SAE International™

SURFACE VEHICLE STANDARD

J1926-2

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Connections for General Use and Fluid Power—Ports and Stud Ends with ASME B1.1 Threads and O-Ring Sealing—Part 2: Heavy-Duty (S Series) Stud Ends

RATIONALE

SAE J1926-2 covers the requirements for Heavy-Duty stud ends formerly covered in SAE J1453. The design parameters are the same and remain unchanged except for conversion to metric dimensions and in rounding. Performance ratings have been added to the standard.

FOREWORD

SAE J1926 consists of the following parts, under the general title:

Connections for general use and fluid power

Ports and stud ends with ASME B1.1 threads and O-ring sealing:

— Part 1: Port with O-Ring Seal in Truncated Housing
— Part 2: Heavy-Duty (S Series) Stud Ends
— Part 3: Light-Duty (L Series) Stud Ends

These standards define performance requirements, dimensions, and designs for port and stud end connections for heavy-duty in Part 2 and light-duty in Part 3. Significant testing through 40 years of use has confirmed the performance requirements of these ports and stud ends.

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/pipes, or to hose fittings and hoses.

1. SCOPE

This part of SAE J1926 specifies dimensions, performance requirements, and test procedures for adjustable and nonadjustable heavy-duty (S series) stud ends with ASME B1.1 threads for use in fluid power and general applications and the O-rings used with them.

Stud ends in accordance with this part of SAE J1926 may be used at working pressures up to 63 MPa for nonadjustable stud ends and up to 40 MPa for adjustable stud ends. The permissible working pressure depends upon materials, design, working conditions, application, etc.

For threaded ports and stud ends specified in new designs for hydraulic fluid power applications, only SAE J2244 shall be used. Threaded ports and stud ends in accordance with ISO 1179, ISO 9974, and ISO 11926 shall not be used for new design in hydraulic fluid power applications.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
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Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

Conformance to the dimensional information does not guarantee rated performance. Each manufacturer shall perform testing according to the specification contained in this document to ensure that components made to this document comply with the performance rating.

Appendices A and B of this document are normative; Appendix C of this document is informative.

2. REFERENCES

2.1 Applicable Publications

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

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J515 Hydraulic O-ring

SAE J1644 Metallic Tube Connections for Fluid Power and General Use—Test Methods for Threaded Hydraulic Fluid Power Connectors

SAE J2244-2 Connections for Fluid Power and General Use—Ports and Stud Ends with ISO 261 Thread and O-ring Sealing—Part 2: Heavy-Duty (S Series) Stud Ends, Dimensions, Designs, Test Methods, and Requirements

2.1.2 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 1179-1[1] Connections for general use and fluid power—Ports and stud ends with ISO 228-1 threads with elastomeric and metal-to-metal sealing—Part 1: Threaded port

ISO 1179-2[1] Connections for general use and fluid power—Ports and stud ends with ISO 228-1 threads with elastomeric and 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 and metal-to-metal sealing—Part 3: Light duty (L series) stud end 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 and metal-to-metal sealing—Part 4: Stud end for general use only with metal-to-metal sealing (type B)

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

[1] To be published.

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: Port 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 8434-2[2] Metallic tube fittings for fluid power and general use—Part 2: 37° Flared Fittings

ISO 9974-1:1996 Connections for general use and fluid power—Ports and stud ends with ISO 261 threads with elastomeric and metal-to-metal sealing—Part 1: Threaded port

ISO 11926-1:1995 Connections for general use and fluid power—Ports and stud ends with ISO 261 threads and O-ring sealing—Part 1: Threaded port with O-ring seal in truncated housing

ISO 11926-2:1995 Connections for general use and fluid power—Ports and stud ends with ISO 261 threads and O-ring sealing—Part 2: Heavy duty (S series) stud ends

ISO 11926-3:1995 Connections for general use and fluid power—Ports and stud ends with ISO 261 threads and O-ring sealing—Part 3: Light duty (L series) stud ends

2.1.3 ASME Publications

Available from the American Society of Mechanical Engineers, 22 Law Drive, PO Box 2900, Fairfield, NJ 07007-2900, Tel: 973-882-1170, www.asme.org.

