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

Part 2:
37° flared connectors

*Raccordements de tubes métalliques pour transmissions hydrauliques
et pneumatiques et applications générales —*

Partie 2: Connecteurs évasés à 37°

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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 8434-2 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 8434-2:1994), 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*:

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

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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), tubes and hoses. Tubes are rigid conductors; hoses are flexible conductors.

This part of ISO 8434 is based on the US standard ANSI/SAE J514 [1]. The threads for the 37° flared connection are unified inch threads in accordance with ISO 263. The inch threads were not changed to metric threads according to ISO 261 to allow connectors complying with this International 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 specified in this part of ISO 8434 are dimensioned to be used with ISO standard metric wrenches.

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Metallic tube connections for fluid power and general use —

Part 2: 37° flared connectors

1 Scope

This part of ISO 8434 specifies general and dimensional requirements for the design and performance of 37° flared connectors that are suitable for use with ferrous and non-ferrous tubes with outside diameters from 6 mm to 50,8 mm, 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, ISO 1179-1, ISO 9974-1 and ISO 11926-1. (See ISO 12151-5 for related hose fitting specification.)

These connectors provide full-flow connections with metal-to-metal sealing 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, sufficient testing will need to be conducted and the results 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 5.5.

Both metric and inch tubing can be accommodated by changing the sleeve (see Figure 7). 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 37° flared 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 68-2, *ISO general-purpose screw threads — Basic profile — Part 2: Inch screw threads*

ISO 228-1:2000, *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 263, *ISO inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0.06 to 6 in*

ISO 1127, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length*

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 1179-2:—¹⁾, *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)*

ISO 1179-3:—¹⁾, *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 1179-4:—¹⁾, *Connections for general use and fluid power — Ports and stud ends with ISO 228-1 threads with elastomeric or metal-to-metal sealing — Part 4: Stud ends for general use only with metal-to-metal sealing (type B)*

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

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

ISO 4759-1:2000, *Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C*

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

ISO 5864:1993, *ISO inch screw threads — Allowances and tolerances*

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

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ISO 6149-3, *Connections for hydraulic 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 9974-1, *Connections for general use and fluid power — Ports and stud ends with ISO 261 threads with elastomeric or metal-to-metal sealing — Part 1: Threaded ports*

ISO 9974-2, *Connections for general use and fluid power — Ports and stud ends with ISO 261 threads with elastomeric or metal-to-metal sealing — Part 2: Stud ends with elastomeric sealing (type E)*

ISO 9974-3:1996, *Connections for general use and fluid power — Ports and stud ends with ISO 261 threads with elastomeric or metal-to-metal sealing — Part 3: Stud ends with metal-to-metal sealing (type B)*

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

ISO 11926-1, *Connections for general use and fluid power — Ports and stud ends with ISO 725 threads and O-ring sealing — Part 1: Ports with O-ring seal in truncated housing*

ISO 11926-3:1995, *Connections for general use and fluid power — Ports and stud ends with ISO 725 threads and O-ring sealing — Part 3: Light-duty (L series) stud ends*

1) To be published. (Revision of ISO 1179:1981)

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 document, the terms and definitions given in ISO 5598 and the following apply.

3.1

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).

3.2

non-adjustable stud end

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

3.3

fluid power

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

[ISO 5598]

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3.4

connector connection

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

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3.5

fastening thread

terminal thread of a complete connector

3.6

run

two principal, axially aligned outlets of a tee or cross

3.7

branch

side outlet(s) of a tee or cross

3.8

chamfer

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

3.9

assembly torque

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

3.10

working pressure

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

3.11

face-to-face dimension

distance between the two parallel faces of axially aligned outlets of a connector

