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BRITISH STANDARD

BS ISO
6149-2:2006

Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing —

Part 2: Dimensions, design, test methods and requirements for heavy-duty (S series) stud ends

ICS 23.100.40

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National foreword

This British Standard reproduces verbatim ISO 6149-2:2006 and implements it as the UK national standard. It supersedes BS ISO 6149-2:1993 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee MCE/18, Fluid power systems and components, to Subcommittee MCE/18/-/4, Connectors and associated components, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii to v, a blank page, pages 1 to 11 and a back cover.

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BS ISO 6149-2:2006

INTERNATIONAL STANDARD

ISO 6149-2

Second edition
2006-02-15

Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing —

Part 2: Dimensions, design, test methods and requirements for heavy-duty (S series) stud ends

Raccordements pour transmissions hydrauliques et applications générales — Orifices et éléments mâles à filetage métrique ISO 261 et joint torique —

Partie 2: Dimensions, conception, méthodes d'essai et exigences des éléments mâles de série lourde (série S)

Reference number
ISO 6149-2:2006(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.

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 6149-2 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 6149-2:1993), which has been technically revised.

ISO 6149 consists of the following parts, under the general title *Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing*:

— *Part 1: Ports with truncated housing for O-ring seal*

— *Part 2: Dimensions, design, test methods and requirements for heavy-duty (S series) stud ends*

— *Part 3: Dimensions, design, test methods and requirements for light-duty (L series) stud ends*

— *Part 4: Dimensions, design, test methods and requirements of external and internal hexport plugs*

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Introduction

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

Components are connected through their threaded ports by stud ends on fluid conductor connectors to tubes and pipes or to hose fittings and hoses.

For threaded ports and stud ends specified in new designs in hydraulic fluid power applications, ISO/TC 131/SC 4 recommends that the ISO 6149 series be used because these International Standards specify ports and stud ends with metric threads and O-ring sealing and because the subcommittee would like to help users by recommending one preferred system. ISO/TC 131/SC 4 further recommends that threaded ports and stud ends in accordance with the ISO 1179 series, ISO 9974 series and ISO 11926 series not be used for new designs in hydraulic fluid power applications; these International Standards are maintained because they specify ports and stud ends that are currently used in hydraulic systems worldwide.

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Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing —

Part 2: Dimensions, design, test methods and requirements for heavy-duty (S series) stud ends

1 Scope

This part of ISO 6149 specifies dimensions, performance requirements and test procedures for metric adjustable and non-adjustable heavy-duty (S series) stud ends and O-rings.

Stud ends in accordance with this part of ISO 6149 may be used at working pressures up to 63 MPa [630 bar[1)]] for non-adjustable stud ends and 40 MPa (400 bar) for adjustable stud ends. The permissible working pressure depends upon the stud end size, materials, design, working conditions, application, etc.

Conformance to the dimensional information in this part of ISO 6149 does not guarantee rated performance. Each manufacturer should perform testing according to the specification contained in this part of ISO 6149 to assure that components comply with the performance ratings.

NOTE 1 A significant number of tests have been conducted to confirm the performance requirements of connection ends made from carbon steel.

NOTE 2 This part of ISO 6149 applies to connectors detailed in ISO 8434-1, ISO 8434-3 and ISO 8434-4, and plugs in accordance with ISO 6149-4. See ISO 12151-4 for related hose fitting specification.

NOTE 3 The Introduction of this part of ISO 6149 gives recommendations for ports and stud ends to be used for new designs in hydraulic fluid power applications.

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

ISO 965-1, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data*

ISO 3601-3:2005, *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*

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1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

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

ISO 5598[2)], *Fluid power systems and components — Vocabulary*

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 6149, 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

4 Dimensions

Heavy-duty (S series) stud ends shall conform to the dimensions given in Figures 1 and 2 and given in Table 1. Hex tolerances across flats shall be in accordance with ISO 4759-1, product grade C.

5 Requirements

5.1 Working pressure

Heavy-duty (S series) stud ends made of low carbon steel shall be designed for use at the working pressures given in Table 2.

