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Metallic tube connections for fluid power and general use —

Part 6: 60° cone connectors with or without O-ring

Raccords de tubes métalliques pour transmissions hydrauliques et pneumatiques et applications générales —

Partie 6: Raccords coniques à 60° avec ou sans joint torique

ICS 23.100.40

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8434-6 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

ISO 8434 consists of the following parts, under the general title *Metallic tube connections for fluid power and general use*:

- Part 1: 24° cone connectors
- Part 2: 37° flared connectors
- Part 3: O-ring face seal connectors
- Part 4: 24° cone connectors with O-ring weld-on nipples
- Part 6: 60° cone connectors with or without O-ring

This part of ISO 8434 is based on British standard BS 5200. The threads for the 60° cone connection are pipe threads conforming to ISO 228-1.

Introduction

In fluid power systems, power is transmitted and controlled through a fluid (liquid or gas) under pressure within an enclosed circuit. In general applications, a fluid may be conveyed under pressure.

Components may be connected through their ports by connections (connectors) and conductors (tubes and hoses). Tubes are rigid conductors; hoses are flexible conductors.

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Metallic tube connections for fluid power and general use — Part 6: 60° cone connectors with or without O-ring

1 Scope

This part of ISO 8434 specifies general and dimensional requirements for the design and performance of 60° cone connectors and braze-on nipples with or without O-ring sealing, made of steel for tube outside diameters of 6 mm through 50 mm, inclusive, or hose sizes 5 through 51, inclusive. These connectors are for use in fluid power and general applications within the limits of pressure and temperature specified in this part of ISO 8434.

They are intended for the connection of tubes and hose fittings to ports in accordance with ISO 6149-1 and ISO 1179-1 (see ISO 12151-6 for related hose fitting specification).

These connectors provide full-flow connections in hydraulic systems operating to the working pressures shown in Table 1. Because many factors influence the pressure at which a system performs satisfactorily, these values shall not be understood as guaranteed minimums. For every application, it is recommended that sufficient testing be conducted and reviewed by both the user and manufacturer to ensure that required performance levels are met.

NOTE 1 For new designs in hydraulic fluid power applications, see the requirements given in 9.6. Where the requirements of the application allow for the use of elastomeric seals, connector designs that conform to International Standards and incorporate elastomeric sealing are preferred.

NOTE 2 For use under conditions outside the pressure and/or temperature limits specified, see 5.3

2 Normative references

The following referenced documents are indispensable for the application 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 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

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 1179-1¹⁾, *Connections for general use and fluid power — Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing — Part 1: Threaded ports*

ISO 1179-2²⁾, *Connections for general use and fluid power — Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing — Part 2: Heavy-duty (S series) and light-duty (L series) stud ends with elastomeric sealing (type E)*

¹⁾ To be published; revision in part of ISO 1179:1981.

²⁾ To be published; revision in part of ISO 1179:1981.

ISO 1179-3³⁾, *Connections for general use and fluid power — Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing — Part 3: Light-duty (L series) stud ends with sealing by O-ring with retaining ring (types G and H)*

ISO 3304, *Plain end seamless precision steel tubes — Technical conditions for delivery*

ISO 3305, *Plain end welding precision steel tubes — Technical conditions for delivery*

ISO 3601-3, *Fluid power systems — Sealing devices — O-rings — Part 3: Quality acceptance criteria*

ISO 4759-1, *Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C*

ISO 5598⁴⁾, *Fluid power systems and components — Vocabulary*

ISO 6149-3, *Connections for fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing — Part 3: Dimensions, design, test methods and requirements for light-duty (L series) stud ends*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 10763, *Hydraulic fluid power — Plain-end, seamless and welded precision steel tubes — Dimensions and nominal working pressures*

ISO 12151-6⁵⁾, *Connections for hydraulic fluid power and general use — Hose fittings — Part 6: Hose fittings with ISO 8434-6 60 degree cone ends*

ISO 19879, *Metallic tube connections for fluid power and general use — Test methods for hydraulic fluid power connections*

3 Terms and definitions

For the purposes of this part of ISO 8434, the terms and definitions given in ISO 5598 and the following apply.

3.1

fluid power

means whereby energy is transmitted, controlled and distributed using a pressurized fluid as the medium

[ISO 5598]

3.2

connector

leakproof device to connect pipelines (conductors) to one another, or to equipment

[ISO 5598]

3.3

fastening thread

terminal thread of a complete connector

3.4

run

two principal, axially aligned outlets of a tee or cross

³⁾ To be published; revision in part of ISO 1179:1981.

⁴⁾ Under revision.

⁵⁾ To be published.

