

INTERNATIONAL STANDARD

ISO 8434-4

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Metallic tube connections for fluid power and general use —

Part 4:

24° cone connectors with O-ring weld-on
nipples

ISO 8434-4:1995

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

Partie 4: Raccords à cône à 24°, à embout à souder à joint torique



Reference number
ISO 8434-4:1995(E)

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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.

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 8434-4 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 degree compression fittings
- Part 2: 37 degree flared fittings
- Part 3: O-ring face seal fittings
- Part 4: 24 degree cone connectors with O-ring weld-on nipples
- Part 5: Test methods for threaded hydraulic fluid power connections

Annex A forms an integral part of this part of ISO 8434.

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 (fittings) and conductors. Tubes are rigid conductors; hoses are flexible conductors.

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Metallic tube connections for fluid power and general use —

Part 4:

24° cone connectors with O-ring weld-on nipples

1 Scope

This part of ISO 8434 specifies general and dimensional requirements for the design and performance of 24° cone connectors with O-ring weld-on nipples that are suitable for use with steel and stainless steel tubes with outside diameters from 6 mm to 42 mm, inclusive. These fittings are for use in fluid power and general applications where elastomeric seals can be used, within the limits of pressure and temperature specified in this part of ISO 8434. S series fittings in accordance with this part of ISO 8434 may be used at working pressures up to 63 MPa (630 bar¹⁾). L-series fittings in accordance with this part of ISO 8434 may be used at working pressures up to 25 MPa (250 bar) (see table 1).

They are intended for the connection of tubes and hose fittings to ports in accordance with ISO 6149-1, ISO 1179-1 and ISO 9974-1.

NOTES

1 For new designs in hydraulic fluid power applications, see the requirements given in 9.6.

2 For use under conditions outside the pressure and/or temperature limits specified, see 5.4.

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

2) To be published. (Revision of ISO 261:1973)

3) To be published.

2 Normative references

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The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8434. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8434 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 48:1994, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*.

ISO 228-1:1994, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*.

ISO 261:—²⁾, *ISO general-purpose metric screw threads — General plan*.

ISO 1127:1992, *Stainless steel tubes — Dimensions, tolerances and conventional masses per unit length*.

ISO 1179-1:—³⁾, *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:—³⁾, *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 3304:1985, *Plain end seamless precision steel tubes — Technical conditions for delivery.*

ISO 3305:1985, *Plain end welded precision steel tubes — Technical conditions for delivery.*

ISO 3601-3:1987, *Fluid systems — Sealing devices — O-rings — Part 3: Quality acceptance criteria.*

ISO 4397:1993, *Fluid power systems and components — Connectors and associated components — Nominal outside diameters of tubes and nominal inside diameters of hoses.*

ISO 4759-1:1978, *Tolerances for fasteners — Part 1: Bolts, screws and nuts with thread diameters between 1,6 (inclusive) and 150 mm (inclusive) and product grades A, B and C.*

ISO 5598:1985, *Fluid power systems and components — Vocabulary.*

ISO 6149-1:1993, *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.*

ISO 6149-2:1993, *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 6149-3:1993, *Connections for fluid power and general use — Ports and stud ends with ISO 261 threads and O-ring sealing — Part 3: Light-duty (L series) stud ends — Dimensions, design, test methods and requirements.*

ISO 8434-1:1994, *Metallic tube connections for fluid power and general use — Part 1: 24 degree compression fittings.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 9974-1:—³⁾, *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:—³⁾, *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).*

3 Definitions

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

3.1 fluid power: Means whereby energy is transmitted, controlled and distributed using a pressurized fluid as the medium.

[ISO 5598]

3.2 connection; fitting: Leakproof device to connect pipelines (conductors) to one another, or to equipment.

[ISO 5598]

3.3 fastening thread: Terminal thread of a complete fitting.

3.4 run: Two principal, axially aligned outlets of a tee or cross.

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 the thread.

3.7 assembly torque: The 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]

4 Requirements for materials

Figure 1 shows the cross-section and component parts of a typical 24° cone connector with O-ring weld-on nipple.

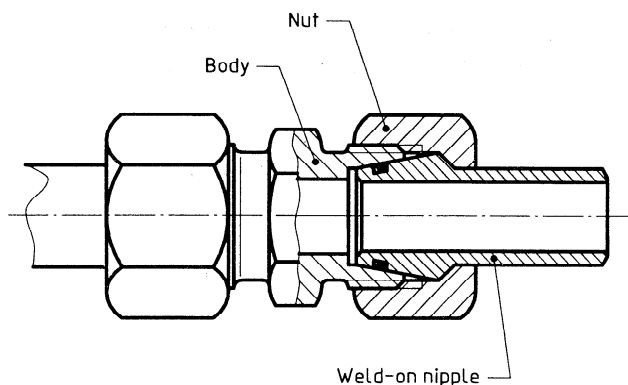


Figure 1 — Cross-section of typical 24° cone connector with O-ring weld-on nipple

4.1 Fitting 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.

4.2 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.

