



**International
Standard**

ISO 13948-2

**Diesel engines — Fuel injection
pumps and fuel injector low-
pressure connections —**

**Part 2:
Non-threaded (push-on)
connections**

*Moteurs diesels — Raccords basse pression pour pompes
d'injection de combustible et porte-injecteurs de combustible
complets —*

Partie 2: Raccords non filetés (à pression)

**Fourth edition
2024-08**

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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 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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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 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain and powertrain fluids*.

This fourth edition cancels and replaces the third edition (ISO 13948-2:2016), which has been technically revised.

The main changes are as follows:

- dimensional tolerances on forming parts were optimized;
- language inclusivity was improved.

A list of all parts in the ISO 13948 series can be found on the ISO website.

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

There is a large variety of low-pressure connections on fuel injection equipment. These connections use different sealing principles and designs. This document specifies a common set of preferred types.

The ISO 13948 series is divided into two parts. ISO 13948-1 covers threaded connections. This document covers non-threaded (push-on) connections for use with low-pressure fuel supply and return, boost air pressure and lubricating oil supply and return.

Low-pressure connections to fuel filters are covered in ISO 7310, ISO 7311 and ISO 7654. High-pressure end-connections for pumps and injectors are covered in ISO 2974 and ISO 13296.

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Diesel engines — Fuel injection pumps and fuel injector low-pressure connections —

Part 2: Non-threaded (push-on) connections

1 Scope

This document specifies requirements for the connection ends of push-on connections used with fuel injection equipment.

Three types of push-on connections (types A, B and C) are described in this document.

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 21920-3, *Geometrical product specifications (GPS) — Surface texture: Profile — Part 3: Specification operators*

3 Terms and definitions

No terms and definitions are listed in this document.

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/>

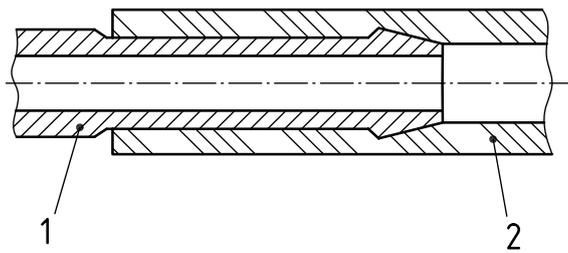
4 Connection designs and applications

4.1 Type A: Nipple connections

[Figure 1](#) gives an example of a nipple connection.

This design is intended for use directly with the mating hose ([Figure 1](#), label 2) or in conjunction with a retaining clip around the hose (not shown) for a more secure connection.

The nipple ([Figure 1](#), label 1) can be machined (see [Figure 4](#)), formed (see [Figure 5](#) and [Figure 6](#)) or moulded (see [Figure 7](#)).



Key

- 1 nipple
- 2 hose

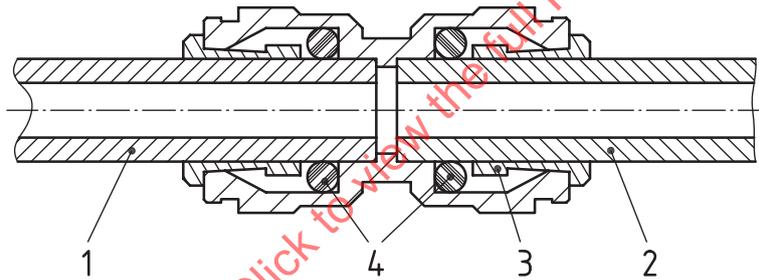
Figure 1 — Type A connection (principle)

4.2 Type B: Stand pipe connections

Figure 2 gives an example of a stand pipe connection.

This design is used in conjunction with proprietary push-on connections (Figure 2, label 3) attached to the mating hose (Figure 2, label 2) that seals by compressing ring seals (Figure 2, label 4) around the outside diameters of the stand pipe (Figure 2, label 1) and of the mating hose.

An identification may be applied to indicate to the user that the hose is fully engaged (see Figure 10).



