

Submitted for recognition as an American National Standard

REFRIGERATION TUBE FITTINGS—GENERAL SPECIFICATIONS

- 1. Scope**—This SAE Standard covers complete general and dimensional specifications for refrigeration tube fittings of the flare type specified in Figures 1 to 42 and Tables 1 to 16. These fittings are intended for general use with flared annealed copper tubing in refrigeration applications.

Dimensions of single and double 45 degree flares on tubing to be used in conjunction with these fittings are given in Figure 2 and Table 1 of SAE J533.

The following general specifications supplement the dimensional data contained in Tables 1 to 16 with respect to all unspecified details.

2. References

- 2.1 Applicable Documents**—The following publications form a part of this specification to the extent specified herein. The latest version 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 J533—Flares for Tubing

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

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

ANSI B1.1—Screw Threads

ANSI B2.1—Pipe Threads

ANSI B70.1

- 2.1.3 ASTM PUBLICATION**—Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

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

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

SAE J513 Revised JUN93

TABLE 1—STRAIGHT THREAD SPECIFICATION DATA, in

Nominal Size	Series Designation	External Thread	External Thread	Internal Thread	Internal Thread	Internal Thread	Internal Thread
		Pitch Dia Max	Pitch Dia Min	Pitch Dia Max	Pitch Dia Min ^a	Minor Dia ^b Max	Minor Dia ^b Min
5/16-24	UNF	0.2843	0.2806	0.2902	0.2854	0.2754	0.2670
3/8 -24	UNF	0.3468	0.3430	0.3528	0.3479	0.3372	0.3300
7/16-20	UNF	0.4037	0.3995	0.4104	0.4050	0.3916	0.3830
1/2 -20	UNF	0.4462	0.4619	0.4731	0.4675	0.4537	0.4460
5/8 -18	UNF	0.5875	0.5828	0.5949	0.5889	0.5730	0.5650
3/4 -16	UNF	0.7079	0.7029	0.7159	0.7094	0.6908	0.6820
7/8 -14	UNF	0.8270	0.8216	0.8356	0.8286	0.8068	0.7980
1-1/16-14	UNS	1.0145	1.0092	1.0230	1.0161	0.9940	0.9850

^a These values are also the basic pitch diameter.

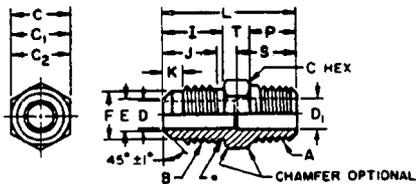
^b Class 3B minor diameter limits.

TABLE 2

Nominal Pipe Thread Size in	External Thread Chamfer Diameter ^a	External Thread Length of Chamfered or Partial Thread	External Thread Length of Chamfered or Partial Thread			
	Max mm	Max in	Min mm	Min in	Min mm	Min in
1/8	8.1	0.32	7.6	0.30	0.90	0.037
1/4	10.7	0.42	10.2	0.40	1.42	0.056
3/8	14.0	0.55	13.5	0.53	1.42	0.056
1/2	17.3	0.68	16.8	0.66	1.80	0.071
3/4	22.6	0.89	22.1	0.87	1.80	0.071

Nominal Pipe Thread Size in	External Thread Length of Chamfered or Partial Thread	External Thread Length of Chamfered or Partial Thread	Internal Thread Countersink Diameter ^a			
	Max mm	Max in	Min mm	Min in	Max mm	Max in
1/8	1.42	0.056	10.7	0.42	11.2	0.44
1/4	2.11	0.083	14.0	0.55	14.5	0.57
3/8	2.11	0.083	17.5	0.69	18.0	0.71
1/2	2.72	0.107	21.6	0.85	22.1	0.87
3/4	2.72	0.107	26.9	1.06	27.4	1.08

^a Tabulated diameters conform with Appendix A, SAE J476.



*UNDERCUT TO G DIA OPTIONAL ON FLARE SIZES 1/2 AND LARGER UNLESS OTHERWISE SPECIFIED BY PURCHASER

FIGURE 1—CONNECTOR
(HALF UNION)
(010102) (U1)

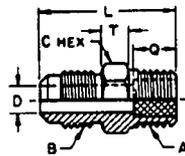


FIGURE 2—FUSIBLE CONNECTOR
(HALF UNION)
(010163) (FU)

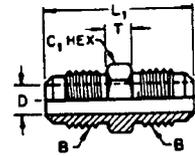


FIGURE 3—UNION
(010101)(U2)

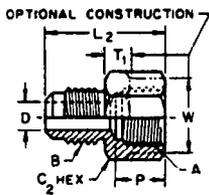


FIGURE 4—INTERNAL PIPE
THREAD CONNECTOR
(HALF UNION)
(010103) (U3)

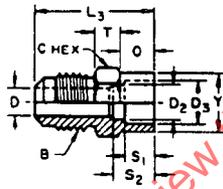


FIGURE 5—SOLDER
CONNECTOR
(HALF UNION)
(010104) (US3)

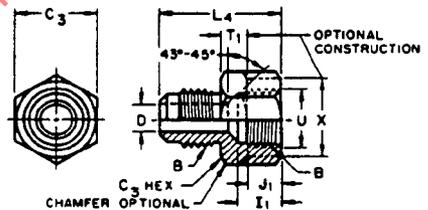


FIGURE 6—INTERNAL FLARE
TO EXTERNAL
FLARE ADAPTOR
(010105) (UR3)

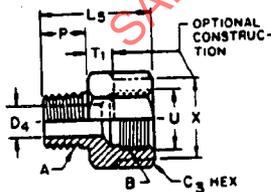


FIGURE 7—INTERNAL FLARE
TO EXTERNAL
PIPE ADAPTOR
(010106) (U5)

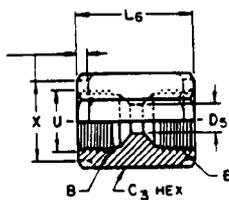


FIGURE 8—INTERNAL
FLARE UNION
(010107) (U4)

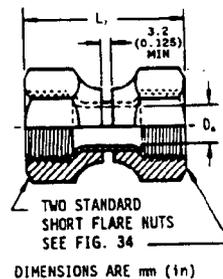


FIGURE 9—INTERNAL
FLARE SWIVEL UNION
(010108) (US4)

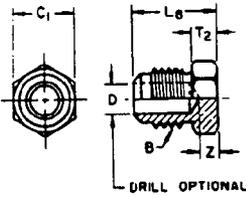


FIGURE 10—PLUG
(010109) (P2)

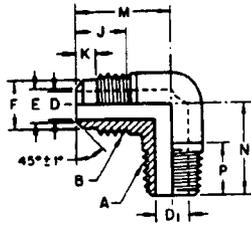


FIGURE 11—90 DEGREE ELBOW
(010202) (E1)

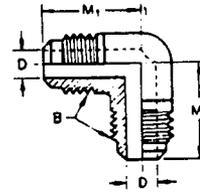


FIGURE 12—90 DEGREE
ELBOW UNION
(010201) (E2)

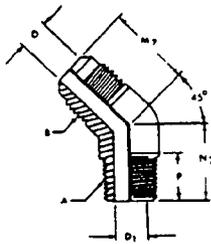


FIGURE 13—45 DEGREE
ELBOW
(010302) (E5)

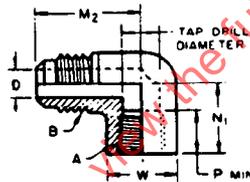


FIGURE 14—90 DEGREE
INTERNAL PIPE
THREAD ELBOW
(010203) (E3)

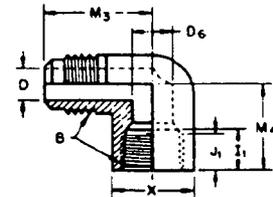


FIGURE 15—INTERNAL FLARE
TO EXTERNAL FLARE
90 DEGREE ELBOW
(010205) (E4)

SAENORM.COM : Click to view the full PDF of j513 - 109306

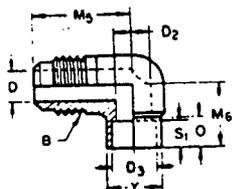


FIGURE 16—90 DEGREE
SOLDER ELBOW
(010204) (ES)

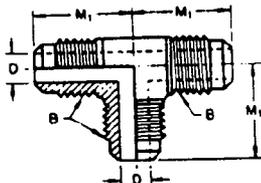


FIGURE 17—THREE-
WAY TEE
(010401) (T2)

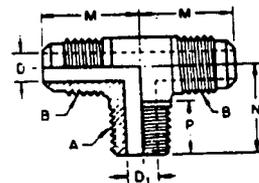


FIGURE 18—TWO-WAY TEE
(010425) (T1)

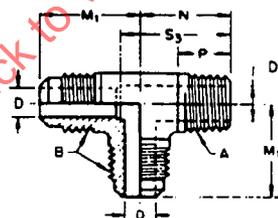


FIGURE 19—RIGHT ANGLE
TWO-WAY TEE
(010424) (T3)

NOTE—UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. THE DIMENSIONAL DESIGNATIONS IN FIGURES 1, 6 AND 11 AND THE FIRST FIGURE IN EACH GROUP SHALL APPLY TO CORRESPONDING FEATURES OF OTHER FIGURES ON THIS PAGE UNLESS SHOWN OTHERWISE. THE ILLUSTRATIONS ON THIS PAGE APPLY TO TABLE 3. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

SAE J513 Revised JUN93

TABLE 3—DIMENSIONS OF CONNECTORS, UNIONS, ADAPTORS, ELBOWS, TEES, AND CROSSES
(Figures 1 to 20)

Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	B Straight Thread Nominal Size	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	C ₃ Hex in Nom	D° Drill mm	D° Drill in	D ₁ ° Drill mm	D ₁ ° Drill in
3/16	1/8	3/8 -24	7/16	3/8	9/16	1/2	3.18	0.125	5.56	0.219
1/4	1/8	7/16-20	7/16	7/16	9/16	5/8	4.78	0.188	5.56	0.219
5/16	1/8	1/2 -20	1/2	1/2	9/16	1- 1/16	5.56	0.219	5.56	0.219
3/8	1/4	5/8 -18	5/8	5/8	11/16	13/16	7.14	0.281	7.92	0.312
1/2	3/8	3/4 -16	3/4	3/4	13/16	15/16	10.31	0.406	10.31	0.406
5/8	1/2	7/8 -14	7/8	7/8	1	1- 1/16	12.70	0.500	14.27	0.562
3/4	1/2	1-1/16-14	1-1/16	1-1/16	1- 1/16	1- 5/16	15.88	0.625	14.27	0.562

