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Second edition
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Pneumatic fluid power — Connections — Ports and stud ends

Transmissions pneumatiques — Raccordements — Orifices et éléments mâles

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 16030:2001), which has been technically revised.

The main changes are as follows:

— clarification of the scope regarding the use of ISO 16030 and ISO 1179 (all parts);

— update of cycles number (from 1 000 000 to 200 000) in 6.4;

— update of values in Table B.1.

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

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 (e.g. ISO 7-1 and ISO 1179 (all parts)) have been used in pneumatic fluid power systems. See the scope of this document for further information on the relationship between those standards and this document.

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 (all parts).

Pneumatic fluid power — Connections — Ports and stud ends

1 Scope

This document specifies dimensions and performance requirements for ports and stud ends with parallel threads (G series thread) 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).

This document is applicable for threaded ports and stud ends specified in new designs in pneumatic fluid power applications.

WARNING — Ports and stud ends conforming to this document are not intended to connect with ports and stud ends that conform to ISO 1179 (all parts) or threads that conform to ISO 7-1.

As shown in Figure 1, significant differences in thread depth exists between ISO 16030 requirement and ISO 1179-1 (Δ1 and Δ2) that makes ports and stud ends conforming to ISO 7-1 unsuitable.

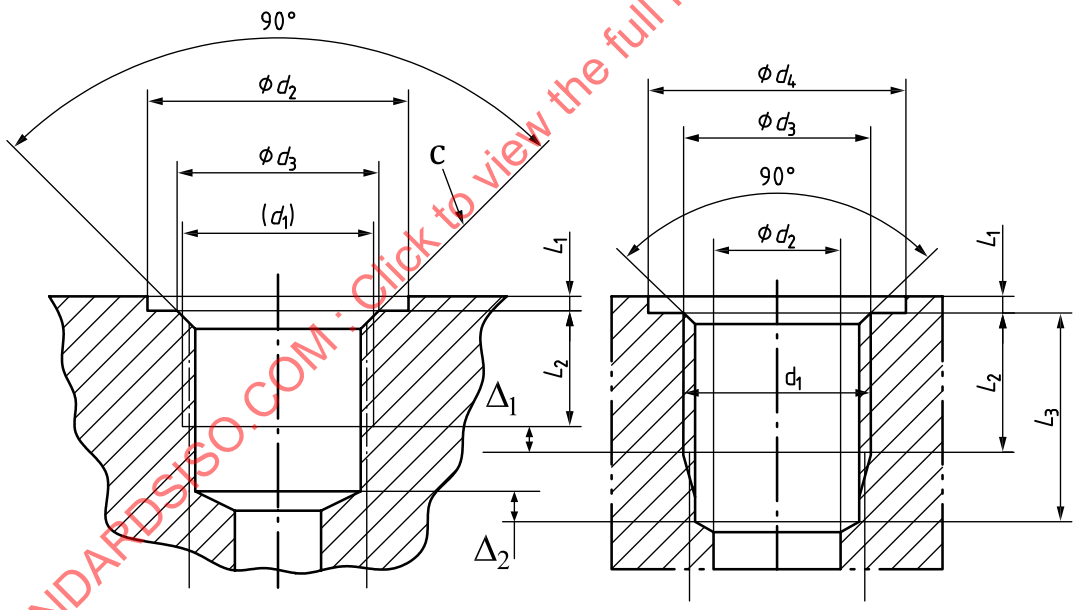


Figure 1 — Different thread depths requirements between ISO 16030 and ISO 1179-1

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 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*

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

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

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and the following 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/

3.1
collar
raised portion of a coupling nipple that functions as a connection for a ferrule or other locking device or functions as a hose stop

[SOURCE: ISO 8330:2014, 2.2.9.2]

4 Dimensional requirements

4.1 Ports shall conform to the dimensions shown in Figure 2 and given in Table 1. Examples of distances between centrelines of ISO 16030 ports are provided in Annex B.

4.2 Stud ends shall conform to the dimensions shown in Figure 3 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).

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 tests

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.

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 200 000 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 4 for 200 000 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) in accordance with 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.

