made. Parts used for any of the specified tests shall not be tested further, used, or returned to stock.

6.1.2 Test fluid

The test fluid for the burst pressure test shall be a liquid, and the test fluid for the cyclic endurance (impulse) test shall be either a neutral gas or a liquid. The test fluid for the leakage test and the long-term creep test shall be a neutral gas.

6.1.3 Temperature

Unless otherwise specified, tests shall be conducted at room temperature (23 °C ± 5 °C).

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6.1.4 Material

6.1.4.1 Testing of ports

The ports to be tested shall be from actual products. Stud ends that are used to test ports shall be made of low-carbon steel or stainless steel, with dimension L_4 at its minimum.

6.1.4.2 Testing of stud ends and sealing devices

The stud ends and sealing devices to be tested shall be from actual products. Test blocks that contain the test ports shall be made from low-carbon steel or stainless steel.

6.1.5 Thread lubrication

For testing only, threads and contact surfaces shall be lubricated with hydraulic oil that has a viscosity of VG 32 in accordance with ISO 3448 prior to the application of torque, in order to test correctly the maximum clamp loading.

6.2 Burst pressure test

6.2.1 Principle

Test three samples to confirm that ports, stud ends and sealing devices meet or exceed a ratio of 5:1 between the burst pressure and maximum rated pressure.

6.2.2 Material and torque requirements

6.2.2.1 Testing of stud ends

Test stud ends from actual products in the test block ports (as described in 6.1.4.2) at the torque value given in Table 3.

6.2.2.2 Testing of ports

Test ports from actual products with test stud ends (as described in 6.1.4.1) at twice the torque value given in Table 3.

6.2.3 Procedure and pressure rise rate

Apply torque. Increase the pressure at a constant rate so as to reach the specified test pressure within a time period of 3 s to 15 s. Once the specified test pressure has been reached, hold this pressure level for a period of at least 2 min.

6.2.4 Pass/fail criteria

No cracks, fractures or separation of the stud end from the port shall appear.

6.3 Leakage test

6.3.1 Principle

Test three stud end samples at minimum torque to confirm that they do not leak after the application of 1,5 times the maximum rated pressure for a period of 2 min. It is not necessary to submit ports to the leakage test.

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6.3.2 Material and torque requirements

Test stud ends from actual products in the test block ports (as described in 6.1.4.2) at the minimum torque values specified by the connector manufacturer.

6.3.3 Procedure

Apply a pressure equal to 1,5 times the maximum rated pressure for a period of 2 min.

6.3.4 Pass/fail criteria

Leakage shall not occur during the application of pressure.

6.4 Cyclic endurance (impulse) test

6.4.1 Principle

Test 10 samples to confirm that they do not exceed the allowed amount of leakage after the application of the specified maximum rated pressure within a tolerance of $^{+20}_{0}\,\%$ for a minimum of 1 000 000 cycles.

6.4.2 Material and torque requirements

Test samples shall be as specified in 6.1.4 and shall consist of 10 samples of actual ports with test stud ends (as described in 6.1.4.1) and 10 samples of actual stud ends in the test block ports (as described in 6.1.4.2). Stud ends shall be tested at the torque value given in Table 3 and ports at twice the torque value given in Table 3.

6.4.3 Procedure and pressure impulse cycle

Submit each sample first to a pressure impulse cycle that meets the wave pattern shown in Figure 3 for 1 000 000 cycles and then to a leakage test (see 6.3).

6.4.4 Pass/fail criteria

After testing, each sample shall pass the leakage test, and the leakage rate of each sample shall not exceed 1 cm^3/min (ANR) (see ISO 8778) at the maximum rated pressure when tested with a neutral gas.

6.5 Overtorque capability test

6.5.1 Principle

Test three samples each of the port and the stud end to confirm that no severe deformation occurs because of the application of torque.

6.5.2 Material and torque requirements

6.5.2.1 Stud ends

Test stud ends from actual products in the test block ports (as described in 6.1.4.2) at the torque value given in Table 3.

6.5.2.2 Ports

Test ports from actual products with test stud ends (as described in 6.1.4.1) after application of twice the torque value given in Table 3.

