

Spherical and Flanged Sleeve (Compression) Tube Fittings

- 1. Scope**—This SAE Standard covers complete general and dimensional specifications for tube fittings of the spherical and flanged sleeve compression types for use in the piping of air brake systems on automotive vehicles. The spherical sleeve compression type Figures 1A to 5 and Tables 1 to 3 is intended for use with annealed copper alloy tubing per SAE J1149, Type 1. The flanged sleeve compression type Figures 6A to 11 and Tables 4 to 6 is intended for use with nylon tubing per SAE J844. It is not intended to restrict or preclude other designs of a tube fitting for use with SAE J844, air brake tubing. Performance requirements for SAE J844 are covered in SAE J1131. See SAE J1131 for the Performance Requirements of Reusable (Push to Connect) Fittings Intended for Use in Automotive Air Brake Systems.

CAUTION—To assure satisfactory performance, tapered sleeve compression type fitting components (SAE J512) should not be intermixed with the spherical or flanged sleeve components, nor should the spherical sleeve compression type components be intermixed with the flanged sleeve compression type components when assembling connection in areas where the three types are available.

2. References

- 2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

- 2.1.1 SAE PUBLICATIONS**—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J476—Dryseal Pipe Threads
SAE J512—Automotive Tube Fittings
SAE J844—Nonmetallic Air Brake System Tubing
SAE J846—Coding Systems for Identification of Fluid Conductors and Connectors
SAE J1131—Performance Requirements for SAE J844 Nonmetallic Tubing and Fitting Assemblies Used in Automotive Air Brake Systems
SAE J1149—Metallic Air Brake System Tubing and Pipe

- 2.1.2 ANSI PUBLICATION**—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI/ASME B1.1-1989—Unified Inch Screw Thread (UN and UNR)

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2.1.3 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 117—Method of Salt Spray (Fog) Testing
FMVSS 106—Brake Hoses

TABLE 1A—DIMENSIONS OF CONNECTORS, UNIONS, ELBOWS, AND TEES (FIGURES 1A TO 3E)

Nom Tube OD, in	Aa Dryseal Taper Thread in	B, Nom Thread Size, in Class 2A Ext.	C Nom, in	C ₁ Nom, in	C ₂ Nom, in	D Dia Drill mm	D Dia Drill in	D ₁ Dia Drill mm	D ₁ Dia Drill in	E Dia mm +0.10 -0.00	E Dia in +0.004 -0.000	F Dia mm +0.10 -0.00	F Dia in +0.004 -0.000	Gb Dia mm +0.00 -0.25	Gb Dia in +0.000 -0.010
1/4	1/8	7/16-24	7/16	7/16	9/16	4.78	0.188	4.78	0.188	6.45	0.254	7.90	0.311	9.96	0.392
5/16	1/8	1/2 -24	1/2	1/2	9/16	6.35	0.250	4.78	0.188	8.08	0.318	9.60	0.378	9.96	0.454
3/8	1/4	17/32-24	9/16	9/16	11/16	7.92	0.312	7.92	0.312	9.70	0.382	11.38	0.448	12.34	0.486
1/2	3/8	11/16-20	11/16	11/16	7/8	10.31	0.406	10.31	0.406	12.88	0.507	14.66	0.577	16.08	0.633
5/8	1/2	13/16-18	7/8	13/16	1- 1/16	13.49	0.531	13.49	0.531	16.05	0.632	18.01	0.709	19.10	0.752
3/4	1/2	1 -18 1	1	1	1- 1/16	16.66	0.656	13.49	0.531	19.25	0.758	21.59	0.850	23.85	0.939
3/4	3/4	1 -18 1- 1/16	1- 1/4	1- 1/4	1- 1/4	16.66	0.656	19.05	0.750	19.25	0.758	21.59	0.850	23.85	0.939
1	1	1- 1/4 -16 1- 3/8	1- 3/8	1- 1/4	1- 5/8	22.22	0.875	22.22	0.875	25.60	1.008	28.50	1.122	30.02	1.182

Nom Tube OD, in	Ic mm	Ic in	J Full Thread Min mm	J Full Thread Min in	K mm	K in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03	L ₂ mm ±0.8	L ₂ in ±0.03	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03
1/4	8.4	0.33	6.9	0.27	6.4	0.25	22.9	0.90	21.6	0.85	21.6	0.85	16.0	0.63	17.8	0.70
5/16	8.6	0.34	7.1	0.28	7.1	0.28	23.9	0.94	22.9	0.90	21.8	0.86	17.0	0.67	17.8	0.70
3/8	11.2	0.44	9.7	0.38	7.9	0.31	31.0	1.22	27.9	1.10	30.2	1.19	20.3	0.80	22.9	0.90
1/2	13.5	0.53	11.2	0.44	11.2	0.44	34.0	1.34	33.3	1.31	32.5	1.28	23.9	0.94	26.4	1.04
5/8	15.0	0.59	12.7	0.50	11.2	0.44	40.4	1.59	36.3	1.43	38.4	1.51	27.9	1.10	30.5	1.20
3/4	16.8	0.66	13.5	0.53	14.2	0.56	42.9	1.69	40.6	1.60	40.1	1.58	30.5	1.20	31.2	1.23
3/4	16.8	0.66	13.5	0.53	14.2	0.56	43.7	1.72	—	—	41.4	1.63	32.5	1.28	34.5	1.36
1	18.3	0.72	15.0	0.59	19.8	0.78	50.8	2.00	45.2	1.78	48.5	1.91	36.6	1.44	40.4	1.59

Nom Tube OD, in	M ₂ mm ±0.8	M ₂ in ±0.03	M ₃ mm ±0.8	M ₃ in ±0.03	N mm ±0.8	N in ±0.03	N ₁ mm ±0.8	N ₁ in ±0.03	N ₂ mm ±0.8	N ₂ in ±0.03	P min mm	P min in	P ₁ mm	P ₁ in	S Max mm	S Max in
1/4	12.7	0.50	16.0	0.63	17.0	0.67	13.7	0.54	16.3	0.64	9.7	0.38	9.7	0.38	—	—
5/16	13.7	0.54	17.0	0.67	17.8	0.70	14.5	0.57	16.3	0.64	9.7	0.38	9.7	0.38	11.4	0.45
3/8	18.3	0.72	20.3	0.80	23.6	0.93	19.8	0.78	21.8	0.86	14.2	0.56	14.2	0.56	—	—
1/2	21.6	0.85	23.9	0.94	25.4	1.00	21.1	0.83	24.1	0.95	14.2	0.56	14.2	0.56	æ	—
5/8	23.9	0.94	27.9	1.10	31.8	1.25	27.4	1.08	29.7	1.17	19.1	0.75	19.1	0.75	—	—
3/4	28.4	1.12	31.8	1.25	34.0	1.34	29.0	1.14	30.5	1.20	19.1	0.75	19.1	0.75	20.3	0.80
3/4	30.5	1.20	—	—	34.0	1.34	29.0	1.14	30.5	1.20	19.1	0.75	19.1	0.75	21.8	0.86
1	32.3	1.27	36.6	1.44	42.2	1.66	36.6	1.44	37.6	1.48	23.9	0.94	23.9	0.94	—	—

Continued on next page.

**TABLE 1A—DIMENSIONS OF CONNECTORS, UNIONS, ELBOWS, AND TEES
(FIGURES 1A TO 3E) (CONTINUED)**

Nom Tube OD, in	S ₁ Min mm	S ₁ Min in	T ^d Ref mm	T ^d Ref in	T ₁ Min mm	T ₁ Min in	V Dia Max mm	V Dia Max in	V Dia Min mm	V Dia Min in	W ^e Forged or Bar Min mm +0.0- 0.5	W ^e Forged or Bar Min in +0.00 -0.02
1/4	—	—	4.6	0.18	4.6	0.18	9.7	0.38	9.1	0.36	14.2	0.56
5/16	19.8	0.78	5.3	0.21	5.3	0.21	11.2	0.44	10.7	0.42	14.2	0.56
3/8	—	—	5.3	0.21	5.3	0.21	12.2	0.48	11.7	0.46	17.5	0.69
1/2	—	—	6.1	0.24	6.1	0.24	15.7	0.62	15.5	0.61	20.6	0.81
5/8	—	—	6.1	0.24	6.1	0.24	18.5	0.73	18.3	0.72	25.4	1.00
3/4	38.1	1.50	6.9	0.27	6.9	0.27	23.4	0.92	22.9	0.90	25.4	1.00
3/4	43.7	1.72	7.6	0.30	7.6	0.30	23.4	0.92	22.9	0.90	31.8	1.25
1	—	—	8.4	0.33	8.4	0.33	29.5	1.16	29.0	1.14	38.1	1.50

a Dryseal American Standard Taper Pipe Thread, except as noted in General Specifications.

b Where thread relief undercut is used, last thread shall be chamfered 1/2 to 1 pitch long from G diameter. Thread marks on surface of undercut shall be permissible.

c For elbows and tees, the L dimensions shown shall apply to turned or finished length. Where body is relieved beyond thread, length of turned boss L may be reduced to the minimum full thread length J.

d Minimum design thickness, not subject to inspection.

e Basic dimensions shown shall apply as min dia or across flats for bosses. The -0.5 mm (-0.02 in) tolerance shall apply only to chamfer on full hexagon version in Figure 1C.