3.5**branch**

side outlet(s) of a tee or cross

3.6**chamfer**

removal of a conical portion at the entrance of a thread to assist assembly and prevent damage to the start of a thread

3.7**assembly torque**

torque to be applied in order to achieve a satisfactory final assembly

3.8**rated pressure**

pressure, confirmed through testing, at which a component or piping is designed to operate for a number of repetitions sufficient to assure adequate service life.

[ISO/DIS 5598]

3.9**adjustable stud end**

stud end connector that allows for connector orientation through final tightening of the locknut to complete the connection.

NOTE This type of stud end is typically used on shaped connectors (e.g. tees, crosses and elbows).

3.10**nonadjustable stud end**

stud end connector that does not require specific orientation through final tightening of the connection because it is only used on straight connectors

4 Materials**4.1 General**

Figure 1 shows the cross-section and component parts of a typical 60° cone connector with O-ring.

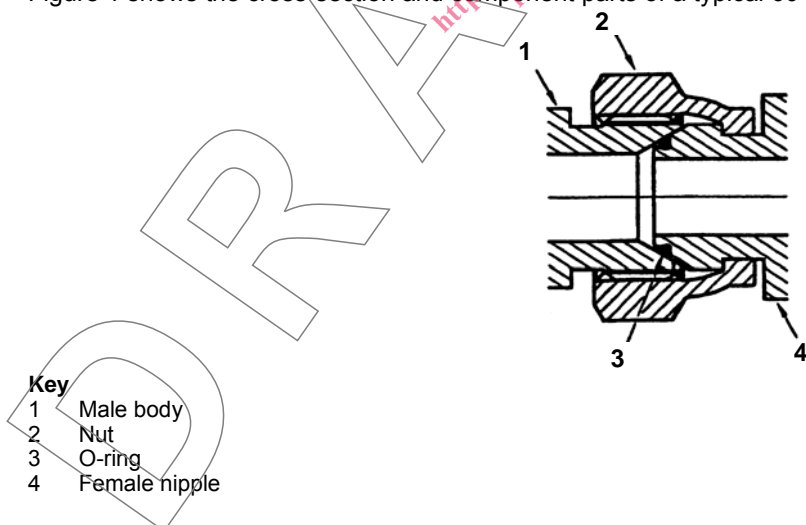


Figure 1 — Cross-section of typical 60° cone connector with O-ring

4.2 Connector bodies

Bodies shall be manufactured from carbon steel or stainless steel that will provide the minimum pressure/temperature requirements specified in Clause 5. They shall have characteristics that make them suitable for use with the fluid to be conveyed and that will provide an effective joint. Weld-on nipples shall be made of materials classified as suitable for welding.

4.3 Nuts

Nuts to be used with carbon steel bodies shall be made of carbon steel and those for use with stainless steel bodies shall be made of stainless steel, unless otherwise specified.

4.4 O-rings

Unless otherwise specified, for use with petroleum base hydraulic fluids at the pressure and temperature requirements in Clause 5 and Table 1 and for testing, the O-rings shall be made of NBR (nitrile) with a hardness of (90 ± 5) IRHD, measured in accordance with ISO 48, shall conform to the dimensions given in Table 5 and shall meet or exceed the O-ring quality acceptance criteria for grade N of ISO 3601-3. In those cases where the pressure and temperature requirements of this part of ISO 8434 and/or the hydraulic fluid used in the system differ from those specified in Clause 5 and Table 1, the connector manufacturer shall be consulted to ensure that an appropriate O-ring material is selected.

5 Pressure/temperature requirements

5.1 60° cone connectors in conformance with this part of ISO 8434 made of carbon steel shall meet or exceed without leakage the requirements from a vacuum of 6,5 kPa (0,065 bar) absolute pressure to the rated pressures given in Table 1 when used at temperatures between -40 °C and $+120$ °C. For stud end connectors, the upper limit shall be the lower of the rated pressure given in Table 1 and the rated pressure for the relevant stud end, i.e., ISO 1179-2, ISO 1179-3 or ISO 6149-3.

Table 1 — Rated pressures for 60° cone connector ends

Tube outside diameter	Thread size	Rated pressure ^a			
		With O-ring		Without O-ring	
		MPa	(bar)	MPa	(bar)
6	G 1/8 A	—	—	35	(350)
8	G 1/4 A	40	(400)	35	(350)
10	G 3/8 A	40	(400)	35	(350)
12	G 1/2 A	35	(350)	31,5	(315)
16	G 5/8 A	35	(350)	31,5	(315)
20	G 3/4 A	31,5	(315)	25	(250)
25	G 1 A	25	(250)	20	(200)
32	G 1 1/4 A	20	(200)	16	(160)
38	G 1 1/2 A	16	(160)	12,5	(125)
50	G 2 A	12,5	(125)	8	(80)
^a See 5.1.					