Nom Tube OD in	D ₂ Drill mm	D ₂ Drill in	D ₃ ^h Dia mm ±0.025	D ₃ ^h Dia in ±0.0010	D ₄ Drill mm	D ₄ Drill in	D ₅ Drill mm	D ₅ Drill in	D ₆ Tube ID mm	D ₆ Tube ID in
3/16	3.96	0.156	4.864	0.1915	4.78	0.188	4.78	0.188	2.97	0.117
1/4	4.78	0.188	6.452	0.2540	5.56	0.219	6.35	0.250	4.57	0.180
5/16	6.35	0.250	8.039	0.3165	5.56	0.219	7.92	0.312	6.15	0.242
3/8	7.92	0.312	9.627	0.3790	8.74	0.344	9.52	0.375	7.75	0.305
1/2	11.13	0.438	12.802	0.5040	10.31	0.406	12.70	0.500	10.92	0.430
5/8	13.89	0.547	15.977	0.6290	14.27	0.562	15.88	0.625	14.10	0.555
3/4	17.48	0.688	19.152	0.7540	14.27	0.562	19.05	0.750	17.27	0.680

Nom Tube OD in	E Dia mm	E Dia in	F Dia mm	F Dia in	G° Dia mm +0.00 -0.25	G° Dia in +0.000 -0.010	I mm	I in	I ₁ mm	I ₁ in
3/16	3.96	0.156	7.54	0.297	—	—	11.2	0.44	7.1	0.28
1/4	5.56	0.219	8.74	0.344	—	—	12.7	0.50	8.6	0.34
5/16	6.35	0.250	10.31	0.406	—	—	14.2	0.56	9.7	0.38
3/8	7.92	0.312	13.49	0.531	—	—	15.7	0.62	11.2	0.44
1/2	11.13	0.438	16.28	0.641	16.74	0.659	19.0	0.75	13.5	0.53
5/8	13.89	0.531	19.05	0.750	19.56	0.770	22.4	0.88	16.8	0.66
3/4	18.26	0.719	23.83	0.938	24.33	0.958	25.4	1.00	19.8	0.78

SAE J513 Revised JUN93

TABLE 3—(Continued)

Nom Tube OD in	J ^c Full Thread Min mm	J ^c Full Thread Min in	J ₁ Full Thread Min mm	J ₁ 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
3/16	9.7	0.38	5.6	0.22	3.0	0.12	25.4	1.00	26.9	1.06
1/4	10.4	0.41	6.9	0.27	4.1	0.16	26.9	1.06	30.2	1.19
5/16	11.9	0.47	7.6	0.30	4.8	0.19	29.5	1.16	34.0	1.34
3/8	13.7	0.54	8.6	0.34	5.6	0.22	36.6	1.44	38.1	1.50
1/2	16.8	0.66	11.2	0.44	6.4	0.25	41.1	1.62	46.0	1.81
5/8	19.3	0.76	14.0	0.55	7.1	0.28	50.8	2.00	53.8	2.12
3/4	22.9	0.90	17.0	0.67	7.1	0.28	55.6	2.19	62.0	2.44

Nom Tube OD in	L ₂ mm ±0.8	L ₂ in ±0.03	L ₃ mm ±0.8	L ₃ in ±0.03	L ₄ mm ±0.8	L ₄ in ±0.03	L ₅ mm ±0.8	L ₅ in ±0.03	L ₆ mm ±0.8	L ₆ in ±0.03
3/16	24.6	0.97	23.9	0.94	23.9	0.94	20.6	0.81	22.4	0.88
1/4	26.2	1.03	25.4	1.00	26.9	1.06	23.1	0.91	25.4	1.00
5/16	26.9	1.06	27.7	1.09	28.4	1.12	23.9	0.94	26.9	1.06
3/8	33.3	1.31	30.2	1.19	33.3	1.31	32.5	1.28	31.8	1.25
1/2	38.1	1.50	36.6	1.44	39.6	1.56	35.1	1.33	36.6	1.44
5/8	46.0	1.81	44.4	1.75	46.0	1.81	42.2	1.66	42.9	1.69
3/4	48.5	1.91	52.3	2.06	52.3	2.06	47.8	1.88	50.8	2.00

Nom Tube OD in	L ₇ Min mm	L ₇ Min in	L ₈ mm ±0.8	L ₈ in ±0.03	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	M ₂ mm ±0.8	M ₂ in ±0.03
3/16	33.3	1.31	15.0	0.59	19.0	0.75	19.0	0.75	20.6	0.81
1/4	33.3	1.31	17.5	0.69	20.6	0.81	22.4	0.88	22.4	0.88
5/16	35.1	1.38	19.8	0.78	23.1	0.91	23.1	0.91	23.9	0.94
3/8	38.1	1.50	22.4	0.88	25.4	1.00	26.9	1.06	27.7	1.09
1/2	44.4	1.75	26.9	1.06	31.0	1.22	31.0	1.22	32.5	1.28
5/8	50.8	2.00	30.2	1.19	35.8	1.41	35.8	1.41	38.1	1.50
3/4	60.5	2.38	33.3	1.31	41.1	1.62	42.2	1.66	41.1	1.62

SAE J513 Revised JUN93

TABLE 3—(Continued)

Nom Tube OD in	M ₃ mm ±0.8	M ₃ in ±0.03	M ₄ mm ±0.8	M ₄ in ±0.03	M ₅ mm ±0.8	M ₅ in ±0.03	M ₆ mm ±0.8	M ₆ in ±0.03	M ₇ mm ±0.8	M ₇ in ±0.03
3/16	—	—	—	—	18.3	0.72	15.0	0.59	15.7	0.62
1/4	23.9	0.94	19.8	0.78	20.6	0.81	15.7	0.62	17.0	0.67
5/16	—	—	—	—	23.1	0.91	16.8	0.66	19.8	0.78
3/8	29.5	1.16	24.6	0.97	26.2	1.03	18.3	0.72	22.6	0.89
1/2	34.0	1.34	28.4	1.12	31.0	1.22	21.3	0.84	26.9	1.06
5/8	—	—	—	—	35.8	1.41	26.2	1.03	31.2	1.23
3/4	—	—	—	—	41.1	1.62	31.8	1.25	35.8	1.41

Nom Tube OD in	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	O mm	O in	P Min mm	P Min in
3/16	19.0	0.75	11.2	0.44	13.2	0.52	7.9	0.31	9.7	0.38
1/4	19.8	0.78	11.9	0.47	16.3	0.64	7.9	0.31	9.7	0.38
5/16	19.8	0.78	11.9	0.47	16.3	0.64	7.9	0.31	9.7	0.38
3/8	26.9	1.06	17.5	0.69	21.8	0.86	7.9	0.31	14.2	0.56
1/2	28.4	1.12	19.0	0.75	24.1	0.95	9.7	0.38	14.2	0.56
5/8	35.1	1.38	25.4	1.00	29.7	1.17	12.7	0.50	19.0	0.75
3/4	38.1	1.50	26.9	1.06	30.5	1.20	15.7	0.62	19.0	0.75

Nom Tube OD in	Q ^d mm	Q ^d in	S ^e Max mm	S ^e Max in	S ₁ mm	S ₁ in	S ₂ ^e Max mm	S ₂ ^e Max in	S ₃ ^e Min mm	S ₃ ^e Min in
3/16	—	—	12.2	0.48	7.9	0.31	10.4	0.41	21.6	0.85
1/4	—	—	12.2	0.48	7.9	0.31	—	—	23.4	0.92
5/16	—	—	—	—	7.9	0.31	10.7	0.42	—	—
3/8	17.5	0.69	17.5	0.69	7.9	0.31	11.2	0.44	31.5	1.24
1/2	—	—	—	—	9.7	0.38	13.7	0.54	—	—
5/8	23.9	0.94	23.9	0.94	12.7	0.50	17.5	0.69	42.4	1.67
3/4	—	—	31.0	1.22	15.7	0.62	21.3	0.84	51.3	2.02

SAE J513 Revised JUN93

TABLE 3—(Continued)

Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ ^f Min mm	T ₁ ^f Min in	T ₂ ^f Ref mm	T ₂ ^f Ref in	U Dia Min mm	U Dia Min in	U Dia Max mm	U Dia Max in
3/16	4.6	0.18	5.3	0.21	3.8	0.15	9.9	0.39	10.4	0.41
1/4	4.6	0.18	6.1	0.24	4.6	0.18	11.4	0.45	11.9	0.47
5/16	5.3	0.21	6.1	0.24	5.3	0.21	13.0	0.51	13.5	0.53
3/8	6.1	0.24	7.6	0.30	6.1	0.24	16.3	0.64	17.0	0.67
1/2	7.6	0.30	9.4	0.37	7.6	0.30	19.6	0.77	20.3	0.80
5/8	9.4	0.37	10.9	0.43	7.6	0.30	22.9	0.90	23.6	0.93
3/4	10.9	0.43	12.4	0.49	7.6	0.30	27.4	1.08	28.2	1.11

Nom Tube OD in	W ^g Dia mm +0.00 -0.5	W ^g Dia in +0.00 -0.02	X ^g Dia mm +0.00 -0.5	X ^g Dia in +0.00 -0.02	Y Dia Min mm	Y Dia Min in	Z Min mm	Z Min in
3/16	14.2	0.56	12.7	0.50	7.1	0.28	1.5	0.06
1/4	14.2	0.56	15.7	0.62	8.6	0.34	1.3	0.05
5/16	14.2	0.56	17.5	0.69	10.2	0.40	1.5	0.06
3/8	17.5	0.69	20.6	0.81	12.2	0.48	1.5	0.06
1/2	20.6	0.81	23.9	0.94	15.2	0.60	2.0	0.08
5/8	25.4	1.00	26.9	1.06	18.8	0.74	2.5	0.10
3/4	26.9	1.06	33.3	1.31	21.8	0.86	2.5	0.10

- ^a For reducing sizes of unions, internal flare to external flare adaptors, and 90 degree elbow unions, see Table 4; for reducing sizes of solder connectors and 90 degree solder elbows, see Table 5; for reducing sizes of connectors, internal pipe thread connectors, internal flare to external pipe adaptors, 90 degree elbow, 45 degree elbow, and internal pipe thread 90 degree elbow, see Table 6; for reducing sizes of tees, see Tables 7 and 8.
- ^b Dryseal American Standard Taper Pipe Thread.
- ^c Where thread relief undercut is used, last thread shall be chamfered 1/2 to 1 pitch long from G diameter and dimension J may be reduced by an amount equal to 1/2 pitch.
- ^d Available with three types of fusible alloys as specified in general specifications.
- ^e At manufacturer's option through passages in fittings shown in Figures 1, 5, and 19 may conform with the smaller diameter specified or be counterbored to the larger diameter from the appropriate end for depths S, S₂ or S₃, respectively.
- ^f Minimum design thickness, not subject to inspection.
- ^g Basic dimensions shown shall apply as minimum diameter for bosses or across flats. The -0.5 mm (-0.02 in) tolerance shall apply only to chamfer diameters on full hexagon versions of fittings shown in Figures 4, 6 to 8.
- ^h ID of solder cup shall not be out of round by more than 0.08 mm (0.003 in).