**TABLE 1B—DIMENSIONS OF SPECIAL SIZE FITTINGS,B
CONNECTORS, ELBOWS, AND TEES (FIGURES 1A, 1C, 2A, 2C, 2D, 3B, 3C, 3D, AND 3E)**

Nom Tube OD, in	A ^a Dryseal Taper Thread, in	A ^a ₁ Dryseal Taper Thread, in	B, Nom Thread Size, in Class 2A Ext.	C Nom, in	C ₂ Nom, in	L mm ±0.8	L in ±0.03	L ₂ mm ±0.8	L ₂ in ±0.03	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03
1/4	1/4		7/16-24	9/16	11/16	28.2	1.11	27.4	1.08	17.5	0.69	20.1	0.79
1/4	3/8	1/8	7/16-24	11/16	7/8	29.0	1.14	27.4	1.08	18.8	0.74	21.3	0.84
1/4	1/2		7/16-24	7/8	1- 1/16	33.8	1.33	31.8	1.25	21.3	0.84	23.9	0.94
5/16	1/4		1/2 -24	9/16	11/16	28.4	1.12	27.7	1.09	17.8	0.70	20.3	0.80
5/16	3/8	1/8	1/2 -24	11/16	7/8	29.2	1.15	27.7	1.09	19.0	0.75	26.6	0.85
5/16	1/2		1/2 -24	7/8	1- 1/16	34.0	1.34	32.0	1.26	21.6	0.85	24.1	0.95
3/8	1/8		17/32-24	9/16	9/16	26.4	1.04	25.7	1.01	18.5	0.73	21.3	0.84
3/8	3/8	1/4	17/32-24	11/16	7/8	31.8	1.22	30.2	1.19	21.6	0.85	24.1	0.95
3/8	1/4	1/4	17/32-24	9/16	9/16	31.0	1.22	30.2	1.19	20.3	0.80	22.9	0.90
3/8	1/2		17/32-24	7/8	1- 1/16	36.6	1.44	34.5	1.36	24.1	0.95	26.7	1.05
1/2	1/8		11/16-20	11/16	11/16	29.5	1.16	27.9	1.10	20.3	0.80	23.1	0.91
1/2	1/4		11/16-20	11/16	11/16	34.0	1.34	32.5	1.28	22.1	0.87	24.6	0.97
1/2	3/8	1/4	11/16-20	11/16	7/8	34.0	1.34	32.5	1.28	23.9	0.94	26.4	1.04
1/2	1/2	3/8	11/16-20	7/8	1- 1/16	38.9	1.53	36.8	1.45	26.4	1.04	29.0	1.14
1/2	3/4		11/16-20	1- 1/16	1- 1/4	40.4	1.59	38.1	1.50	29.2	1.15	31.2	1.23
1/2	1		11/16-20	1- 3/8	1- 5/8	46.0	1.81	43.7	1.72	31.8	1.25	35.6	1.40
5/8	1/4		13/16-18	13/16	13/16	35.6	1.40	33.5	1.32	24.1	0.95	26.4	1.04
5/8	3/8	1/2	13/16-18	13/16	7/8	35.6	1.40	33.5	1.32	25.7	1.01	27.9	1.10
5/8	3/4		13/16-18	1- 1/16	1- 1/4	41.9	1.65	39.6	1.56	30.7	1.21	32.8	1.29
5/8	1		13/16-18	1- 3/8	1- 5/8	47.5	1.87	45.2	1.78	33.3	1.31	37.1	1.46
3/4	1/4		1 -18	1	1	38.1	1.50	35.3	1.39	26.7	1.05	27.2	1.07
3/4	3/8		1 -18	1	1	38.1	1.50	35.3	1.39	27.9	1.10	28.7	1.13
3/4	1		1 -18	1- 3/8	1- 5/8	49.3	1.94	47.0	1.85	35.1	1.38	38.9	1.53
1	1/2	3/4	1- 1/4 -16	1- 1/4	1- 1/4	46.0	1.81	43.7	1.72	30.5	1.20	34.0	1.34
1	3/4		1- 1/4 -16	1- 1/4	1- 1/4	46.0	1.81	43.7	1.72	33.3	1.31	37.1	1.46

Continued on next page.

TABLE 1B—DIMENSIONS OF SPECIAL SIZE FITTINGS,^b
CONNECTORS, ELBOWS, AND TEES (FIGURES 1A, 1C, 2A, 2C, 2D, 3B, 3C, 3D, AND 3E) (CONTINUED)

Nom Tube OD, in	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03	N ₁ mm ±0.8	N ₁ in ±0.03	N ₂ mm ±0.8	N ₂ in ±0.03	N ₃ mm ±0.8	N ₃ in ±0.03	We mm +0.0 -0.5	We in +0.00 -0.02
1/4	15.5	0.61	22.4	0.88	18.3	0.72	21.8	0.86			17.5	0.69
1/4	16.5	0.65	22.1	0.87	18.3	0.72	24.1	0.95	23.9	0.94	20.6	0.81
1/4	17.3	0.68	26.9	1.06	23.1	0.91	29.7	1.17			25.4	1.00
5/16	15.7	0.62	23.1	0.91	19.0	0.75	21.8	0.86			17.5	0.69
5/16	16.8	0.66	23.1	0.91	19.0	0.75	24.1	0.95	23.9	0.94	20.6	0.81
5/16	17.5	0.69	27.7	1.09	23.9	0.94	29.7	1.17			25.4	1.00
3/8	18.3	0.72	19.0	0.75	15.2	0.60	17.3	0.68			14.2	0.56
3/8	19.3	0.76	23.4	0.92	19.8	0.78	24.1	0.95	25.4	1.00	20.6	0.81
3/8	18.3	0.72	23.6	0.93	19.8	0.78	21.8	0.86	23.6	0.93	17.5	0.69
3/8	20.1	0.79	28.2	1.11	24.6	0.97	29.7	1.17			25.4	1.00
1/2	21.6	0.85	20.8	0.82	16.5	0.65	19.6	0.77			14.2	0.56
1/2	21.6	0.85	25.4	1.00	21.1	0.83	24.1	0.95			17.5	0.69
1/2	21.6	0.85	25.4	1.00	21.1	0.83	24.1	0.95	25.4	1.00	20.6	0.81
1/2	22.4	0.88	30.2	1.19	25.9	1.02	29.7	1.17	31.8	1.25	25.4	1.00
1/2	27.2	1.07	30.0	1.18	25.7	1.01	30.5	1.20			31.8	1.25
1/2	27.4	1.08	35.1	1.38	30.7	1.21	37.6	1.48			38.1	1.50
5/8	23.9	0.94	26.9	1.06	22.6	0.89	24.8	0.98			17.5	0.69
5/8	23.9	0.94	26.9	1.06	22.6	0.89	24.8	0.98	34.0	1.34	20.6	0.81
5/8	28.7	1.13	31.8	1.25	27.4	1.08	30.5	1.20			31.8	1.25
5/8	29.0	1.14	36.6	1.44	32.3	1.27	37.6	1.48			38.1	1.50
3/4	28.4	1.12	29.2	1.15	24.1	0.95	25.7	1.01			17.5	0.69
3/4	28.4	1.12	29.2	1.15	24.1	0.95	25.7	1.01			20.6	0.81
3/4	30.7	1.21	38.9	1.53	33.8	1.33	37.6	1.48			38.1	1.50
1	32.3	1.27	37.3	1.47	31.8	1.25	32.8	1.29	37.3	1.47	25.4	1.00
1	32.3	1.27	37.3	1.47	31.8	1.25	32.8	1.29			31.8	1.25