ASME B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 ASTM Publications

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117 Method of Salt Spray (Fog) Test

ASTM B 633 Standard Specifications for Electrodeposited Coatings of Zinc or Iron and Steel

2.2.2 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO 48:1979 Vulcanized rubbers—Determination of hardness (Hardness between 30 and 85 IRHD)

ISO 263:1973 ISO inch screw threads—General plan and selection for screws, bolts and nuts—Diameter range 0,06 to 6 in

ISO 1101:1983 Technical drawings—Tolerancing of form, orientation, location and run-out—Generalities, definitions, symbols, indications on drawings

[2] To be published.

ISO 1302:1978 Technical drawings—Method of indicating surface texture on drawings

ISO 3448:1975 Industrial liquid lubricants—ISO viscosity classification

ISO 3601-3:1987 Fluid systemsSealing devices—O-rings—Part 3: Quality acceptance criteria

ISO 6803:1984 Rubber or plastic hoses and hose assemblies—Hydraulic pressure impulse test without flexing

ISO 9974-2[3] Connections for general use and fluid power—Ports and stud ends with ISO 261 threads with elastomeric and metal-to-metal sealing—Part 2: Stud end with elastomeric sealing (type E)

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

3. DEFINITIONS

For the purpose of this part of SAE J1926, the definitions given in ISO 5598 and the following shall apply.

3.1 Adjustable Stud End

A stud end connector that allows for fitting orientation through final tightening of the locknut to complete the connection. This type of stud end is typically used on shaped fittings (e.g., tees, crosses, and elbows).

3.2 Nonadjustable Stud End

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

4. STUD END SIZE SPECIFICATIONS

The stud ends shall be specified by SAE J1926-2 and the thread size, separated by a colon, for example, SAE J1926-2:1/2-20.

5. REQUIREMENTS

5.1 Dimensions

Heavy-duty (S series) SAE J1926-2 stud ends shall conform to the dimensions in Figures 1A and 1B and Table 1. Hex tolerances across flats shall be according to ISO 4759-1 product grade C.

5.2 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.

[3] To be published.

