
**Metallic tube connections for fluid power
and general use —**

**Part 3:
O-ring face seal connectors**

*Raccordements de tubes métalliques pour transmissions hydrauliques
et pneumatiques et applications générales —
Partie 3: Connecteurs à joints faciaux toriques*

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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.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 8434-3 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 8434-3:1995), which has been technically revised.

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

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- Part 1: 24° cone connectors
 - Part 2: 37° flared fittings
 - Part 3: O-ring face seal connectors
 - Part 4: 24° cone connectors with O-ring weld-on nipples¹⁾
 - Part 5: Test methods for threaded hydraulic fluid power connections²⁾
 - Part 6: 60° cone connectors with or without O-ring

1) ISO 8434-4 will be incorporated into the revision of ISO 8434-1.

2) ISO 8434-5 will be withdrawn once ISO 19879 is published.

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.

This part of ISO 8434 is based on the USA standard ANSI/SAE J1453. The threads for the O-ring face seal connection are unified inch threads to ISO 263. The inch threads were not changed to metric threads to ISO 261 to allow connectors complying with this standard to be used in existing applications without requiring a change to tube or hose assemblies. Also, the thread-to-nut overtorque and seal performance have been extensively tested; to change to metric threads would require an extensive test program at considerable cost without providing any functional improvement. The threads are integral to themselves, connectors of this type match only to themselves, and other than having metric threads, no value in changing could be found. Major international companies that have used these connectors have adopted the design without noting any problems. All wrench flats are dimensioned to be used with ISO standard metric wrenches.

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Metallic tube connections for fluid power and general use —

Part 3: O-ring face seal connectors

1 Scope

This part of ISO 8434 specifies the general and dimensional requirements for the design and performance of O-ring face seal connectors made of steel for tube outside diameters or hose inside diameters of 6 mm through 38 mm, inclusive. These connectors are for use in fluid power and general applications where elastomeric seals can be used to prevent fluid leakage, including leakage caused by variations in assembly procedures. They are intended for the connection of tubes and hose fittings to ports in accordance with ISO 6149-1. (See ISO 12151-1 for related hose fitting specification.)

These connectors provide leakproof, full-flow connections in hydraulic systems operating from a vacuum of 6,5 kPa [0,065 bar³⁾] absolute pressure 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 For use under conditions outside the pressure and/or temperature limits specified, see 5.3.

Both metric and inch tubing can be accommodated by changing the sleeve (see Annex D). In the past, these connectors have been used predominantly with inch tubing. For new and future designs, the use of metric tubing is preferred.

This part of ISO 8434 also specifies a performance and qualification test for O-ring face seal connectors.

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 68-2, *ISO general-purpose screw threads — Basic profile — Part 2: Inch screw threads*

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

ISO 263, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0,06 to 6 in*

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

3) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1N/mm².

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

ISO 3601-3:—⁴⁾, *Fluid 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 5598, *Fluid power systems and components — Vocabulary*⁵⁾

ISO 5864, *ISO inch screw threads — Allowances and tolerances*

ISO 6149-1, *Connections for fluid power and general use — Ports and stud ends with ISO 261 threads and O-ring sealing — Part 1: Ports with O-ring seal in truncated housing*⁶⁾

ISO 6149-2:—⁷⁾, *Connections for fluid power and general use — Ports and stud ends with ISO 261 threads and O-ring sealing — Part 2: Heavy-duty (S series) stud ends — Dimensions, design, test methods and requirements*

ISO 8434-1, *Metallic tube connections for fluid power and general use — Part 1: 24° cone connectors*⁸⁾

ISO 8434-2, *Metallic tube connections for fluid power and general use — Part 2: 37° flared fittings*

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

ISO 12151-1, *Connections for hydraulic fluid power and general use — Hose fittings — Part 1: Hose fittings with ISO 8434-3 O-ring face seal ends*

ISO 19879, *Metallic tube connections for fluid power and general use — Test methods for hydraulic fluid power connections*⁹⁾

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598, ISO 8434-1 and ISO 8434-2, 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]

4) To be published. (Revision of ISO 3601-3:1987)

5) To be published. (Revision of ISO 5598:1985)

6) To be published. (Revision of ISO 6149-1:1993)

7) To be published. (Revision of ISO 6149-2:1993)

8) To be published. (Revision of ISO 8434-1:1994 and ISO 8434-4:1995)

9) To be published. (Revision of ISO 8434-5:1995)

3.3**fastening thread**

terminal thread of a complete connector

3.4**run**

two principal, axially aligned outlets of a tee or cross

3.5**branch**

side outlet 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 the thread

3.7**assembly torque**

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

3.8**working pressure**

pressure at which the apparatus is being operated in a given application

[ISO 5598]

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3.9**adjustable stud end**

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

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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**

