SAE International™

SURFACE VEHICLE STANDARD

SAE J1926-2 MAR2010

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(R) 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

General revision for harmonization with J1453-3 and ISO 11926-2, addition of sizes -32, -40 and-48 and converting the document to metric hex standard in accordance with FCCTC resolution on metric hex conversion. The resolution provides rationale for converting to metric hex and not using inch hex for new designs as follows:

"In an effort to standardize within a global market and ensuring that companies can remain competitive in an international market, it is the intent to convert to metric hex sizes which will:

- lead to one global standard

- guide users to a preferred system

- reduce complexity

- eliminate duplication

- reduce confusion"

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

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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/J1926/2_201003

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 25 years of use has confirmed the performance requirements of these ports and stud ends (up through size -24). SAE 1926-2 stud ends up to size -24 were originally designed for high pressure connectors of SAE J1453 (current SAE J1453-3). Size -32 was developed later with performance verification via round robin testing by FCCTC-SC1 committee members.

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 that are currently not listed in SAE J515.

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 41.3 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 ISO 6149 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.

NOTE: This document specifies inch as well as metric hexes for the stud ends. Therefore, any product drawing specifying stud ends in accordance with this document must specify hex type, inch or metric, to assure getting intended hex.

Stud ends or parts specified before January 1, 2010 using this standard, shall be supplied with inch hexes, unless otherwise specified.

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.

Appendix A of this document is informative.

2. REFERENCES

2.1 Applicable Documents

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 International, 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 Specification for O-ring Materials Used with Hydraulic Connectors

SAE J1926-1 Connections for General Use and Fluid Power – Ports and Stud Ends with ASME B 1.1 Threads and O-ring Sealing – Part 1: Port with O-ring Seal in Truncated Housing

SAE J2593 Information Report for the Installation of Fluid Conductors and Connectors

2.1.2 ISO Publications

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

ISO 4759-1 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 Fluid power systems and components vocabulary

ISO 19879 Metallic tube connections for fluid power and general use - Test methods for hydraulic fluid power connections

2.1.3 ASME Publications

Available from American Society of Mechanical Engineers, 22 Law Drive, P.O. 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 SAE Publications

Available from SAE International, 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 J1453-3 Specification for O-ring Face Seal Connectors: Part 3—Requirements, Dimensions, and Tests for Steel Unions, Bulkheads, Swivels, Braze Sleeves, Connectors, Caps and Connectors with SAE J1926-2 Inch Stud Ends

SAE J1926-3 Connections for General Use and Fluid Power—Ports and Stud Ends with ASME B1.1 Threads and O-ring Sealing—Part 3: Light Duty (L Series) Stud Ends

SAE J1926-4 Connector for Fluid Power and General Use—Ports and Stud Ends with ASME B1.1 Threads and O-ring Seal—Part 4: External Hex and Internal Hex Inch Port Plugs—Dimensions, Design, Test Methods and Requirements

2.2.2 ISO Publications

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

ISO 48 Rubber, Vulcanized or thermoplastic—Determination of hardness (Hardness between 10 IRHD and 100 IRHD)

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

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

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 6149-1 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 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 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 6410-1 Technical Drawings – Screw threads and threaded parts – Part 1: General conventions

ISO 9974-1 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 9974-2 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 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)

ISO 11926-2 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

[1] To be published

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 before 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

4.1 Size Designation

The stud ends shall be designated by SAE J1926-2 and the thread size, separated by a colon, for example, SAE J1926-2:1/2-20. Products drawings specifying this stud end shall have the type of hex, inch or metric, listed.

4.2 Reduced Size Stud Ends for Jump Size Connectors

For jump size connectors where the hex size of the other end, e.g. tube/hose end, is larger than the stud hex “V” in Table 1, a shoulder may have to be turned to appropriate diameter and length to avoid interference with the port spot face. For details, see appropriate connector standard, e.g. SAE J1453-3 Table B2.

4.3 Assembly

For proper stud end assembly, follow instructions in SAE J2593.

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.

CAUTION: The pressures for sizes -40 (3-12 UN) and -48 (3 ½-12) are based on calculations for guidance only.