5.2 Performance

Heavy-duty (S series) stud ends made of low carbon steel shall meet or exceed the burst and impulse pressures given in Table 2, when submitted to burst and cyclic endurance (impulse) tests conducted in accordance with Clause 7 and assembled using the torques in Table 5.

5.3 Flatness and fit of adjustable stud end washers

The washer shall be clinched to the stud end with a tight slip fit to an interference fit. The slip fit shall be tight enough so that the washer cannot be shaken loose to cause it to drop from its uppermost position by its own weight. The locknut torque needed to move the washer at the maximum washer interference fit shall not exceed the torques given in Table 3.

Any washer surface that is out of flatness shall be uniform (i.e. not wavy) and concave with respect to the stud end and shall conform to the allowances given in Table 3.

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2) To be published. (Revision of 5598:1985)

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6 O-rings

O-rings for use with heavy-duty (S series) stud ends shall conform to the dimensions shown in Figure 3 and given in Table 4.

Unless otherwise specified, for use with petroleum base hydraulic fluids at the pressure and temperature requirements in Clause 5 and Table 2 and for testing, the O-rings shall be made of NBR (nitrile) with a hardness of (90 ± 5) IRHD, measured as per ISO 48, and shall conform to the dimensions given in Table 4 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 6149 and/or the hydraulic fluid used in the system differ from those specified in Clause 5 and Table 2, the connector manufacturer shall be consulted to ensure that an appropriate O-ring material is selected.

7 Test methods

Burst and cyclic endurance (impulse) tests shall be conducted in accordance with ISO 19879.

8 Designation of stud ends

Heavy-duty (S series) stud ends shall be designated by

a) "Stud end";

b) reference to this part of ISO 6149; i.e. ISO 6149-2;

c) thread size ($d_1 \times P$).

EXAMPLE A stud end in accordance with this part of ISO 6149, with a thread M18 × 1,5 is designated as follows:

Stud end ISO 6149-2 - M18 × 1,5

9 Identification

Heavy-duty (S series) stud ends shall be identified as shown in Figures 1 and 2 and in accordance with the dimensions given in Table 1. Non-adjustable (straight) stud ends shall be identified by a cylindrical machining of diameter d_2 and length L_5, adjacent to thread d_1 and a notch on diameter, d_2. Adjustable stud ends shall be identified by only a cylindrical machining of diameter d_2 and length L_{10}, on the end of the locknut that is adjacent to the washer. In addition to this identification, for both the non-adjustable and adjustable stud ends, the manufacturer may mark the stud ends with the word "metric".