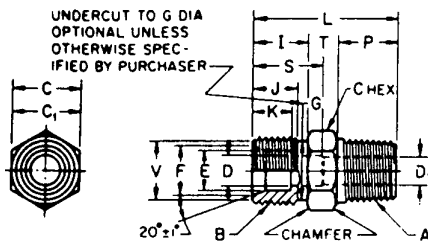


FIGURE 1A (120102)

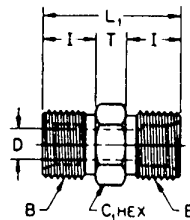


FIGURE 1B (120101)

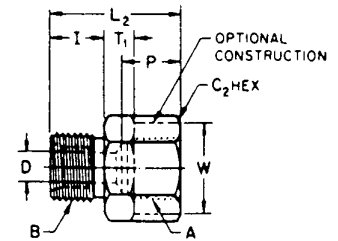


FIGURE 1C (120103)

FIGURE 1—CONNECTORS AND UNIONS

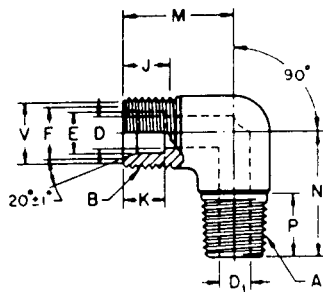


FIGURE 2A (120202)

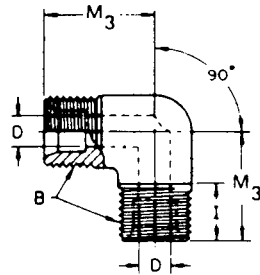


FIGURE 2B (120201)

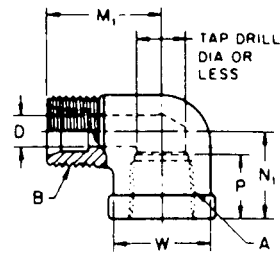


FIGURE 2C (120203)

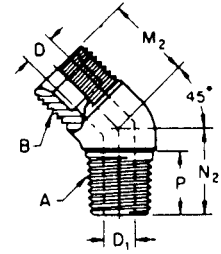


FIGURE 2D (120302)

FIGURE 2—ELBOWS

NOTE—Unspecified detail with respect to dimensions, tolerances, contours, material, workmanship, etc., must conform to general specifications for spherical and flanged sleeve (compression) tube fittings. The dimensional designations on the first figure in each group shall apply to other figures in that group except as shown otherwise. Codes shown in brackets adjacent to figure numbers represent respective fitting identification in accordance with SAE J846.

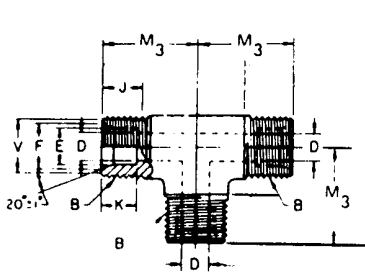


FIGURE 3A (120401)

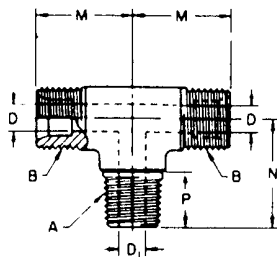


FIGURE 3B (120425)

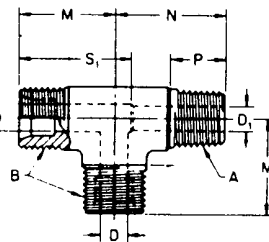


FIGURE 3C (120424)

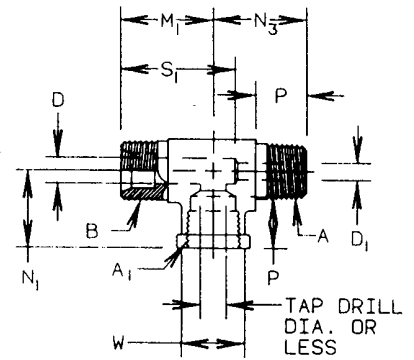


FIGURE 3D (120435)

FIGURE 3—TEES

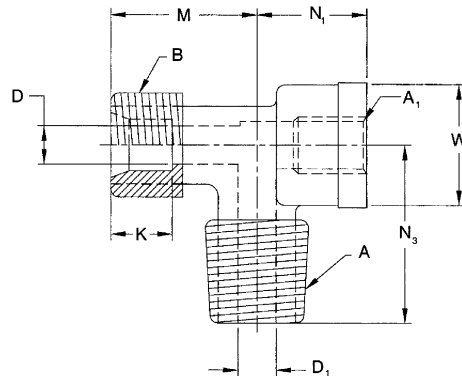


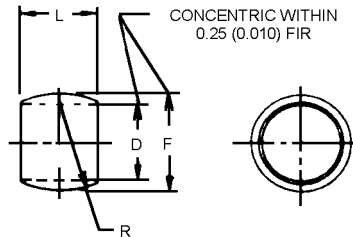
FIGURE 3E (120434)

NOTE—Unspecified detail with respect to dimensions, tolerances, contours, material, workmanship, etc., must conform to general specifications for spherical and flanged sleeve (compression) tube fittings. The dimensional designations on the first figure in each group shall apply to other figures in that group except as shown otherwise. Codes shown in brackets adjacent to figure numbers represent respective fitting identification in accordance with SAE J846.

FIGURES 1A THRU 3E

TABLE 2—DIMENSIONS OF SPHERICAL SLEEVES (FIGURE 4)

Nominal Tube OD, in	D Dia mm +0.10 -0.00	D Dia in +0.004 -0.000	F Dia mm +0.10 -0.00	F Dia in +0.004 -0.000	L mm ±0.13	L in ±0.005	R Radius mm +0.10 -0.00	R Radius in +0.004 -0.000
1/4	6.43	0.253	8.13	0.320	6.35	0.250	7.92	0.312
5/16	8.03	0.316	9.80	0.386	7.14	0.281	9.09	0.358
3/8	9.65	0.380	11.66	0.459	7.95	0.313	10.26	0.404
1/2	12.83	0.505	15.04	0.592	9.52	0.375	12.65	0.498
5/8	16.00	0.630	18.59	0.732	11.13	0.438	15.06	0.593
3/4	19.20	0.756	22.15	0.872	12.70	0.500	17.42	0.686
1	25.55	1.006	29.21	1.150	15.90	0.626	22.17	0.873



Note: Dimensions are mm (in)

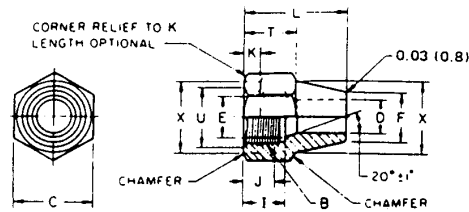
NOTE—Unspecified detail with respect to dimensions, tolerances, contours, material, workmanship, etc., must conform to general specifications for spherical and flanged sleeve (compression) tube fittings. Codes shown in brackets adjacent to figure numbers represent respective fitting identification in accordance with SAE J846.