SAE J513 Revised JUN93

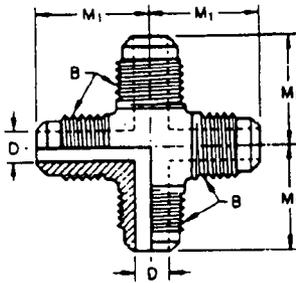
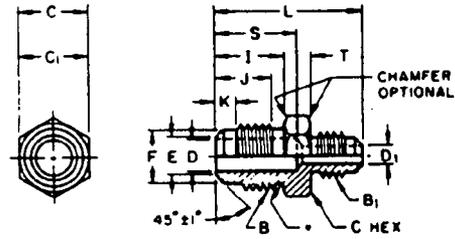


FIGURE 20—CROSS
(010501) (C1)



*UNDERCUT TO G DIA OPTIONAL ON FLARE
SIZES 1/2 AND LARGER UNLESS OTHERWISE
SPECIFIED BY PURCHASER (SEE FOOTNOTE C1)

FIGURE 21—REDUCING UNION
(010101) (UR2)

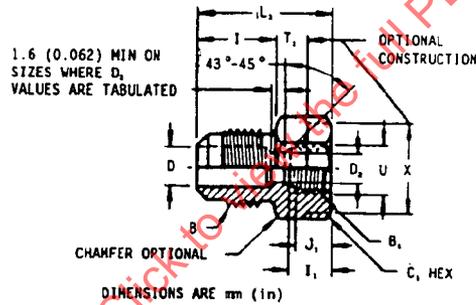


FIGURE 22—INTERNAL FLARE TO EXTERNAL FLARE REDUCING ADAPTOR
(010105) (UR3)

NOTE—UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. THE ILLUSTRATIONS ON THIS PAGE APPLY TO TABLE 4. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

SAE J513 Revised JUN93

TABLE 4—DIMENSIONS OF REDUCING UNIONS, REDUCING ADAPTERS, AND REDUCING ELBOW UNIONS
(Figures 21 to 23)^a

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
3/16	1/4	7/16	5/8	3.18	0.125	4.78	0.188	—	—	28.4	1.12	26.2	1.03
3/16	5/16	1/2	11/16	3.18	0.125	5.56	0.219	—	—	31.0	1.22	26.9	1.06
3/16	3/8	5/8	13/16	3.18	0.125	7.14	0.281	—	—	33.3	1.31	30.2	1.19
3/16	1/2	3/4	15/16	2.18	0.125	10.31	0.406	—	—	38.1	1.50	34.0	1.34
3/16	5/8	7/8	1- 1/16	3.18	0.125	12.70	0.500	—	—	42.9	1.69	38.9	1.53
3/16	3/4	1-1/16	1- 5/16	3.18	0.125	15.88	0.625	—	—	47.8	1.88	44.4	1.75

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X' Dia mm +0.0 -0.5	X' Dia in +0.00 -0.02
3/16	1/4	19.0	0.75	22.4	0.88	15.2	0.60	4.6	0.18	6.1	0.24	15.7	0.62
3/16	5/16	19.8	0.78	23.1	0.91	17.0	0.67	5.3	0.21	6.1	0.24	17.5	0.69
3/16	3/8	21.3	0.84	26.9	1.06	19.0	0.75	6.1	0.24	7.6	0.30	20.6	0.81
3/16	1/2	23.1	0.91	31.0	1.22	23.1	0.91	7.6	0.30	9.4	0.37	23.9	0.94
3/16	5/8	24.6	0.97	35.8	1.41	27.2	1.07	9.4	0.37	10.9	0.43	26.9	1.06
3/16	3/4	26.9	1.06	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
1/4	3/16	7/16	1/2	4.78	0.188	3.18	0.125	—	—	28.4	1.12	24.6	0.97
1/4	5/16	1/2	11/16	4.78	0.188	5.56	0.219	—	—	32.5	1.28	28.4	1.12
1/4	3/8	5/8	13/16	4.78	0.188	7.14	0.281	—	—	35.1	1.38	31.0	1.22
1/4	1/2	3/4	15/16	4.78	0.188	10.31	0.406	—	—	39.6	1.56	35.1	1.38
1/4	5/8	7/8	1- 1/16	4.78	0.188	12.70	0.500	—	—	44.4	1.75	39.6	1.56
1/4	3/4	1-1/16	1- 5/16	4.78	0.188	15.88	0.625	—	—	49.3	1.94	42.9	1.69

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X' Dia mm +0.0 -0.5	X' Dia in +0.00 -0.02
1/4	3/16	22.4	0.88	19.0	0.75	15.2	0.60	4.6	0.18	5.3	0.21	12.7	0.50
1/4	5/16	21.3	0.84	23.1	0.91	17.0	0.67	5.3	0.21	6.1	0.24	17.5	0.69
1/4	3/8	23.1	0.91	26.9	1.06	19.0	0.75	6.1	0.24	7.6	0.30	20.6	0.81
1/4	1/2	24.6	0.97	31.0	1.22	23.1	0.91	7.6	0.30	9.4	0.37	23.9	0.94
1/4	5/8	26.2	1.03	35.8	1.41	27.2	1.07	9.4	0.37	10.9	0.43	26.2	1.06
1/4	3/4	28.4	1.12	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

SAE J513 Revised JUN93

TABLE 4—(Continued)

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
5/16	3/16	1/2	1/2	5.56	0.219	3.18	0.125	4.78	0.188	31.0	1.22	25.4	1.00
5/16	1/4	1/2	5/8	5.56	0.219	4.78	0.188	—	—	32.5	1.28	27.7	1.09
5/16	3/8	5/8	13/16	5.56	0.219	7.14	0.281	—	—	36.6	1.44	31.8	1.25
5/16	1/2	3/4	15/16	5.56	0.219	10.31	0.406	—	—	41.1	1.62	35.8	1.41
5/16	5/8	7/8	1- 1/16	5.56	0.219	12.70	0.500	—	—	46.0	1.81	40.4	1.59
5/16	3/4	1-1/16	1- 5/16	5.56	0.219	15.88	0.625	—	—	50.8	2.00	46.0	1.81

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X ^f Dia mm +0.0 -0.5	X ^f Dia in +0.00 -0.02
5/16	3/16	23.1	0.91	19.8	0.78	17.0	0.67	5.3	0.21	5.3	0.21	12.7	0.50
5/16	1/4	23.1	0.91	21.3	0.84	17.0	0.67	5.3	0.21	6.1	0.24	15.7	0.62
5/16	3/8	24.6	0.97	26.9	1.06	19.0	0.75	6.1	0.24	7.6	0.30	20.6	0.81
5/16	1/2	26.2	1.03	31.0	1.22	23.1	0.91	7.6	0.30	9.4	0.37	23.9	0.94
5/16	5/8	27.7	1.09	35.8	1.41	27.2	1.07	9.4	0.37	10.9	0.43	26.9	1.06
5/16	3/4	30.2	1.19	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
3/8	3/16	5/8	5/8	7.14	0.281	3.18	0.125	4.78	0.188	33.3	1.31	26.2	1.03
3/8	1/4	5/8	5/8	7.14	0.281	4.78	0.188	6.35	0.250	35.1	1.38	28.4	1.12
3/8	5/16	5/8	11/16	7.14	0.281	5.56	0.219	—	—	36.6	1.44	30.2	1.19
3/8	1/2	3/4	15/16	7.14	0.281	10.31	0.406	—	—	42.9	1.69	36.6	1.44
3/8	5/8	7/8	1- 1/16	7.14	0.281	12.70	0.500	—	—	47.8	1.88	41.1	1.62
3/8	3/4	1-1/16	1- 5/16	7.14	0.281	15.89	0.625	—	—	52.3	2.06	46.7	1.84

SAE J513 Revised JUN93

TABLE 4—(Continued)

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X ^f Dia mm +0.0 -0.5	X ^f Dia in +0.00 -0.02
3/8	3/16	26.9	1.06	21.3	0.84	19.0	0.75	6.1	0.24	6.1	0.24	15.7	0.62
3/8	1/4	26.9	1.06	23.1	0.91	19.0	0.75	6.1	0.24	6.1	0.24	15.7	0.62
3/8	5/16	26.9	1.06	24.6	0.97	19.0	0.75	6.1	0.24	6.1	0.24	17.5	0.69
3/8	1/2	27.7	1.09	31.0	1.22	23.1	0.91	7.6	0.30	9.4	0.37	23.9	0.94
3/8	5/8	29.5	1.16	35.8	1.41	27.2	1.07	9.4	0.37	10.9	0.43	26.9	1.06
3/8	3/4	31.8	1.25	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
1/2	3/16	3/4	3/4	10.31	0.406	3.18	0.125	4.78	0.188	38.1	1.50	29.5	1.16
1/2	1/4	3/4	3/4	10.31	0.406	4.78	0.188	6.35	0.250	39.6	1.56	31.8	1.25
1/2	5/16	3/4	3/4	10.31	0.406	5.56	0.219	7.92	0.312	41.1	1.62	32.5	1.28
1/2	3/8	3/4	13/16	10.31	0.506	7.14	0.281	9.52	0.375	42.9	1.69	35.8	1.41
1/2	5/8	7/8	1- 1/16	10.31	0.406	12.70	0.500	—	—	50.8	2.00	42.9	1.69
1/2	3/4	1-1/16	1- 5/16	10.31	0.406	15.88	0.625	—	—	55.6	2.19	48.5	1.91

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X ^f Dia mm +0.0 -0.5	X ^f Dia in +0.00 -0.02
1/2	3/16	31.0	1.22	23.1	0.91	23.1	0.91	7.6	0.30	7.6	0.30	19.0	0.75
1/2	1/4	31.0	1.22	24.6	0.97	23.1	0.91	7.6	0.30	7.6	0.30	19.0	0.75
1/2	5/16	31.0	1.22	26.2	1.03	23.1	0.91	7.6	0.30	7.6	0.30	19.0	0.75
1/2	3/8	31.0	1.22	27.7	1.09	23.1	0.91	7.6	0.30	7.6	0.30	20.6	0.81
1/2	5/8	32.5	1.28	35.8	1.41	27.2	1.07	9.4	0.37	10.9	0.43	26.9	1.06
1/2	3/4	35.1	1.38	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

SAENORP.COM · Click to view the PDF of J513 - 199306

SAE J513 Revised JUN93

TABLE 4—(Continued)