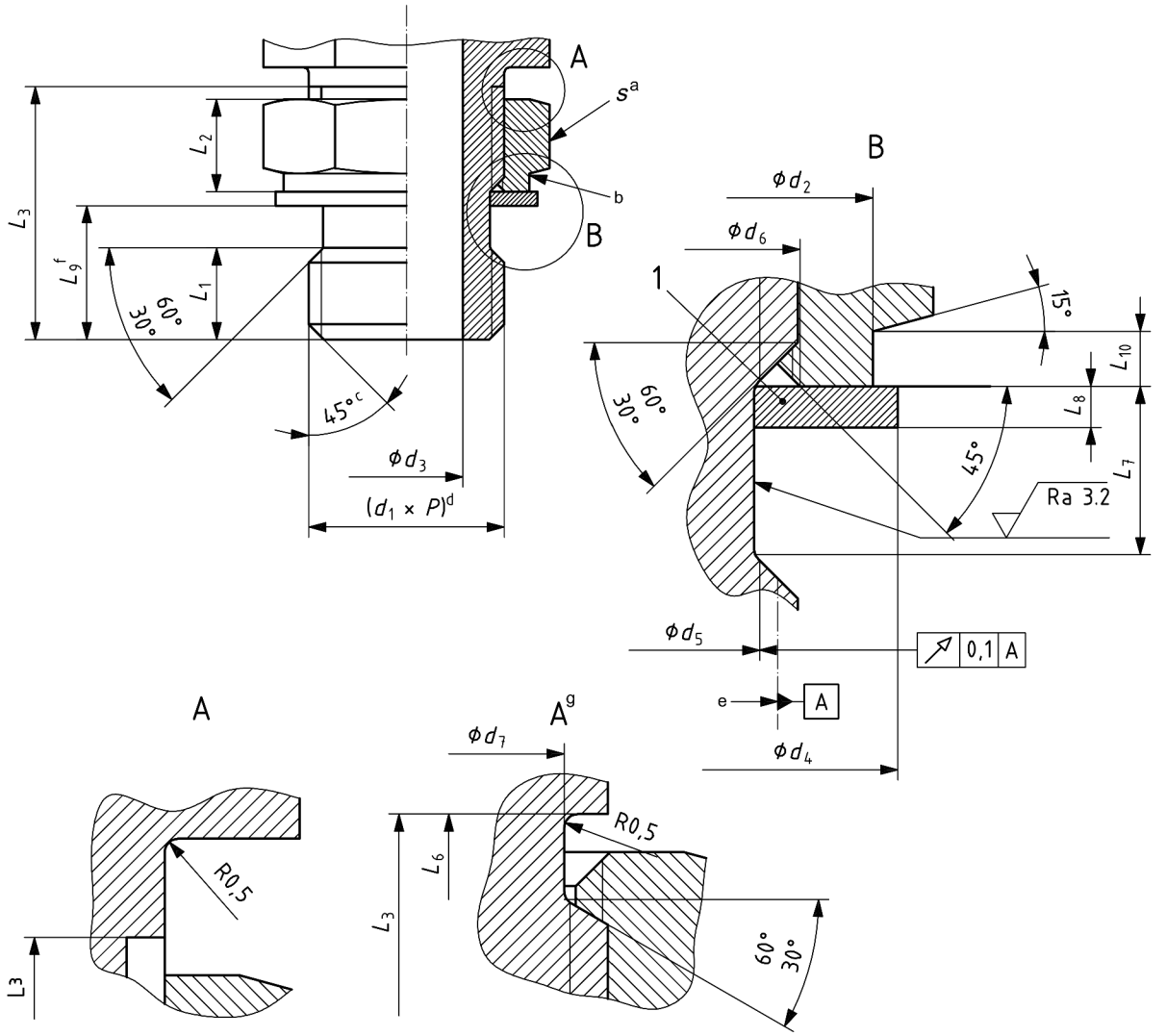
10 Identification statement (reference to this part of ISO 6149)

It is strongly recommended to manufacturers who have chosen to conform to this International Standard that the following statement be used in test reports, catalogues and sales literature:

"Heavy-duty (S series) stud ends conform to ISO 6149-2:2006, *Connections for hydraulic fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing — Part 2: Dimensions, design, test methods and requirements for heavy-duty (S series) stud ends.*"

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Dimensions in millimetres
surface roughness in micrometres



Key

1 clinch washer (see 5.3)

a Width across flats.

b Machining required for identification of metric stud end (see Clause 8).

c Chamfer to minor diameter of thread.

d Thread.

e Pitch diameter.

