

INCH-POUND

MS9196C  
 27 April 2015  
 SUPERSEDING  
 MS9196B  
 16 February 2010

DETAIL SPECIFICATION SHEET

TEE, TUBE - SAE-AMS5646, BOSS

Inactive for new design after 20 September 2000.

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and SAE-AS4841.

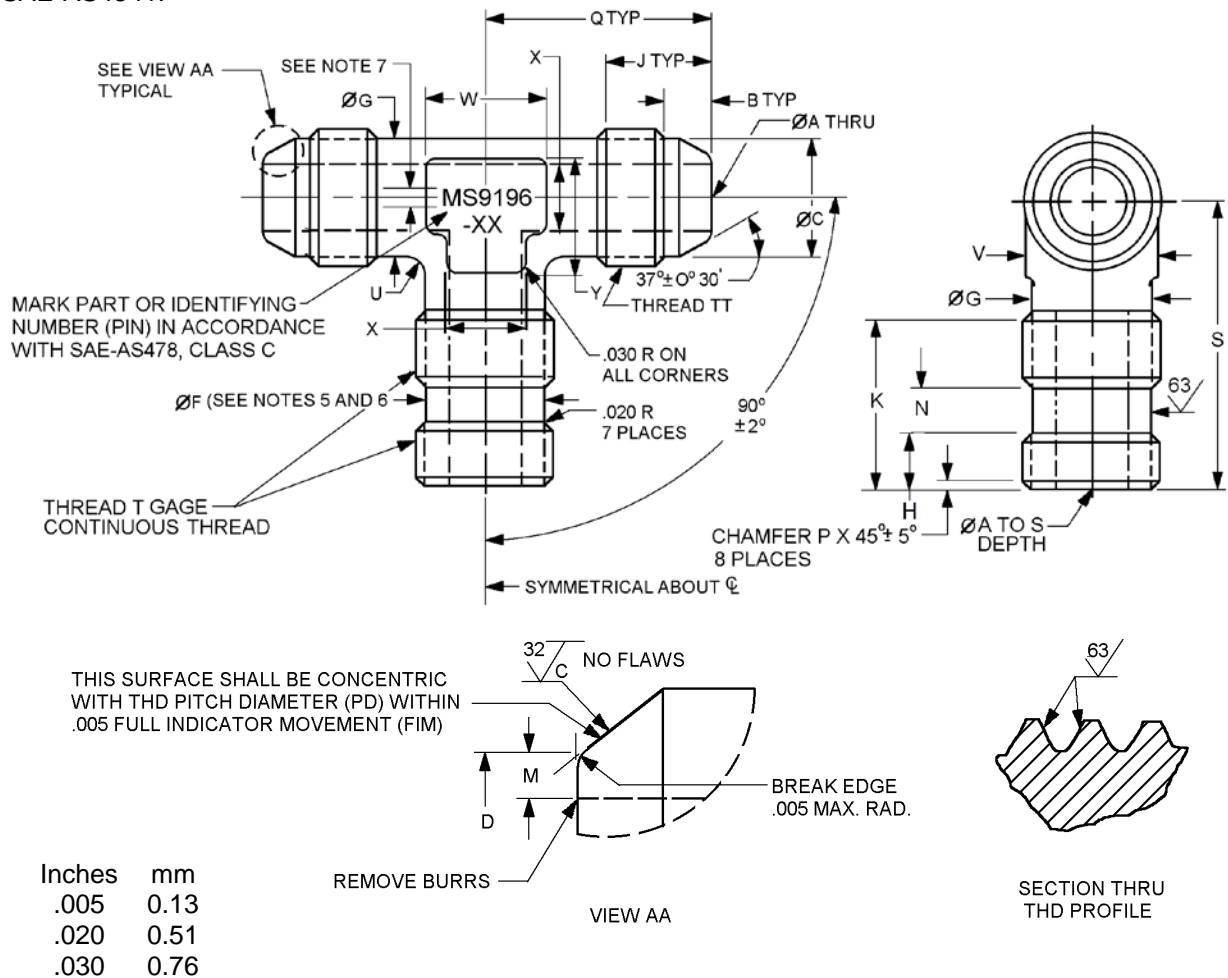


FIGURE 1. Tee, tube, boss.