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6.5.3 Procedure

Apply torque. The port test block or the actual tested product shall be restrained during the test, and the wrench shall be located at the hex of the stud end or the hex of the connector.

6.5.4 Pass/fail criteria

Any visible crack or severe deformation that would render the port or stud end unusable shall be considered a failure.

6.6 Long-term creep test

6.6.1 Principle

Test six samples of stud ends from an actual product in the test block ports (as described in 6.1.4.2) to confirm that they do not exceed the allowed amount of leakage after the torque is applied and stud ends are subjected to the maximum rated pressure and the maximum rated temperature for a given time. It is not necessary to subject ports that are made from metal to this test.

6.6.2 Material and torque requirements

For testing of ports and/or stud ends for long-term creep, the materials and test torques specified in 6.5.2 shall be used.

6.6.3 Procedure

Apply torque. The assemblies shall then be held (aged) at the maximum rated pressure and maximum rated temperature of the product for 1 000 h.

6.6.4 Pass/fail criteria

After the test, the leakage rate shall not exceed 1 cm^3/min (ANR) when the stud end is pressurized to 1,5 times the rated pressure at room temperature (23 °C ± 5 °C).

7 Designation

Ports and stud ends conforming to this International Standard shall be designated by

a) the word(s) "Port" or "Stud end";

b) reference to this International Standard (ISO 16030);

c) thread size (dimension d_1 from Table 1 or 2);

d) any adjustment to the temperature range specified in 5.2, in parentheses (if applicable).

EXAMPLES **Port ISO 16030 - M7**

Stud end ISO 16030 - G 1/8

Stud end ISO 16030 - G 1 (– 40 °C/+ 50 °C)

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8 **Identification statement** (reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Ports and/or stud ends conform to ISO 16030:2001, *Pneumatic fluid power — Connections — Ports and stud ends.*"

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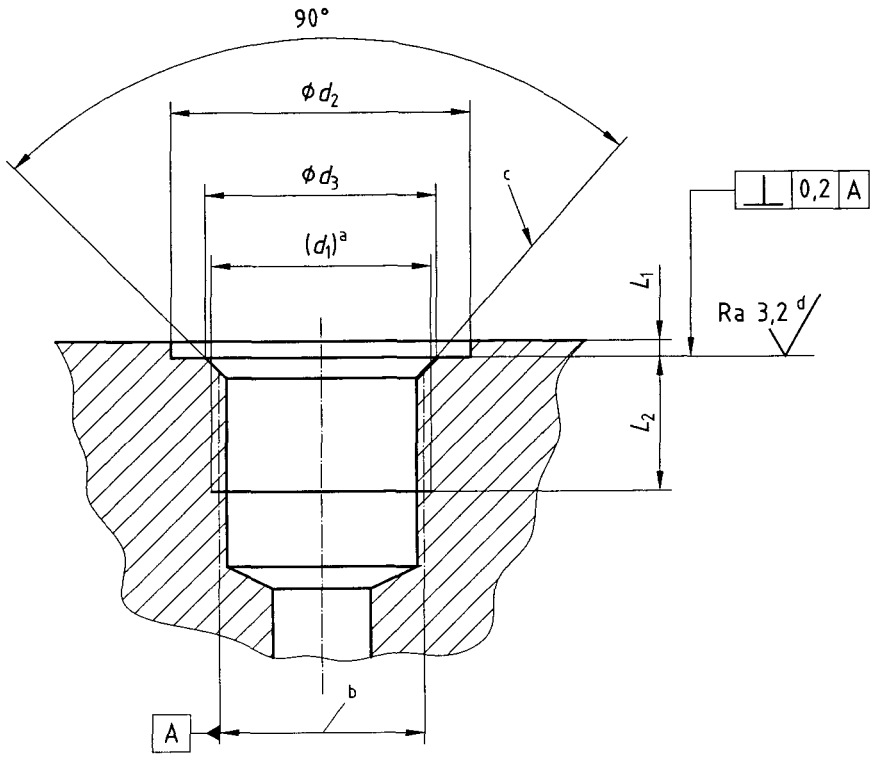
Dimensions in millimetres
Surface roughness in micrometres



a Thread

b Pitch diameter

c No burrs or radial scratches are allowed on this surface.

d This value applies when the surface shows concentric grooves, otherwise Ra 2,4 µm.