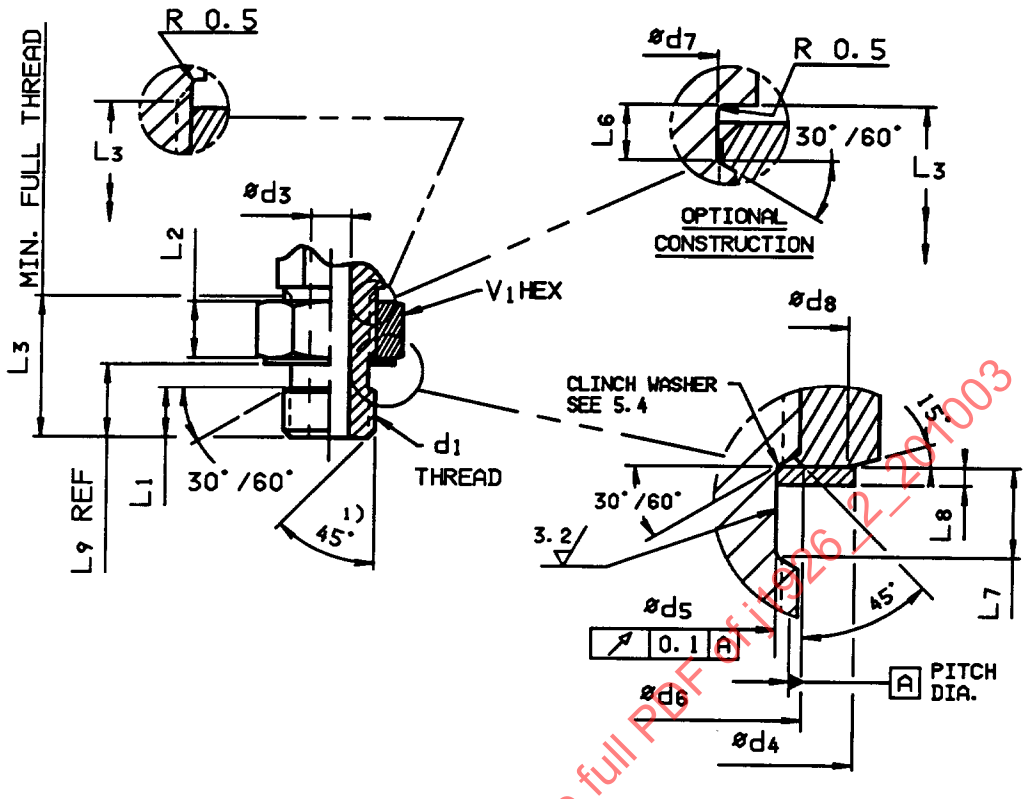

FIGURE 1A - ADJUSTABLE SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END DETAIL