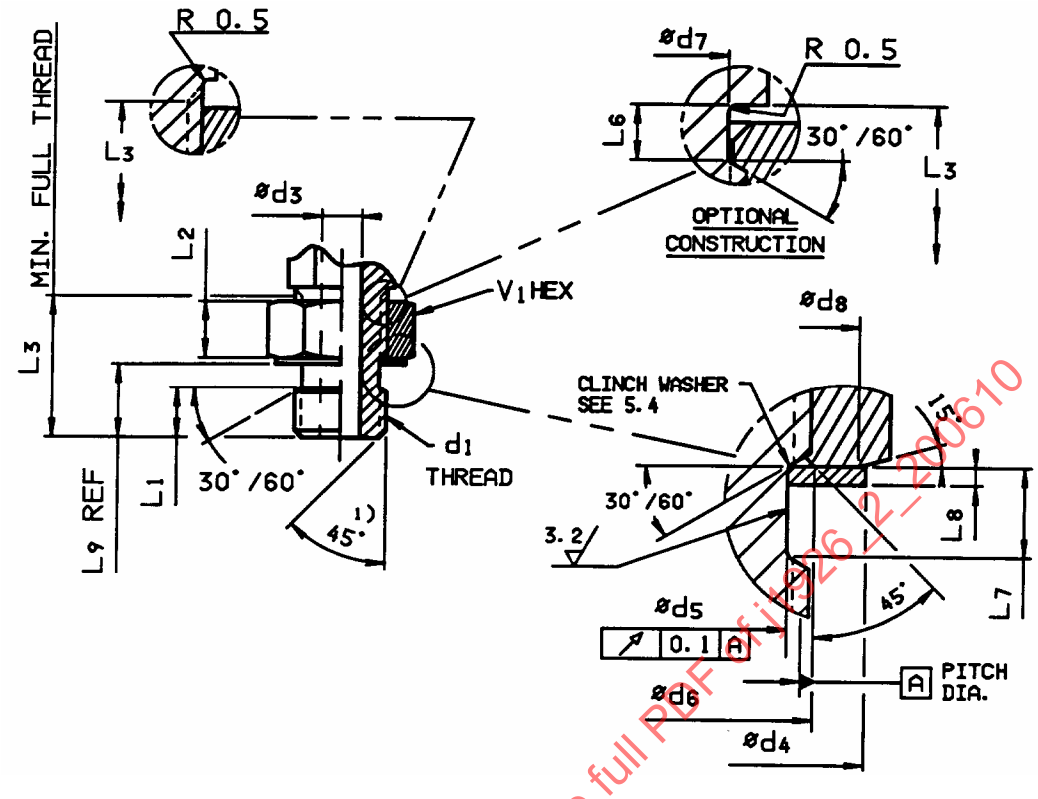

FIGURE 1A - ADJUSTABLE SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END DETAIL

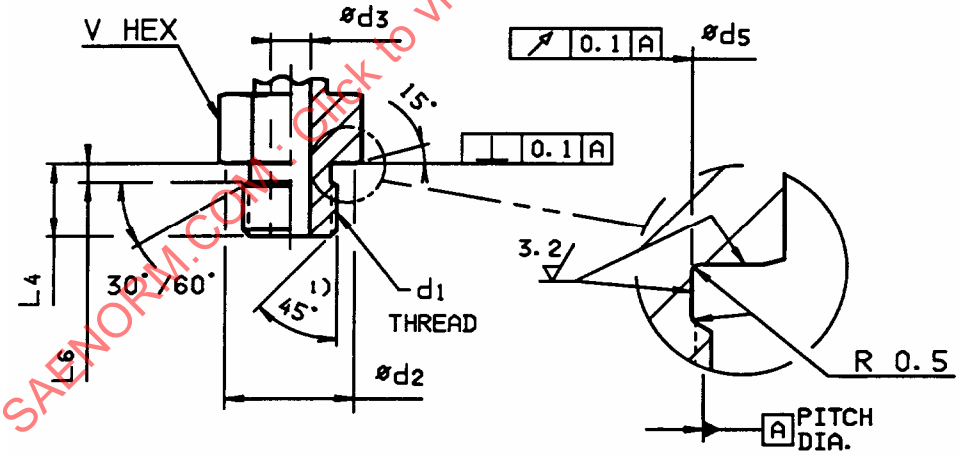

FIGURE 1B - NONADJUSTABLE SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END DETAIL

TABLE 1 - SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END DIMENSIONS

Dimensions in millimeters

Nominal Tube OD or Hose ID Inch Tubing Dash Size	Nominal Tube OD or Hose ID Inch Tubing mm	Nominal Tube OD or Hose ID Inch Tubing in	Nominal Tube OD or Hose ID Metric Tubing mm	d_1[1] Thread Size in	ϕd_2 ±0.2	ϕd_3		ϕd_4 ±0.4	ϕd_5 +0.05 -0.08	ϕd_6 ±0.2	ϕd_7 +0 -0.3	ϕd_8 ±0.2
-3	4.76	0.188	5	3/8-24	12.5	3.2	+0.18/0	14.6	7.95	9.9	8	14.1
-4	6.35	0.250	6	7/16-20	14.1	4.5	+0.18/0	16.5	9.25	11.5	9.3	14.9
-5	7.94	0.312	8	1/2-20	15.7	6	+0.18/0	18.3	10.85	13	10.9	17.3
-6	9.52	0.375	10	9/16-18	17.3	7.5	+0.22/0	20.2	12.24	14.6	12.3	18.8
-8	12.70	0.500	12	3/4-16	22	10	+0.22/0	25.7	16.76	19.4	16.8	23.6
-10	15.88	0.625	16	7/8-14	25.2	12.5	+0.27/0	29.3	19.63	22.6	19.7	26.8
-12	19.05	0.750	20	1-1/16-12	31.5	15.5	+0.27/0	36.7	24	27.3	24	34.7
-14	22.22	0.875	22	1-3/16-12	34.7	18	+0.27/0	40.4	27.18	30.5	27.2	37.9
-16	25.40	1.000	25	1-5/16-12	37.9	21.5	+0.33/0	44	30.35	33.7	30.4	41.1
-20	31.75	1.250	30	1-5/8-12	47.4	27.5	+0.33/0	55	38.28	41.6	38.3	47.4
-24	38.10	1.500	38	1-7/8-12	53.8	33.5	+0.39/0	62.3	44.6	48	44.6	53.8