4.3 O-rings

Unless otherwise specified, for use at the pressure and temperature requirements given in clause 5 and table 1, O-rings for use with fittings in accordance with this part of ISO 8434 shall be made of NBR (nitrile) with a hardness of (90 ± 5) IRHD, measured in accordance with ISO 48, and 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.

5 Pressure/temperature requirements

5.1 Fittings complying with this part of ISO 8434 made of carbon steel and stainless steel shall meet or exceed without leakage the requirements of a vacuum of 6,5 kPa (0,065 bar) absolute pressure up to the working pressures given in table 1 when used at temperatures between -35 °C and $+100\text{ °C}$.

5.2 Weld-on nipples in carbon and stainless steel with different wall thicknesses shall be suitable for use up to the working pressures given in table 2 when used at temperatures between -35 °C and $+100\text{ °C}$.

5.3 Fittings in stainless steel shall be suitable for use at the working pressures given in tables 1 and 2. For pressure derating for fittings made of stainless steel that are to be used at temperatures outside the ranges given in 5.1 and 5.2, see table 3.

5.4 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.

5.5 According to different applications and different pressure ratings, there are two series of fittings. The series are referred to as

L: light duty

S: heavy duty

Ranges of the tube outside diameters and pressure requirements are shown in table 1.

5.6 The fitting assembly shall not leak or fail when hydrostatically tested at four times the applicable recommended working pressure specified in table 1. Testing shall be conducted at room temperature.

5.7 The pressure/temperature requirements given in tables 1 to 3 and in 5.1 to 5.6 are for weld-on nipples and fitting bodies only. For port and stud end pressure/temperature requirements, the values specified in the respective port and stud end standards and in annex A of this part of ISO 8434 shall apply.

Table 1 — Working pressures for carbon and stainless steel 24° cone connectors with O-ring weld-on nipples

Series	Tube outside diameter ¹⁾	Working pressure	
	mm	MPa	(bar)
L	15	25	(250)
	18 to 22 incl.	16	(160)
	28 to 42 incl.	10	(100)
S	6 to 12 incl.	63	(630)
	16 to 25 incl.	40	(400)
	30 to 38 incl.	25	(250)

NOTE — For higher pressure ratings and for dynamic conditions, the manufacturer shall be consulted.

1) Tube outside diameters per ISO 4397.

6 Designation of fittings

6.1 Fittings shall be designated by an alphanumeric code to facilitate ordering. They shall be designated by ISO 8434-4, followed by a spaced hyphen, then the fitting style letter symbols (see 6.2), followed by a spaced hyphen, then the series letter (see 5.5), immediately followed by the outside diameter of the tube with which they are to be connected, followed by a multiplication sign (×) then the wall thickness. For stud ends (connector ends), another spaced hyphen followed by the thread designation of the stud end and the sealing type shall be added.

EXAMPLE

A straight stud fitting (SDS) for use with tubing of 12 mm OD and 2 mm wall thickness, with an M18 × 1,5 stud end in accordance with ISO 6149-2 (S series), is designated as follows:

ISO 8434-4 - SDS - S12 × 2 - M18

6.2 The letter symbol designation of the fitting style shall have two parts: the connection end type, immediately followed by the shape of the fitting.

6.3 Tube ends are assumed to be male 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 fittings and reducing elbows shall be designated by specifying the larger tube end first.

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

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

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

6.8 If the fitting has a tube union connection, it shall be designated first, then the designation shall proceed clockwise.

6.9 The following letter symbols shall be used:

Connection end type	Letter
Bulkhead	BH
Swivel	SW
Weld-on	WD
Weld-in	WI
Port	P
Stud	SD
Reducing	RE
Shape	Letter
Straight	S
Elbow	E
Tee	T
Run tee	RT
Branch tee	BT
Cross	K
Component type	Letter
Nut	N
Locknut	LN
Nipple	NP

Examples of compression fittings and designations are given in figures 2 to 7.