FIGURE 4—SPHERICAL SLEEVES (120115)

TABLE 3—DIMENSIONS OF SPHERICAL SLEEVE NUTS (FIGURE 5)

Nom Tube OD, in	B, Nom Thread Size, in Class 2B Int	C Nom, in	D Dia mm +0.10 -0.00	D Dia in +0.004 -0.000	E mm +0.10 -0.00	E in +0.004 -0.000	F Dia mm	F Dia in	I mm	I in
1/4	7/16-24	9/16	6.45	0.254	7.90	0.311	9.7	0.38	7.9	0.31
5/16	1/2 -24	5/8	8.08	0.318	9.60	0.378	11.2	0.44	7.9	0.31
3/8	17/32-24	5/8	9.70	0.382	11.38	0.448	11.9	0.47	10.4	0.41
1/2	11/16-20	13/16	12.88	0.507	14.78	0.582	16.0	0.63	12.7	0.50
5/8	13/16-18	15/16	16.05	0.632	18.14	0.714	19.6	0.77	14.2	0.56
3/4	1 -18	1- 1/8	19.25	0.758	21.59	0.850	23.4	0.92	15.7	0.62
1	1- 1/4 -16	1- 3/8	25.60	1.008	28.50	1.122	30.2	1.19	17.5	0.69

Nom Tube OD, in	J Full Thread Min mm	J Full Thread Min in	K mm	K in	L mm	L in	T mm	T in	U Dia mm +0.5 -0.0	U Dia in +0.02 -0.00	X Dia Min mm	X Dia Min in
1/4	6.4	0.25	3.3	0.13	19.0	0.75	9.7	0.38	11.4	0.45	13.5	0.53
5/16	6.4	0.25	3.3	0.13	22.4	0.88	12.7	0.50	13.0	0.51	15.0	0.59
3/8	8.9	0.35	3.3	0.13	28.7	1.13	13.5	0.53	13.7	0.54	15.5	0.61
1/2	10.7	0.42	3.3	0.13	31.8	1.25	16.0	0.63	17.8	0.70	19.8	0.78
5/8	12.2	0.48	4.8	0.19	35.1	1.38	18.3	0.72	21.1	0.83	23.1	0.91
3/4	13.7	0.54	4.8	0.19	39.6	1.56	19.0	0.75	25.9	1.02	27.7	1.09
1	15.2	0.60	4.8	0.19	42.9	1.69	23.9	0.94	32.3	1.27	34.0	1.34



NOTE: Dimensions are mm (in)

FIGURE 5—SPHERICAL SLEEVE NUTS (120111)

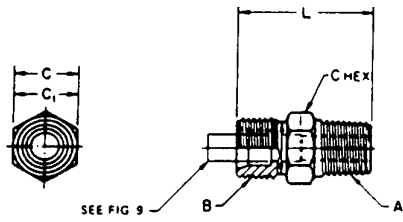


FIGURE 6A (100102)

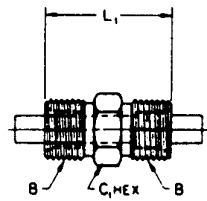


FIGURE 6B (100101)

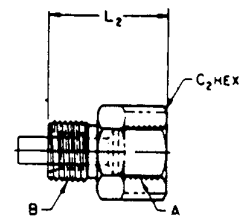


FIGURE 6C (100103)

FIGURE 6—CONNECTORS AND UNIONS

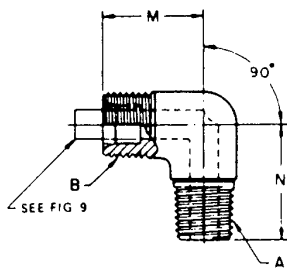


FIGURE 7A (100202)

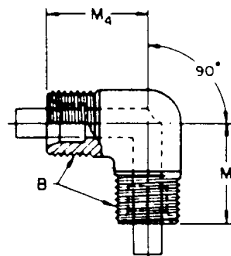


FIGURE 7B (100201)

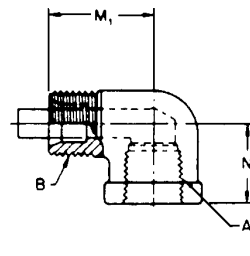


FIGURE 7C (100203)

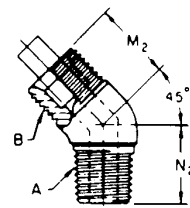


FIGURE 7D (100302)

FIGURE 7—ELBOWS

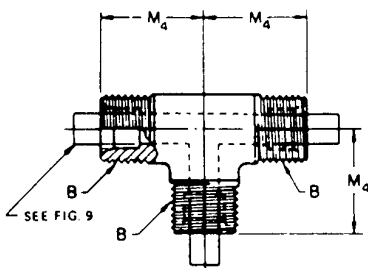


FIGURE 8A (100401)

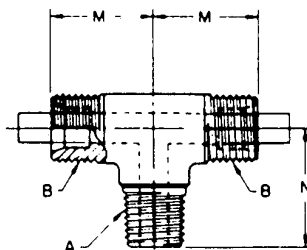


FIGURE 8B (100425)

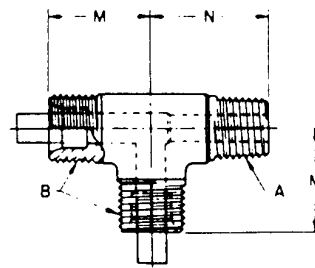


FIGURE 8C (100424)

FIGURE 8—TEES

NOTE—Flanged sleeve type fittings having tube support features (Figures 6A to 8C) are intended only for use with nylon tubing per SAE J844 in conjunction with flanged sleeve in Figure 10 and flanged sleeve nut in Figure 11.

Unspecified detail with respect to dimensions, tolerances, contours, materials, workmanship, etc., must conform to general specifications for spherical and flanged sleeve (compression) tube fittings. All dimensions for Figures 6A to 8C shall correspond with respective Figures 1A to 3C and Table 1A and 1B except for addition of the tube support shown in Figure 9 and Table 4. Codes shown in brackets adjacent to figure numbers represent respective fitting identification in accordance with SAE J846.

FIGURES 5 TO 8C

TABLE 4—DIMENSIONS OF TUBE SUPPORT (FIGURE 9)⁽¹⁾

Nom Tube OD, in	D ₂ Dia Min mm	D ₂ Dia Min in	D ₃ Dia Min mm	D ₃ Dia Min in	D ₃ Dia Max mm	D ₃ Dia Max in	L ₃ Min mm	L ₃ Min in	O Min mm	O Min in	O Max mm	O Max in	Z Min mm	Z Min in	Z Max mm	Z Max in
1/4	3.12	0.123	4.09	0.161	4.19	0.165	11.4	0.45	6.1	0.24	7.6	0.30	0.30	0.012	0.43	0.017
3/8	5.21	0.205	6.17	0.243	6.27	0.247	14.5	0.57	7.4	0.29	8.9	0.35	0.33	0.013	0.43	0.017
1/2	8.28	0.326	9.35	0.368	9.45	0.372	19.0	0.75	8.6	0.34	10.2	0.40	0.33	0.013	0.48	0.019
5/8	9.75	0.384	10.97	0.432	11.07	0.436	20.1	0.79	10.2	0.40	11.7	0.46	0.41	0.016	0.56	0.022
3/4	12.73	0.501	14.15	0.557	14.25	0.561	24.6	0.97	11.7	0.46	13.2	0.52	0.41	0.016	0.66	0.026

1. For dimensions depicted on Figure 9 but not shown in Table 4, refer to Table 1A and 1B.

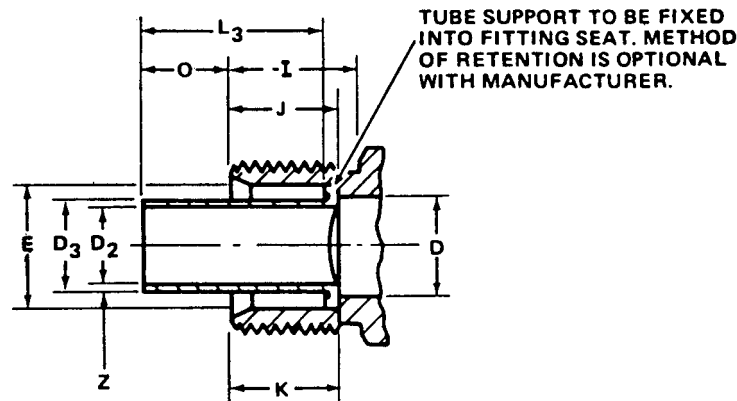


FIGURE 9—TUBE SUPPORT

TABLE 5—DIMENSIONS OF FLANGED SLEEVES (FIGURES 10A TO 10B)

Nom Tube OD, in	D Dia mm ±0.05	D Dia in ±0.002	E Dia mm ±0.05	E Dia in ±0.002	F Dia mm ±0.05	F Dia in ±0.002	G Ref mm	G Ref in	H Dia Max mm	H Dia Max in	H Dia Min mm	H Dia Min in
1/4	6.50	0.256	7.01	0.276	8.10	0.319	1.27	0.050	9.25	0.364	8.99	0.354
3/8	9.75	0.384	10.31	0.406	11.63	0.458	1.52	0.060	12.22	0.481	12.12	0.477
1/2	12.93	0.509	13.67	0.538	15.11	0.595	1.52	0.060	15.95	0.628	15.75	0.620
5/8	16.10	0.634	16.36	0.644	18.31	0.721	2.03	0.080	19.00	0.748	18.90	0.744
3/4	19.30	0.760	19.61	0.772	21.95	0.864	2.29	0.090	23.55	0.927	23.90	0.917