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
5/8	3/16	7/8	7/8	12.70	0.500	3.18	0.125	4.78	0.188	42.9	1.69	31.8	1.25
5/8	1/4	7/8	7/8	12.70	0.500	4.78	0.188	6.35	0.250	44.4	1.75	33.3	1.31
5/8	5/16	7/8	7/8	12.70	0.500	5.56	0.219	7.92	0.312	46.0	1.81	35.1	1.38
5/8	3/8	7/8	7/8	12.70	0.500	7.14	0.281	9.52	0.375	47.8	1.88	37.3	1.47
5/8	1/2	7/8	15/16	12.70	0.500	10.31	0.406	—	—	50.8	2.00	41.1	1.62
5/8	3/4	1-1/16	1-5/16	12.70	0.500	15.88	0.625	—	—	58.7	2.31	50.0	1.97

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X' Dia mm +0.0 -0.5	X' Dia in +0.00 -0.02
5/8	3/16	35.8	1.41	24.6	0.97	27.2	1.07	9.4	0.37	9.4	0.37	22.4	0.88
5/8	1/4	35.8	1.41	26.2	1.03	27.2	1.07	9.4	0.37	9.4	0.37	22.4	0.88
5/8	5/16	35.8	1.41	27.7	1.09	27.2	1.07	9.4	0.37	9.4	0.37	22.4	0.88
5/8	3/8	35.8	1.41	29.5	1.16	27.2	1.07	9.4	0.37	9.4	0.37	22.4	0.88
5/8	1/2	35.8	1.41	32.5	1.28	27.2	1.07	9.4	0.37	9.4	0.37	23.9	0.94
5/8	3/4	38.1	1.50	42.2	1.66	31.0	1.22	10.9	0.43	12.4	0.49	33.3	1.31

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	C in Nom	C ₁ in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03	L ₁ mm ±0.8	L ₁ in ±0.03
3/4	3/16	1-1/16	1-1/16	15.88	0.625	3.18	0.125	4.78	0.188	47.8	1.88	36.6	1.44
3/4	1/4	1-1/16	1-1/16	15.88	0.625	4.78	0.188	6.35	0.250	49.3	1.94	36.6	1.44
3/4	5/16	1-1/16	1-1/16	15.88	0.625	5.56	0.219	7.92	0.312	50.8	2.00	36.6	1.44
3/4	3/8	1-1/16	1-1/16	15.88	0.625	7.14	0.281	9.52	0.375	52.3	2.06	38.9	1.53
3/4	1/2	1-1/16	1-1/16	15.88	0.625	10.31	0.406	12.70	0.500	55.6	2.19	42.9	1.69
3/4	5/8	1-1/16	1-1/16	15.88	0.625	12.70	0.500	—	—	58.7	2.31	47.8	1.88

TABLE 4—(Continued)

B ^c Nom Tube OD in	B ₁ ^c Nom Tube OD in	M mm ±0.8	M in ±0.03	M ₁ mm ±0.8	M ₁ in ±0.03	S ^d Max mm	S ^d Max in	T ^e Ref mm	T ^e Ref in	T ₁ Min mm	T ₁ Min in	X' Dia mm +0.0 -0.5	X' Dia in +0.00 -0.02
3/4	3/16	42.2	1.66	26.9	1.06	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06
3/4	1/4	42.2	1.66	28.4	1.12	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06
3/4	5/16	42.2	1.66	30.2	1.19	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06
3/4	3/8	42.2	1.66	31.8	1.25	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06
3/4	1/2	42.2	1.66	35.1	1.38	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06
3/4	5/8	42.2	1.66	38.1	1.50	31.0	1.22	10.9	0.43	10.9	0.43	26.9	1.06

^a For flare dimensions shown on Figures 21 to 23 but not covered in Table 4, see corresponding dimensions for the specified Tube OD in Table 3.

^b In these sizes the reducing unions and reducing elbows are the reverses of sizes already specified in Table.

^c Where thread relief undercut is used last thread shall be chamfered 1/2 to 1 pitch long from G diameter and dimension J may be reduced by an amount equal to 1/2 pitch.

^d At manufacturer's option through passages in fittings shown in Figure 21 may conform with the smaller diameter specified or be counterbored to the larger diameter from the appropriate end for depth S.

^e Minimum design thickness, not subject to inspection.

^f Basic dimensions shown shall apply as minimum for bosses. The -0.51 mm (-0.02 in) tolerance shall apply only to chamfer diameter on full hexagon version of fittings in Figure 22.

SAENORM.COM : Click to view the full PDF of SAE J513-199306

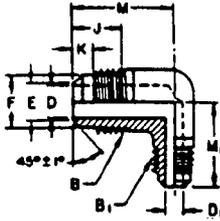
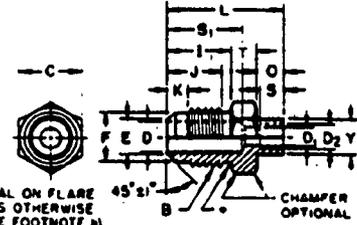


FIGURE 23—90 DEGREE
REDUCING ELBOW UNION
(010201) (ER2)



*UNDERCUT TO G DIA OPTIONAL ON FLARE
SIZES 1/2 AND LARGER UNLESS OTHERWISE
SPECIFIED BY PURCHASER (SEE FOOTNOTE B)

FIGURE 24—FLARE TO SOLDER
REDUCING CONNECTOR
(HALF UNION)
(010104) (US3)

NOTE— UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. THE ILLUSTRATIONS ON THIS PAGE APPLY TO TABLE 4. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

SAENORM.COM : Click to view the full PDF of J513-102016

SAE J513 Revised JUN93

TABLE 5—DIMENSIONS OF REDUCING SOLDER CONNECTORS AND REDUCING SOLDER ELBOWS
(Figures 24 and 25)^a

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
3/16	1/8	3/8	3.18	0.125	2.39	0.094	3.277	0.1290	23.1	0.91	18.3	0.72
3/16	1/4	7/16	3.18	0.125	4.78	0.188	6.452	0.2540	23.9	0.94	18.3	0.72
3/16	5/16	7/16	3.18	0.125	6.35	0.250	8.039	0.3165	23.9	0.94	19.0	0.75
3/16	3/8	1/2	3.18	0.125	7.92	0.312	9.627	0.3790	23.9	0.94	19.8	0.78
3/16	1/2	5/8	3.18	0.125	11.13	0.438	12.802	0.5040	26.2	1.03	21.3	0.84
3/16	5/8	3/4	3.18	0.125	13.89	0.547	15.977	0.6290	30.2	1.19	23.1	0.91
3/16	3/4	7/8	3.18	0.125	17.48	0.688	19.152	0.7540	35.1	1.38	24.6	0.97
3/16	7/8	1	3.18	0.125	19.84	0.781	22.327	0.8790	39.6	1.56	26.9	1.06

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
3/16	1/8	15.0	0.59	7.9	0.31	7.9	0.31	13.2	0.52	3.8	0.15	5.6	0.22
3/16	1/4	15.0	0.59	7.9	0.31	7.9	0.31	10.4	0.41	4.6	0.18	8.6	0.34
3/16	5/16	15.7	0.62	7.9	0.31	7.9	0.31	10.4	0.41	4.6	0.18	10.2	0.40
3/16	3/8	16.8	0.66	7.9	0.31	7.9	0.31	10.4	0.41	4.6	0.18	12.2	0.48
3/16	1/2	19.8	0.78	9.7	0.38	9.7	0.38	12.4	0.49	5.3	0.21	15.2	0.60
3/16	5/8	24.6	0.97	12.7	0.50	12.7	0.50	16.0	0.63	6.1	0.24	18.8	0.74
3/16	3/4	29.5	1.16	15.7	0.62	15.7	0.62	19.8	0.78	7.6	0.30	21.8	0.86
3/16	7/8	35.1	1.38	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
1/4	1/8	7/16	4.78	0.188	2.39	0.094	3.277	0.1290	25.4	1.00	20.6	0.81
1/4	3/16	7/16	4.78	0.188	4.78	0.188	4.864	0.1915	25.4	1.00	20.6	0.81
1/4	5/16	7/16	4.78	0.188	6.35	0.250	8.039	0.3165	25.4	1.00	20.6	0.81
1/4	3/8	1/2	4.78	0.188	7.92	0.312	9.627	0.3790	25.4	1.00	21.3	0.84
1/4	1/2	5/8	4.78	0.188	11.13	0.438	12.802	0.5040	27.7	1.09	23.1	0.91
1/4	5/8	3/4	4.78	0.188	13.89	0.547	15.977	0.6290	31.8	1.25	24.6	0.97
1/4	3/4	7/8	4.78	0.188	17.48	0.688	19.152	0.7540	36.6	1.44	26.2	1.03
1/4	7/8	1	4.78	0.188	19.84	0.781	22.327	0.8790	41.1	1.62	28.4	1.12

SAE J513 Revised JUN93

TABLE 5—(Continued)

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
1/4	1/8	15.7	0.62	7.9	0.31	7.9	0.31	15.2	0.60	4.6	0.18	5.6	0.22
1/4	3/16	15.7	0.62	7.9	0.31	7.9	0.31	15.2	0.60	4.6	0.18	7.1	0.28
1/4	5/16	15.7	0.62	7.9	0.31	7.9	0.31	10.4	0.41	4.6	0.18	10.2	0.40
1/4	3/8	16.8	0.66	7.9	0.31	7.9	0.31	10.4	0.41	4.6	0.18	12.2	0.48
1/4	1/2	19.8	0.78	9.7	0.38	9.7	0.38	12.4	0.49	5.3	0.21	15.2	0.60
1/4	5/8	24.6	0.97	12.7	0.50	12.7	0.50	16.0	0.63	6.1	0.24	18.8	0.74
1/4	3/4	29.5	1.16	15.7	0.62	15.7	0.62	19.8	0.78	7.6	0.30	21.8	0.86
1/4	7/8	35.1	1.38	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^o Dia mm ±0.025	D ₂ ^o Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
5/16	1/8	1/2	5.56	0.219	2.39	0.094	3.277	0.1290	27.7	1.09	23.1	0.91
5/16	3/16	1/2	5.56	0.219	3.96	0.156	4.864	0.1915	27.7	1.09	23.1	0.91
5/16	1/4	1/2	5.56	0.219	4.78	0.188	6.452	0.2540	27.7	1.09	23.1	0.91
5/16	3/8	1/2	5.56	0.219	7.92	0.312	9.627	0.3790	27.7	1.09	23.1	0.91
5/16	1/2	5/8	5.56	0.219	11.13	0.438	12.802	0.5040	29.5	1.16	24.6	0.97
5/16	5/8	3/4	5.56	0.219	13.89	0.547	15.977	0.6290	33.3	1.31	26.2	1.03
5/16	3/4	7/8	5.56	0.219	17.48	0.688	19.152	0.7540	38.1	1.50	27.7	1.09
5/16	7/8	1	5.56	0.219	19.84	0.781	22.327	0.8790	42.9	1.69	30.2	1.19