Table 2 — Working pressures for carbon and stainless steel weld-on nipples with various tube wall thicknesses

Dimensions in millimetres

Series	Tube OD ¹⁾	Working pressure											
		10 MPa (100 bar)		16 MPa (160 bar)		25 MPa (250 bar)		31,5 MPa (315 bar)		40 MPa (400 bar)		63 MPa (630 bar)	
		d_2 ²⁾	e ³⁾	d_2	e	d_2	e	d_2	e	d_2	e	d_2	e
L	15	10	2,5	10	2,5	10	2,5						
	18	13	2,5	13	2,5								
	22	17	2,5	17	2,5								
	28	23	2,5										
	35	29	3										
	42	36	3										
S	6	2,5	1,75	2,5	1,75	2,5	1,75	2,5	1,75	2,5	1,75	2,5	1,75
	8	4	2	4	2	4	2	4	2	4	2	4	2
	10	6	2	6	2	6	2	6	2	6	2	5	2,5
	12	8	2	8	2	8	2	8	2	7	2,5	6	3
	16	11	2,5	11	2,5	11	2,5	11	2,5	10	3		
	20	14	3	14	3	14	3	14	3	12	4		
	25	19	3	19	3	19	3	17	4	16	4,5		
	30	24	3	24	3	22	4						
	38	32	3	32	3	28	5						

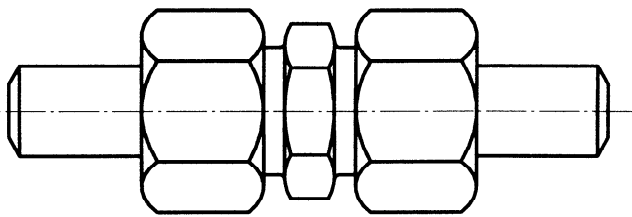
NOTE — For pressure and/or temperature applications outside those given in this part of ISO 8434, the manufacturer shall be consulted.

1) OD = outside diameter
2) d_2 = tube inside diameter
3) e = tube wall thickness

Table 3 — Pressure deratings for fittings made from stainless steel and used at temperatures outside the ranges given in 5.1 and 5.2

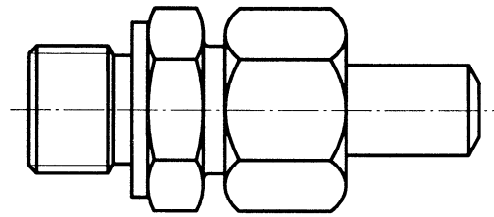
Working pressure for temperature range					
– 35 °C to + 50 °C		+ 100 °C		+ 200 °C	
MPa	(bar)	MPa	(bar)	MPa	(bar)
63	(630)	56,1	(561)	50,4	(504)
40	(400)	35,6	(356)	32	(320)
31,5	(315)	28	(280)	25	(250)
25	(250)	22,3	(223)	20	(200)
16	(160)	14,2	(142)	12,8	(128)
10	(100)	8,9	(89)	8	(80)

NOTE — Intermediate values may be interpolated.



ISO 8434-4 - S - S20 × 3

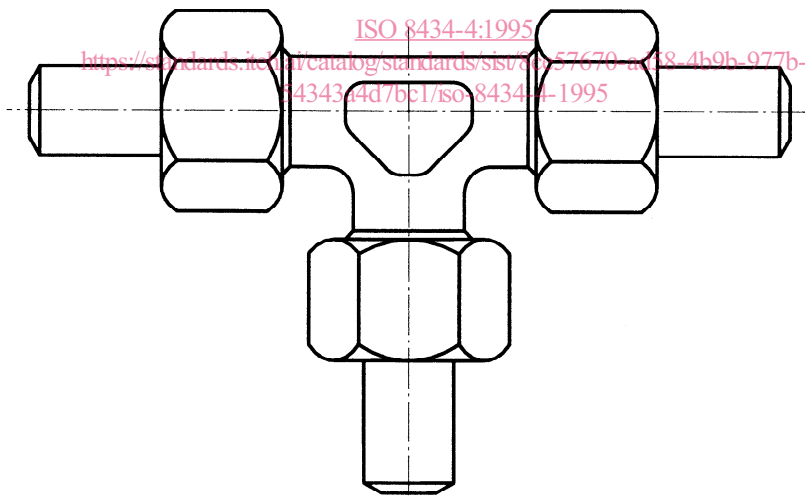
Figure 2 — Straight fitting



ISO 8434-4 - SDS - S20 × 3 - M18

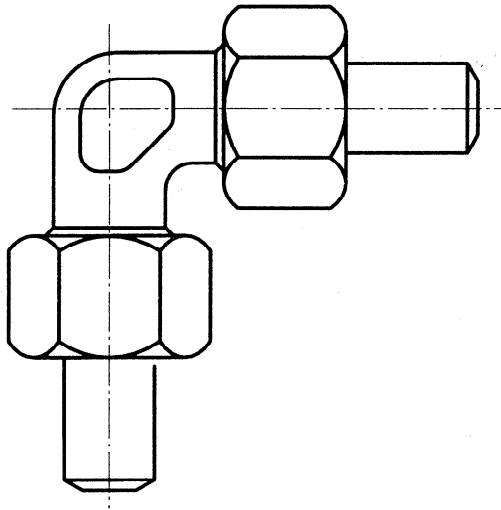
Figure 3 — Straight stud fitting

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ISO 8434-4 - S - L22 × 2,5

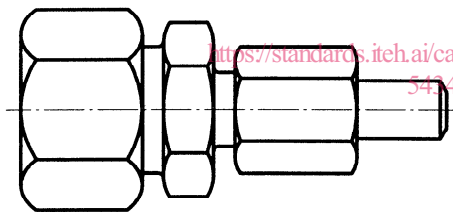
Figure 4 — Tee



ISO 8434-4 - E - S20 × 3

Figure 5 — Elbow

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ISO 8434-4 - RESW - S20 × 3 - S12 × 2