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Dash number	Tube OD (reference) inches (mm)	A diameter inches (mm)		B inches (mm) +.015 (0.38) -.000	C diameter inches (mm) +.000 -.010 (0.25)
-02	.125 (3.18)	.058 (1.47)	- .065 (1.65)	.144 (3.66)	.245 (6.22)
-03	.188 (4.78)	.121 (3.07)	- .128 (3.25)	.144 (3.66)	.307 (7.80)
-04	.250 (6.35)	.168 (4.27)	- .175 (4.45)	.160 (4.06)	.359 (9.12)
-05	.313 (7.95)	.230 (5.84)	- .237 (6.02)	.160 (4.06)	.421 (10.69)
-06	.375 (9.53)	.293 (7.44)	- .301 (7.65)	.165 (4.19)	.476 (12.09)
-07	.438 (11.13)	.355 (9.02)	- .363 (9.22)	.165 (4.19)	.539 (13.69)
-08	.500 (12.70)	.387 (9.83)	- .395 (10.03)	.229 (5.82)	.654 (16.61)
-09	.562 (14.27)	.434 (11.02)	- .442 (11.23)	.229 (5.82)	.716 (18.19)
-10	.625 (15.88)	.480 (12.19)	- .488 (12.40)	.255 (6.48)	.767 (19.48)
-11	.688 (17.48)	.542 (13.77)	- .552 (14.02)	.304 (7.72)	.875 (22.23)
-12	.750 (19.05)	.604 (15.34)	- .614 (15.60)	.304 (7.72)	.938 (23.83)
-14	.875 (22.23)	.729 (18.52)	- .739 (18.77)	.304 (7.72)	1.062 (26.97)
-16	1.000 (25.40)	.839 (21.31)	- .851 (21.62)	.312 (7.92)	1.188 (30.18)
-18	1.125 (28.58)	.948 (24.08)	- .960 (24.38)	.312 (7.92)	1.375 (34.93)
-20	1.250 (31.75)	1.073 (27.25)	- 1.086 (27.58)	.363 (9.22)	1.500 (38.10)
-24	1.500 (38.10)	1.307 (33.20)	- 1.320 (33.53)	.374 (9.50)	1.750 (44.45)
-28	1.750 (44.45)	1.542 (39.17)	- 1.557 (39.55)	.447 (11.35)	2.125 (53.98)
-32	2.000 (50.80)	1.776 (45.11)	- 1.791 (45.49)	.457 (11.61)	2.375 (60.33)

FIGURE 1. Tee, tube, boss - Continued.

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Dash number	D diameter inches (mm) $\pm 0.003$ (0.08)	F diameter inches (mm) $+0.002$ (0.05) $-0.003$ (0.08) (see notes 5 and 6)	G diameter inches (mm)	H inches (mm) $\pm 0.010$ (0.25)	J inches (mm) $\pm 0.010$ (0.25)
-02	.132 (3.35)	.250 (6.35)	.240 (6.10)	.208 (5.28)	.317 (8.05)
-03	.195 (4.95)	.312 (7.92)	.300 (7.62)	.208 (5.28)	.346 (8.79)
-04	.242 (6.15)	.364 (9.25)	.350 (8.89)	.250 (6.35)	.398 (10.11)
-05	.304 (7.72)	.426 (10.82)	.415 (10.54)	.250 (6.35)	.398 (10.11)
-06	.368 (9.35)	.481 (12.22)	.470 (11.94)	.278 (7.06)	.398 (10.11)
-07	.430 (10.92)	.544 (13.82)	.535 (13.59)	.278 (7.06)	.398 (10.11)
-08	.462 (11.73)	.660 (16.76)	.650 (16.51)	.312 (7.92)	.489 (12.42)
-09	.509 (12.93)	.722 (18.34)	.710 (18.03)	.312 (7.92)	.489 (12.42)
-10	.555 (14.10)	.773 (19.63)	.765 (19.43)	.357 (9.07)	.585 (14.86)
-11	.619 (15.72)	.882 (22.40)	.870 (22.10)	.417 (10.59)	.663 (16.84)
-12	.681 (17.30)	.945 (24.00)	.935 (23.75)	.417 (10.59)	.663 (16.84)
-14	.808 (20.52)	1.070 (27.18)	1.055 (26.80)	.417 (10.59)	.710 (18.03)
-16	.918 (23.32)	1.195 (30.35)	1.185 (30.10)	.417 (10.59)	.720 (18.29)
-18	1.027 (26.09)	1.382 (35.10)	1.365 (34.67)	.417 (10.59)	.767 (19.48)
-20	1.153 (29.29)	1.507 (38.28)	1.495 (37.97)	.417 (10.59)	.767 (19.48)
-24	1.387 (35.23)	1.756 (44.60)	1.745 (44.32)	.417 (10.59)	.889 (22.58)
-28	1.652 (41.96)	2.131 (54.13)	2.120 (53.85)	.417 (10.59)	1.017 (25.83)
-32	1.886 (47.90)	2.381 (60.48)	2.370 (60.20)	.417 (10.59)	1.142 (29.01)

FIGURE 1. Tee, tube, boss - Continued.