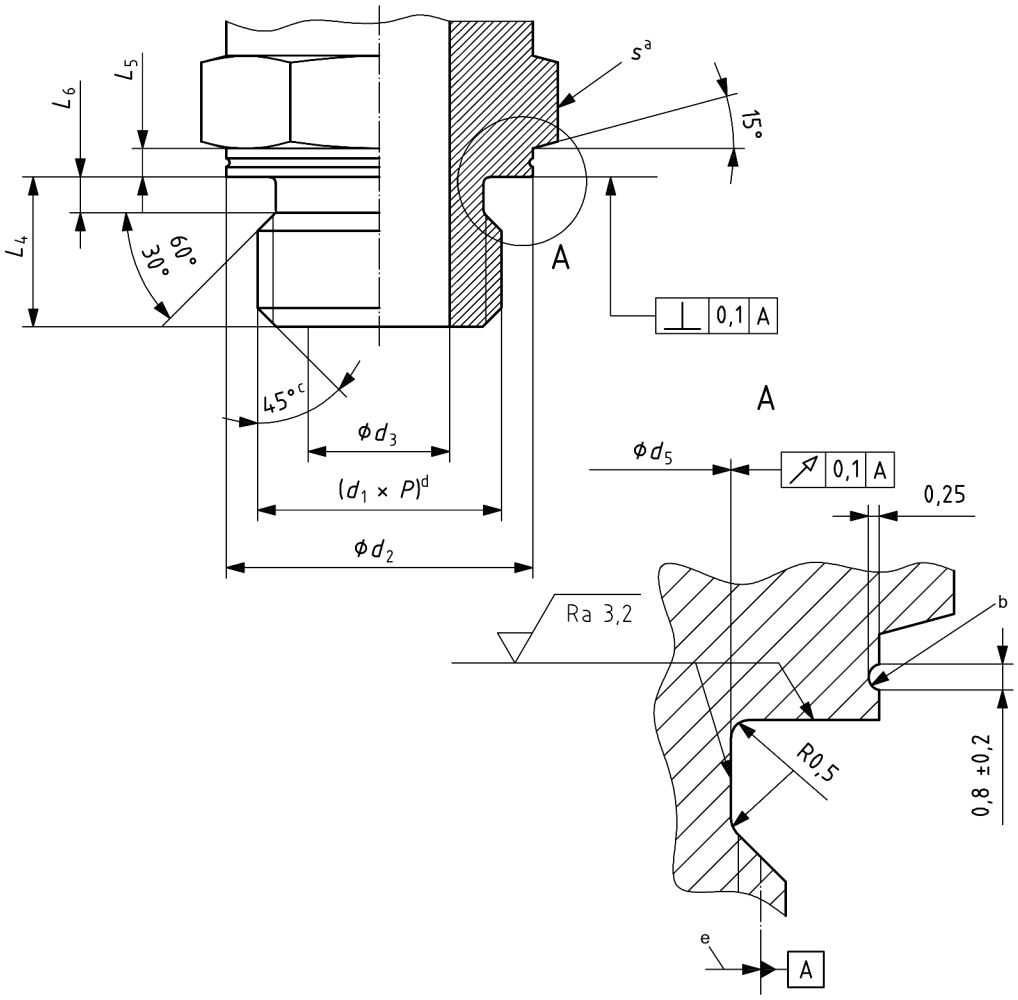
f For reference only.

g Variation.

Figure 1 — Adjustable heavy-duty (S series) stud end

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Dimensions in millimetres
surface roughness in micrometres



a Width across flats.

b Notch of optional shape, centrally located on L_5; required for identification of metric stud end (see Clause 8).

c Chamfer to minor diameter of thread.

d Thread.

e Pitch diameter.

Figure 2 — Non-adjustable heavy-duty (S series) stud end

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Table 1 — Dimensions of heavy-duty (S series) stud ends