1. Sizes 3/8 thru 7/8 are UNF-2A, sizes 1-1/16 thru 1-7/8 are UN-2A.

TABLE 1 - SAE J1926/2 HEAVY-DUTY (S SERIES) STUD END DIMENSIONS (CONTINUED)

Dimensions in millimeters

Nominal[1] Tube OD or Hose ID Inch Tubing Dash Size	Nominal Tube OD or Hose ID Inch Tubing mm	Nominal Tube OD or Hose ID Inch Tubing in	Nominal Tube OD or Hose ID Metric Tubing mm	L_1 ±0.2	L_2 ±0.2	L_3 min	L_4 ±0.2	L_6 ±0.15	L_7 ±0.1	L_8 ±0.08	L_9 ref	V[2][3] Hex	V_{12} Hex
-3	4.76	0.188	5	7	7.2	18.2	9.5	1.75	3.4	0.8	9.6	12.70	14.29
-4	6.35	0.250	6	8.2	8	20.5	11	2.05	3.7	0.9	11	14.29	15.88
-5	7.94	0.312	8	8.2	8	22.4	11	2.05	3.7	0.9	11	15.88	17.46
-6	9.52	0.375	10	9	8.5	22.4	12	2.05	4.1	0.9	12.2	17.46	19.05
-8	12.70	0.500	12	10	10.3	26.1	14	2.25	4.9	1	13.9	22.22	23.81
-10	15.88	0.625	16	11.8	11.5	30.2	16	2.85	5.7	1.25	16.3	25.40	26.99
-12	19.05	0.750	20	13.8	12.8	33.8	18.5	3.35	6	1.25	18.6	31.75	34.93
-14	22.22	0.875	22	13.8	12.8	33.8	18.5	3.35	6	1.25	18.6	34.93	38.10
-16	25.40	1.000	25	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6	38.10	41.28
-20	31.75	1.250	30	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6	47.63	47.63
-24	38.10	1.500	38	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6	53.98	53.98

1. Sizes 3/8 thru 7/8 (–3 thru –10) are UNF-2A, sizes 1-1/16 thru 1-7/8 are UN-2A.
2. See Appendix A for recommended metric hex sizes.
3. For jump sizes V hex size may be larger; however, the corners may have to be turned to appropriate diameter and length to fit port spotface.

5.3 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 tested according to 5.5.

TABLE 2 - SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END PRESSURES

Units in megapascals[2]

Thread Size in	Stud End Styles Nonadjustable Working[1] Pressure	Stud End Styles Nonadjustable Test Pressure Burst	Stud End Styles Nonadjustable Test Pressure Impulse[3]	Stud End Styles Adjustable Working[1] Pressure	Stud End Styles Adjustable Test Pressure Burst	Stud End Styles Adjustable Test Pressure Impulse[3]
3/8-24 UNF-2A	63	252	83.8	40	160	53.2
7/16-20 UNF-2A	63	252	83.8	40	160	53.2
1/2-20 UNF-2A	63	252	83.8	40	160	53.2
9/16-18 UNF-2A	63	252	83.8	40	160	53.2
3/4-16 UNF-2A	63	252	83.8	40	160	53.2
7/8-14 UNF-2A	63	252	83.8	40	160	53.2
1-1/16-12 UN-2A	40	160	53.2	40	160	53.2
1-3/16-12 UN-2A	40	160	53.2	40	160	53.2
1-5/16-12 UN-2A	40	160	53.2	31.5	126	41.9
1-5/8-12 UN-2A	25	100	33.2	25	100	33.2
1-7/8-12 UN-2A	25	100	33.2	20	80	26.6

1. These pressure ratings were established using fittings made of low-carbon steel and tested in accordance with 5.5.
2. To convert from MPa to bar multiply by 10. To convert from MPa to psi multiply by 145.04.
3. Cyclic endurance test pressure.

