INTERNATIONAL STANDARD

ISO 9974-2

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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)

Raccordements pour applications générales et transmissions hydrauliques et pneumatiques — Orifices et éléments mâles à filetage ISO 261 et joint en élastomère ou étanchéité métal sur métal —

Partie 2: Éléments mâles avec joint en élastomère (type E)

Reference number
ISO 9974-2:1996(E)

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 9974-2 was prepared jointly by Technical Committees ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 5, *Threaded or plain end butt-welding fittings, threads, gauging of threads*, and ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

ISO 9974 consists of the following parts, under the general title *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*

— *Part 2: Stud ends with elastomeric sealing (type E)*

— *Part 3: Stud ends with metal-to-metal sealing (type B)*

The performance requirements, dimensions and designs are defined for port and stud end connections for the L and S series in ISO 9974-2 and for the LL, L and S series in ISO 9974-3. Significant testing over more than 30 years of use has confirmed the performance requirements of these port and stud end connections.

Stud ends conforming to ISO 9974-2 and 9974-3 are identical to those conforming to DIN 3852-1. ISO 9974-2 stud ends are used on ISO 8434-1 and ISO 8434-4 fittings, and ISO 9974-3 stud ends are used on ISO 8434-1 fittings.

Annex A forms an integral part of this part of ISO 9974. Annex B is for information only.

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

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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)

1 Scope

This part of ISO 9974 specifies dimensions, performance requirements and test procedures for heavy-duty (S series) and light-duty (L series) stud ends with ISO 261 threads and the elastomeric sealing that is used with them. It also specifies the designation of these stud ends and their elastomeric sealing.

Heavy-duty (S series) stud ends with type E sealing in accordance with this part of ISO 9974 may be used at working pressures up to 63 MPa (630 bar [1]). Light-duty (L series) stud ends with type E sealing in accordance with this part of ISO 9974 may be used at working pressures up to 25 MPa (250 bar). The permissible working pressure depends upon the stud end size, materials, design, working conditions, application, etc.

For threaded ports and stud ends specified in new designs in hydraulic fluid power applications, only ISO 6149 is to be used. Threaded ports and stud ends in accordance with ISO 1179, ISO 9974 and ISO 11926 are not to be used for new designs in hydraulic fluid power applications.

Conformance to the dimensional information in this part of ISO 9974 does not guarantee rated performance. Each manufacturer should perform testing according to the specification contained in this part of ISO 9974 to assure that components comply with the performance ratings.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9974. 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 9974 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 261:— [2], *ISO general-purpose metric screw threads — General plan.*

ISO 3448:1992, *Industrial liquid lubricants — ISO viscosity classification.*

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 6508:1986, *Metallic materials — Hardness test — Rockwell test (scales A - B - C - D - E - F - G - H - K).*

ISO 6803:1994, *Rubber or plastics hoses and hose assemblies — Hydraulic pressure impulse test without flexing.*

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

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

3 Definitions

For the purposes of this part of ISO 9974, the definitions given in ISO 5598 apply.

4 Dimensions

Stud ends shall conform to the dimensions shown in figure 1 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

Stud ends made of low carbon steel shall be designed for use at the working pressures given in table 2.

5.2 Performance

Stud ends made of low carbon steel shall meet at least the burst and impulse pressures given in table 2, when tested in accordance with clause 7.

6 Elastomeric seals

Elastomeric seals for use with both heavy-duty (S series) and light-duty (L series) stud ends in accordance with this part of ISO 9974 shall conform to the dimensions shown in figure 2 and given in table 3. Figure 3 shows the correct installation of the seal.

7 Test methods

Parts used for the cyclic endurance or burst test shall not be tested further, used or returned to stock.

7.1 Burst pressure test

7.1.1 Principle

Test three samples to confirm that stud ends in accordance with this part of ISO 9974 meet or exceed a ratio of 4:1 between the relevant burst and working pressures.

7.1.2 Materials

7.1.2.1 Test block and stud ends

Test blocks shall be unplated and hardened to 50 HRC to 55 HRC (see ISO 6508). Stud ends shall be made from low carbon steel and plated.

7.1.2.2 Test seals

Unless otherwise specified, test seals shall be made from nitrile (NBR) rubber with a hardness of (90 ± 5) IRHD when measured in accordance with ISO 48. Test seals shall conform to the dimensions given in table 3.

7.1.3 Procedure

7.1.3.1 Thread lubrication

For testing only, threads and contact surfaces shall be lubricated with hydraulic oil with a viscosity of VG 32 in accordance with ISO 3448 prior to the application of torque.

7.1.3.2 Stud end torque

Test stud ends after application of the torques given in table 4.