3.12

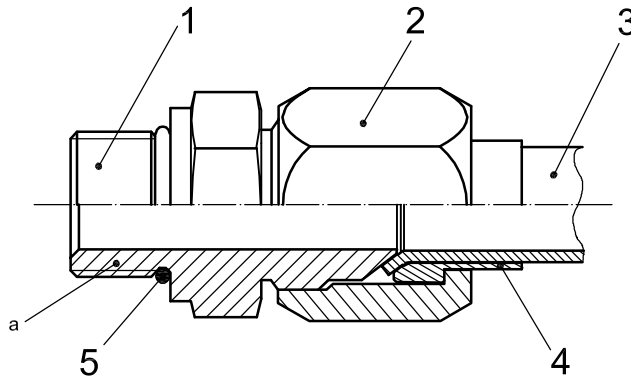
face-to-centre dimension

distance from the face of an outlet to the central axis of an angularly disposed outlet

4 Requirements for materials

4.1 General

Figure 1 shows the cross-section and components of a typical 37° flared connector.



Key

- 1 straight stud connector body
- 2 tube nut
- 3 tube
- 4 sleeve
- 5 O-ring

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^a Stud end in accordance with ISO 1179-3, ISO 6149-3, ISO 9974-2 or ISO 11926-3.

Figure 1 — Cross-section of typical 37° flared connection

4.2 Connector bodies

Bodies shall be manufactured from carbon steel, stainless steels or copper alloys, which will provide the minimum requirements for the pressure/temperature ratings 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 to provide an effective joint.

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. Nuts to be used with copper alloy bodies shall be made of a material similar to the bodies.

4.4 Sleeves

Sleeves shall be manufactured from a material similar to the bodies.

5 Pressure/temperature requirements

5.1 The working pressure of the connector shall be the lower of the working pressure of the 37° flared connector connection given in Table 1 and the working pressure of the respective stud end.

5.2 Flared connectors in conformance with this part of ISO 8434 made of carbon steel shall meet or exceed without leakage the requirements to the working pressures given in Table 1 when used at temperatures from –40 °C to +120 °C with petroleum base hydraulic fluids.

5.3 Connectors made of stainless steel complying with this part of ISO 8434 shall be suitable for use at the working pressures given in Table 1 when used at temperatures from –60 °C to +50 °C. Pressure derating for connectors made from stainless steel and used at elevated temperatures shall be:

4 % at +50 °C;

11 % at +100 °C;

20 % at +200 °C.

Derating factors for temperatures between these values shall be interpolated.

5.4 Copper alloy connectors shall be suitable for use at the working pressures given in Table 1 when used at temperatures from –40 °C to +175 °C.

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

5.6 Connectors conforming to this part of ISO 8434 shall be tested in accordance with Clause 15 to ensure that they meet or exceed the pressure requirements given in Table 1.

5.7 The pressure/temperature requirements given in Table 1 and in 5.1 to 5.5 are for tube connections and connector bodies only. For port and stud end pressure/temperature ratings, the values in the respective port and stud end standards shall apply.

5.8 To achieve these maximum working pressures with a 4:1 design factor, the maximum tube wall thicknesses shown in Table 1 are sufficient. See ISO 10763 to confirm the necessary tube wall thickness for the specified working pressure.

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 8434-2, followed by a space, then the connector style letter symbols (see 6.2), followed by a hyphen, then, for the ends, the outside diameter of the tube with which they are to be connected, each separated by a multiplication symbol, ×. There shall be no space on either side of the multiplication symbol. For stud ends (connector ends), the thread designation of the stud end shall be added.

Table 1 — Working pressures for 37° flared connections

Tube outside diameter (OD) ^a		Wall thickness of tube for flaring ^b		Working pressure ^c			
Metric	Inch	Metric tube	Inch tube	Carbon steel and stainless steel		Copper alloy ^d	
mm	in	mm	mm	MPa	(bar) ^e	MPa	(bar) ^e
6	1/4	1,5	1,65	35	(350)	20	(200)
8	5/16	1,5	1,65	35	(350)	20	(200)
10	3/8	1,5	1,65	35	(350)	16	(160)
12	1/2	2	2,1	31	(310)	16	(160)
16	5/8	2,5	2,41	24	(240)	12,5	(125)
20	3/4	3	2,76	24	(240)	12,5	(125)
25	1	3	3,05	21	(210)	10	(100)
30 and 32	1 1/4	3	3,05	17	(170)	8	(80)
38	1 1/2	3	3,05	14	(140)	6,3	(63)
50	2	3,5	3,4	10,5	(105)	5	(50)

^a Metric tubing shall be preferred.