Figure 6 — Reducing swivel adaptor

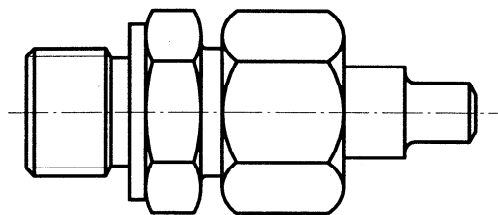
ISO 8434-4 - RESD - S20 × 3 - S12 × 2 - G 3/8
A - E

Figure 7 — Reducing stud fitting

7 Requirements for tubes

Carbon steel tubes shall comply with ISO 3304 or ISO 3305 (cold-drawn and annealed or normalized). Stainless steel tubes shall comply with ISO 1127 (cold-drawn and annealed or normalized).

8 Across-flats dimensions

8.1 The dimensions across flats for nuts and on the bodies of the fittings shall be as given in tables 6 to 9. For sizes up to and including 24 mm, tolerances for across-flats dimensions for forgings shall be ${}^0_{-0,8}$ mm. For sizes larger than 24 mm they shall be ${}^0_{-1}$ mm.

8.2 Hex tolerances across flats shall be in accordance with ISO 4759-1:1978, product grade C. Minimum across-corner hex dimensions are 1,092 times the 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 Fittings

The fittings shall conform to the requirements given in figures 8 to 17 and tables 4 to 10.

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. The sealing seats of fittings shall be concentric with straight thread pitch diameters within 0,25 mm full indicator movement (FIM).

9.3 Passage tolerances

Where passages in straight fittings 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.

9.4 Angular tolerances

Angular tolerances on axis of ends of elbows, tees and crosses shall be $\pm 2,5^\circ$ for tube sizes 10 mm and less, 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 4 to 10 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 Ports and stud ends

The dimensions of stud ends shall conform to those given in ISO 6149-2, ISO 1179-2 or ISO 9974-2 for the S series, and ISO 6149-3, ISO 1179-2 or ISO 9974-2 for the L series. For new designs in hydraulic fluid power applications, only ports and stud ends in accordance with the relevant parts of ISO 6149 shall be used. Ports and stud ends in accordance with the relevant parts of ISO 1179 and ISO 9974 shall not be used for new designs in hydraulic fluid power applications.

10 Screw threads

10.1 Compression ends

The screw threads on the compression ends of the fittings shall be ISO metric in accordance with ISO 261.

Threads shall be chamfered at the face of the fitting to an included angle of 45°. The diameter of the chamfer shall be equal to the minor diameter of the thread, with a tolerance of $\begin{matrix} 0 \\ -0,4 \end{matrix}$ mm.

10.2 Stud ends (connection ends)

The thread for stud ends (connection ends) of fittings shall be chosen from ISO 261 (for ISO 6149 or ISO 9974 stud ends) or ISO 228-1 (Class A) (for ISO 1179 stud ends).

NOTE 3 Parallel threads require an undercut with a sealing washer, O-ring or similar device to ensure a leakproof joint.

10.3 Thread undercuts and recesses

These shall be in accordance with the relevant stud end standard.

11 Manufacture

11.1 Workmanship

Workmanship shall conform to the best commercial practice to produce high-quality fittings. Fittings shall be free from visual contaminants, all hanging burrs, loose scale and slivers that 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 $R_a \leq 6,3 \mu\text{m}$, except where otherwise specified.

11.2 Finish

The external surfaces and threads on all fittings, nuts and adaptors, except weld-on fittings and nipples, shall be protected with an appropriate coating to pass a minimum 18-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 shall be considered failure. Fluid passages shall be excluded from the plating or coating requirements but shall be protected from rust. Weld-on fittings and nipples shall be protected from corrosion by an oil film or phosphate coating.

11.3 Shaped fittings

Shaped fittings up to and including size 12 mm tube outside diameter may be machined from forgings or barstock. Shaped fittings larger than size 12 mm tube outside diameter shall be made from forgings.

11.4 Corners

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

12 Assembly instruction

The assembly of the fittings with the connecting tubes shall be carried out without external loads.

The manufacturer shall draw up assembly instructions for the use of the fittings. These instructions shall include at least the following:

- details relating to the material and quality of suitable tubes;
- details concerning the preparation of the selected tube;