7.1.3.3 Pressure rise rate

During the burst test, the rate of pressure rise shall not exceed 138 MPa/min (1 380 bar/min).

7.1.4 Test report

Test results and conditions shall be reported on the test data form given in annex A.

7.2 Cyclic endurance (impulse) test

7.2.1 Principle

Test six samples at their respective impulse pressures.

7.2.2 Materials

Use the same materials as those given in 7.1.2.

7.2.3 Procedure

7.2.3.1 Thread lubrication

Apply lubricant as specified in 7.1.3.1.

Dimensions in millimetres,
surface roughness in micrometres

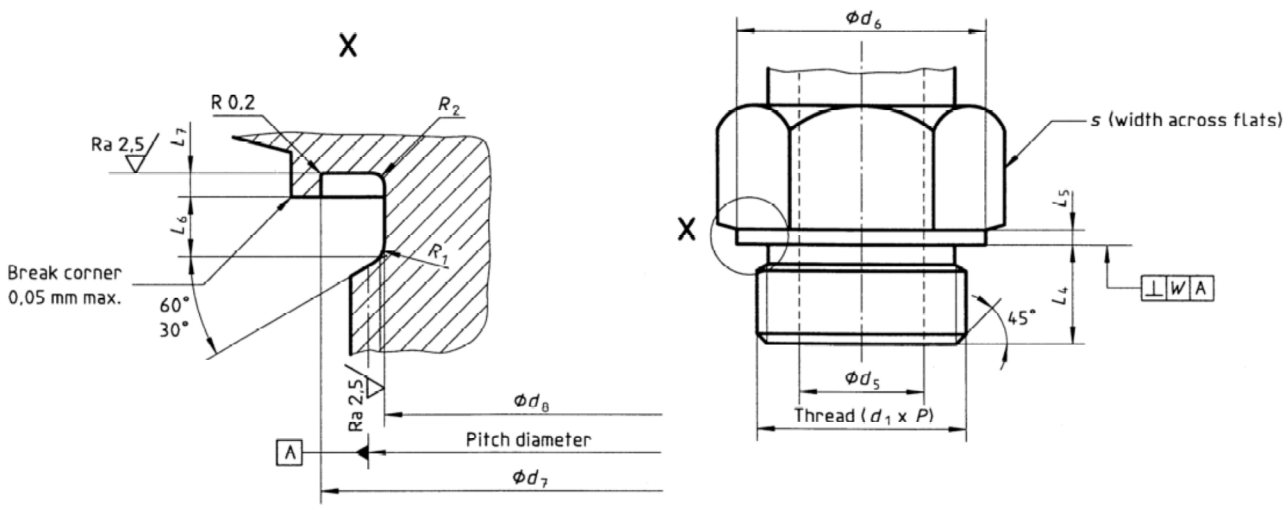


Figure 1 — Light-duty (L series) and heavy-duty (S series) stud end with elastomeric sealing (type E)

Table 1 — Dimensions of light-duty (L series) and heavy-duty (S series) stud ends with elastomeric sealing (type E)

Dimensions in millimetres

Thread ($d_1 \times P$)	d_5				d_6	d_7	d_8	L_4	L_5	L_6	L_7	R_1	R_2	s	W
	L series		S series												
	nom.[1]	tol.[2]	nom.[1]	tol.[2]	$^{0}_{-0,2}$	$^{+0,1}_{0}$	$^{0}_{-0,2}$	± 0,2	min.	$^{+0,3}_{0}$	$^{+0,1}_{0}$	± 0,1	± 0,1		
M10 × 1	4	$^{+0,18}_{0}$	—	—	13,9	12	8,3	8	1,5	2	0,7	1	0,5	14	
M12 × 1,5	6	$^{+0,18}_{0}$	4	$^{+0,18}_{0}$	16,9	14,5	9,7	12	2	3	1,2	1,2	0,5	17	
M14 × 1,5	7	$^{+0,22}_{0}$	5	$^{+0,18}_{0}$	18,9	16,6	11,7	12	2	3	1,2	1,2	0,5	19	
M16 × 1,5	9	$^{+0,22}_{0}$	7	$^{+0,22}_{0}$	21,9	19	13,7	12	2	3	1,2	1,2	0,5	22	0,1
M18 × 1,5	11	$^{+0,27}_{0}$	8	$^{+0,22}_{0}$	23,9	21	15,7	12	2,5	3	1,2	1,2	0,6	24	
M20 × 1,5 [3]	—	—	10	$^{+0,22}_{0}$	25,9	23	17,7	14	2,5	3	1,2	1,2	0,6	27	
M22 × 1,5	14	$^{+0,27}_{0}$	12	$^{+0,27}_{0}$	26,9	24,5	19,7	14	3	3	1,2	1,2	0,6	27	
M26 × 1,5	18	$^{+0,27}_{0}$	—	—	31,9	29,3	23,8	16	3	3	1,2	1,2	0,6	32	
M27 × 2	—	—	16	$^{+0,27}_{0}$	31,9	29,3	23,8	16	3	4	1,2	1,6	0,6	32	
M33 × 2	23	$^{+0,33}_{0}$	20	$^{+0,33}_{0}$	39,9	36	29,6	18	3	4	1,6	1,6	0,8	41	0,2
M42 × 2	30	$^{+0,33}_{0}$	25	$^{+0,33}_{0}$	49,9	46	38,6	20	3	4	1,6	1,6	0,8	50	
M48 × 2	36	$^{+0,39}_{0}$	32	$^{+0,39}_{0}$	54,9	51	44,5	22	3	4	1,6	1,6	0,8	55	