Key

- 1 stand pipe
- 2 hose
- 3 push-on connection
- 4 ring seals

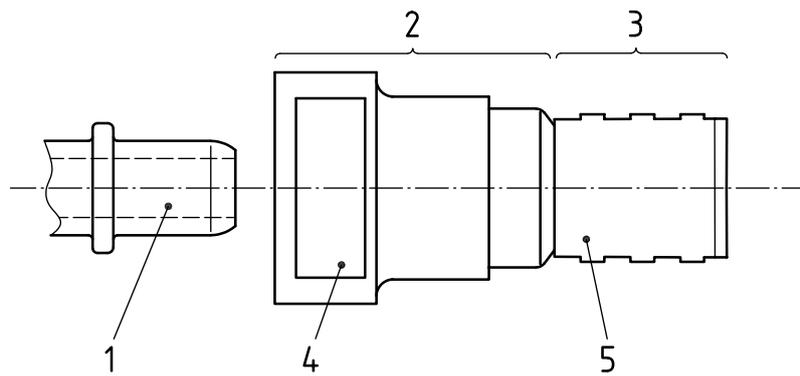
Figure 2 — Type B connection (principle)

4.3 Type C: Quick connector coupling connections

Figure 3 gives an example of a quick connector coupling connection. Type C connections are specified in Reference [7].

This design is used in conjunction with proprietary push-on quick connector couplings attached to the mating plug tube end form. The quick connector coupling contains one or more O-ring seals to seal along the outer surface of the plug tube end, and a latching device to engage with the collar diameter feature.

The plug tube end form is shown in Figure 11 and the dimensions are defined in Table 4 and Table 5.



Key

- 1 plug tube end
- 2 socket end
- 3 stem
- 4 quick connector coupling
- 5 section of hose or tube

Figure 3 — Type C connection (principle)

5 Dimensions and surface quality

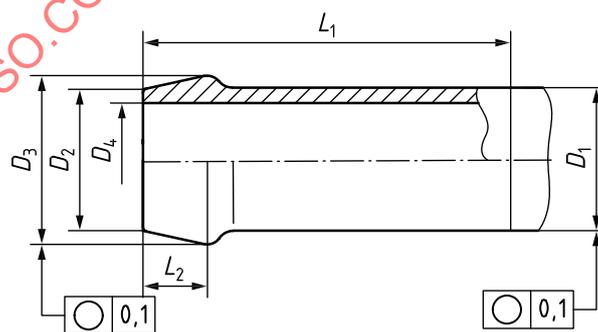
5.1 Type A connection ends

5.1.1 Nipple types

5.1.1.1 Nipple, machined, type A.1

See [Figure 4](#) for an example of a type A.1 connection.

See [Table 1](#) for the parameters.



Dimensions in millimetres

Figure 4 — Nipple, type A.1

5.1.1.2 Nipple, formed, type A.2

5.1.1.2.1 Nipple, bulge, type A.2.1

See [Figure 5](#) for an example of a type A.2.1 connection

See [Table 1](#) for the parameters.

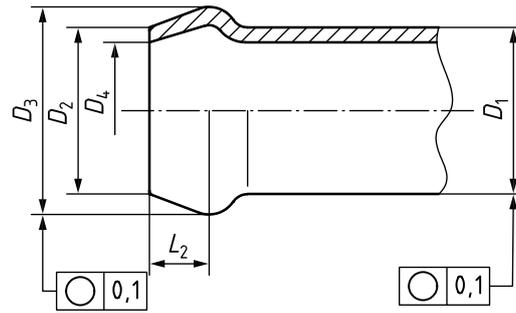


Figure 5 — Nipple, type A.2.1

5.1.1.2.2 Nipple, bulge and spool type, A.2.2

See [Figure 6](#) for an example of a type A.2.2 connection.

See [Table 1](#) for the parameters.