Figure 1 — Port

Table 1 — Port dimensions

Dimensions in millimetres

Thread[a] (d_1)	d_2	d_3		L_1	L_2
	min.	nom.	tol.	max.	min.
M3	7	3,1	$^{+0,3}_{0}$	0,5	4
M5	9	5,1		0,5	4,5
M7	12	7,1		0,5	6
G 1/8	15	9,8	$^{+0,4}_{0}$	0,5	6
G 1/4	19	13,3		1	7
G 3/8	23	16,8		1	8
G 1/2	27	21		1	9,5
G 3/4	33	26,5		1	11
G 1	40	33,4		1	12
G 1 1/4	50	42,1	$^{+0,5}_{0}$	2	17
G 1 1/2	56	48		2	18
G 2	69	60		2	20

[a] Metric threads M3 to M7 shall conform to ISO 261 and pipe threads G 1/8 to G 2 shall conform to ISO 228-1.

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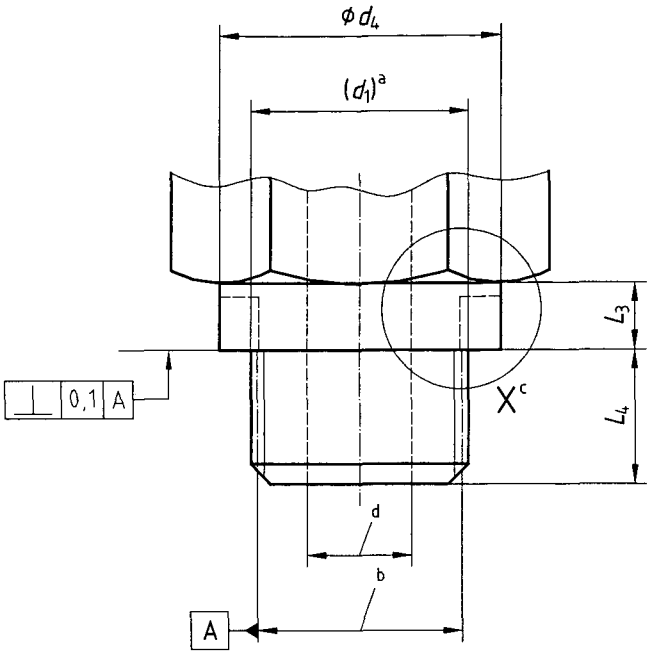
Dimensions in millimetres



a Thread

b Pitch diameter

c Manufacturer's option. See annex A for examples of sealing.

d Size and shape of through hole depends on material and design.

Figure 2 — Stud end

Table 2 — Stud end dimensions

Dimensions in millimetres

Thread[a] (d_1)	d_4 max.	L_3 min.	L_4 nom.	L_4 tol.
M3	6,5	1	3,5	$^{0}_{-0,5}$
M5	8,5	1	4	$^{0}_{-0,8}$
M7	11,5	1	5,5	$^{0}_{-1}$
G 1/8 B	14,5	1	5,5	$^{0}_{-0,9}$
G 1/4 B	18,5	1,5	6,5	$^{0}_{-1,3}$
G 3/8 B	22,5	1,5	7,5	
G 1/2 B	26,5	1,5	9	$^{0}_{-1,8}$
G 3/4 B	32,5	1,5	10,5	
G 1 B	39	1,5	11,5	$^{0}_{-2,3}$
G 1 1/4 B	49	2,5	16,5	
G 1 1/2 B	55	2,5	17,5	
G 2 B	68	2,5	19,5	

a Metric threads M3 to M7 shall conform to ISO 261 and pipe threads G 1/8 to G 2 shall conform to ISO 228-1.