Nom Tube OD, in	I Max mm	I Max in	I Min mm	I Min in	K Dia mm ±0.05	K Dia in ±0.002	L mm ±0.13	L in ±0.005	M mm ±0.13	M in ±0.005
1/4	3.18	0.125	3.05	0.120	—	—	7.49	0.295	—	—
3/8	4.32	0.170	4.06	0.160	—	—	9.91	0.390	—	—
1/2	4.83	0.190	4.57	0.180	—	—	10.92	0.430	—	—
5/8	5.33	0.210	5.08	0.200	17.37	0.684	12.45	0.490	1.40	0.055
3/4	5.84	0.230	5.59	0.220	21.01	0.827	13.72	0.540	1.90	0.075

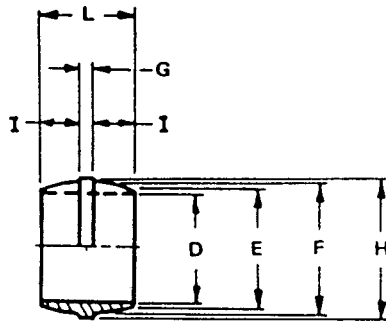
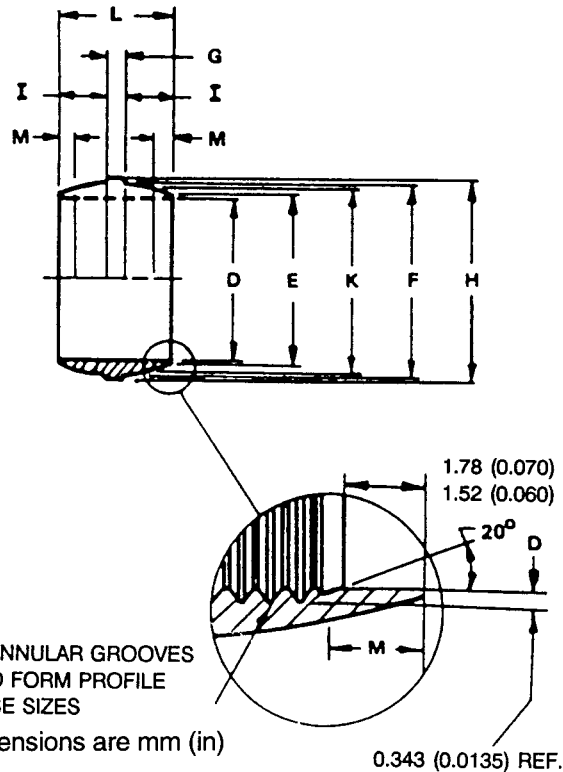


FIGURE 10A—FLANGED SLEEVE, 1/4, 3/8,
AND 1/2 IN SIZES (100115)



0.64 (0.025) PITCH ANNULAR GROOVES
OF UNIFIED THREAD FORM PROFILE
OPTIONAL ON THESE SIZES

NOTE: Dimensions are mm (in)

0.343 (0.0135) REF.

FIGURE 10B—FLANGE SLEEVE
5/8 AND 3/4 IN SIZES (100115)

NOTE—Unspecified detail with respect to dimensions, tolerances, contours, material, workmanship, etc., must conform to general specifications for spherical and flanged sleeve (compression) tube fittings. Codes shown in brackets adjacent to figure numbers represent respective fitting identification in accordance with SAE J846.

FIGURES 10A AND 10B

TABLE 6—DIMENSIONS OF FLANGED SLEEVE NUTS (FIGURE 11)

Nom Tube OD, in	B ₁ Nom Thread Size, in Class 2B Int	C Hex Nom in	D Dia mm +0.10 -0.00	D Dia in +0.004 -0.00	E Dia mm +0.10 -0.00	E Dia in +0.004 -0.000	F Dia mm ±0.5	F Dia in ±0.02	I mm	I in
1/4	7/16-24	9/16	6.45	0.254	7.90	0.311	8.6	0.34	7.9	0.31
3/8	17/32-24	5/8	9.70	0.382	11.38	0.448	11.9	0.47	11.2	0.44
1/2	11/16-20	13/16	12.88	0.507	14.78	0.582	15.5	0.61	13.0	0.51
5/8	13/16-18	15/16	16.05	0.632	18.14	0.714	18.8	0.74	14.7	0.58
3/4	1 -18	1- 1/8	19.25	0.758	21.59	0.850	22.4	0.88	15.7	0.62

Continued on next page.

TABLE 6—DIMENSIONS OF FLANGED SLEEVE NUTS (FIGURE 11) (CONTINUED)

Nom Tube OD, in	J Full Thd Min mm	J Full Thd Min in	K mm	K in	L mm	L in	U Dia mm +0.5 -0.0	U Dia in +0.02 -0.00	X Dia Min mm	X Dia Min in
1/4	6.4	0.25	3.3	0.13	11.4	0.45	11.4	0.45	13.5	0.53
3/8	9.7	0.38	3.3	0.13	16.0	0.63	13.7	0.54	15.5	0.61
1/2	11.2	0.44	3.3	0.13	18.3	0.72	17.8	0.70	19.8	0.78
5/8	12.7	0.50	4.8	0.19	19.6	0.77	21.1	0.83	23.1	0.91
3/4	13.7	0.54	4.8	0.19	20.6	0.81	25.9	1.02	27.7	1.09

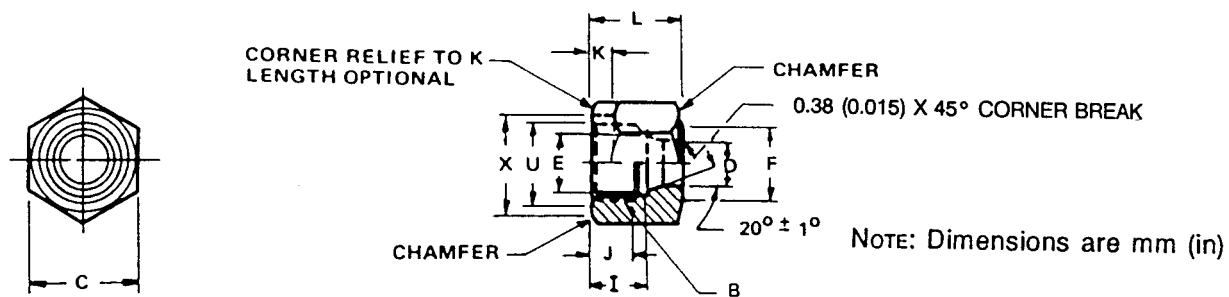


FIGURE 11—FLANGED SLEEVE NUTS (100110)

3. **General Specifications**—The following general specifications supplement the dimensional data contained in Tables 1 to 8 with respect to all unspecified details.

TABLE 7—STRAIGHT THREAD SPECIFICATION DATA, IN

Nominal Size	Series Designation	External Thread Pitch Diameter Max	External Thread Pitch Diameter Min	Internal Thread Pitch Diameter Max	Internal Thread Pitch Diameter Min ⁽¹⁾	Internal Thread Minor Diameter Max	Internal Thread Minor Diameter Min
7/16-24	UNS	0.4093	0.4055	0.4153	0.4104	0.402	0.392
1/2 -24	UNS	0.4717	0.4678	0.4780	0.4729	0.465	0.455
17/32-24	UNS	0.5030	0.4991	0.5092	0.5041	0.496	0.486
11/16-20	UN	0.6537	0.6494	0.6606	0.6550	0.645	0.633
13/16-18	UNS	0.7750	0.7704	0.7824	0.7764	0.765	0.752
1 -18	UNS	0.9625	0.9578	0.9701	0.9639	0.953	0.940
1- 1/4 -16	UN	1.2079	1.2028	1.2160	1.2094	1.196	1.182

1. These values are also the basic pitch diameter.

- 3.1 **Identification**—At manufacturer's option, or where so specified by the purchaser, the fittings, except sleeves, may be permanently and legibly marked air brake. The nut shall be permanently and legibly marked according to the current U.S. Department of Transportation FMVSS 106 Regulation (NHTSA). The location of such markings shall be optional with manufacturer.