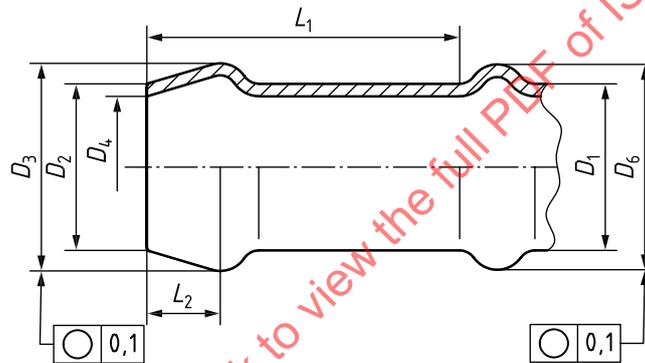
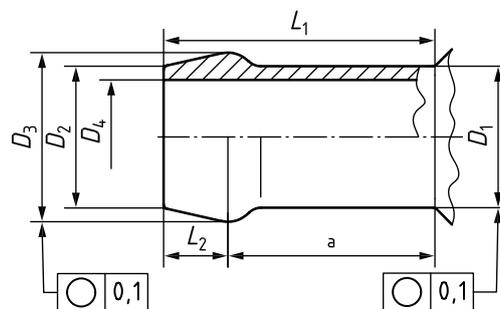


Figure 6 — Nipple, type A.2.2

5.1.1.3 Nipple, moulded, type A.3

See [Figure 7](#) for an example of a type A.3 connection.

See [Table 1](#) for the parameters.



NOTE Within area "a", the moulded joint misalignment or moulded joint parting height is 0,05 mm maximum.

Figure 7 — Nipple, type A.3

5.1.2 Basic dimensions and tolerances

See [Table 1](#) for dimensions and tolerances for nipples, type A connection.

Table 1 — Basic dimensions and tolerances for nipples, types A

Dimensions in millimetres

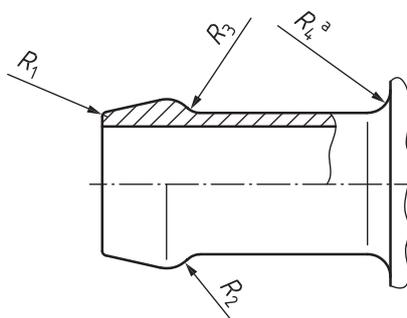
Type	L_1 nominal	L_2	D_1	D_2	D_3	D_4 maximum	D_6 minimum
A.1 (machined)	20 to 24	$3,2 \pm 0,5$	$\emptyset 12,1 \pm 0,1$	$\emptyset 11,3 \pm 0,2$	$\emptyset 13,3 \pm 0,1$	$\emptyset 10$	—
		$3,2 \pm 0,5$	$\emptyset 10,1 \pm 0,1$	$\emptyset 9,3 \pm 0,2$	$\emptyset 11,1 \pm 0,1$	$\emptyset 8$	—
		$3,2 \pm 0,5$	$\emptyset 8,1 \pm 0,1$	$\emptyset 7,3 \pm 0,2$	$\emptyset 9,1 \pm 0,1$	$\emptyset 6$	—
	16	$2,8 \pm 0,5$	$\emptyset 6,35 \pm 0,1$	$\emptyset 6,2 \pm 0,2$	$\emptyset 7,4 \pm 0,1$	— ^a	—
	12	$2,2 \pm 0,5$	$\emptyset 4,0 \pm 0,1$	$\emptyset 3,8 \pm 0,2$	$\emptyset 5 \pm 0,1$	$\emptyset 2,6$	—
A.2.1 (formed) bulge type	—	$3,2 \pm 0,5$	$\emptyset 12,1 \pm 0,1$	$\emptyset 11,3 \pm 0,2$	$\emptyset 13,3 \pm 0,3$	$\emptyset 10,2$	—
		$3,2 \pm 0,5$	$\emptyset 10,1 \pm 0,1$	$\emptyset 9,3 \pm 0,2$	$\emptyset 11,1 \pm 0,3$	$\emptyset 8,2$	—
		$3,2 \pm 0,5$	$\emptyset 8,1 \pm 0,1$	$\emptyset 7,3 \pm 0,2$	$\emptyset 9,1 \pm 0,3$	$\emptyset 6,2$	—
		$2,8 \pm 0,5$	$\emptyset 6,35 \pm 0,1$	$\emptyset 6,1 \pm 0,2$	$\emptyset 7,4 \pm 0,3$	$\emptyset 5$	—
		$2,2 \pm 0,5$	$\emptyset 4,76 \pm 0,1$	$\emptyset 4,6 \pm 0,2$	$\emptyset 5,6 \pm 0,3$	$\emptyset 3,5$	—
A.2.2 (formed) bulge and spool type	20 to 24	$3,2 \pm 0,5$	$\emptyset 12,1 \pm 0,1$	$\emptyset 11,3 \pm 0,2$	$\emptyset 13,3 \pm 0,3$	$\emptyset 10,2$	$\emptyset 13,2$
		$3,2 \pm 0,5$	$\emptyset 10,1 \pm 0,1$	$\emptyset 9,3 \pm 0,2$	$\emptyset 11,1 \pm 0,3$	$\emptyset 8,2$	$\emptyset 11,2$
		$3,2 \pm 0,5$	$\emptyset 8,1 \pm 0,1$	$\emptyset 7,3 \pm 0,2$	$\emptyset 9,1 \pm 0,3$	$\emptyset 6,2$	$\emptyset 9$
	28	$2,8 \pm 0,5$	$\emptyset 6,35 \pm 0,1$	$\emptyset 6,1 \pm 0,2$	$\emptyset 7,4 \pm 0,3$	$\emptyset 5$	$\emptyset 7,1$
	28	$2,2 \pm 0,5$	$\emptyset 4,76 \pm 0,1$	$\emptyset 4,6 \pm 0,2$	$\emptyset 5,6 \pm 0,3$	$\emptyset 3,5$	$\emptyset 5,3$
A.3 (moulded)	20 to 24	$3,2 \pm 0,5$	$\emptyset 12,1 \pm 0,1$	$\emptyset 11,3 \pm 0,2$	$\emptyset 13,3 \pm 0,1$	$\emptyset 9,2$	—
		$3,2 \pm 0,5$	$\emptyset 10,1 \pm 0,1$	$\emptyset 9,3 \pm 0,2$	$\emptyset 11,1 \pm 0,1$	$\emptyset 7,2$	—
		$3,2 \pm 0,5$	$\emptyset 8,1 \pm 0,1$	$\emptyset 7,3 \pm 0,2$	$\emptyset 9,1 \pm 0,1$	$\emptyset 5,2$	—
	16	$2,8 \pm 0,5$	$\emptyset 6,35 \pm 0,1$	$\emptyset 6,2 \pm 0,2$	$\emptyset 7,4 \pm 0,1$	— ^a	—
	12	$2,2 \pm 0,5$	$\emptyset 4,0 \pm 0,1$	$\emptyset 3,8 \pm 0,2$	$\emptyset 5 \pm 0,1$	$\emptyset 2,6$	—