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 document shall be designated by

a) the word(s) “Port” or “Stud end”;

b) reference to this document (i.e. ISO 16030);

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

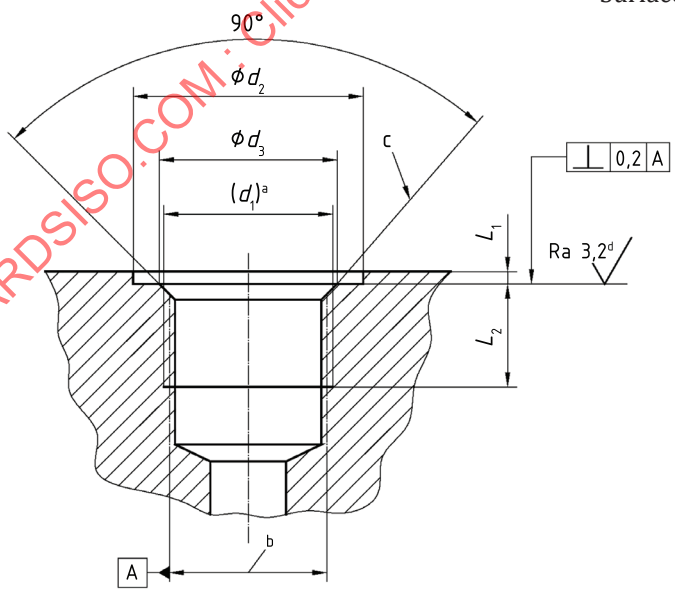
Stud end ISO 16030 - G 1 (–40 °C/+50 °C)

8 Identification statement — Reference to this document

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

”Ports and/or stud ends conform to ISO 16030:2021, *Pneumatic fluid power — Connections — Ports and stud ends*.”

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 2 — Port

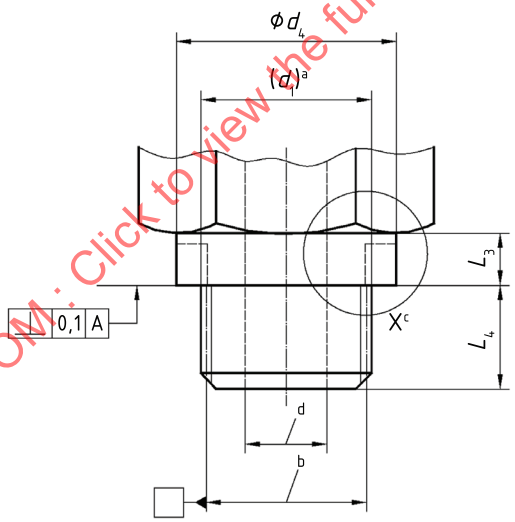
Table 1 — Port dimensions

Dimensions in millimetres

Thread[a] d_1	d_2 min.	d_3 nom.	d_3 tol.	L_1 max.	L_2 min.
M3	7	3,1	$^{+0,3}_{0}$	0,5	3,5
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.

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 3 — Stud end

Table 2 — Stud end dimensions

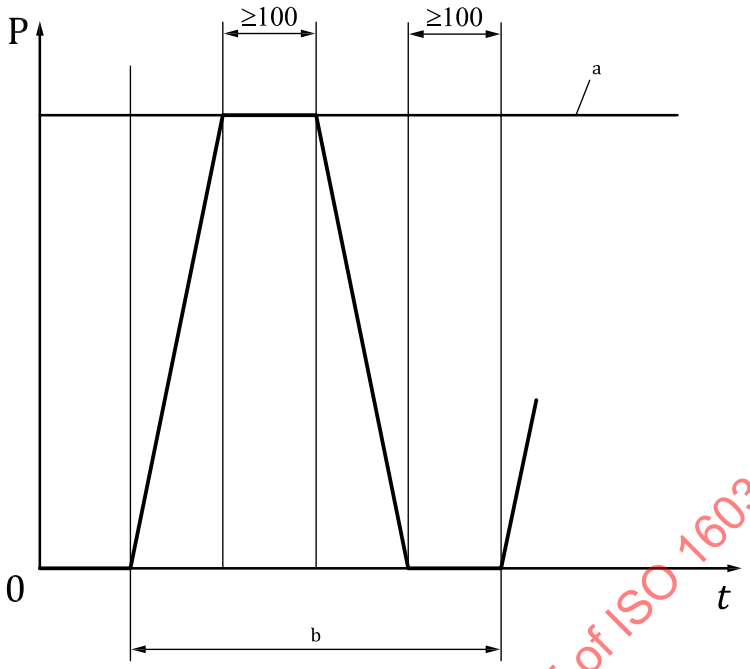
Dimensions in millimetres

Thread[a] d_1	d_4 max.	L_3 min.	L_4 nom.	L_4 tol.
M3	6,5	1	3	$^{0}_{-0,5}$
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.