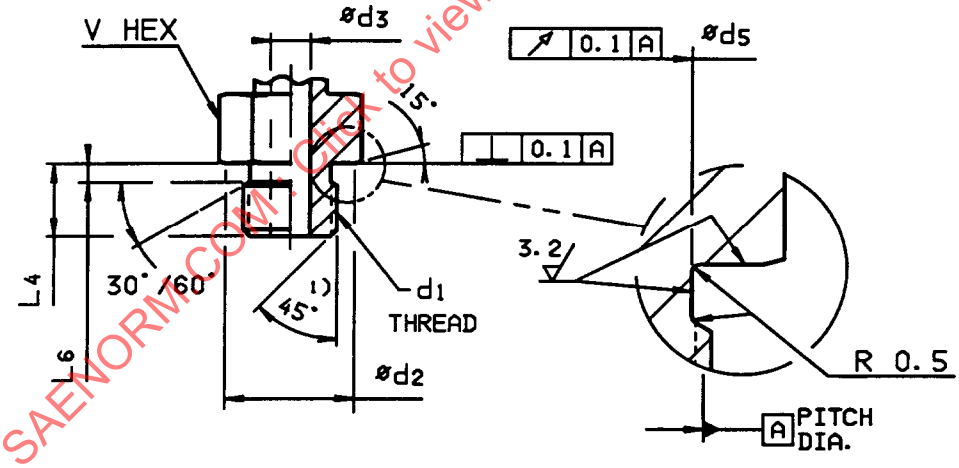

FIGURE 1B - NONADJUSTABLE SAE J1926-2 HEAVY-DUTY (S SERIES) STUD END DETAIL

1) CHAMFER TO MINOR DIAMETER OF THREAD

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

Dimensions in millimeters

Nominal Tube OD Inch Tubing Dash Size	Nominal Tube OD Inch Tubing mm	Nominal Tube OD Inch Tubing in	Nominal Tube OD Metric Tubing mm	d_1[1] Thread Size in	ϕd_2 ±0.2 for Metric Hex	ϕd_2[2] ±0.2 for Inch Hex	ϕd_3	Tol.	ϕd_4 ±0.4	ϕd_5 +0.05 -0.08	ϕd_6 ±0.2	ϕd_7 +0 -0.3	ϕd_8 ±0.2 for Metric Hex
-3	4.76	0.188	5	3/8-24	13.8	12.5	3	±0.1	14.6	7.95	9.9	8	13.8
-4	6.35	0.250	6	7/16-20	14.1[3]	14.1	4.5	±0.1	16.5	9.25	11.5	9.3	13.8
-5	7.94	0.312	8	1/2-20	16.8	15.8[4]	6	±0.1	18.3	10.85	13	10.9	16.8
-6	9.52	0.375	10	9/16-18	18.8	17.3	7.5	±0.2	20.2	12.24	14.6	12.3	18.8
-8	12.70	0.500	12	3/4-16	23.8	22	10	±0.2	25.7	16.76	19.4	16.8	23.8
-10	15.88	0.625	16	7/8-14	26.8	25.2	12.5	±0.2	29.3	19.63	22.6	19.7	26.8
-12	19.05	0.750	20	1-1/16-12	31.8	31.5	15.5	±0.2	36.7	24	27.3	24	35.8
-14	22.22	0.875	22	1-3/16-12	35.8	34.7	18	±0.2	40.4	27.18	30.5	27.2	40.8
-16	25.40	1.000	25	1-5/16-12	40.8	37.9	21.5	±0.2	44	30.35	33.7	30.4	40.8
-20	31.75	1.250	30	1-5/8-12	49.8	47.4	27.5	±0.2	55	38.28	41.6	38.3	48.8
-24	38.10	1.500	38	1-7/8-12	54.8	53.8	33.5	±0.3	62.3	44.6	48	44.6	54.8
-32	50.8	2.000	50	2 ½-12	69.8	69.6	40.0	±0.3	80.3	60.48	63.8	60.5	69.8
-40	63.5	2.500	-	3-12	84.8	82.4	53	±0.3	93	73.2	76.5	73.2	84.8
-48	76.2	3.000	-	3 ½-12	94.8	95.1	63	±0.3	105	85.9	89.2	85.9	94.8

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

Dimensions in millimeters

Nominal Tube OD Inch Tubing Dash Size	Nominal Tube OD Inch Tubing mm	Nominal Tube OD Inch Tubing in	Nominal Tube OD Metric Tubing mm	ϕd_8 (2) ±0.2 for Inch Hex	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
-3	4.76	0.188	5	14.1	7	7.2	18.8	9.5	1.75	3.4	0.8	9.6
-4	6.35	0.250	6	15.7	7.8	8	20.5	11	2.05	4.1	0.9	11
-5	7.94	0.312	8	17.3	7.8	8	20.5	11	2.05	4.1	0.9	11
-6	9.52	0.375	10	18.8	9	8.5	22.4	12	2.25	4.1	0.9	12.2
-8	12.70	0.500	12	23.6	10	10.3	26.1	14	2.55	4.9	1	13.9
-10	15.88	0.625	16	26.8	11.8	11.5	30.2	16	2.85	5.7	1.25	16.3
-12	19.05	0.750	20	34.7	13.8	12.8	33.8	18.5	3.35	6	1.25	18.6
-14	22.22	0.875	22	37.9	13.8	12.8	33.8	18.5	3.35	6	1.25	18.6
-16	25.40	1.000	25	41.1	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6
-20	31.75	1.250	30	47.4	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6
-24	38.10	1.500	38	53.8	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6
-32	50.80	2.000	50	69.6	13.8	13.6	34.6	18.5	3.35	6	1.25	18.6
-40	63.5	2.500	-	82.4	16	16	40.0	21	3.5	6.5	1.5	21
-48	76.2	3.000	-	95.1	20	20	48.0	25	3.5	6.5.	1.5	25