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Dash number	K inches (mm) ±.010 (0.25)	M min inches (mm)	N inches (mm) +.010 (0.25) -.000
-02	.682 (17.32)	.030 (0.76)	.125 (3.18)
-03	.682 (17.32)	.030 (0.76)	.131 (3.33)
-04	.748 (19.00)	.030 (0.76)	.140 (3.56)
-05	.748 (19.00)	.030 (0.76)	.140 (3.56)
-06	.813 (20.65)	.030 (0.76)	.156 (3.96)
-07	.813 (20.65)	.030 (0.76)	.172 (4.37)
-08	.903 (22.94)	.030 (0.76)	.187 (4.75)
-09	.903 (22.94)	.030 (0.76)	.203 (5.16)
-10	1.018 (25.86)	.030 (0.76)	.219 (5.56)
-11	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-12	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-14	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-16	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-18	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-20	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-24	1.122 (28.50)	.030 (0.76)	.234 (5.94)
-28	1.205 (30.61)	.044 (1.12)	.234 (5.94)
-32	1.320 (33.53)	.044 (1.12)	.234 (5.94)

FIGURE 1. Tee, tube, boss - Continued.

## MS9196C

Dash number	P inches (mm)	Q inches (mm) ±.010 (0.25)	S inches (mm) +.010 (0.25)	Thread T (see note 11)
-02	.020 (0.51) - .050 (1.27)	.707 (17.96)	1.000 (25.40)	.3125 - 24UNF - 3A
-03	.020 (0.51) - .050 (1.27)	.764 (19.41)	1.000 (25.40)	.375 - 24UNF - 3A
-04	.030 (0.76) - .060 (1.52)	.826 (20.98)	1.115 (28.32)	.4375 - 20UNF - 3A
-05	.030 (0.76) - .060 (1.52)	.889 (22.58)	1.140 (28.96)	.500 - 20UNF - 3A
-06	.040 (1.02) - .070 (1.78)	.998 (25.35)	1.270 (32.26)	.5625 - 18UNF-3A
-07	.040 (1.02) - .070 (1.78)	.998 (25.35)	1.305 (33.15)	.625 - 18UNF 3A
-08	.040 (1.02) - .070 (1.78)	1.195 (30.35)	1.460 (37.08)	.7500 - 16UNF - 3A
-09	.040 (1.02) - .070 (1.78)	1.195 (30.35)	1.490 (37.85)	.8125 - 16UN - 3A
-10	.050 (1.27) - .080 (2.03)	1.411 (35.84)	1.680 (42.67)	.8750 - 14UNF - 3A
-11	.050 (1.27) - .080 (2.03)	1.614 (41.00)	1.855 (47.12)	1.000 - 12UNF - 3A
-12	.050 (1.27) - .080 (2.03)	1.614 (41.00)	1.885 (47.88)	1.0625 - 12UN - 3A
-14	.050 (1.27) - .080 (2.03)	1.768 (44.91)	1.945 (49.40)	1.1875 - 12UN - 3A
-16	.050 (1.27) - .080 (2.03)	1.778 (45.16)	2.010 (51.05)	1.3125 - 12UN - 3A
-18	.050 (1.27) - .080 (2.03)	2.027 (51.49)	2.100 (53.34)	1.500 - 12UNF - 3A
-20	.050 (1.27) - .080 (2.03)	2.027 (51.49)	2.165 (54.99)	1.625 - 12UN - 3A
-24	.050 (1.27) - .080 (2.03)	2.293 (58.24)	2.290 (58.17)	1.8750 - 12UN - 3A
-28	.050 (1.27) - .080 (2.03)	2.777 (70.54)	2.625 (66.68)	2.2500 - 12UN - 3A
-32	.050 (1.27) - .080 (2.03)	3.027 (76.89)	2.975 (75.57)	2.500 - 12UN - 3A

FIGURE 1. Tee, tube, boss - Continued.