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



Key

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

b One complete cycle.

t time, ms

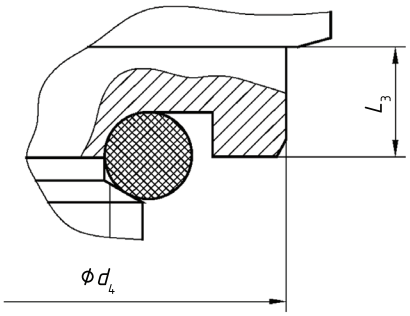
P test pressure

Figure 4 — Pressure impulse cycle waveform for cyclic endurance (impulse) test

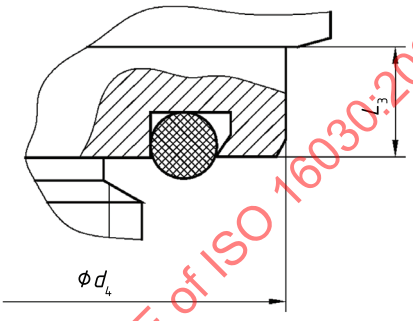
Annex A
(informative)

Examples of the sealing method

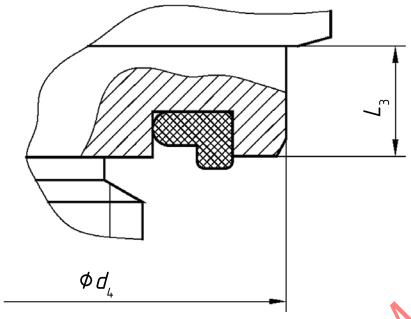
See Figure A.1.



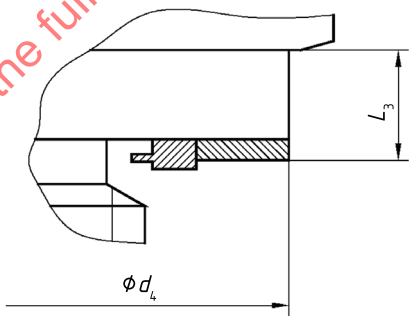
a) O-ring sealing with groove configuration (1)



b) O-ring sealing with groove configuration (2)



c) Profile seal



d) Composite seal

NOTE See details dimensions in Figure 3.

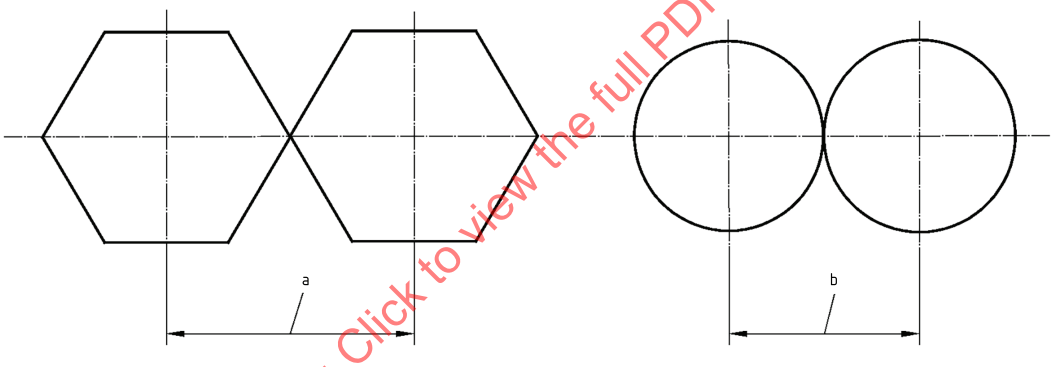
Figure A.1 — Examples of sealing methods

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 document 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 document was published and should accommodate most applications. However, smaller distances between port centrelines can 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