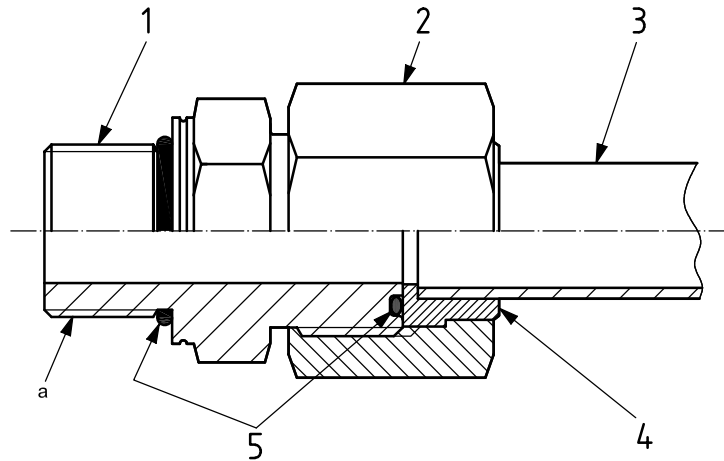
Figure 1 shows the cross-section and components of a typical O-ring face seal connector.

4.2 Connector bodies

Bodies shall be manufactured from carbon steel that will provide the minimum pressure/temperature requirements specified in Clause 5, when tested in accordance with Clause 15. 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 sleeves 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, unless otherwise specified. In tube assemblies where sleeves are copper brazed, nuts become annealed, reducing their strength. Nuts for copper brazed assemblies shall be made from suitable, higher strength material to meet the performance requirements in 15.1. High-strength nuts (style B nuts) shall be identified by a turned diameter, d_{14} , as shown in Figure 5.



Key

- 1 straight stud connector body
- 2 tube nut
- 3 tube
- 4 braze-on sleeve
- 5 O-ring
- a Stud end in accordance with ISO 6149-2.

Figure 1 — Cross-section and components of typical O-ring face seal connector body

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4.4 O-rings

ISO 8434-3:2005

Unless otherwise specified, for use with petroleum-based 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 per ISO 48, and shall conform to the dimensions given in Table 6 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 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 working pressures given in Table 1 when used at temperatures between -40 °C and $+120$ °C with petroleum-based hydraulic fluids.

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 other than the temperature and/or pressure limits given in Table 1 and in 5.1 and 5.2, the manufacturer shall be consulted.

Table 1 — Working pressures for O-ring face seal connectors

Tube outside diameter ^a		Thread ^b	Maximum working pressure			
			Connectors with nonadjustable stud ends		Connectors with adjustable stud ends	
mm	in		MPa	(bar)	MPa	(bar)
6	1/4	M12 × 1,5	63	(630)	40	(400)
8	5/16	M14 × 1,5	63	(630)	40	(400)
10	3/8	M16 × 1,5	63	(630)	40	(400)
12	1/2	M18 × 1,5	63	(630)	40	(400)
16	5/8	M22 × 1,5	40	(400)	40	(400)
20	3/4	M27 × 2	40	(400)	40	(400)
22	7/8	M30 × 2 ^c	40	(400)	35	(350)
25	1	M33 × 2	40	(400)	35	(350)
30	1 1/4	M42 × 2	25	(250)	25	(250)
38	1 1/2	M48 × 2	25	(250)	20	(200)

NOTE These pressures were established using connectors made of low carbon steel and tested according to Clause 15.

^a Metric tubing shall be preferred.

^b Port in accordance with ISO 6149-1; stud end in accordance with ISO 6149-2.

^c This size will be included in the revisions of ISO 6149-1 and ISO 6149-2.

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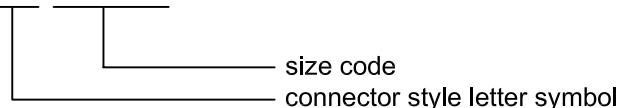
6 Designation of connectors

ISO 8434-3:2005

6.1 Connectors shall be designated by an alphanumeric code to facilitate ordering. They shall be designated by the word "Connector" followed by ISO 8434-3, followed by a spaced hyphen, then the connector style letter symbols (see 6.2 and 6.9), 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 (×). If the style of O-ring groove needs to be included, its letter symbol shall be added after the number for the first outside diameter (see 6.8 for further information). There shall be no spaces on either side of the multiplication symbol. For stud ends (connector ends), the thread designation of the stud end shall be added.

EXAMPLE A straight stud connector (SDS) for use with 12 mm OD tubing with a heavy-duty (S series) M18 × 1,5 stud end, in accordance with ISO 6149-2, is designated as follows:

Connector ISO 8434-3 - SDS-12×12M18



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.

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 style of O-ring groove (see Figure 2) shall be designated as follows.

- If the O-ring groove conforms to styles A (angled groove) or B (half-dovetail groove) (grooves designed to provide improved retention of the O-ring), the code letter A or B shall be added to the designation as specified in 6.1.
- If the O-ring groove conforms to style C, the code letter C shall be added to the designation as specified in 6.1.
- If no preference is stated by either the purchaser or supplier, no code letter related to the O-ring groove shall be added to the designation.

For tee and cross connectors, the O-ring groove style shall be indicated only one time, after the first connection end size. It is assumed that all ends on the connector have the same type of groove.