^a Bore size specified by manufacturer.

5.1.3 Radii

See [Figure 8](#) for positions of the nipple radii.

See [Table 2](#) for dimensions of the nipple radii.



Key

^a Only for moulded nipples.

Figure 8 — Nipple radii

Table 2 — Dimensions of radii for nipples, types A

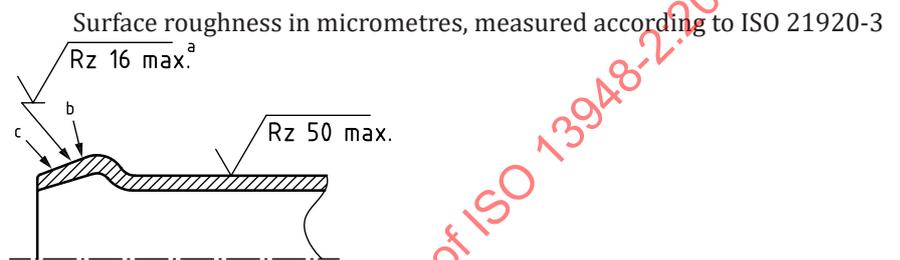
Dimensions in millimetres

Nipple type	R_1 minimum	R_2 nominal	R_3 nominal	R_4^a minimum
Machined	0,2	1 to 1,5	0,5 to 1	—
Formed	0,2	1 to 1,5	0,5 to 1	—
Moulded	0,2	1 to 1,5	—	1

^a Only for moulded nipples.