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Dash number	Thread TT (see note 11)					
	Size	Major diameter inches (mm)		Pitch diameter inches (mm)		Minor diameter max inches (mm)
-02	.3125 – 24UNS-3A	.3023 (7.678)	.3095 (7.861)	.2797 (7.104)	.2824 (7.173)	.2584 (6.563)
-03	.375 – 24UNS-3A	.3648 (9.266)	.3720 (9.449)	.3420 (8.687)	.3449 (8.760)	.3209 (8.151)
-04	.4375 – 20UNS-3A	.4264 (10.831)	.4345 (11.036)	.3989 (10.132)	.4020 (10.211)	.3732 (9.479)
-05	.500 – 20UNS-3A	.4889 (12.418)	.4970 (12.623)	.4613 (11.717)	.4645 (11.798)	.4357 (11.067)
-06	.5625 – 18UNS-3A	.5508 (13.990)	.5595 (14.211)	.5200 (13.208)	.5234 (13.294)	.4913 (12.479)
-07	.625 – 18UNS-3A	.6133 (15.578)	.6220 (15.799)	.5824 (14.793)	.5859 (14.881)	.5538 (14.067)
-08	.750 – 16UNS-3A	.7376 (18.735)	.7470 (18.974)	.7026 (17.846)	.7064 (17.942)	.6703 (17.026)
-09	.8125 – 16UNS-3A	.8001 (20.323)	.8095 (20.561)	.7653 (19.44)	.7689 (19.530)	.7328 (18.613)
-10	.875 – 14UNS-3A	.8617 (21.887)	.8720 (22.149)	.8215 (20.866)	.8256 (20.970)	.7844 (19.924)
-11	1.000 – 12UNS-3A	.9856 (25.034)	.9970 (25.324)	.9385 (23.838)	.9429 (23.950)	.8948 (22.728)
-12	1.0625 – 12UNS-3A	1.0481 (26.622)	1.0595 (26.911)	1.0012 (25.430)	1.0054 (25.537)	.9573 (24.315)
-14	1.1875 – 12UNS-3A	1.1731 (29.797)	1.1845 (30.086)	1.1261 (28.603)	1.1304 (28.712)	1.0823 (27.490)
-16	1.3125 – 12UNS-3A	1.2981 (32.972)	1.3095 (33.261)	1.2511 (31.778)	1.2554 (31.887)	1.2073 (30.665)
-18	1.500 – 12UNS-3A	1.4856 (37.734)	1.4970 (38.024)	1.4381 (36.528)	1.4429 (36.650)	1.3948 (35.428)
-20	1.625 – 12UNS-3	1.6106 (40.909)	1.6220 (41.199)	1.5635 (39.713)	1.5679 (39.825)	1.5198 (38.603)
-24	1.875 – 12UNS-3	1.8606 (47.259)	1.8720 (47.549)	1.8134 (46.060)	1.8179 (46.175)	1.7698 (44.953)
-28	2.250 – 12UNS-3A	2.2356 (56.784)	2.2470 (57.074)	2.1884 (55.585)	2.1929 (55.700)	2.1448 (54.478)
-32	2.500 – 12UNS-3A	2.4856 (63.134)	2.4970 (63.424)	2.4429 (62.050)	2.4383 (61.933)	2.3948 (60.828)

FIGURE 1. Tee, tube, boss - Continued.

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Dash number	U radius inches (mm)	V inches (mm)	W inches (mm)	X inches (mm)	Y inches (mm)
-02	.062 (1.57)	.250 (6.35)	.400 (10.16)	.200 (5.08)	.300 (7.62)
-03	.062 (1.57)	.312 (7.92)	.400 (10.16)	.220 (5.59)	.310 (7.87)
-04	.062 (1.57)	.375 (9.53)	.500 (12.70)	.260 (6.60)	.360 (9.14)
-05	.062 (1.57)	.438 (11.13)	.580 (14.73)	.300 (7.62)	.420 (10.67)
-06	.094 (2.39)	.500 (12.70)	.650 (16.51)	.330 (8.38)	.490 (12.45)
-07	.094 (2.39)	.562 (14.27)	.650 (16.51)	.330 (8.38)	.490 (12.45)
-08	.094 (2.39)	.688 (17.48)	.850 (21.59)	.430 (10.92)	.640 (16.26)
-09	.094 (2.39)	.750 (19.05)	.880 (21.59)	.440 (11.18)	.660 (16.76)
-10	.094 (2.39)	.812 (20.62)	1.000 (25.40)	.500 (12.70)	.750 (19.05)
-11	.094 (2.39)	.938 (23.83)	1.000 (25.40)	.500 (12.70)	.750 (19.05)
-12	.094 (2.39)	1.000 (25.40)	1.000 (25.40)	.500 (12.70)	.750 (19.05)
-14	.125 (3.18)	1.125 (28.58)	1.000 (25.40)	.500 (12.70)	.750 (19.05)
-16	.125 (3.18)	1.250 (31.75)	1.000 (25.40)	.500 (12.70)	.750 (19.05)
-18	.125 (3.18)	1.438 (36.53)	1.200 (30.48)	.600 (15.24)	.900 (22.86)
-20	.125 (3.18)	1.625 (41.28)	1.200 (30.48)	.600 (15.24)	.900 (22.86)
-24	.125 (3.18)	1.812 (46.02)	1.200 (30.48)	.600 (15.24)	.900 (22.86)
-28	.188 (4.78)	2.188 (55.58)	1.320 (33.53)	.660 (16.76)	.990 (25.15)
-32	.250 (6.35)	2.438 (61.93)	1.500 (38.10)	.750 (19.05)	1.125 (28.58)