EXAMPLE A tee connector with three connection ends that connect to a tube with a nominal outside diameter of 12 mm and that have O-ring grooves that provides improved retention of the O-ring would be designated as follows:

ISO 8434-3 -T - 12A×12×12

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6.9 The following letter symbols shall be used:

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Connection end type

Letter

Bulkhead	BH
Swivel	SW
Weld-on	WD
Braze-on	BR
Port	P
Reducer	RD
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	I

7 Requirements for tubes

7.1 The connectors shall be suitable for use with tubes with limits of outside diameter as given in Tables 2 and 3. These limits include ovality.

7.2 Metric tubing shall be preferred. Tubing shall comply with the relevant dimensions given in Table 2 or 3.

7.3 Carbon steel tubes shall, except for dimensions of inch tubes, 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).

Table 2 — Metric tube sizes

Tube outside diameter mm	Limits of the outside diameter mm	
	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
22 ^a	21,9	22,1
25	24,9	25,1
30	29,85	30,15
38	37,85	38,15
Metric tubing shall be preferred.		
^a This size will be included in the revisions of ISO 6149-1 and ISO 6149-2.		

Table 3 — Inch tube sizes

Tube outside diameter		Limits of the outside diameter mm	
in	mm ^a	min.	max.
1/4	6,35	6,25	6,45
5/16	7,94	7,84	8,04
3/8	9,52	9,42	9,62
1/2	12,7	12,6	12,8
5/8	15,88	15,78	15,98
3/4	19,05	18,95	19,15
7/8	22,23	22,13	22,33
1	25,4	25,3	25,5
1 1/4	31,75	31,6	31,9
1 1/2	38,1	37,95	38,25
^a Equivalent dimension in millimetres.			

8 Across-flats dimensions and tolerances

8.1 The dimensions across flats of elbow, tee and cross connectors shall be as shown in Tables 11 to 15 and 17, with 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/-1,0 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 4759-1:2000, 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 18 and Tables 6 through 22. 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 specified passage.

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9.4 Angular tolerances

Angular tolerances on axis of end on elbows, tees and crosses, shall be $\pm 2,5^\circ$ for tube sizes up to and including 10 mm and $\pm 1,5^\circ$ for all larger sizes.

9.5 Contour details

Details of contour shall be chosen by the manufacturer provided the dimensions given in Tables 6 to 22 are maintained. Wrench flats on elbows and tees shall conform to the dimensions given in the relevant tables. Abrupt reduction of a section shall be avoided. Junctions of small external sections and adjoining sections that are relatively heavy shall be blended by means of ample fillets.

9.6 Stud ends

The dimensions for the stud ends shall conform to those given in ISO 6149-2.

9.7 Reducing connectors

Dimension of reducing connectors shall be in accordance with Annex B.

10 Screw threads

10.1 O-ring face seal ends

The screw threads on the tube connection ends of the connectors shall be ISO inch screw threads in accordance with ISO 263 and Annex A, except for the 1-14 UNS class 2A and 2B threads, whose dimensions are also found in Annex A.

10.2 Stud ends (connection ends)

The screw threads for the stud ends of connectors shall be ISO metric in accordance with ISO 261.

11 Manufacture

11.1 Construction

Carbon steel connectors made from multiple components shall be bonded together with materials having a melting point of not less than 1 000° C.

11.2 Workmanship

Workmanship shall conform to the best commercial practice to produce high-quality connectors. Connectors shall be free from visual contaminants, all hanging burrs, loose scale and slivers which might be dislodged in use and any other defects that might affect the function of the parts. All machined surfaces shall have a surface roughness value of $Ra \leq 6,3 \mu\text{m}$, except where otherwise specified.

11.3 Finish

The external surface and threads on all connectors, except braze-on type components and weld-on nipples, shall be plated or coated with a suitable material that passes a 72 h neutral salt spray test in accordance with ISO 9227, unless otherwise agreed upon by the manufacturer and user. Any appearance of red rust during the salt spray test on any area, except those noted below, shall be considered failure:

- all internal fluid passages;
- edges, such as hex points, serrations and crests of threads, where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects;
- areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending and other post-plate metal forming operations;
- areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

Fluid passages shall be excluded from the plating and/or coating requirements but shall be protected from rust.

Braze-on type connectors, braze sleeves and weld nipples shall be protected from corrosion by an oil film or phosphate coating or by another method that does not negatively affect their ability to be welded or brazed.

Parts manufactured in accordance with this part of ISO 8434 shall not be cadmium plated.

NOTE Changes in plating can affect assembly torques and require requalification, when applicable.

11.4 Connector protection

By a method agreed between manufacturer and user, the face of the connectors and threads (both internal and external) shall be protected by the manufacturer from nicks and scratches that would be detrimental to the function of the connector. Passages shall be securely covered to prevent the entrance of dirt or other contaminants. Covers that contribute to contamination shall not be used.

Braze-on type connectors require protection on the sealing face and threaded end only. Nuts and sleeves that are furnished separately from the connector shall be protected from rust but do not require capping.

11.5 Corners

Unless otherwise noted, all sharp corners shall be broken to 0,15 mm max.