3.2 Size Designations—Fitting sizes are designated by the corresponding nominal outside diameter of the tubing for the various sizes of tube ends and by the corresponding standard nominal pipe size for pipe thread ends.

TABLE 8—TOLERANCES FOR EXTERNAL AND INTERNAL THREADS

Nom Pipe Thread Size, in	External Thread Chamfer Diameter ⁽¹⁾ Max mm	External Thread Chamfer Diameter ⁽¹⁾ Max in	External Thread Chamfer Diameter ⁽¹⁾ Min mm	External Thread Chamfer Diameter ⁽¹⁾ Min in	External Thread Length of Chamfered or Partial Thread Min mm	External Thread Length of Chamfered or Partial Thread Min in	External Thread Length of Chamfered or Partial Thread Max mm	External Thread Length of Chamfered or Partial Thread Max in	Internal Thread Countersink Diameter ⁽¹⁾ Min mm	Internal Thread Countersink Diameter ⁽¹⁾ Min in	Internal Thread Countersink Diameter ⁽¹⁾ Max mm	Internal Thread Countersink Diameter ⁽¹⁾ Max in
1/8	8.1	0.32	7.6	0.30	0.94	0.037	1.42	0.056	10.7	0.42	11.2	0.44
1/4	10.7	0.42	10.2	0.40	1.42	0.056	2.11	0.083	14.0	0.55	14.5	0.57
3/8	14.0	0.55	13.5	0.53	1.42	0.056	2.11	0.083	17.5	0.69	18.0	0.71
1/2	17.3	0.68	16.8	0.66	1.80	0.071	2.72	0.107	21.6	0.85	22.1	0.87
3/4	22.6	0.89	22.1	0.87	1.80	0.071	2.72	0.107	26.9	1.06	27.4	1.08
1	28.4	1.12	27.7	1.09	2.21	0.087	3.30	0.130	34.0	1.34	34.8	1.37

1. Tabulated diameters conform with Appendix A, SAE J476.

3.3 Dimensions and Tolerances—Except for nominal size and thread specifications, dimensions and tolerances are given in both SI units and U.S. customary as designated. Tabulated dimensions shall apply to the finished parts. The maximum and minimum across flat dimensions shall be within the commercial tolerance of bar or extruded stock from which the fittings are produced. The minimum across corners dimensions of hexagons shall be 1.092 times the nominal width across flats, but shall not result in a side flat width less than 0.43 times the nominal width across flats.

Unless otherwise specified, tolerance on hole diameters designated “drill” in the dimensional tables shall be as tabulated in Table 9.

TABLE 9—TOLERANCE ON HOLE DIAMETERS

Drill Size Range mm	Drill Size Range in	Tolerance Plus mm	Tolerance Plus in	Tolerance Minus mm	Tolerance Minus in
0.343 thru 4.699	0.0135 thru 0.1850	0.08	0.003	0.05	0.002
4.762 thru 6.299	0.1875 thru 0.2480	0.10	0.004	0.05	0.002
6.350 thru 19.050	0.2500 thru 0.7500	0.15	0.006	0.08	0.003
19.251 thru 25.400	0.7579 thru 1.0000	0.18	0.007	0.10	0.004

Tolerance on all dimensions not otherwise specified shall be ± 0.25 mm (± 0.010 in). Tube seat diameters E shall be concentric with straight thread pitch diameters within 0.25 mm (0.010 in) full indicator reading (FIR). Large seat diameters F shall be concentric with tube seat diameters E within 0.13 mm (0.005 in) full indicator reading (FIR). The surface of tube stop at base of seat shall be flat and perpendicular to the axis of thread. Angular tolerance on axis of ends of elbows and tees shall be ± 2.50 degrees for sizes up to and including 3/8 in, and ± 1.50 degrees for sizes larger than 3/8 in.

Where so illustrated, hexagon corners shall be chamfered 30 degrees ± 5 degrees to a diameter equal to the nominal width across flats, with a tolerance of -0.41 mm (-0.016 in); or, where design permits, corners may be chamfered to the diameter of the abutting surface, provided the length of chamfer does not exceed that produced by the 30 degree chamfer previously described.

- 3.4 Passages**—Where passages in straight fittings are machined from opposite ends, the offset at the meeting point shall not exceed 0.38 mm (0.015 in). The cross-sectional area at the junction of passages in angle fittings shall not be less than that of the smallest passage. At manufacturer's option, all passages in a particular fitting may conform with the smallest diameter specified for that fitting. Where the passage is specified as tap drill diameter or less, the minimum shall be no less than the minimum diameter of the smallest passage in the fitting.
- 3.5 Wall Thickness**—Unless otherwise designated, the wall thickness at any point on fittings shall not be less than the thickness established by the specified dimensions, tolerances, and eccentricities for inner and outer surfaces.
- 3.6 Contour**—Details of contour shall be optional with manufacturer, provided the tabulated dimensions are maintained and serviceability of the fittings is not impaired. Wrench flats on elbows and tees shall be optional. Where extruded and forged shapes are reduced to conserve material, the wall thickness, unless otherwise specified, shall not be less than the respective minimum values tabulated in Table 10.

TABLE 10—MINIMUM WALL THICKNESS FOR EXTRUDED AND FORGED SHAPES

Nominal Tube OD, in	Wall Thickness, Min Extruded Shapes ⁽¹⁾ mm	Wall Thickness, Min Extruded Shapes ⁽¹⁾ in	Wall Thickness, Min Forged Shapes mm	Wall Thickness, Min Forged Shapes in
1/4	1.0	0.04	1.90	0.075
5/16	1.3	0.05	1.90	0.075
3/8	1.3	0.05	2.16	0.085
1/2	1.5	0.06	2.29	0.090
5/8	2.0	0.08	2.54	0.100
3/4	2.0	0.08	2.54	0.100
1	2.0	0.08	3.05	0.120

1. Applies to reduction to one plane of shape only.

- 3.7 Straight Threads**—Unified standard Class 2A external and Class 2B internal threads shall apply to plain finish (unplated) fittings of all types. For internally threaded parts with additive finish, the Class 2B diameters shall apply after plating.

The pitch diameter tolerance shall be the same as the corresponding diameter-pitch combination and class of the Unified 18 and 20 thread series or for special diameter-pitch combinations shall be based on diameter, pitch, and a length of engagement of nine times the pitch. See ANSI B1.1.

For convenient reference, the data generally required to specify threads are given in Table 7. (Inasmuch as threads are normally produced and gaged with equipment made to the inch system of measurement, conversion of size designations and dimensions to SI units is considered unnecessary.)

Where external threads are produced by roll threading and the body is not undercut, the unthreaded portion of body adjacent to the shoulder may be reduced to the minimum pitch diameter.

External threads shall be chamfered to the diameters specified to produce a length of chamfered or partial thread equivalent to 1/4 to 1-1/4 times the pitch (rounded to a three-place decimal).

Internal threads shall be countersunk 90 degrees included angle to the diameters specified.

3.8 Thread Eccentricity Tolerances—The various thread elements of Class 2A external and Class 2B internal straight threads on tube fittings shall be concentric within the limitations specified in the General Specifications of SAE J512.

3.9 Pipe Threads—Taper pipe threads, unless there is specific authorization to the contrary, shall conform to the Dryseal American Standard Taper Pipe Thread (NPTF). Specifications for pipe threads are given in detail in SAE J476.

The length of full form external thread shall not be shorter than L2 plus one pitch (thread), except that where thread is cut through into a relieved body or undercut on the fitting, the minimum full threaded length may be reduced by one pitch (thread).

Where external pipe threads are produced by roll threading, the diameter of the unthreaded portion of shank adjacent to shoulder may be reduced to the E2 basic pitch diameter.

The tube fitting dimensions tabulated herein are based on length of the Dryseal American Standard Taper Pipe Thread (NPTF), it being the consensus of manufacturers and users that trouble-free assembly cannot be assured unless a full length thread is used. However, the tap drill depths and overall lengths specified in the tables for fittings with internal taper pipe threads are not consistent with the tap drill depths and overall thread lengths of the Dryseal American Standard Taper Pipe Threads (NPTF) given in Table A2, Appendix A of SAE J476. The full length Dryseal American Standard Taper Pipe Taps specified in Table B2 of SAE J476 cannot be used, as the tap drill depths and overall lengths of the fittings have been reduced to the minimum required by bottoming taps to produce standard full thread length. The deviations described previously are peculiar to these tube fittings and as special tooling is required, caution should be exercised in specifying such deviations for any other products.