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
5/16	1/8	16.8	0.66	7.9	0.31	7.9	0.31	17.0	0.67	5.3	0.21	5.6	0.22
5/16	3/16	16.8	0.66	7.9	0.31	7.9	0.31	17.0	0.67	5.3	0.21	7.1	0.28
5/16	1/4	16.8	0.66	7.9	0.31	7.9	0.31	17.0	0.67	5.3	0.21	8.6	0.34
5/16	3/8	16.8	0.66	7.9	0.31	7.9	0.31	10.7	0.42	5.3	0.21	12.2	0.48
5/16	1/2	19.8	0.78	9.7	0.38	9.7	0.38	12.4	0.49	5.3	0.21	15.2	0.60
5/16	5/8	24.6	0.97	12.7	0.50	12.7	0.50	16.0	0.63	6.1	0.24	18.8	0.74
5/16	3/4	29.5	1.16	15.7	0.62	15.7	0.62	19.8	0.78	7.6	0.30	21.8	0.86
5/16	7/8	35.1	1.38	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

SAE J513 Revised JUN93

TABLE 5—(Continued)

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
3/8	1/8	5/8	7.14	0.281	2.39	0.094	3.277	0.1290	30.2	1.19	26.2	1.03
3/8	3/16	5/8	7.14	0.281	3.96	0.156	4.864	0.1915	30.2	1.19	26.2	1.03
3/8	1/4	5/8	7.14	0.281	4.78	0.188	6.452	0.2540	30.2	1.19	26.2	1.03
3/8	5/16	5/8	7.14	0.281	6.35	0.250	8.039	0.3165	30.2	1.19	26.2	1.03
3/8	1/2	5/8	7.14	0.281	11.13	0.438	12.802	0.5040	31.8	1.25	26.2	1.03
3/8	5/8	3/4	7.14	0.281	13.89	0.547	15.977	0.6290	35.1	1.38	27.7	1.09
3/8	3/4	7/8	7.14	0.281	17.48	0.688	19.152	0.7540	39.6	1.56	29.5	1.16
3/8	7/8	1	7.14	0.281	19.84	0.781	22.327	0.8790	44.4	1.75	31.8	1.25

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
3/8	1/8	18.3	0.72	7.9	0.31	7.9	0.31	19.0	0.75	6.1	0.24	5.6	0.22
3/8	3/16	18.3	0.72	7.9	0.31	7.9	0.31	19.0	0.75	6.1	0.24	7.1	0.28
3/8	1/4	18.3	0.72	7.9	0.31	7.9	0.31	19.0	0.75	6.1	0.24	8.6	0.34
3/8	5/16	18.3	0.72	7.9	0.31	7.9	0.31	19.0	0.75	6.1	0.24	10.2	0.40
3/8	1/2	19.8	0.78	9.7	0.38	9.7	0.38	13.0	0.51	6.1	0.24	15.2	0.60
3/8	5/8	24.6	0.97	12.7	0.50	12.7	0.50	16.0	0.63	6.1	0.24	18.8	0.74
3/8	3/4	29.5	1.16	15.7	0.62	15.7	0.62	19.8	0.78	7.6	0.30	21.8	0.86
3/8	7/8	31.8	1.25	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
1/2	1/8	3/4	10.31	0.406	2.39	0.094	3.277	0.1290	35.1	1.38	31.0	1.22
1/2	3/16	3/4	10.31	0.406	3.96	0.156	4.864	0.1915	35.1	1.38	31.0	1.22
1/2	1/4	3/4	10.31	0.406	4.78	0.188	6.452	0.2540	35.1	1.38	31.0	1.22
1/2	5/16	3/4	10.31	0.406	6.35	0.250	8.039	0.3165	35.1	1.38	31.0	1.22
1/2	3/8	3/4	10.31	0.406	7.92	0.312	9.627	0.3790	35.1	1.38	31.0	1.22
1/2	5/8	3/4	10.31	0.406	13.89	0.547	15.977	0.6290	39.6	1.56	31.0	1.22
1/2	3/4	7/8	10.31	0.406	17.48	0.688	19.152	0.7540	42.9	1.69	32.5	1.28
1/2	7/8	1	10.31	0.406	19.84	0.781	22.327	0.8790	47.8	1.88	35.1	1.38

SAE J513 Revised JUN93

TABLE 5—(Continued)

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
1/2	1/8	19.8	0.78	7.9	0.31	7.9	0.31	23.1	0.91	7.6	0.30	5.6	0.22
1/2	3/16	19.8	0.78	7.9	0.31	7.9	0.31	23.1	0.91	7.6	0.30	7.1	0.28
1/2	1/4	19.8	0.78	7.9	0.31	7.9	0.31	23.1	0.91	7.6	0.30	8.6	0.34
1/2	5/16	19.8	0.78	7.9	0.31	7.9	0.31	23.1	0.91	7.6	0.30	10.2	0.40
1/2	3/8	19.8	0.78	7.9	0.31	7.9	0.31	23.1	0.91	7.6	0.30	12.2	0.48
1/2	5/8	24.6	0.97	12.7	0.50	12.7	0.50	16.8	0.66	7.6	0.30	18.8	0.74
1/2	3/4	29.5	1.16	15.7	0.62	15.7	0.62	19.8	0.78	7.6	0.30	21.8	0.86
1/2	7/8	35.1	1.38	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
5/8	1/8	7/8	12.70	0.500	2.39	0.094	3.277	0.1290	39.6	1.56	35.8	1.41
5/8	3/16	7/8	12.70	0.500	3.96	0.156	4.864	0.1915	39.6	1.56	35.8	1.41
5/8	1/4	7/8	12.70	0.500	4.78	0.188	6.452	0.2540	39.6	1.56	35.8	1.41
5/8	5/16	7/8	12.70	0.500	6.35	0.250	8.039	0.3165	39.6	1.56	35.8	1.41
5/8	3/8	7/8	12.70	0.500	7.92	0.312	9.627	0.3790	39.6	1.56	35.8	1.41
5/8	1/2	7/8	12.70	0.500	11.13	0.438	12.802	0.5040	41.1	1.62	35.8	1.41
5/8	3/4	7/8	12.70	0.500	17.48	0.688	19.152	0.7540	47.8	1.88	35.8	1.41
5/8	7/8	1	12.70	0.500	19.84	0.781	22.327	0.8790	50.8	2.00	38.1	1.50

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
5/8	1/8	21.3	0.84	7.9	0.31	7.9	0.31	27.2	1.07	9.4	0.37	5.6	0.22
5/8	3/16	21.3	0.84	7.9	0.31	7.9	0.31	27.2	1.07	9.4	0.37	7.1	0.28
5/8	1/4	21.3	0.84	7.9	0.31	7.9	0.31	27.2	1.07	9.4	0.37	8.6	0.34
5/8	5/16	21.3	0.84	7.9	0.31	7.9	0.31	27.2	1.07	9.4	0.37	10.2	0.40
5/8	3/8	21.3	0.84	7.9	0.31	7.9	0.31	27.2	1.07	9.4	0.37	12.2	0.48
5/8	1/2	23.1	0.91	9.7	0.38	9.7	0.38	27.2	1.07	9.4	0.37	15.2	0.60
5/8	3/4	29.5	1.16	15.7	0.62	15.7	0.62	20.6	0.81	9.4	0.37	21.8	0.86
5/8	7/8	35.1	1.38	19.0	0.75	19.0	0.75	23.9	0.94	9.4	0.37	24.9	0.98

SAE J513 Revised JUN93

TABLE 5—(Continued)

B Nom Tube OD in	Solder Tube OD in	C Hex in Nom	D ^c Drill mm	D ^c Drill in	D ₁ ^c Drill mm	D ₁ ^c Drill in	D ₂ ^e Dia mm ±0.025	D ₂ ^e Dia in ±0.0010	L mm ±0.8	L in ±0.03	M mm ±0.8	M in ±0.03
3/4	1/8	1-1/16	15.88	0.625	—	0.094	3.277	0.1290	44.4	1.75	41.1	1.62
3/4	3/16	1-1/16	15.88	0.625	—	0.156	4.864	0.1915	44.4	1.75	41.1	1.62
3/4	1/4	1-1/16	15.88	0.625	—	0.188	6.452	0.2540	44.4	1.75	41.1	1.62
3/4	5/16	1-1/16	15.88	0.625	—	0.250	8.039	0.3165	44.4	1.75	41.1	1.62
3/4	3/8	1-1/16	15.88	0.625	—	0.312	9.627	0.3790	44.4	1.75	41.1	1.62
3/4	1/2	1-1/16	15.88	0.625	—	0.438	12.802	0.5040	46.0	1.81	41.1	1.62
3/4	5/8	1-1/16	15.88	0.625	—	0.547	15.977	0.6290	49.3	1.94	41.1	1.62
3/4	3/4	1-1/16	15.88	0.625	—	0.781	22.327	0.8790	55.6	2.19	41.1	1.62

B Nom Tube OD in	Solder Tube OD in	M ₁ mm ±0.8	M ₁ in ±0.03	O mm	O in	S mm	S in	S ₁ ^c Max mm	S ₁ ^c Max in	T ^d Ref mm	T ^d Ref in	Y Dia Min mm	Y Dia Min in
3/4	1/8	23.9	0.94	7.9	0.31	7.9	0.31	31.0	1.22	10.9	0.43	5.6	0.22
3/4	3/16	23.9	0.94	7.9	0.31	7.9	0.31	31.0	1.22	10.9	0.43	7.1	0.28
3/4	1/4	23.9	0.94	7.9	0.31	7.9	0.31	31.0	1.22	10.9	0.43	8.6	0.34
3/4	5/16	23.9	0.94	7.9	0.31	7.9	0.31	31.0	1.22	10.9	0.43	10.2	0.40
3/4	3/8	23.9	0.94	7.9	0.31	7.9	0.31	31.0	1.22	10.9	0.43	12.2	0.48
3/4	1/2	25.4	1.00	9.7	0.38	9.7	0.38	31.0	1.22	10.9	0.43	15.2	0.60
3/4	5/8	28.4	1.12	12.7	0.50	12.7	0.50	31.0	1.22	10.9	0.43	18.8	0.74
3/4	7/8	35.1	1.38	19.0	0.75	19.0	0.75	24.6	0.97	10.9	0.43	24.9	0.98

- ^a For flare dimensions shown on Figures 24 and 25 but not covered in Table 5, see corresponding dimensions for the specified Tube OD in Table 3.
- ^b Where thread relief undercut is used, last thread shall be chamfered 1/2 to 1 pitch long from G diameter and dimension J may be reduced by an amount equal to 1/2 pitch.
- ^c At manufacturer's option through passages in fittings shown in Figure 24 may conform with the smaller diameter specified or be counterbored to the larger diameter from appropriate end for depth S.
- ^d Minimum design thickness, not subject to inspection.
- ^e ID of solder cup shall not be out of round by more than 0.08 mm (0.003 in).