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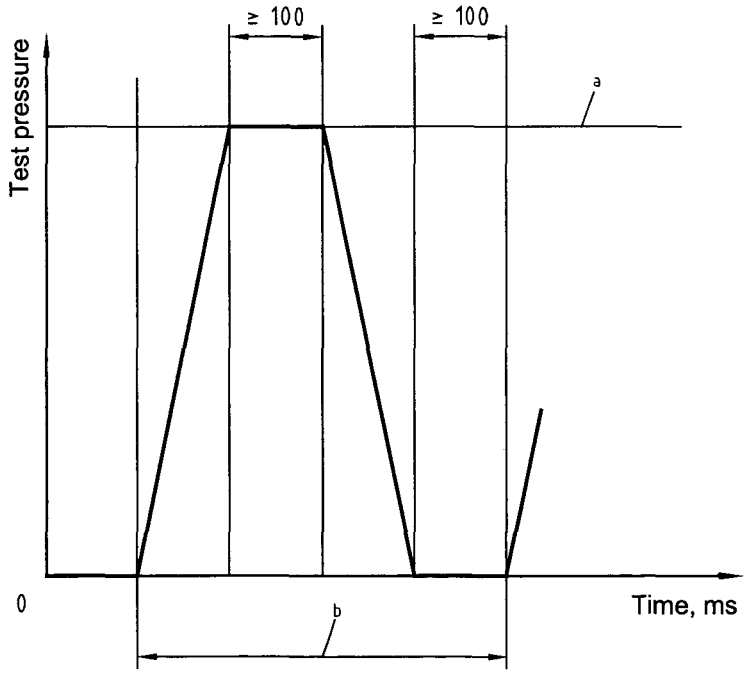
Table 3 — Torques for stud end qualification tests

Thread (d_1)	Torque N·m ± 5 %
M3	0,3
M5	0,8
M7	2
G 1/8	3
G 1/4	6
G 3/8	10
G 1/2	15
G 3/4	22
G 1	35
G 1 1/4	85
G 1 1/2	110
G 2	180



a Maximum rated pressure $^{+20\ \%}_{0}$

b One complete cycle

Figure 3 — Pressure impulse cycle waveform for cyclic endurance (impulse) test

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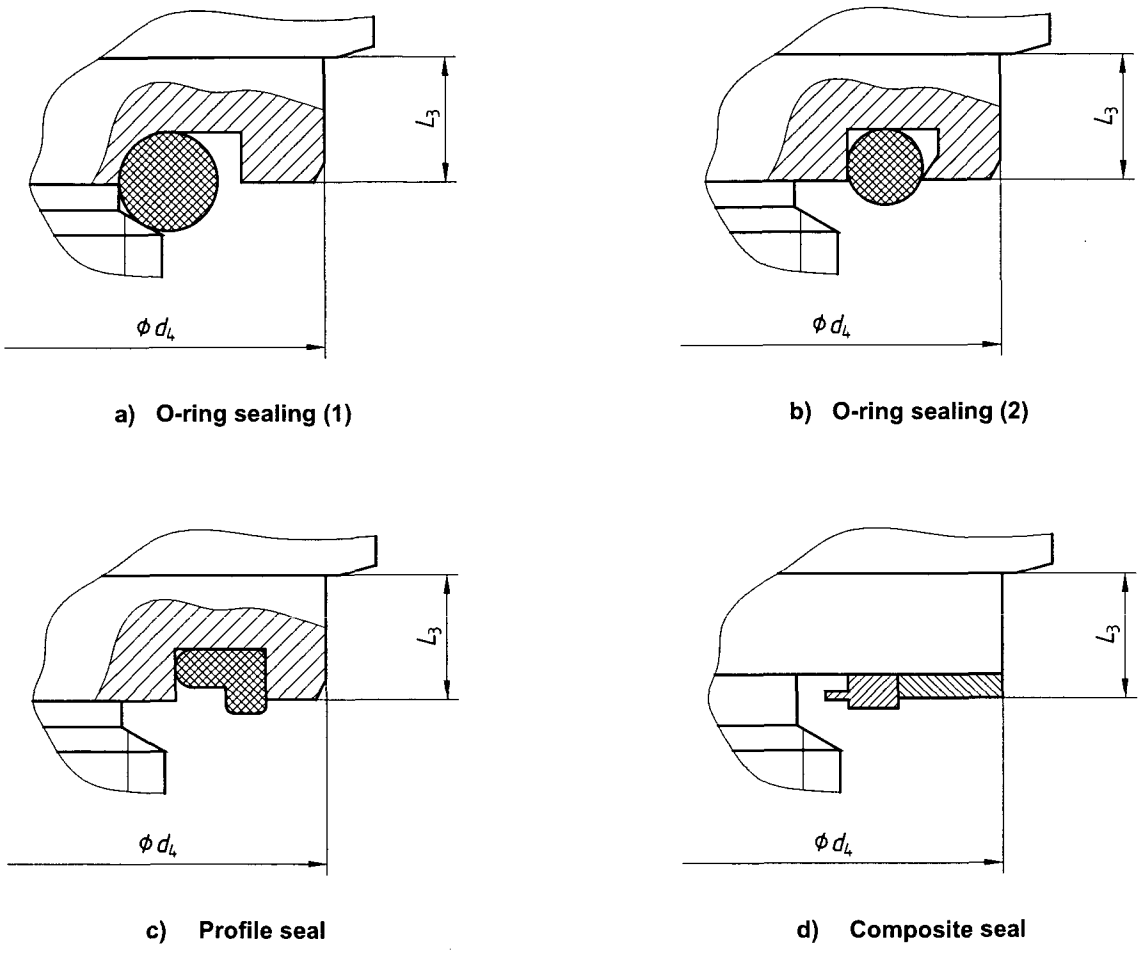
Annex A
(informative)