External pipe threads shall be chamfered from the diameters tabulated in Table 8 to produce the specified length of chamfered or partial thread. Internal pipe threads shall be countersunk 90 degrees included angle, to the diameters tabulated in Table 8.

3.10 Material and Manufacture—Fittings shall be made from brass and, at manufacturer's option and in accordance with his process of manufacture, may be milled from the bar and forged. Brass shall be UNS C36000 (half-hard), UNS C34500, or UNS C35000 for bar or extruded stock and UNS C37700 for forgings. Sleeves shown in Figure 4 shall be made from UNS C36000 brass and annealed to a maximum hardness of Rockwell F70. Sleeves shown in Figure 10 shall be made from UNS C36000 brass. Tube supports shown in Figure 9 shall be made from UNS C26000 or 300 series stainless steel, according to manufacturer's process standard. Nuts may be made from steel when so specified by the purchaser.

3.11 Finish—The external surfaces and threads of all carbon steel parts shall be plated or coated with a suitable material that passes a 72 h salt spray test in accordance with ASTM B 117. Any appearance of red rust during the 72 h salt spray test shall be considered failure, except for the following:

- a. All internal fluid passages.
- b. Edges such as hex points, serrations, and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects.
- c. Areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending, and other post-plate metal forming operations.
- d. Areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

NOTE—Cadmium plating is not preferred due to environmental reasons. Parts manufactured to this Standard after January 1, 1997, shall not be cadmium plated. Internal fluid passages shall be protected from corrosion during storage. Changes in plating may affect assembly torques and require requalification, when applicable.

3.12 Workmanship—Workmanship shall conform to the best commercial practice to produce high-quality fittings. Fittings shall be free from all machining fluids, chips, hanging burrs, loose scale, and slivers which might become dislodged in usage and all other defects which might affect their serviceability. All seating surfaces for the spherical sleeve must be smooth except that annular tool marks up to 2.5 mm (100 min) maximum shall be permissible.

3.13 Assembly Considerations—Where it is not objectionable from a function or production standpoint, the use of a compatible lubricant or sealant may be desirable in assembling Dryseal pipe threads on spherical and flanged sleeve (compression) tube fittings to minimize galling and effect a pressure-tight seal.

4. Notes

4.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED BY THE SAE FLUID CONDUCTORS AND CONNECTORS TECHNICAL COMMITTEE

APPENDIX A

TABLES FOR CALCULATING DIMENSIONS ON SPECIAL SIZES

A.1 The tables in this Appendix present various factors to be used in determining the dimensions applicable to special size combination fittings not contained in SAE J246. (See Table 1A for calculated sizes.)
For any special size fitting, be it a connector, 45 or 90 degree elbow, tee, or cross, one end is always standard. Consider this end to be the largest on the fitting, it may then be used as the basis for establishing the stock size and the length (either overall or end to center) by deducting factors equivalent to the reduction in machining requirements from the appropriate standard lengths.

A.1.1 The factors applicable to the various end configurations and size reductions tabulated in Tables A1 to A9 were determined on the following basis:

- a. Those pertaining to lengths were derived by maintaining the standard hexagon thickness for straight fittings and the standard centerline to machining start for shaped fittings.
- b. Tables A1 and A2 were derived by subtracting the standard machining length required for the smaller end from that required for the larger end.
- c. Table A3 factors are equal to one-half the difference in tube end thread diameters.
- d. Table A4 factors are equal to one-half the difference in pipe end thread dimensions.
- e. Table A5 factors are equal to one-half the difference in the tube end D drill diameter.
- f. Table A6 factors are equal to one-half the difference in the pipe end W diameter or width.

A.1.2 Straight, Tube Size Reduced

$$L(L1, L2) \text{ special size} = L(L1, L2) \text{ std size} - \text{factor from Table A2 (Eq. A1)} \quad (\text{Eq. A1})$$

EXAMPLE—For a straight connector (Figures 1A and 1C) with 3/8 in tube and 3/8 in NPTF, the overall length would be determined as follows:

- a. 34.0 mm (1.34 in) = L overall length for 1/2 tube to 3/8 NPTF from Table 7
- b. 2.3 mm (0.09 in) = factor from Table A2 for 3/8 machining on 1/2 size fitting 31.8 mm (1.25 in) = overall length

The proper hex size will be the larger of the values for the tube size and external pipe size shown in Tables A7 and A8, respectively. The 3/8 in tube to 3/8 in NPTF fitting's hex size will (from Table A8) be 11/16 in.

A.1.3 Straight, Pipe Size Reduced

$$L(L1, L2) \text{ special size} = L(L1, L2) \text{ std size} - \text{factor from Table A1} \quad (\text{Eq. A2})$$

A.1.4 Elbows with External Pipe Threads, Tube Size Reduced

$$M \text{ special size} = M \text{ std size} - \text{factor from Table A2} \quad (\text{Eq. A3})$$

$$N \text{ special size} = N \text{ std size} - \text{factor from Table A3} \quad (\text{Eq. A4})$$

EXAMPLE—For elbows and tees (Figures 2A, 3B, 3C) with 1/4 in tube and 1/4 in NPTF, the end to center length M would be derived as follows:

- a. 20.3 mm (0.80 in) (M dimension for 3/8 tube to 1/4 NPTF from Table 1A) - 2.8 mm (0.11 in) (factor from Table A2 for 1/4 machined on 3/8 size fitting) = 17.5 mm (0.69 in) (end-to-center length)

The end to center length N would be derived as follows:

- a. 23.6 mm (0.93 in) (N dimension for 3/8 tube to 1/4 NPTF from Table 1A) - 1.3 mm (0.05 in) (factor from Table A3 for 1/4 machined on 3/8 size fitting) = 22.3 mm (0.88 in) (end-to-center length)

The proper wrench pad width will be the larger value for the tube size and external pipe size shown in Tables A7 and A8, respectively. The wrench pad width for 1/4 in tube to 1/4 in NPTF fitting will (from Table A8) be 14.0 mm (0.55 in).

A.1.5 Elbows with External Pipe Thread, Pipe Size Reduced

$$M \text{ special size} = M \text{ std size} - \text{factor from Table A4} \quad (\text{Eq. A5})$$

$$N \text{ special size} = N \text{ std size} - \text{factor from Table A1} \quad (\text{Eq. A6})$$

A.1.6 Elbows, All Tube Ends

$$M4 \text{ reduced end} = M4 \text{ std size} - \text{factor from Table A2} \quad (\text{Eq. A7})$$

$$M4 \text{ end not reduced} = M4 \text{ std size} - \text{factor from Table A3} \quad (\text{Eq. A8})$$

A.1.7 Tees with External Pipe Thread, Tube Size Reduced—Figure as two elbows. Use larger of the two figures obtained for the branch centerline-to-end dimension.

A.1.8 Tees with External Pipe Thread, Pipe Size Reduced—Figure as two elbows. Use larger of the two figures obtained for the branch centerline-to-end dimension.

A.1.9 Tees, All Tube Ends—Figure as two elbows. Use larger of the two figures obtained for the branch centerline-to-end dimension.