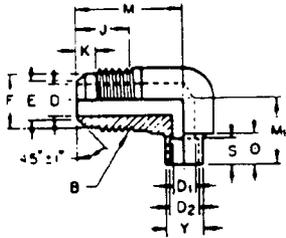


FIGURE 25—FLARE TO SOLDER 90 DEGREE REDUCING ELBOW (010204) (ES)

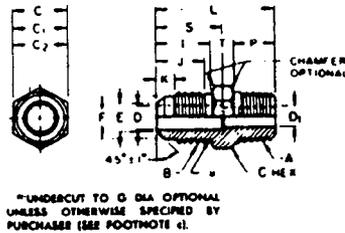


FIGURE 26—REDUCING CONNECTOR (HALF UNION) (010102) (U1)

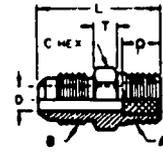


FIGURE 27—FUSIBLE REDUCING CONNECTOR (HALF UNION) (010163) (FU)

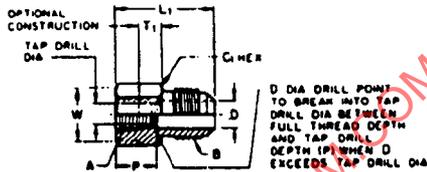


FIGURE 28—INTERNAL THREAD REDUCING CONNECTOR (HALF UNION) (010103) (U3)

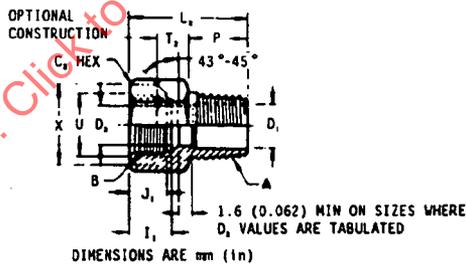


FIGURE 29—INTERNAL FLARE TO EXTERNAL PIPE REDUCING ADAPTOR (010106) (U5)

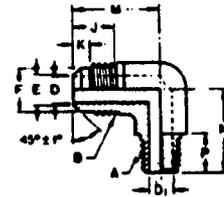


FIGURE 30—90 DEGREE REDUCING ELBOW (010202) (E1)

NOTE—UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. THE DIMENSIONAL DESIGNATIONS IN FIGURES 1 AND 30 SHALL APPLY TO CORRESPONDING FEATURES OF OTHER FIGURES ON THIS PAGE UNLESS SHOWN OTHERWISE. THE ILLUSTRATIONS ON THIS PAGE APPLY TO TABLE 6. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE JB46 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

SAE J513 Revised JUN93

TABLE 6—DIMENSIONS OF REDUCING CONNECTORS, REDUCING ADAPTORS, AND REDUCING ELBOWS
(Figures 26 to 32)^a

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
3/16	3/8	11/16	13/16	11/16	3.18	0.125	10.31	0.406	4.78	0.188	31.8	1.22
3/16	1/2	7/8	1	7/8	3.18	0.125	14.27	0.562	4.78	0.188	38.1	1.44
3/16	3/4	1- 1/16	1- 1/4	1- 1/16	3.18	0.125	19.05	0.750	4.78	0.188	41.1	1.50

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
3/16	31.0	1.22	21.3	0.84	22.4	0.88	24.6	0.97	19.0	0.75	25.4	1.00
3/16	36.6	1.44	26.9	1.06	24.6	0.97	26.9	1.06	20.3	0.80	32.5	1.28
3/16	38.1	1.50	30.2	1.19	26.9	1.06	31.0	1.22	21.3	0.84	35.1	1.38

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
3/16	15.8	0.62	24.1	0.95	14.2	0.56	—	—	17.5	0.69
3/16	20.6	0.81	29.7	1.17	19.0	0.75	—	—	23.1	0.91
3/16	20.6	0.81	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
3/16	6.1	0.24	7.6	0.30	6.1	0.24	20.6	0.81	17.5	0.69
3/16	7.6	0.30	9.4	0.37	7.6	0.30	25.4	1.00	22.4	0.88
3/16	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
1/4	1/4	9/16	11/16	5/8	4.78	0.188	7.92	0.312	6.35	0.250	31.8	1.25
1/4	3/8	11/16	13/16	11/16	4.78	0.188	10.31	0.406	6.35	0.250	33.3	1.31
1/4	1/2	7/8	1	7/8	4.78	0.188	14.27	0.562	6.35	0.250	39.6	1.56
1/4	3/4	1- 1/16	1- 1/4	1-1/16	4.78	0.188	19.05	0.750	6.35	0.250	42.9	1.69

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
1/4	31.8	1.25	26.2	1.03	23.1	0.91	24.6	0.97	19.0	0.75	23.9	0.94
1/4	32.5	1.28	23.9	0.94	23.9	0.94	26.2	1.03	20.1	0.79	26.2	1.03
1/4	38.1	1.50	26.9	1.06	26.2	1.03	28.4	1.12	21.6	0.85	32.5	1.28
1/4	39.6	1.56	30.2	1.19	28.4	1.12	32.5	1.28	22.6	0.89	35.1	1.38

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
1/4	16.8	0.66	21.8	0.86	14.2	0.56	16.8	0.66	16.8	0.66
1/4	16.8	0.66	24.1	0.95	14.2	0.56	17.5	0.69	17.5	0.69
1/4	21.3	0.84	29.7	1.17	19.0	0.75	—	—	23.1	0.91
1/4	21.3	0.84	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
1/4	4.6	0.18	6.1	0.24	6.1	0.24	17.5	0.69	15.7	0.62
1/4	6.1	0.24	7.6	0.30	6.1	0.24	20.6	0.81	17.5	0.69
1/4	7.6	0.30	9.4	0.37	7.6	0.30	25.4	1.00	22.4	0.88
1/4	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
5/16	1/4	9/16	11/16	11/16	5.56	0.219	7.92	0.312	7.92	0.312	34.0	1.34
5/16	3/8	11/16	13/16	11/16	5.56	0.219	10.31	0.406	7.92	0.312	35.1	1.38
5/16	1/2	7/8	1	7/8	5.56	0.219	14.27	0.562	7.92	0.312	41.1	1.62
5/16	3/4	1- 1/16	1- 1/4	1- 1/16	5.56	0.219	19.05	0.750	7.92	0.312	44.4	1.75

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
5/16	32.5	1.28	27.7	1.09	24.6	0.97	26.2	1.03	20.6	0.81	23.9	0.94
5/16	33.3	1.31	25.4	1.00	25.4	1.00	27.7	1.09	21.6	0.85	26.2	1.03
5/16	38.9	1.53	28.4	1.12	27.7	1.09	30.2	1.19	23.1	0.91	32.5	1.28
5/16	40.4	1.52	30.2	1.19	30.2	1.19	34.0	1.34	24.1	0.95	35.1	1.38

B Nom Tube OD in	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	Q ^a mm	Q ^a in	S ^d Max mm	S ^d Max in
5/16	16.8	0.66	21.8	0.86	14.2	0.56	—	—	17.0	0.67
5/16	16.8	0.66	24.1	0.95	14.2	0.56	—	—	17.5	0.69
5/16	21.3	0.84	29.7	1.17	19.0	0.75	—	—	23.1	0.91
5/16	21.3	0.84	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
5/16	5.3	0.21	6.1	0.24	6.1	0.24	17.5	0.69	17.5	0.69
5/16	6.1	0.24	7.6	0.30	6.1	0.24	20.6	0.81	17.5	0.69
5/16	7.6	0.30	9.4	0.37	7.6	0.30	25.4	1.00	22.4	0.88
5/16	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
3/8	1/8	5/8	5/8	13/16	7.14	0.281	5.56	0.219	—	—	31.8	1.25
3/8	3/8	11/16	13/16	13/16	7.14	0.281	10.31	0.406	9.52	0.375	36.6	1.44
3/8	1/2	7/8	1	7/8	7.14	0.281	14.27	0.562	9.52	0.375	42.9	1.69
3/8	3/4	1-1/16	1- 1/4	1- 1/16	7.14	0.281	19.05	0.750	9.52	0.375	46.0	1.81

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
3/8	28.4	1.12	27.7	1.09	26.2	1.03	26.9	1.06	22.6	0.89	23.1	0.91
3/8	35.1	1.38	28.4	1.12	26.9	1.06	29.5	1.16	23.6	0.93	27.7	1.09
3/8	41.1	1.62	31.8	1.25	29.5	1.16	31.8	1.25	25.1	0.99	32.5	1.28
3/8	42.2	1.66	30.2	1.19	31.8	1.25	35.8	1.41	26.2	1.03	35.1	1.38

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
3/8	12.7	0.50	17.0	0.67	9.7	0.38	—	—	19.0	0.75
3/8	17.5	0.69	24.1	0.95	14.2	0.56	17.5	0.69	17.5	0.69
3/8	22.4	0.88	29.7	1.17	19.0	0.75	—	—	23.1	0.91
3/8	22.4	0.88	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
3/8	6.1	0.24	6.1	0.24	7.6	0.30	15.7	0.62	20.6	0.81
3/8	6.1	0.24	7.6	0.30	7.6	0.30	20.6	0.81	20.6	0.81
3/8	7.6	0.30	9.4	0.37	7.6	0.30	25.4	1.00	22.4	0.88
3/8	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
1/2	1/8	3/4	3/4	15/16	10.31	0.406	5.56	0.219	—	—	36.6	1.44
1/2	1/4	3/4	3/4	15/16	10.31	0.406	7.92	0.312	—	—	41.1	1.62
1/2	1/2	7/8	1	15/16	10.31	0.406	14.27	0.562	12.70	0.500	46.0	1.81
1/2	3/4	1- 1/16	1- 1/4	1- 1/16	10.31	0.406	19.05	0.750	12.70	0.500	49.3	1.94

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
1/2	30.2	1.19	31.8	1.25	31.0	1.22	31.0	1.22	26.9	1.06	25.4	1.00
1/2	35.8	1.41	34.0	1.34	31.0	1.22	31.0	1.22	26.9	1.06	30.2	1.19
1/2	44.4	1.75	37.3	1.47	32.5	1.28	35.1	1.38	28.4	1.12	35.1	1.38
1/2	46.0	1.81	35.1	1.38	35.1	1.38	38.9	1.53	29.5	1.16	35.1	1.38