5.2 The connector assembly shall meet or exceed all applicable performance requirements given in Clause 15. Testing shall be conducted at room temperature.

5.3 For applications under conditions outside the temperature and/or pressure limits given in Table 1 and 5.1 and 5.2, the manufacturer shall be consulted.

6 Designation of connectors

6.1 Connectors shall be designated by an alphanumeric code to facilitate ordering. They shall be designated by the word “Connector” followed by ISO 8434-6, followed by a hyphen, then the connector style letter symbols (see 6.2), followed by a spaced hyphen and, for the ends, the outside diameter of the tube with which they are to be connected, each separated by a multiplication symbol (\times). For stud ends (connector ends), the thread designation and the number of the relevant standard shall be added.

EXAMPLE

A straight stud connector (SDS) for use with 12 mm OD tubing with a light-duty (L series) M18 \times 1,5 stud end, in accordance with ISO 6149-3, is designated as follows:

Connector ISO 8434-6-SDS - 12 \times M18 - ISO 6149-3

Size code

Connector style letter symbol

6.2 The letter symbol designation of the connector style shall have two parts: the connection end type immediately followed by the shape of the connector. The letters A and B shall be used to distinguish different styles, where such options exist.

6.3 Tube ends are assumed and thus do not need to be included in the code. However, if another type of end is involved, it shall be designated.

6.4 Reducing connectors and reducing elbows shall be designated by specifying the larger tube end first. For reducing swivel type connectors, the swivel end shall be designated first.

6.5 Stud connectors shall be designated by specifying the tube end first, then the thread size for the stud end.

6.6 For tee connectors, the order of designation of the connection ends shall be from larger tube end to the smaller tube end on the run, followed by the branch end.

6.7 For cross connectors, the order of designation of the connection ends shall be from left to right, followed by top to bottom, with larger ends on the left and at the top.

6.8 The following letter symbols shall be used:

Connection end type	Letter
Bulkhead	BH
Swivel	SW
Weld-on	WD
Braze-on	BR
Port	P
Stud	SD

Shape	Letter
Straight	S
Elbow	E
45° elbow	E45
Tee	T
Run tee	RT
Branch tee	BT
Cross	K
Long	L

Component type	Letter
Nut	N
Sleeve	SL
Locknut	LN
Plug	PL
Cap	CP
Nipple	NP
Metric	M
Inch (imperial)	I

7 Requirements for tubes

7.1 The connectors shall be suitable for use with tubes with limits of outside diameter given in Table 2. These limits include ovality.

7.2 Tubing shall comply with the relevant dimensions given in Table 2 and shall be selected in accordance with ISO 10763 for appropriate rated pressures.

Table 2 — Tube sizes

Tube outside diameter	Limits of outside diameter	
	min.	max.
6	5,9	6,1
8	7,9	8,1
10	9,9	10,1
12	11,9	12,1
16	15,9	16,1
20	19,9	20,1
25	24,9	25,1
30	29,85	30,15
38	37,85	38,15
50	49,8	50,2

7.3 Carbon steel tubes shall comply with ISO 3304 (seamless cold-finished as-drawn or annealed or normalized) or ISO 3305 (welded cold-finished as-drawn or annealed or normalized).

8 Across-flats dimensions and tolerances

8.1 The dimensions across flats of elbow and tee connectors shall have a minus tolerance only. For sizes up to and including 24 mm, tolerances for across-flats dimensions for forgings shall be $+0/-0,8$ mm, and for sizes larger than 24 mm, they shall be $+0/-1$ mm. The basic forging size may be increased up to the maximum size shown for barstock, but the size selected shall be a metric across-flat size with minus tolerance only.

8.2 Hex tolerances across flats shall be in accordance with ISO 4759-1, product grade C. Minimum across-corner hex dimensions are 1,092 times the nominal width across flats. The minimum side flat is 0,43 times the nominal width across flats. Unless otherwise specified or shown, hex corners shall be chamfered 15° to 30° to a diameter equal to the width across flats, with a tolerance of $+0/-0,4$ mm.

9 Design

9.1 Connectors

The connectors shall conform to the requirements given in Figures 2 through 33 and Tables 3 through 21. They shall be designed so that resistance to flow is reduced to a minimum.

9.2 Dimensions

Dimensions specified apply to finished parts, including any plating or other treatments. The tolerance value for all dimensions not otherwise limited shall be $\pm 0,4$ mm.

9.3 Passage tolerances

Where passages in straight connectors are machined from opposite ends, the offset at the meeting point shall not exceed 0,4 mm. No cross-sectional area at a junction of passages shall be less than that of the smallest passage.