Examples of sealing methods

See Figure A.1.



a) **O-ring sealing (1)**

b) **O-ring sealing (2)**

c) **Profile seal**

d) **Composite seal**

Figure A.1 — Examples of sealing methods (see detail X in Figure 2)

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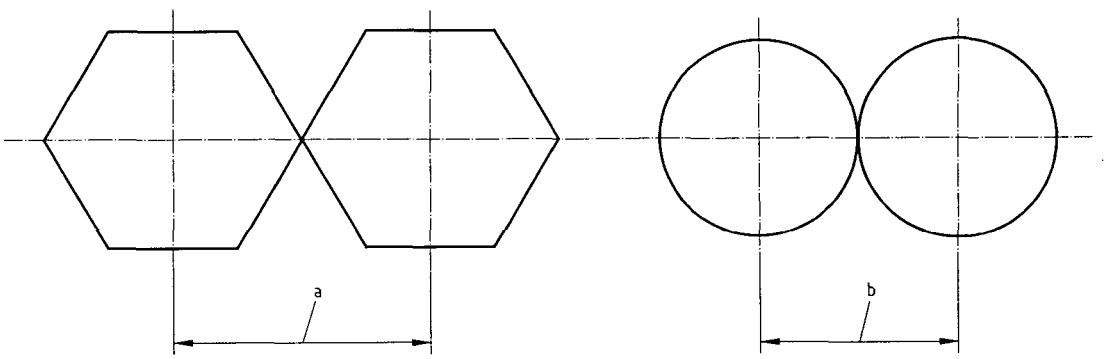
Annex B
(informative)

Distances between centrelines of ISO 16030 ports

B.1 The minimum distance between port centrelines depends upon the connectors intended for use with the ports. Different connectors have different stud end body sizes, tube nut hex dimensions and, in the case of push-in type connectors, collar diameters. Dimensions shown in Figure B.1 and given in Table B.1 were taken from connectors that were commonly available in the marketplace at the time this International Standard was published. The last column, titled "Minimum distance between port centrelines", represents the minimum dimension that will accommodate the largest sizes of connectors that were commonly available in the marketplace at the time this International Standard was published and should accommodate most applications. However, smaller distances between port centrelines may be possible by using smaller or special connectors.