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
1/2	14.2	0.56	19.3	0.76	9.7	0.38	—	—	23.1	0.91
1/2	19.0	0.75	24.1	0.95	14.2	0.56	—	—	23.1	0.91
1/2	23.9	0.94	29.7	1.17	19.0	0.75	—	—	23.1	0.91
1/2	23.9	0.94	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
1/2	7.6	0.30	7.6	0.30	9.4	0.37	19.0	0.75	23.9	0.94
1/2	7.6	0.30	7.6	0.30	9.4	0.37	19.0	0.75	23.9	0.94
1/2	7.6	0.30	9.4	0.37	9.4	0.37	25.4	1.00	23.9	0.94
1/2	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
5/8	1/8	7/8	7/8	1-1/16	12.70	0.500	5.56	0.219	—	—	41.1	1.62
5/8	1/4	7/8	7/8	1-1/16	12.70	0.500	7.92	0.312	—	—	46.0	1.81
5/8	3/8	7/8	7/8	1-1/16	12.70	0.500	10.31	0.406	—	—	46.0	1.81
5/8	3/4	1-1/16	1-1/4	1-1/16	12.70	0.500	19.05	0.750	15.88	0.625	52.3	2.06

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
5/8	32.5	1.28	35.8	1.41	35.8	1.41	35.8	1.41	31.2	1.23	26.9	1.06
5/8	38.1	1.50	38.9	1.53	35.8	1.41	35.8	1.41	31.2	1.23	31.8	1.25
5/8	40.4	1.59	39.6	1.56	35.8	1.41	35.8	1.41	31.2	1.23	31.8	1.25
5/8	48.5	1.91	42.2	1.66	36.6	1.44	42.2	1.66	32.3	1.27	38.1	1.50

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
5/8	15.7	0.62	20.1	0.79	9.7	0.38	—	—	27.2	1.07
5/8	20.6	0.81	24.9	0.98	14.2	0.56	—	—	27.2	1.07
5/8	20.6	0.81	24.9	0.98	14.2	0.56	—	—	27.2	1.07
5/8	25.4	1.00	30.5	1.20	19.0	0.75	—	—	24.6	0.97

B Nom Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g mm +0.0 -0.5	W ^g in +0.00 -0.02	X ^g mm +0.0 -0.5	X ^g in +0.00 -0.02
5/8	9.4	0.37	9.4	0.37	10.9	0.43	22.4	0.88	26.9	1.06
5/8	9.4	0.37	9.4	0.37	10.9	0.43	22.4	0.88	26.9	1.06
5/8	9.4	0.37	9.4	0.37	10.9	0.43	22.4	0.88	26.9	1.06
5/8	10.9	0.43	12.4	0.49	10.9	0.43	31.8	1.25	26.9	1.06

SAE J513 Revised JUN93

TABLE 6—(Continued)

B Nom Tube OD in	A Dryseal Pipe Thread NPTF ^b	C Hex in Nom	C ₁ Hex in Nom	C ₂ Hex in Nom	D ^d Drill mm	D ^d Drill in	D ₁ ^d Drill mm	D ₁ ^d Drill in	D ₂ Drill mm	D ₂ Drill in	L mm ±0.8	L in ±0.03
3/4	1/8	1-1/16	1-1/16	1-5/16	15.88	0.625	5.56	0.219	—	—	46.0	1.81
3/4	1/4	1-1/16	1-1/16	1-5/16	15.88	0.625	7.92	0.312	—	—	50.8	2.00
3/4	3/8	1-1/16	1-1/16	1-5/16	15.88	0.625	10.31	0.406	—	—	50.8	2.00
3/4	3/4	1-1/16	1-1/4	1-5/16	15.88	0.625	19.05	0.750	—	—	55.6	2.19

B Nom Tube OD in	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	M ₂ mm ±0.8	M ₂ in ±0.03	N mm ±0.8	N in ±0.03
3/4	35.1	1.38	41.1	1.62	41.1	1.62	40.4	1.59	35.8	1.41	31.0	1.22
3/4	39.6	1.56	44.4	1.75	41.1	1.62	40.4	1.59	35.8	1.41	35.8	1.41
3/4	42.2	1.66	45.2	1.78	41.1	1.62	40.4	1.59	35.8	1.41	35.8	1.41
3/4	50.0	1.97	45.2	1.78	40.4	1.59	45.2	1.78	35.8	1.41	41.1	1.62

B Nom Tube OD in	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	Q ^e mm	Q ^e in	S ^d Max mm	S ^d Max in
3/4	17.5	0.69	20.8	0.82	9.7	0.38	—	—	31.0	1.22
3/4	22.4	0.88	25.7	1.01	14.2	0.56	—	—	31.0	1.22
3/4	22.4	0.88	25.7	1.01	14.2	0.56	—	—	31.0	1.22
3/4	26.9	1.06	30.5	1.20	19.0	0.75	—	—	24.6	0.97

SAENORM.COM: Click to view the full PDF of J513-199306

TABLE 6—(Continued)

B Norm Tube OD in	T ^f Ref mm	T ^f Ref in	T ₁ Min mm	T ₁ Min in	T ₂ Min mm	T ₂ Min in	W ^g	W ^g	X ^g	X ^g
							mm	in	mm	in
3/4	10.9	0.43	10.9	0.43	12.4	0.49	+0.0 -0.5	+0.00 -0.02	+0.0 -0.5	+0.00 -0.02
3/4	10.9	0.43	10.9	0.43	12.4	0.49	26.9	1.06	33.3	1.31
3/4	10.9	0.43	10.9	0.43	12.4	0.49	26.9	1.06	33.3	1.31
3/4	10.9	0.43	12.4	0.49	12.4	0.49	31.8	1.25	33.3	1.31

^a For flare dimensions shown on Figures 26 to 32 but not given in Table 6, see corresponding dimensions for the specified Tube OD in Table 3.

^b Dryseal American Standard Taper Pipe Thread.

^c Where thread relief undercut is used, last thread shall be chamfered 1/2 to 1 pitch long from G diameter and dimension J may be reduced by an amount equal to 1/2 pitch.

^d At manufacturer's option, through passages in fittings shown in Figure 26 may conform with the smaller diameter specified or be counterbored to the larger diameter from the appropriate end for depth S.

^e Available with three types of fusible alloys as specified in General Specifications.

^f Minimum design thickness, not subject to inspection.

^g Basic dimensions shown shall apply as minimum for bosses. The -0.51 mm (-0.02 in) tolerance shall apply only to chamfer diameters on full hexagon versions of fittings shown in Figures 28 and 29.

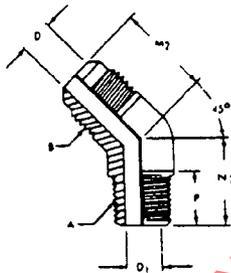


FIGURE 31—45 DEGREE
REDUCING ELBOW
(010302) (E5)

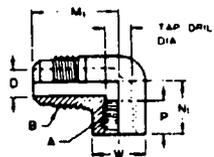


FIGURE 32—90 DEGREE
INTERNAL PIPE THREAD
REDUCING ELBOW
(010203) (E3)

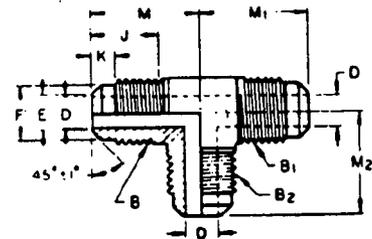


FIGURE 33—THREE-WAY
REDUCING TEE
(010401) (TR2)

NOTE—UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. THE ILLUSTRATIONS ON THIS PAGE APPLY TO TABLES 7 TO 10. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

SAE J513 Revised JUN93

TABLE 7—END TO CENTER DIMENSIONS OF FLARE TO FLARE ENDS ON REDUCING TEES^a

B and B ₁ Tube OD of Run in	End to Center ±0.8 mm ±0.03 in	B ₂ Nominal Flare Sizes of Branch in 3/16 mm	B ₂ Nominal Flare Sizes of Branch in 3/16 in	B ₂ Nominal Flare Sizes of Branch in 1/4 mm	B ₂ Nominal Flare Sizes of Branch in 1/4 in	B ₂ Nominal Flare Sizes of Branch in 5/16 mm	B ₂ Nominal Flare Sizes of Branch in 5/16 in
		3/16	M or M ₁	19.0	0.75	19.0	0.75
3/16	M ₂	19.0	0.75	22.4	0.88	23.1	0.91
1/4	M or M ₁	22.4	0.88	22.4	0.88	21.3	0.84
1/4	M ₂	19.0	0.75	22.4	0.88	23.1	0.91
5/16	M or M ₁	23.1	0.91	23.1	0.91	23.1	0.91
5/16	M ₂	19.8	0.78	21.3	0.84	23.1	0.91
3/8	M or M ₁	26.9	1.06	26.9	1.06	26.9	1.06
3/8	M ₂	21.3	0.84	23.1	0.91	24.6	0.97
1/2	M or M ₁	31.0	1.22	31.0	1.22	31.0	1.22
1/2	M ₂	23.1	0.91	24.6	0.97	26.2	1.03
5/8	M or M ₁	35.8	1.41	35.8	1.41	35.8	1.41
5/8	M ₂	24.6	0.97	26.2	1.03	27.7	1.09
3/4	M or M ₁	42.2	1.66	42.2	1.66	42.2	1.66
3/4	M ₂	26.9	1.06	28.4	1.12	30.2	1.19

B and B ₁ Tube OD of Run in	End to Center ±0.8 mm ±0.03 in	B ₂ Nominal Flare Sizes of Branch in 3/8 mm	B ₂ Nominal Flare Sizes of Branch in 3/8 in	B ₂ Nominal Flare Sizes of Branch in 1/2 mm	B ₂ Nominal Flare Sizes of Branch in 1/2 in	B ₂ Nominal Flare Sizes of Branch in 5/8 mm	B ₂ Nominal Flare Sizes of Branch in 5/8 in	B ₂ Nominal Flare Sizes of Branch in 3/4 mm	B ₂ Nominal Flare Sizes of Branch in 3/4 in
		3/16	M or M ₁	21.3	0.84	23.1	0.91	24.6	0.97
3/16	M ₂	26.9	1.06	31.0	1.22	35.8	1.41	42.2	1.66
1/4	M or M ₁	23.1	0.91	24.6	0.97	26.2	1.03	28.4	1.12
1/4	M ₂	26.9	1.06	31.0	1.22	35.8	1.41	42.2	1.66
5/16	M or M ₁	24.6	0.97	26.2	1.03	27.7	1.09	30.2	1.19
5/16	M ₂	26.9	1.06	31.0	1.22	35.8	1.41	42.2	1.66
3/8	M or M ₁	26.9	1.06	27.7	1.09	29.5	1.16	31.8	1.25
3/8	M ₂	26.9	1.06	31.0	1.22	35.8	1.41	42.2	1.66
1/2	M or M ₁	31.0	1.22	31.0	1.22	32.5	1.28	35.1	1.38
1/2	M ₂	27.7	1.09	31.0	1.22	35.8	1.41	42.2	1.66
5/8	M or M ₁	35.8	1.41	35.8	1.41	35.8	1.41	38.1	1.50
5/8	M ₂	29.5	1.16	32.5	1.28	35.8	1.41	42.2	1.66
3/4	M or M ₁	42.2	1.66	42.2	1.66	42.2	1.66	42.2	1.66
3/4	M ₂	31.8	1.25	35.1	1.38	38.1	1.50	42.2	1.66

^a For flare and pipe thread dimensions shown on Figures 33 to 35, see corresponding dimensions for specified Tube OD and specified pipe thread size in Table 3. For passage diameters, see Tables 9 and 10.