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

Dimensions in millimeters

Nominal Tube OD Inch Tubing Dash Size	Nominal Tube OD Inch Tubing mm	Nominal Tube OD Inch Tubing in	Nominal Tube OD Metric Tubing mm	V[(5)(6)] Hex mm	V_1[(6)] Hex mm	V[(2)(5)] Hex in	V_1[(2)] Hex in
-3	4.76	0.188	5	14	14	12.70	14.29
-4	6.35	0.250	6	14	17	14.29	15.88
-5	7.94	0.312	8	17	17	15.88	17.46
-6	9.52	0.375	10	19	19	17.46	19.05
-8	12.70	0.500	12	24	24	22.22	23.81
-10	15.88	0.625	16	27	27	25.40	26.99
-12	19.05	0.750	20	32	36[(7)]	31.75	34.93
-14	22.22	0.875	22	36	41[(8)]	34.93	38.10
-16	25.40	1.000	25	41	41	38.10	41.28
-20	31.75	1.250	30	50[(9)]	50[(9)]	47.63	47.63
-24	38.10	1.500	38	55	55	53.98	53.98
-32	50.80	2.000	50	70	70	69.85	69.85
-40	63.5	2.500	-	85	85	82.55	82.55
-48	76.2	3.000	-	95	95	95.25	95.25

TABLE 1 NOTES:

1. Sizes 3/8 through 7/8 (-3 through -10) are UNF-2A; sizes 1 1/16 through 3 ½ are UN-2A.
2. Optional inch hex column will be moved to Annex after 12/31/2012.
3. 15 degree chamfer is limited to 13.9/14.3 diameter to increase contact area at port face.
4. 15 degree chamfer is limited to 15.6/16.0 diameter to increase contact area at port face.
5. “V” hex is the minimum hex required for proper functioning of the straight thread O-ring port connection. It does not always control the connector hex. The connector hex is controlled by the larger of the minimum hex required for proper functioning of either end of the connector. Also see 4.2.
6. Stud ends or parts specified before January 1, 2010 using this standard, shall be supplied with inch hexes, unless otherwise specified.
7. Hex corners shall be turned to a diameter of 40 mm ± 0.2 mm to prevent possible interference with the port spotfacediameter.
8. Hex corners shall be turned to a diameter of 44 mm ± 0.2 mm to prevent possible interference with the port spotface diameter.
9. Hex corners shall be turned to a diameter of 57 mm ± 0.2 mm to prevent possible interference with the port spotface diameter.

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	84	42	168	56
7/16-20 UNF-2A	63	252	84	42	168	56
1/2-20 UNF-2A	63	252	84	42	168	56
9/16-18 UNF-2A	63	252	84	42	168	56
3/4-16 UNF-2A	63	252	84	42	168	56
7/8-14 UNF-2A	63	252	84	42	168	56
1-1/16-12 UN-2A	42	168	56	42	168	56
1-3/16-12 UN-2A	42	168	56	42	168	56
1-5/16-12 UN-2A	42	168	56	35	140	47
1-5/8-12 UN-2A	28	112	37	28	112	37
1-7/8-12 UN-2A	28	112	37	21	84	28
2 ½-12 UN-2A	21	84	28	17.5	70	23
3-12 UN-2A	17.5	70	23	14	56	19
3 ½-12 UN-2A	17.5	70	23	14	56	19

1. These pressure ratings were established using fittings made of low-carbon steel and tested in accordance with 4.5, except the ratings for sizes 3-12 and 3 ½-12 are calculated based on the stress levels of size 2 ½-12.
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
2 ½-12 UN-2A	40	0.50
3-12 UN-2A	50	0.50
3 ½-12 UN-2A	60	0.50

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