A.1.10 Elbow with Internal Threads, Tube Size Reduced

$$M1 \text{ special size} = M1 \text{ std size} - \text{factor from Table A2} \quad (\text{Eq. A9})$$

$$N1 \text{ special size} = N1 \text{ std size} - \text{factor from Table A5} \quad (\text{Eq. A10})$$

A.1.11 Elbows with Internal Pipe Threads, Pipe Size Reduced

$$M1 \text{ special size} = M1 \text{ std size} - \text{factor from Table A6} \quad (\text{Eq. A11})$$

$$N1 \text{ special size} = N1 \text{ std size} - \text{factor from Table A1} \quad (\text{Eq. A12})$$

A.1.12 45 Degree Elbow, Tube Size Reduced

$$M2 \text{ special size} = M2 \text{ std size} - \text{factor from Table A2} \quad (\text{Eq. A13})$$

$$N2 \text{ special size} = N2 \text{ std size} \quad (\text{Eq. A14})$$

A.1.13 45 Degree Elbow, Pipe Size Reduced

M2 special size = M2 std size (Eq. A15)

N2 special size = N2 std size - factor from Table A1 (Eq. A16)

TABLE A1—LENGTH FACTORS STANDARD PIPE SIZE

	Nom Pipe Size, in	1/4 mm	1/4 in	3/8 mm	3/8 in	1/2 mm	1/2 in	3/4 mm	3/4 in	1 mm	1 in
Reduced Pipe Size	1/8	4.6	0.18	4.6	0.18	9.7	0.38	9.7	0.38	14.2	0.56
	1/4	—	—	0.0	0.00	4.8	0.19	4.8	0.19	9.7	0.38
	3/8	—	—	—	—	4.8	0.19	4.8	0.19	9.7	0.38
	1/2	—	—	—	—	—	—	0.0	0.00	4.8	0.19
	3/4	—	—	—	—	—	—	—	—	4.8	0.19

TABLE A2—LENGTH FACTORS STANDARD MACHINING SIZE

	Nom Tube OD, in	5/16 mm	5/16 in	3/8 mm	3/8 in	1/2 mm	1/2 in	5/8 mm	5/8 in	3/4 mm	3/4 in	1 mm	1 in
Reduced Tube Size	1/4	0.3	0.01	2.8	0.11	5.1	0.20	6.6	0.26	8.4	0.33	9.9	0.39
	5/16	—	—	2.5	0.10	4.8	0.19	6.4	0.25	8.1	0.32	9.7	0.38
	3/8	—	—	—	—	2.3	0.09	3.8	0.15	5.6	0.22	7.1	0.28
	1/2	—	—	—	—	—	—	1.5	0.06	3.3	0.13	4.8	0.19
	5/8	—	—	—	—	—	—	—	—	1.8	0.07	3.3	0.13
	3/4	—	—	—	—	—	—	—	—	—	—	1.5	0.06

TABLE A3—LENGTH FACTORS STANDARD MACHINING SIZE

	Nom Tube OD, in	5/16 mm	5/16 in	3/8 mm	3/8 in	1/2 mm	1/2 in	5/8 mm	5/8 in	3/4 mm	3/4 in	1 mm	1 in
Reduced Tube Size	1/4	0.8	0.03	1.3	0.05	3.3	0.13	4.8	0.19	7.1	0.28	10.4	1.41
	5/16	—	—	0.5	0.02	2.3	0.09	4.1	0.16	6.4	0.25	9.7	0.38
	3/8	—	—	—	—	2.0	0.08	3.6	0.14	5.8	0.23	9.1	0.36
	1/2	—	—	—	—	—	—	1.5	0.06	4.1	0.16	7.1	0.28
	5/8	—	—	—	—	—	—	—	—	2.3	0.09	5.6	0.22
	3/4	—	—	—	—	—	—	—	—	—	—	3.3	0.13

TABLE A4—LENGTH FACTORS STANDARD PIPE SIZE

	Nom Pipe Size, in	1/4 mm	1/4 in	3/8 mm	3/8 in	1/2 mm	1/2 in	3/4 mm	3/4 in	1 mm	1 in
Reduced	1/8	1.8	0.07	3.6	0.14	5.6	0.22	8.4	0.33	11.7	0.46
Pipe	1/4	—	—	1.8	0.07	3.8	0.15	7.1	0.28	9.9	0.39
Size	3/8	—	—	—	—	2.3	0.09	4.8	0.19	8.1	0.32
	1/2	—	—	—	—	—	—	2.8	0.11	6.1	0.24
	3/4	—	—	—	—	—	—	—	—	3.3	0.13

TABLE A5—LENGTH FACTORS STANDARD MACHINING SIZE

	Nom Tube OD, in	5/16 mm	5/16 in	3/8 mm	3/8 in	1/2 mm	1/2 in	5/8 mm	5/8 in	3/4 mm	3/4 in	1 mm	1 in
	1/4	0.8	0.03	1.5	0.06	2.8	0.11	4.3	0.17	5.8	0.23	8.6	0.34
Reduced	5/16	—	—	0.8	0.03	2.0	0.08	3.6	0.14	5.1	0.20	7.9	0.31
Tube	3/8	—	—	—	—	1.3	0.05	2.8	0.11	4.3	0.17	7.1	0.28
Size	1/2	—	—	—	—	—	—	1.5	0.06	3.3	0.13	5.8	0.23
	5/8	—	—	—	—	—	—	—	—	1.5	0.06	4.3	0.17
	3/4	—	—	—	—	—	—	—	—	—	—	2.8	0.11

TABLE A6—LENGTH FACTORS STANDARD PIPE SIZE

	Nom Pipe Size, in	1/4 mm	1/4 in	3/8 mm	3/8 in	1/2 mm	1/2 in	3/4 mm	3/4 in	1 mm	1 in
	1/8	1.5	0.06	3.3	0.13	5.6	0.22	8.9	0.35	11.9	0.47
Reduced	1/4	—	—	1.8	0.07	4.1	0.16	7.4	0.29	10.4	0.41
Pipe	3/8	—	—	—	—	2.5	0.10	5.6	0.22	8.9	0.35
Size	1/2	—	—	—	—	—	—	3.3	0.13	6.4	0.25
	3/4	—	—	—	—	—	—	—	—	3.3	0.13

TABLE A7—ALUMINUM STOCK SIZE FOR TUBE ENDS

Nom Tube OD, in	Hexagon Width, Min in	Width Over Wrench Pads, Min mm	Width Over Wrench Pads, Min in
1/4	7/16	11.2	0.44
5/16	1/2	12.7	0.50
3/8	9/16	13.5	0.53
1/2	11/16	17.5	0.69
5/8	13/16	20.6	0.81
3/4	1	25.4	1.00
1	1- 1/4	31.8	1.25

TABLE A8—MINIMUM STOCK SIZE FOR EXTERNAL PIPE ENDS

Nom Pipe Size, in	Hexagon Width, Min in	Width Over Wrench Pads, Min mm	Width Over Wrench Pads, Min in
1/8	7/16	10.4	0.41
1/4	9/16	14.0	0.55
3/8	11/16	17.5	0.69
1/2	7/8	21.6	0.85
3/4	1- 1/16	26.9	1.06
1	1- 3/8	33.8	1.33

TABLE A9—MINIMUM STOCK SIZE FOR INTERNAL PIPE ENDS

Nom Pipe Size, in	Hexagon Width, Min in	Width Over Wrench Pads, Min mm	Width Over Wrench Pads, Min in
1/8	9/16	14.2	0.56
1/4	11/16	17.5	0.69
3/8	7/8	20.6	0.81
1/2	1- 1/16	25.4	1.00
3/4	1- 1/4	31.8	1.25
1	1- 5/8	38.1	1.50

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Rationale—The changes to this document include:

Table 1B 3/8 and 1/2 were added to the table.

Figure 3E was added

Title for Table 1a was changed to add Figure 3E

Title for Table 1b was changed to add Figure 3E

Figure 11 was changed to the correct figure.

Relationship of SAE Standard to ISO Standard—Not applicable.

Application—This SAE Standard covers complete general and dimensional specifications for tube fittings of the spherical and flanged sleeve compression types for use in the piping of air brake systems on automotive vehicles. The spherical sleeve compression type Figures 1A to 5 and Tables 1 to 3 is intended for use with annealed copper alloy tubing per SAE J1149, Type 1. The flanged sleeve compression type Figures 6A to 11 and tables 4 to 6 is intended for use with nylon tubing per SAE J844. It is not intended to restrict or preclude other designs of a tube fitting for use with SAE J844, air brake tubing. Performance requirements for SAE J844 are covered in SAE J1131.

Reference Section

SAE J476—Dryseal Pipe Threads

SAE J512—Automotive Tube Fittings

SAE J844—Nonmetallic Air Brake System Tubing

SAE J846—Coding Systems for Identification of Fluid Conductors and Connectors

SAE J1131—Performance Requirements for SAE J844 Nonmetallic Tubing and Fitting Assemblies Used in Automotive Air Brake Systems

SAE J1149—Metallic Air Brake System Tubing and Pipe

ANSI/ASME B1.1-1989—Unified Inch Screw Thread (UN and UNR)

ASTM B 117—Method of Salt Spray (Fog) Testing

FMVSS 106—Brake Hoses

Developed by the SAE Fluid Conductors and Connectors Technical Committee