SAE J513 Revised JUN93

TABLE 8—END TO CENTER DIMENSIONS OF FLARE TO PIPE ENDS ON REDUCING TEES^a

B B ₁ or B ₂ Tube OD in	End to Center ±0.8 mm ±0.03 in	A1									
		Dryseal Taper Thread NPTF ^b in 1/8 mm	Dryseal Taper Thread NPTF ^b in 1/8 in	Dryseal Taper Thread NPTF ^b in 1/4 mm	Dryseal Taper Thread NPTF ^b in 1/4 in	Dryseal Taper Thread NPTF ^b in 3/8 mm	Dryseal Taper Thread NPTF ^b in 3/8 in	Dryseal Taper Thread NPTF ^b in 1/2 mm	Dryseal Taper Thread NPTF ^b in 1/2 in	Dryseal Taper Thread NPTF ^b in 3/4 mm	Dryseal Taper Thread NPTF ^b in 3/4 in
3/16	M ₃	19.0	0.75	20.6	0.81	22.4	0.88	24.6	0.97	26.9	1.06
3/16	N	19.0	0.75	24.6	0.97	25.4	1.00	32.5	1.28	35.1	1.38
1/4	M ₃	20.6	0.81	23.1	0.91	23.9	0.94	26.2	1.03	28.4	1.12
1/4	N	19.8	0.78	23.9	0.94	26.2	1.03	32.5	1.23	35.1	1.38
5/16	M ₃	23.1	0.91	24.6	0.97	25.4	1.00	27.7	1.09	30.2	1.19
5/16	N	19.8	0.78	23.9	0.94	26.2	1.03	32.5	1.28	35.1	1.38
3/8	M ₃	26.2	1.03	25.4	1.00	26.9	1.06	29.5	1.16	31.8	1.25
3/8	N	23.1	0.91	26.9	1.06	27.7	1.09	32.5	1.28	35.1	1.38
1/2	M ₃	31.0	1.22	31.0	1.22	31.0	1.22	32.5	1.28	35.1	1.38
1/2	N	25.4	1.00	30.2	1.19	28.4	1.12	35.1	1.38	35.1	1.38
5/8	M ₃	35.8	1.41	35.8	1.41	35.8	1.41	35.8	1.41	36.6	1.44
5/8	N	26.9	1.06	31.8	1.25	31.8	1.25	35.1	1.38	38.1	1.50
3/4	M ₃	41.1	1.62	41.1	1.62	41.1	1.62	41.1	1.62	40.4	1.59
3/4	N	31.0	1.22	35.8	1.41	35.8	1.41	38.1	1.50	41.1	1.62

^a For flare and pipe thread dimensions shown on Figures 33 to 35, see corresponding dimensions for specified Tube OD and specified pipe thread size in Table 3. For passage diameters, see Tables 9 and 10.

^b Dryseal American Standard Taper Pipe Thread.

SAENORM.COM : Click to view the full PDF SAE J513 JUN93

SAE J513 Revised JUN93

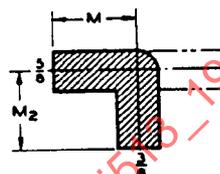
TO DETERMINE CORRECT END TO CENTER LENGTHS ON TEES, EACH 90 DEGREES MUST BE FIGURED SEPERATELY AS AN ELBOW AND THE LARGER OF THE TWO BRANCH LENGTHS SHALL APPLY. SEE EXAMPLES BELOW.

EXAMPLE: Find lengths for 5/8 x 1/2 x 3/8 in three-way tee.

1. From Table 7 obtain values for each 90 degrees separately.
2. Use larger of two M₂ dimensions as found.

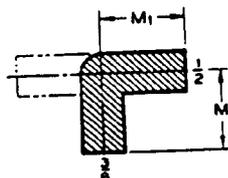
FROM TABLE 7

B Nominal Tube OD in	End to Center	B ₂ 3/8 mm	B ₂ 3/8 in
5/8	M	35.8	1.41
5/8	M ₂	29.5	1.16



FROM TABLE 7

B ₁ Nominal Tube OD in	End to Center	B ₂ 3/8 mm	B ₂ 3/8 in
1/2	M ₁	31.0	1.22
1/2	M ₂	27.7	1.09



Result:

Dimension		mm	in
M	=	35.8	1.41
N	=	28.4	1.12
M ₂	=	32.5	1.28

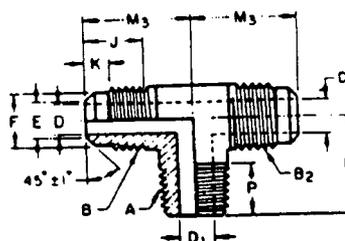


FIGURE 34—TWO-WAY REDUCING TEE (010425) (T1)

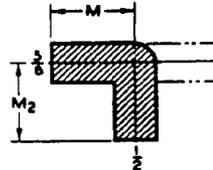
SAE J513 Revised JUN93

EXAMPLE: Find lengths for 5/8 × 3/8 × 1/2 in right angle two-way tee.

1. From Tables 7 and 8 obtain values for each 90 degrees separately.
2. Use the larger dimension M_2 or M_3 as found.

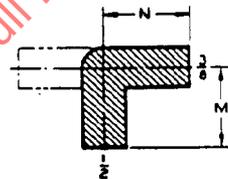
FROM TABLE 7

B Nominal Tube OD in	Center End to Center	B_2 1/2 mm	B_2 1/2 in
5/8	M	35.8	1.41
5/8	M_2	32.5	1.28



FROM TABLE 8

B_2 Nominal Tube OD in	End to Center	A 3/8 mm	A 3/8 in
1/2	M_3	31.0	1.22
1/2	N	28.4	1.22



Result:

Dimension		mm	in
M	=	35.8	1.41
M_1	=	31.0	1.22
M_2	=	29.5	1.16

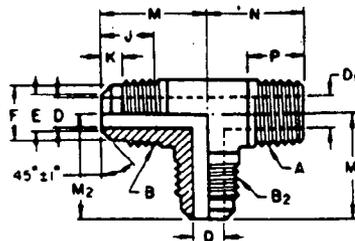


FIGURE 35—RIGHT ANGLE TWO-WAY REDUCING TEE (010424) (T3)

NOTE—UNSPECIFIED DETAIL WITH RESPECT TO DIMENSIONS, TOLERANCES, CONTOUR, MATERIAL, WORKMANSHIP, ETC., MUST CONFORM TO GENERAL SPECIFICATIONS FOR REFRIGERATION TUBE FITTINGS. CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE WITH SAE J846 (FIRST NUMBER) AND ANSI B70.1 (SECOND NUMBER).

TABLE 9—PASSAGE DIAMETERS THROUGH FLARE ENDS

Nom Tube OD in	D ^a Dia Drill mm	D ^a Dia Drill in
3/16	3.18	0.125
1/4	4.78	0.188
5/16	5.56	0.219
3/8	7.14	0.281
1/2	10.31	0.406
5/8	12.70	0.500
3/4	15.88	0.625

^a At manufacturer's option, through passages in tees shown in Figures 33 to 35 having varying diameters at opposite ends may conform to the smaller diameters specified or be counterbored to the larger diameter from the appropriate end for a minimum depth equivalent to the maximum end to center length of that end, plus 1/2 the maximum passage through branch plus 0.3 mm (0.01 in).

TABLE 10—PASSAGE DIAMETERS THROUGH PIPE THREAD ENDS

Nom Pipe Size in	D ^a Dia Drill mm	D ^a Dia Drill in
1/8	5.56	0.219
1/4	7.92	0.312
3/8	10.31	0.406
1/2	14.27	0.562
3/4	19.05	0.750

^a At manufacturer's option, through passages in tees shown in Figures 33 to 35 having varying diameters at opposite ends may conform to the smaller diameters specified or be counterbored to the larger diameter from the appropriate end for a minimum depth equivalent to the maximum end to center length of that end, plus 1/2 the maximum passage through branch plus 0.3 mm (0.01 in).

SAE J513 Revised JUN93

TABLE 11—DIMENSIONS FOR STANDARD SIZES OF SHORT AND LONG FLARE NUTS (Figures 36A and 36B)

Nom Tube OD in	B Straight Thread		C Hex in Nom	D Dia mm +0.13 -0.00	D Dia in +0.005 -0.000	E Dia Min mm	E Dia Min in	I mm	I in	J Full Thread Min mm	J Full Thread Min in
	Nom Size in										
3/16	3/8	-24	1/2	4.88	0.192	10.4	0.41	7.1	0.28	5.6	0.22
1/4	7/16	-20	5/8	6.48	0.255	11.9	0.47	8.6	0.34	6.9	0.27
5/16	1/2	-20	11/16	8.05	0.317	11.9	0.47	9.7	0.38	7.6	0.30
3/8	5/8	-18	13/16	9.65	0.380	15.0	0.59	11.2	0.44	8.6	0.34
1/2	3/4	-16	15/16	12.83	0.505	19.0	0.75	13.5	0.53	11.2	0.44
5/8	7/8	-14	1- 1/16	16.00	0.630	23.9	0.94	16.8	0.66	14.0	0.55
3/4	1-1/16	-14	1- 5/16	19.18	0.755	28.4	1.12	19.8	0.78	17.0	0.67

Nom Tube OD in	L		L ₁ mm +2.3 -0.0	L ₁ in +0.09 -0.00	T mm +0.8	T in +0.03	U Dia Min mm	U Dia Min in	U Dia Max mm	U Dia Max in	X mm +0.0 -0.8	X in +0.00 -0.03
	mm ±0.8	in ±0.03										
3/16	22.4	0.88	13.5	0.53	9.7	0.38	9.9	0.39	10.4	0.41	12.7	0.50
1/4	23.9	0.94	15.0	0.59	11.2	0.44	11.4	0.45	11.9	0.47	15.7	0.62
5/16	23.9	0.94	15.7	0.62	11.2	0.44	13.0	0.51	13.5	0.53	17.5	0.69
3/8	26.9	1.06	17.5	0.69	12.7	0.50	16.3	0.64	17.0	0.67	20.6	0.81
1/2	30.2	1.19	20.6	0.81	14.2	0.56	19.6	0.77	20.3	0.80	23.9	0.94
5/8	36.6	1.44	23.9	0.94	19.0	0.75	22.9	0.90	23.6	0.93	26.9	1.06
3/4	44.5	1.75	28.4	1.12	25.4	1.00	27.4	1.08	28.2	1.11	33.3	1.31

SAENORM.COM : Click to view the full PDF of J513-199305