5.4 Adjustable Stud End Washer Fit and Flatness

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 allowance given in Table 3.

TABLE 3 - ADJUSTABLE STUD END WASHER TORQUE AND FLATNESS ALLOWANCE

Thread Size in	Maximum Nut Torque to Move Washer N·m[1]	Maximum Washer Flatness Allowance mm
3/8-24 UNF-2A	3	0.25
7/16-20 UNF-2A	4	0.25
1/2-20 UNF-2A	5	0.25
9/16-18 UNF-2A	7	0.25
3/4-16 UNF-2A	10	0.25
7/8-14 UNF-2A	12	0.25
1-1/16-12 UN-2A	15	0.40
1-3/16-12 UN-2A	18	0.40
1-5/16-12 UN-2A	20	0.40
1-5/8-12 UN-2A	25	0.50
1-7/8-12 UN-2A	30	0.50

1. To convert from N.m to lb_fft multiply by 0.737.

5.5 Test Methods

Stud ends shall be tested for burst and impulse per SAE J1644 with assembly torque values shown in Table 4.

TABLE 4 - SAE J1926-2 STUD END QUALIFICATION TORQUE

Thread Size in	Torque +10% -0 N·m[1]
3/8-24 UNF-2A	10
7/16-20 UNF-2A	20
1/2-20 UNF-2A	25
9/16-18 UNF-2A	35
3/4-16 UNF-2A	70
7/8-14 UNF-2A	100
1-1/16-12 UN-2A	170
1-3/16-12 UN-2A	215
1-5/16-12 UN-2A	270
1-5/8-12 UN-2A	285
1-7/8-12 UN-2A	370

1. To convert from N.m to $lb_f ft$ multiply by 0.737.

6. O-RING

O-rings used with heavy-duty (S series) SAE J1926-2 stud ends shall conform to the dimensions given in SAE J515.

7. IDENTIFICATION STATEMENT

Use the following statement in test reports, catalogues, and sales literature when electing to comply with this part of SAE J1926:

"Heavy-duty (S series) stud end conforms to SAE J1926-2, Connections for general use and fluid power—Ports and stud ends with ASME B1.1 threads and O-ring sealing—Part 2: Heavy-duty (S series) stud ends."

8. NOTES

8.1 Key Words

Fluid power, pipe fittings, standard connection, standard coupling, pipe joints, ports, stud ends, specifications, design, operating requirements, dimensions, designation, test methods, inch, straight thread, O-ring seal, high pressure.

8.2 Marginal Indicia

The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE FLUID CONDUCTORS AND CONNECTORS TECHNICAL COMMITTEE SC1—AUTOMOTIVE AND HYDRAULIC TUBE FITTING

APPENDIX A - (NORMATIVE)

A.1 By agreement between user and supplier, these metric hex sizes, shown in Table A1, shall be used in lieu of inch hex.

TABLE A1 - METRIC HEX SIZES

Thread Size in	Nonadjustable V Hex	Nonadjustable d_2 ±0.2 mm	Adjustable V_1 Hex	Adjustable d_8 ±0.2 mm
3/8-24 UNF-2A	12	11.8	14	13.8
7/16-20 UNF-2A	14	13.8	17	16.8
1/2-20 UNF-2A	17	16.8	17	16.8
9/16-18 UNF-2A	17	16.8	19	18.8
3/4-16 UNF-2A	22	21.8	24	23.8
7/8-14 UNF-2A	27	26.8	27	26.8
1-1/16-12 UN-2A	32	31.8	36	35.8
1-3/16-12 UN-2A	36	35.8	41	40.8
1-5/16-12 UN-2A	41	40.8	41	40.8
1-5/8-12 UN-2A	50	49.8	50	48.8
1-7/8-12 UN-2A	55	54.8	55	54.8