5.1.4 Surface quality

The outside surface quality requirements (roughness and imperfections) are given in [Figure 9](#)



Key

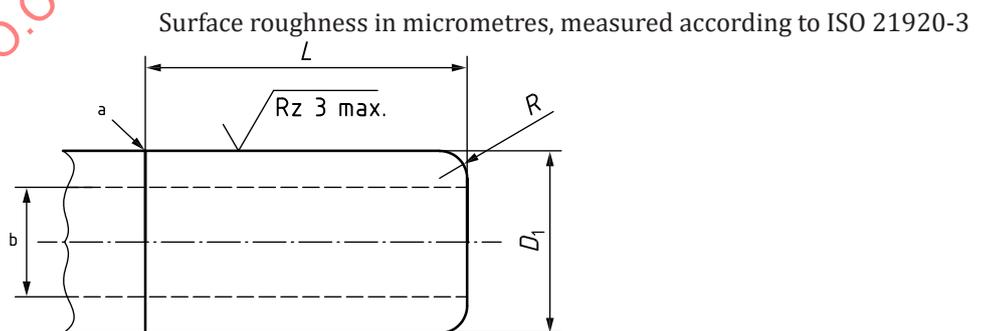
- a Measured lengthwise and crosswise.
- b No longitudinal marks are permitted.
- c Single imperfections with a depth up to 0,05 mm and a length up to 0,5 mm are permitted.

Figure 9 — Outside surface quality requirements

5.2 Type B connection end

See [Figure 10](#) for an example of a type B connection.

See [Table 3](#) for the dimensions.



Key

- a Identification (optional).
- b Bore size specified by manufacturer.

NOTE Materials can be different, for example plastics.

Figure 10 — Stand pipe, type B

Table 3 — Dimensions and tolerances for type B

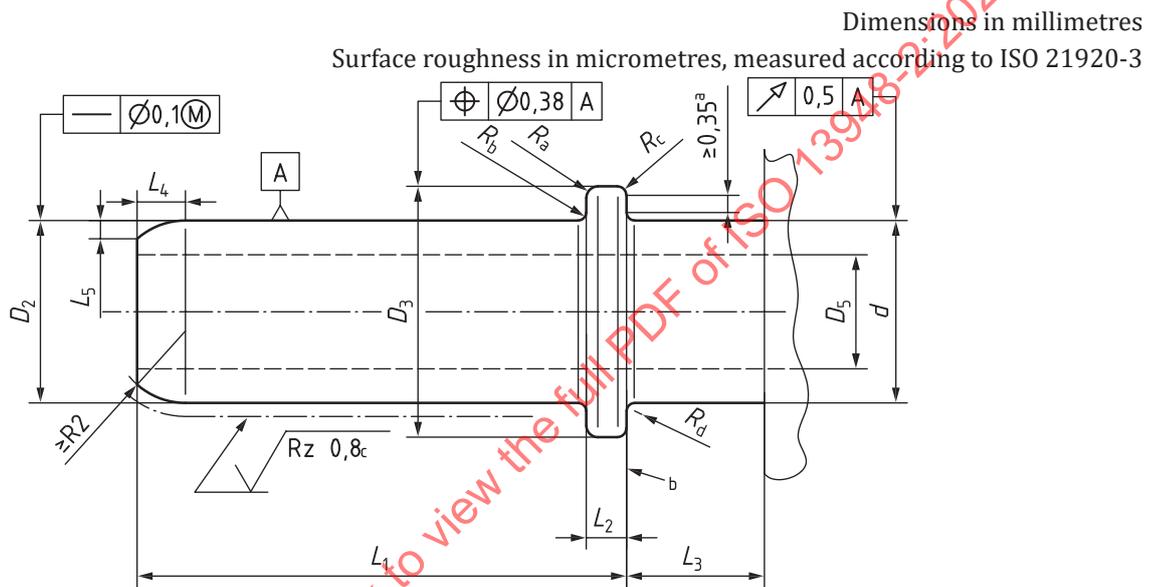
Dimensions in millimetres

D_1	L	R
$\varnothing 8 \pm 0,05$	$28,5 \pm 0,5$	$1,2^{+0,5}_{-0,3}$
$\varnothing 10 \pm 0,05$	$28,5 \pm 0,5$	$1,2^{+0,5}_{-0,3}$

5.3 Type C connection end

See Figure 11 for an example of a type C.

See Table 4 and Table 5 for the parameters.