1) Maximum nominal diameter.
2) Tolerance corresponding to H13 in accordance with ISO 286-2.
3) For measurement applications.

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Table 2 — Pressures for light-duty (L series) and heavy-duty (S series) stud ends with elastomeric sealing (type E)

Series	Thread	Working pressure		Test pressure			
				Burst		Impulse [1]	
		MPa	(bar)	MPa	(bar)	MPa	(bar)
L	M10 × 1	25	(250)	100	(1 000)	33,2	(332)
	M12 × 1,5	25	(250)	100	(1 000)	33,2	(332)
	M14 × 1,5	25	(250)	100	(1 000)	33,2	(332)
	M16 × 1,5	25	(250)	100	(1 000)	33,2	(332)
	M18 × 1,5	25	(250)	100	(1 000)	33,2	(332)
	M22 × 1,5	16	(160)	64	(640)	21,3	(213)
	M26 × 1,5	16	(160)	64	(640)	21,3	(213)
	M33 × 2	10	(100)	40	(400)	13,3	(133)
	M42 × 2	10	(100)	40	(400)	13,3	(133)
	M48 × 2	10	(100)	40	(400)	13,3	(133)
S	M12 × 1,5	63	(630)	252	(2 520)	83,8	(838)
	M14 × 1,5	63	(630)	252	(2 520)	83,8	(838)
	M16 × 1,5	63	(630)	252	(2 520)	83,8	(838)
	M18 × 1,5	63	(630)	252	(2 520)	83,8	(838)
	M20 × 1,5 [2]	63	(630)	252	(2 520)	83,8	(838)
	M22 × 1,5	40	(400)	160	(1 600)	53,2	(532)
	M27 × 2	40	(400)	160	(1 600)	53,2	(532)
	M33 × 2	40	(400)	160	(1 600)	53,2	(532)
	M42 × 2	25	(250)	100	(1 000)	33,2	(332)
	M48 × 2	25	(250)	100	(1 000)	33,2	(332)

NOTE — These pressures were established using fittings made of low carbon steel when tested in accordance with clause 7.

1) Cyclic endurance test pressure.
2) For measurement applications.

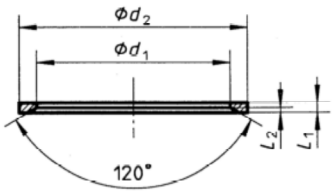


Figure 2 — Elastomeric seal for use with light-duty (L series) and heavy-duty (S series) stud ends

Table 3 — Dimensions of elastomeric seals for use with light-duty (L series) and heavy-duty (S series) stud ends

Dimensions in millimetres

Thread	d_1		d_2		L_1	L_2
	nom.	tol.	nom.	tol.	± 0,1	$^{+0,2}_{0}$
M10 × 1	8,4		11,9		1	0,5
M12 × 1,5	9,8		14,4		1,5	0,8
M14 × 1,5	11,6		16,5		1,5	0,8
M16 × 1,5	13,8		18,9		1,5	0,8
M18 × 1,5	15,7	± 0,2	20,9	± 0,2	1,5	0,8
M20 × 1,5 [1]	17,8		22,9		1,5	0,8
M22 × 1,5	19,6		24,3		1,5	0,8
M26 × 1,5	23,9		29,2		1,5	0,8
M27 × 2	23,9		29,2		1,5	0,8
M33 × 2	29,7		35,7		2	1
M42 × 2	38,8	± 0,3	45,8	± 0,3	2	1
M48 × 2	44,7		50,7		2	1

1) For measurement applications.