FIGURE 1. Tee, tube, boss - Continued.

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## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Unless otherwise specified tolerances for linear dimensions are  $\pm 0.015$  inch (0.38 mm) and angular dimensions are  $\pm 5^\circ$ , all diameters shall be concentric within .010 inch (0.25 mm) FIM.
4. Unless otherwise specified machined surfaces to be  $125\mu$  inches (3.18 $\mu$ m) in accordance with ASME B46.1.
5. Diameter F shall be free of thread marks.
6. Diameter F shall be concentric with PD of thread within .0025 inch (1.134 mm) FIM.
7. Lettering height:
  - For size -02 through -04 dimension: .020 - .040 inch (0.51 - 1.02 mm).
  - For size -05 through -16 dimension: .040 - .060 inch (1.02 - 1.52 mm).
  - For size -18 and larger dimension: .090 - .150 inch (2.29 - 3.81 mm).
8. Parting line mismatch .015 inch (0.38 mm) max.
9. Unless otherwise specified break sharp edges .003 - .015 inches (0.08 - 0.38 mm).
10. Dimensions are to sharp corners unless otherwise specified.
11. All threads shall be in accordance with FED-STD-H28/2.

FIGURE 1. Tee, tube, boss - Continued.

## REQUIREMENTS:

Dimensions and configurations: See figure 1.

Material: Steel, corrosion and heat-resistant in accordance with SAE-AMS5646.

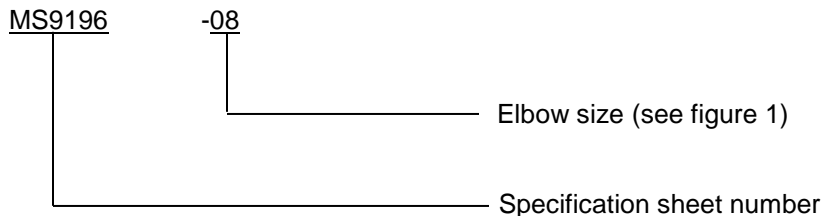
Max operating temperature: Oxidation resistance up to 1500°F (816°C).

Max operating pressure: 1500 psi (10 MPa).

Finish: Passivate in accordance with SAE-AMS2700, method 1.

All parts shall be fluorescent penetrant inspected in accordance with ASTM E1417.

## PIN:



## PIN Example:

MS9196-08 identifies a tee .500 inch (tube), CRES.

Do not use unassigned PINs.

The approximate weight for each fitting is shown in table I



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TABLE I. Approximate weight.

Dash number	Approx Weight lbs/ea (grams/ea)		Dash number	Approx Weight lbs/ea (grams/ea)
-02	.033 (15)		-11	.528 (239)
-03	.047 (21)		-12	.569 (258)
-04	.066 (30)		-14	.691 (313)
-05	.085 (39)		-16	.811 (368)
-06	.108 (49)		-18	1.207 (547)
-07	.124 (56)		-20	1.347 (611)
-08	.239 (108)		-24	1.780 (807)
-09	.272 (123)		-28	3.249 (1474)
-10	.361 (164)		-32	4.166 (1890)

Intended usage: Jet engine, miscellaneous parts, oil, fuel, and de-icing kits.

Not to be used on hydraulic, oxygen or applications requiring pressures of 3000 psi (21 MPa).

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Referenced documents. In addition to SAE-AS4841, this document references the following:

FED-STD-H28/2  
ASME B46.1  
ASTM E1417  
SAE-AS478  
SAE-AMS2700  
SAE-AMS5646

## CONCLUDING MATERIAL

Custodians:  
Navy - AS  
DLA - CC

Preparing activity:  
DLA - CC

(Project 4730-2015-002)

Review activity:  
Navy - SA

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.dla.mil>.