Key

- d nominal diameter
- D_2 seal diameter
- D_3 collar diameter
- D_5 minimum inner diameter
- L_1 length
- L_2 collar width
- L_3 clearance
- L_4 axial length of the tube end R part
- L_5 radial length of tube end R part
- R_a, R_c natural flow of metal
- R_b, R_d tangent radii
- a Minimum 0,35 mm annular surface perpendicular to tube.
- b Collar to start of bend: see connector drawings for minimum distance.
- c Measure across lay, tool marks or weld seams. No flows to exceed 30 μm Rz.

Figure 11 — Plug tube end

Table 4 — Dimensions and tolerances for type C (except for polyamide-coated end forms)

Dimensions in millimetres except *D* (inch)

<i>D</i> inch	<i>D</i> ₁ ^a nominal	<i>D</i> ₂	<i>D</i> ₃	<i>D</i> ₅ minimum	<i>L</i> ₁	<i>L</i> ₂	<i>L</i> ₃ minimum	<i>R</i> _b maximum	<i>R</i> _d maximum	<i>L</i> ₄	<i>L</i> ₅ minimum
3/16	Ø 4,78	Ø 4,63 ± 0,06	Ø 7,1 ± 0,15	Ø 2,2	19,93 ± 0,25	1,75 ± 0,15	8	0,3	0,25	2 ± 0,20	0,8
1/4	Ø 6,35	Ø 6,3 ± 0,06	Ø 8,75 ± 0,15	Ø 3,6	21,25 ± 0,25	1,6 ± 0,15	7	0,3	0,25	2 ± 0,20	0,9
5/16	Ø 8	Ø 7,89 ± 0,06	Ø 10,98 ± 0,15	Ø 4,7	21,45 ± 0,25	1,6 ± 0,15	6	0,4	0,35	2,1 ± 0,20	0,9
	Ø 8	Ø 8 ± 0,08	Ø 11 ± 0,15	Ø 5	21 ± 0,25	1,75 ± 0,15	6	0,35	0,35	2,1 ± 0,20	0,9
3/8	Ø 9,5	Ø 9,49 ± 0,06	Ø 12,94 ± 0,15	Ø 6,3	21,85 ± 0,25	1,6 ± 0,15	6,5	0,6	0,5	2,1 ± 0,20	1,1
7/16	Ø 10	Ø 9,89 ± 0,06	Ø 13,42 ± 0,2	Ø 6,6	24,95 ± 0,25	1,75 ± 0,20	6	0,6	0,6	2,1 ± 0,20	1,1
	Ø 10	Ø 10 ± 0,08	Ø 13,5 ± 0,2	Ø 6,4	24 ± 0,25	1,75 ± 0,20	6	0,6	0,6	2,1 ± 0,20	1,1
	Ø 12	Ø 11,8 ± 0,08	Ø 16,5 ± 0,25	Ø 7,5	26,62 ± 0,25	2,5 ± 0,20	8	1	0,6	2,2 ± 0,20	1,5
1/2	Ø 12,7	Ø 12,61 ± 0,1	Ø 16,51 ± 0,25	Ø 8,1	26,62 ± 0,25	2,5 ± 0,20	8	0,8	0,6	2,2 ± 0,20	1,5
5/8	Ø 16	Ø 15,82 ± 0,1	Ø 19,18 ± 0,25	Ø 11,1	26,62 ± 0,25	2,5 ± 0,20	8	0,5	0,5	2,2 ± 0,20	1,75
3/4	Ø 19	Ø 18,9 ± 0,1	Ø 22,33 ± 0,25	Ø 13,2	26,62 ± 0,25	2,5 ± 0,20	8	0,5	0,5	2,2 ± 0,20	1,75
57/64	Ø 23	Ø 22,7 ± 0,15	Ø 25,7 ± 0,25	Ø 16	29,5 ± 0,25	2,5 ± 0,20	9,5	0,3	0,3	2,2 ± 0,20	1,75
1	Ø 25,4	Ø 25,5 ± 0,15	Ø 28,2 ± 0,25	Ø 19	29,5 ± 0,25	2,5 ± 0,20	9,5	0,15	0,2	2,2 ± 0,20	1,75

^a Tube diameter (nominal coupling size); not shown in [Figure 11](#).