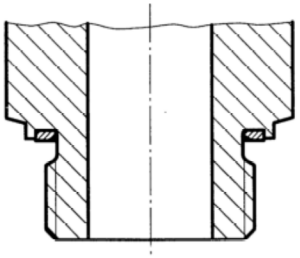


Figure 3 — Correct assembly of elastomeric seal on stud end

Table 4 — Torques for stud end qualification test

Series	Thread	Torque N·m $^{+10\ \%}_{0}$
L	M10 × 1	20
	M12 × 1,5	30
	M14 × 1,5	50
	M16 × 1,5	60
	M18 × 1,5	80
	M22 × 1,5	140
	M26 × 1,5	200
	M33 × 2	380
	M42 × 2	500
	M48 × 2	600
S	M12 × 1,5	45
	M14 × 1,5	60
	M16 × 1,5	80
	M18 × 1,5	100
	M20 × 1,5	140
	M22 × 1,5	150
	M27 × 2	200
	M33 × 2	380
	M42 × 2	500
	M48 × 2	600

NOTE — The torque values are for testing only. Assembly tightening torque depends on many factors, including lubrication, coating and surface finish. The manufacturer shall be consulted.

7.2.3.2 Stud end torques

Apply torque as specified in 7.1.3.2.

7.2.3.3 Cycle and pressure rise rate

The cycle rate shall be uniform between 0,5 Hz and 1,3 Hz and shall conform to the wave pattern shown in ISO 6803, except that the pressure rise rate shall be adjusted accordingly.

7.2.4 Requirements

The six samples tested shall pass a cyclic endurance test of 1 000 000 cycles.

7.2.5 Test report

Test results and conditions shall be reported on the test data form given in annex A.

8 Designation

8.1 Stud ends

The stud ends shall be designated by

a) "Stud end";

b) reference to this part of ISO 9974, i.e. 9974-2;

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

d) stud end series [heavy duty (S) or light duty (L)].

EXAMPLE

Stud end ISO 9974-2 - M12 × 1,5 S

8.2 Elastomeric seals

The elastomeric seals shall be designated by

a) "Elastomeric seal";

b) reference to this part of ISO 9974, i.e. ISO 9974-2;

c) thread size ($d_1 \times P$) of the stud end on which the elastomeric seal is mounted.

EXAMPLE

Elastomeric seal ISO 9974-2 - M12 × 1,5

9 Identification statement (Reference to this part of ISO 9974)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this part of ISO 9974:

"Stud ends with elastomeric sealing conform to ISO 9974-2:1996, *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).*"

Annex A
(normative)

Test data form for ISO 9974-1 ports and ISO 9974-2 stud ends

Stud end specifications:

Manufacturer: .....
Stud end type: .....
Test facility: .....
Size: .....
Minimum material tensile strength: ..... MPa
Stud end working pressure (table 2): ..... MPa
Stud end impulse test pressure (table 2): ..... MPa
Stud end burst test pressure (table 2): ..... MPa
Qualification test assembly torque (table 3): ..... N·m

Burst test results (at least three samples burst tested)

Sample No.	Pressure at failure	Torque	Hardness	Type of failure
1	..... MPa	..... N·m	.....	.....
2	..... MPa	..... N·m	.....	.....
3	..... MPa	..... N·m	.....	.....

Cyclic endurance test results (at least six samples impulse tested)

Sample No.	Cycles at failure	Torque	Hardness	Type of failure
1	.....	..... N·m	.....	.....
2	.....	..... N·m	.....	.....
3	.....	..... N·m	.....	.....
4	.....	..... N·m	.....	.....
5	.....	..... N·m	.....	.....
6	.....	..... N·m	.....	.....

Conclusions: .....

Dimensions/List any exceptions: .....

Name (printed or typed) and signature of person certifying report:

..... Date: .....

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Annex B
(informative)

Bibliography

[1] ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts.*

[2] ISO 1101:1983, *Technical drawings — Geometrical tolerancing — Tolerances of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

[3] 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.*

[4] 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).*

[5] 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).*

[6] ISO 1179-4:— [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 4: Stud ends for general use only with metal-to-metal sealing (type B).*

[7] ISO 1302:1992, *Technical drawings — Method of indicating surface texture on drawings.*

[8] 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.*

[9] 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.*

[10] 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.*

[11] ISO 6410-1:1993, *Technical drawings — Screw threads and threaded parts — Part 1: General conventions.*

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

[13] ISO 8434-4:1995, *Metallic tube connections for fluid power and general use — Part 4: 24 degree cone connectors with O-ring weld-on nipples.*

[14] ISO 9974-1:1996, *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.*

[15] 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).*

[16] ISO 11926-1:1995, *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.*

[17] ISO 11926-2:1995, *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 11926-3:1995, *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.*

[19] DIN 3852-1:1992, *Stud ends and tapped holes, with metric fine pitch thread, for use with compression couplings, valves and screw plugs — Dimensions.*

3) To be published.

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