Dimensions in millimetres

Thread[a] ($d_1 \times P$)	d_2	d_3		d_4	d_5	d_6	d_7	L_1	L_2	L_3	L_4	L_5	L_6	L_7	L_8	L_9	L_{10}	s
	± 0,2	nom	tol.	± 0,4	$^{0}_{-0,1}$	$^{+0,4}_{0}$	$^{0}_{-0,3}$	± 0,2	± 0,2	min.	± 0,2	± 0,1	$^{+0,3}_{0}$	± 0,1	± 0,08	ref.	± 0,1	
M8 × 1	11,8	2	± 0,1	12,5	6,4	8,1	6,4	6,5	7	18	9,5	1,6	2	4	0,9	9,6	1,5	12
M10 × 1	13,8	3	± 0,1	14,5	8,4	10,1	8,4	6,5	7	18	9,5	1,6	2	4	0,9	9,6	1,5	14
M12 × 1,5	16,8	4	± 0,1	17,5	9,7	12,1	9,7	7,5	8,5	21	11	2,5	3	4,5	0,9	11,1	2	17
M14 × 1,5[b]	18,8	6	± 0,1	19,5	11,7	14,1	11,7	7,5	8,5	21	11	2,5	3	4,5	0,9	11,1	2	19
M16 × 1,5	21,8	7	± 0,2	22,5	13,7	16,1	13,7	9	9	23	12,5	2,5	3	4,5	0,9	12,6	2	22
M18 × 1,5	23,8	9	± 0,2	24,5	15,7	18,1	15,7	10,5	10,5	26	14	2,5	3	4,5	0,9	14,1	2,5	24
M20 × 1,5[c]	26,8	—	± 0,2	—	17,7	—	17,7	—	—	—	14	2,5	3	—	—	—	2,5	—
M22 × 1,5	26,8	12	± 0,2	27,5	19,7	22,1	19,7	11	11	27,5	15	2,5	3	5	1,25	14,8	2,5	27
M27 × 2	31,8	15	± 0,2	32,5	24	27,1	24	13,5	13,5	33,5	18,5	2,5	4	6	1,25	18,3	2,5	32
M30 × 2	35,8	17	± 0,2	36,5	27	30,1	27	13,5	13,5	33,5	18,5	2,5	4	6	1,25	18,3	2,5	36
M33 × 2	40,8	20	± 0,2	41,5	30	33,1	30	13,5	13,5	33,5	18,5	3	4	6	1,25	18,3	3	41
M42 × 2	49,8	26	± 0,2	50,5	39	42,1	39	14	14	34,5	19	3	4	6	1,25	18,8	3	50
M48 × 2	54,8	32	± 0,3	55,5	45	48,1	45	16,5	15	38	21,5	3	4	6	1,25	21,3	3	55
M60 × 2	64,8	40	± 0,3	65,5	57	60,1	57	19	17	42,5	24	3	4	6	1,25	23,8	3	65

[a] Conforming to ISO 261, tolerance grade 6g in accordance with ISO 965-1.

[b] Preferred for diagnostic port applications.

[c] For plugs for cartridge valve cavities only (see ISO 6149-4 and ISO 7789).

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Table 2 — Pressures for heavy-duty (S series) stud ends

Thread	Stud end style											
	Non-adjustable						Adjustable					
	Working pressure		Test pressure				Working pressure		Test pressure			
			Burst		Impulse[a]				Burst		Impulse[a]	
	MPa	(bar)	MPa	(bar)	MPa	(bar)	MPa	(bar)	MPa	(bar)	MPa	(bar)
M8 × 1	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M10 × 1	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M12 × 1,5	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M14 × 1,5	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M16 × 1,5	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M18 × 1,5	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M20 × 1,5[b]	40	(400)	160	(1 600)	53,2	(532)	—	—	—	—	—	—
M22 × 1,5	63	(630)	252	(2 520)	83,8	(838)	40	(400)	160	(1 600)	53,2	(532)
M27 × 2	40	(400)	160	(1 600)	53,2	(532)	40	(400)	160	(1 600)	53,2	(532)
M30 × 2	40	(400)	160	(1 600)	53,2	(532)	35	(350)	140	(1 400)	46,5	(465)
M33 × 2	40	(400)	160	(1 600)	53,2	(532)	35	(350)	140	(1 400)	46,5	(465)
M42 × 2	25	(250)	100	(1 000)	33,2	(332)	25	(250)	100	(1 000)	33,2	(332)
M48 × 2	25	(250)	100	(1 000)	33,2	(332)	20	(200)	80	(800)	26,6	(266)
M60 × 2	25	(250)	100	(1 000)	33,2	(332)	16	(160)	64	(640)	21,3	(213)

NOTE These pressures were established using connectors made of low carbon steel and tested in accordance with ISO 19879.

[a] Cyclic endurance test pressure.

[b] For plugs for cartridge valve cavities only (see ISO 6149-4 and ISO 7789).