B.2 For additional information about push-in connectors for thermoplastic tubing, see ISO 14743.



a Width across corners of nut or stud end body

b Diameter of connector collar

Figure B.1 — Illustration of widths across corners of nuts or stud end bodies and diameters of connector collars

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Table B.1 — Typical distances between centrelines of ISO 16030 ports and related information

Dimensions in millimetres

Thread (d_1)	Tube sizes	Ferrule type stud ends				Push-in connector stud ends			Min. distance between port centrelines
		Range of tube nut hex widths across flats	Max. tube nut width across corners	Range of stud end body hex widths across flats	Max. stud end body width across corners	Range of stud end body hex widths across flats	Max. stud end body width across corners	Max. diameter of connector collar	
M3	3	—	—	4,5	5,2	5,5 to 7	8,08	8	**8,1**
	4	—	—	4,5	5,2	7,9 to 9,5	10,97	14,9	**14,9**
M5	3	—	—	7	8,08	6,5 to 8	9,24	8	**9,3**
	4	8 to 10	11,55	7 to 8	9,24	8 to 12	13,86	14,9	**14,9**
	6	12	13,86	10	11,55	10 to 14	16,17	16,9	**16,9**
M7	4	—	—	—	—	—	—	14,9	**14,9**
	6	—	—	—	—	—	—	16,9	**16,9**
G 1/8	4	8 to 11	12,71	13 to 14	16,17	13 to 14	16,17	14,9	**16,2**
	6	11 to 14	16,17	13 to 14	16,17	13 to 14	16,17	16,9	**16,9**
	8	14 to 17	19,64	13 to 14	16,17	14	16,17	18,9	**19,7**
	10	19	21,95	13 to 17	19,64	—	—	—	**22**
G 1/4	4	—	—	—	—	14 to 16	18,48	14,9	**18,5**
	6	12 to 14	16,17	14 to 19	21,95	16 to 17	19,64	16,9	**22**
	8	13 to 17	19,64	17 to 19	21,95	16 to 17	19,64	18,9	**22**
	10	17 to 19	21,95	17 to 19	21,95	17 to 19	21,95	23,5	**23,5**
	12	19 to 22	25,41	17 to 19	21,95	19 to 22	25,41	25,4	**25,4**
G 3/8	6	14	16,17	19 to 22	25,41	—	—	—	**25,4**
	8	14 to 17	19,64	19 to 22	25,41	19 to 22	25,41	18,9	**25,4**
	10	19	21,95	19 to 22	25,41	19 to 22	25,41	23,5	**25,4**
	12	19 to 22	25,41	19 to 22	25,41	20 to 22	25,41	25,4	**25,4**
	14	—	—	—	—	22 to 24	27,72	27,4	**27,7**
	15	24 to 27	31,19	24	27,72	—	—	—	**27,7**
	16	24 to 27	31,19	24	27,72	22 to 24	27,72	24	**27,7**
	18	32	36,96	27	31,19	—	—	—	**37**
G 1/2	6	14	16,17	27	31,19	—	—	—	**31,2**
	8	17	19,64	27	31,19	—	—	—	**31,2**
	10	19	21,95	27	31,19	24 to 27	31,19	23,5	**31,2**
	12	22	25,41	27	31,19	24 to 27	31,19	25,4	**31,2**
	14	—	—	—	—	24 to 27	31,19	27,4	**31,2**
	15	27	31,19	27	31,19	—	—	—	**31,2**
	16	24 to 27	31,19	24 to 27	31,19	24 to 27	31,19	31,1	**31,2**
	18	32	36,96	27	31,19	—	—	—	**37**
	22	36	41,58	32	36,96	—	—	—	**41,6**
G 3/4	12	22	25,41	32	36,96	—	—	—	**37**
	15	27	31,19	32	36,96	—	—	—	**37**
	18	32	36,96	32	36,96	—	—	—	**37**
	22	36	41,58	32	36,96	—	—	—	**41,6**
	28	41	47,36	41	47,36	—	—	—	**47,4**
G 1	22	36	41,58	41	47,36	—	—	—	**47,4**
	28	41	47,36	41	47,36	—	—	—	**47,4**
	35	50	57,75	46	53,13	—	—	—	**57,8**
	42	60	69,3	55	63,53	—	—	—	**69,3**
G 1 1/4	28	41	47,36	50	57,75	—	—	—	**57,8**
	35	50	57,75	50	57,75	—	—	—	**57,8**
	42	60	69,3	55	63,53	—	—	—	**69,3**
G 1 1/2	35	50	57,75	55	63,53	—	—	—	**63,5**
	42	60	69,3	55	63,53	—	—	—	**69,3**
G2	—	—	—	70	80,85	—	—	—	**80,9**

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3) Under preparation.

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