^b Maximum wall thickness that can be flared, due to connector design.

^c For working pressure applications higher than those given in this table, the manufacturer shall be consulted.

^d The pressure values for copper alloy connectors and tubes were produced using brass connectors with phosphoresced soft annealed copper tubing.

^e 1 bar = 10⁵ N/m² = 10⁵ Pa = 0,1 MPa.

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6.2 The letter symbol designation of the connector style shall have three parts: 1) the connection end type immediately followed by 2) the shape of the connector and 3) by the indication that a complete connector is being ordered. The letters A and B shall be used to distinguish different styles, where such options exist.

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

6.4 Reducing connectors and 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 the larger 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 from top to bottom, with the 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
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
Completeness indication	Letter
Complete connector	C
Stud end sealing types	Letter
Metal-to-metal sealing	B
Elastomeric sealing	E
O-ring sealing	F

6.9 Examples of 37° flared connectors and designations are given in Figures 2 and 3.

EXAMPLE A straight stud connector (SDS), including O-ring without sleeve and nut, for use with 12 mm OD tubing with an 3/4-16 UNF stud end in accordance with ISO 11962-3 is designated for ordering as follows:

Connector ISO 8434-2 SDS-12×3/4-16

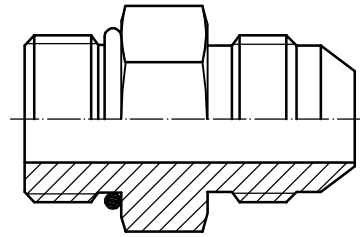


Figure 2 — Straight stud connector (SDS) with stud end in accordance with ISO 11962-3

EXAMPLE A complete straight stud connector (SDSC), including O-ring with sleeve and nut, for use with 12 mm OD tubing with an M16 × 1,5 UNF stud end in accordance with ISO 6149-3 is designated for ordering as follows:

Connector ISO 8434-2 SDSC-12xM16F

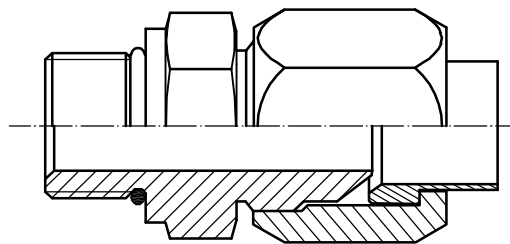


Figure 3 — Straight stud connector, complete (SDSC) with stud end in accordance with ISO 6149-3 (sealing type F)

7 Requirements for tubes

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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 Tables 2 or 3.

7.3 Carbon steel tubes shall, except for dimensions of inch tubes, comply with delivery condition R37 NBK as specified in ISO 3304 (seamless cold-finished as-drawn or annealed or normalized) or ISO 3305 (welded cold-finished as-drawn or annealed or normalized).

7.4 Stainless steel tubes shall, except for dimensions of inch tubes, comply with ISO 1127 (cold drawn and annealed or normalized).

Table 2 — Metric tube sizes

Tube OD mm	Limits of OD	
	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
25	24,9	25,1
30	29,85	30,15
32	31,85	32,15
38	37,85	38,15
50	49,8	50,2

Metric tubing shall be preferred.

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Table 3 — Inch tube sizes

Tube OD in	mm ^a	Limits of OD	
		mm	
		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
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
2	50,8	50,6	51

^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 the respective tables 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.