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Table 3 — Adjustable stud end washer torque and flatness allowance

Thread	Maximum nut torque required to move washer N·m	Maximum washer flatness allowance mm
M8 × 1	1	0,25
M10 × 1	3	0,25
M12 × 1,5	4	0,25
M14 × 1,5	5	0,25
M16 × 1,5	7	0,25
M18 × 1,5	10	0,25
M22 × 1,5	12	0,25
M27 × 2	15	0,4
M30 × 2	18	0,4
M33 × 2	20	0,4
M42 × 2	25	0,5
M48 × 2	30	0,5
M60 × 2	40	0,5

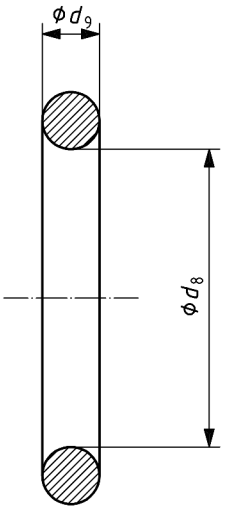


Figure 3 — O-ring

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Table 4 — Dimensions of O-rings

Dimensions in millimetres

Thread	Inside diameter d_8		Cross-section diameter d_9	
	nom.	tol.	nom.	tol.
M8 × 1	6,1	± 0,2	1,6	± 0,08
M10 × 1	8,1	± 0,2	1,6	± 0,08
M12 × 1,5	9,3	± 0,2	2,2	± 0,08
M14 × 1,5	11,3	± 0,2	2,2	± 0,08
M16 × 1,5	13,3	± 0,2	2,2	± 0,08
M18 × 1,5	15,3	± 0,2	2,2	± 0,08
M20 × 1,5[a]	17,3	± 0,22	2,2	± 0,08
M22 × 1,5	19,3	± 0,22	2,2	± 0,08
M27 × 2	23,6	± 0,24	2,9	± 0,09
M30 × 2	26,6	± 0,26	2,9	± 0,09
M33 × 2	29,6	± 0,29	2,9	± 0,09
M42 × 2	38,6	± 0,37	2,9	± 0,09
M48 × 2	44,6	± 0,43	2,9	± 0,09
M60 × 2	56,6	± 0,51	2,9	± 0,09

[a] For plugs for cartridge valve cavities only (see ISO 6149-4 and ISO 7789).

Table 5 — Torques for stud end qualification test

Thread	Torque N·m $^{+10\ \%}_{0}$
M8 × 1	10
M10 × 1	20
M12 × 1,5	35
M14 × 1,5	45
M16 × 1,5	55
M18 × 1,5	70
M20 × 1,5[a]	80
M22 × 1,5	100
M27 × 2	170
M30 × 2	215
M33 × 2	310
M42 × 2	330
M48 × 2	420
M60 × 2	500

[a] For plugs for cartridge valve cavities only (see ISO 6149-4 and ISO 7789).

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Bibliography

[1] ISO 1101, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

[2] 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*

[3] 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 and elastomeric sealing (type E)*

[4] ISO 1179-3[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 3: Light-duty (L series) stud ends with sealing by O-ring with retaining ring (types G and H)*

[5] ISO 1179-4[3)], C*onnections 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)*

[6] ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

[7] ISO 4755, *Fasteners — Thread undercuts for external metric ISO threads*

[8] ISO 6149-4[4)], *Connections for fluid power and general use — Ports and stud ends with ISO 261 metric threads and O-ring sealing — Part 4: Dimensions, design, test methods and requirements for external and internal hexport plugs*

[9] ISO 7789, *Hydraulic fluid power — Two-, three- and four-port screw-in cartridge valves — Cavities*

[10] ISO 8434-1[5)], *Metallic tube connections for fluid power and general use — Part 1: 24 degree cone connectors*

[11] ISO 8434-3, *Metallic tube connections for fluid power and general use — Part 3: O-ring face seal fittings*

[12] ISO 8434-4[6)], *Metallic tube connections for fluid power and general use — Part 4: 24 degree cone connectors with O-ring weld-on nipples*

[13] 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*

[14] 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)*

[15] ISO 9974-3, *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)*

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3) To be published. (Partial revision of ISO 1179:1981)

4) To be published.

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

6) To be incorporated into the new edition of ISO 8434-1.

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

[17] ISO 11926-2, *Connections for general use and fluid power — Ports and stud ends with ISO 725 threads and O-ring sealing — Part 2: Heavy-duty (S series) stud ends*

[18] ISO 11926-3, *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*

[19] ISO 12151-4[7)], *Connections for hydraulic fluid power and general use — Hose fittings — Part 4: Hose fittings with ISO 6149 metric stud ends*

7) To be published.

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