

INCH-POUND

MS20761C  
 20 April 2016  
 SUPERSEDING  
 MS20761B  
 W/AMENDMENT 1  
 9 June 2015

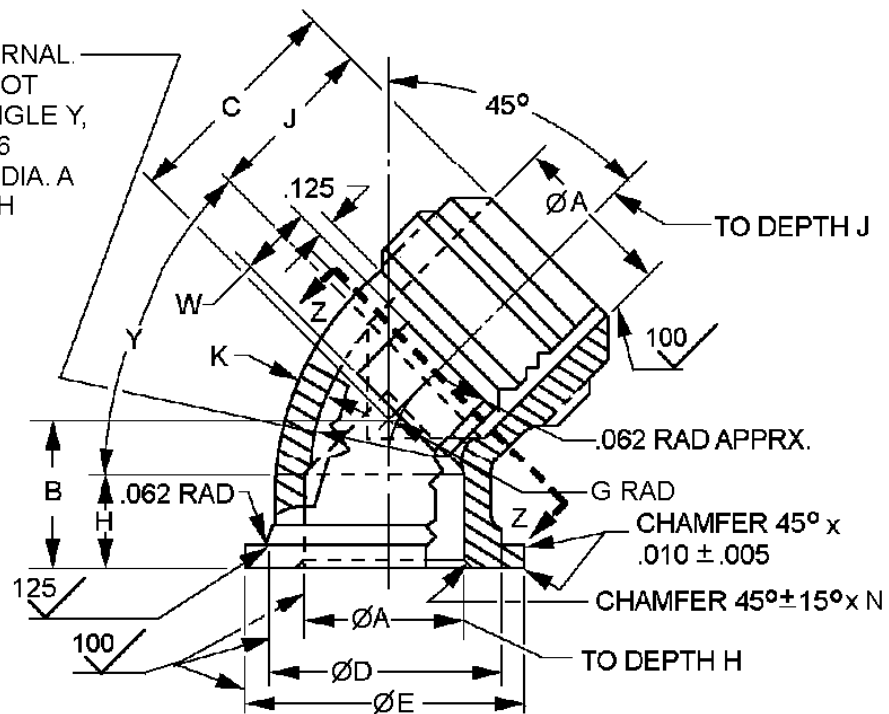
## DETAIL SPECIFICATION SHEET

## ELBOW, FLARED TUBE, FLANGED, SWIVEL, 45 DEGREE

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-AS4875.

TRUE CIRCULAR INTERNAL  
 CROSS SECTION IS NOT  
 REQUIRED WITHIN ANGLE Y,  
 HOWEVER A BALL .016  
 INCH SMALLER THAN DIA. A  
 MUST PASS THROUGH



Inches	mm
.005	0.13
.010	0.25
.016	0.41
.062	1.57
.125	3.18

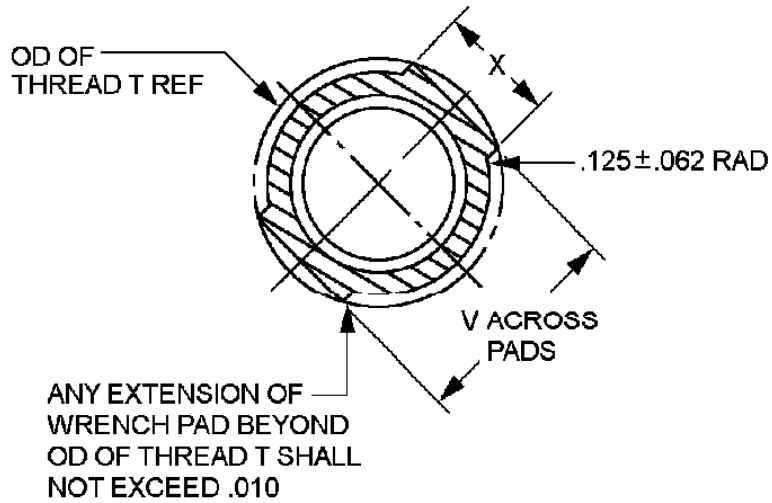
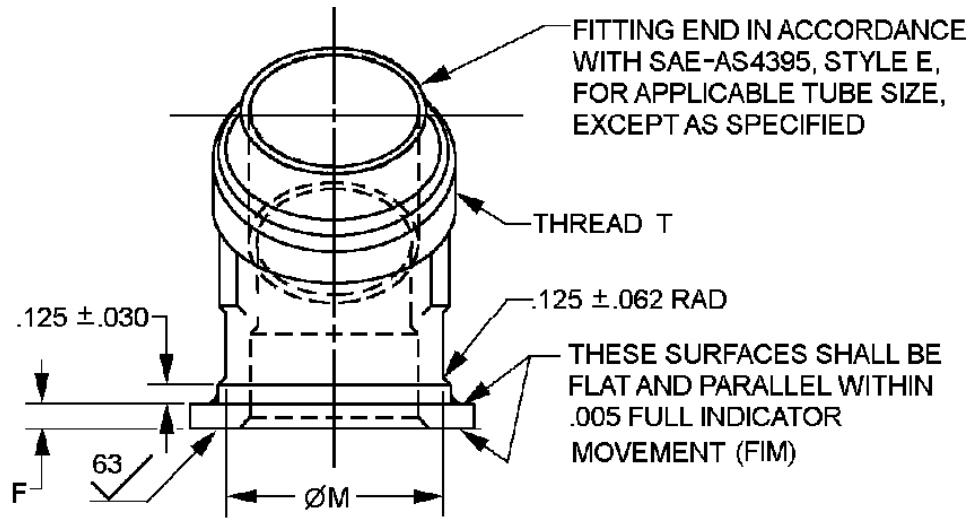
FIGURE 1. Elbow, flanged 45°.

AMSC/NA

FSC 4730



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SECTION Z-Z

Inches	mm
.005	0.13
.010	0.25
.030	0.76
.062	1.57
.125	3.18

FIGURE 1. Elbow, flanged 45° - Continued.

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Size	Tube OD	Thread T SAE-AS4395	A dia. ± .003 (see note 4)	B +.047 -.000	C +.047 -.000	D dia. +.000 -.005 (see note 4)	E dia. +.000 -.005 (see note 4)	F +.000 -.005	G Radius ref.
-12	.750	1.0625-12UN-3A	.609	.812	1.312	.938	1.250	.156	.594
-12-16							1.500		
-16	1.000	1.3125-12UN-3A	.844	.875	1.375	1.188	1.844		.719
-20	1.250	1.6250-12N-3A	1.078	1.000	1.500	1.500	2.125	.188	.875
-20-24				1.062					
-24	1.500	1.8750-12N-3A	1.312	1.094	1.750	1.750	2.750		1.000
-32	2.000	2.500-12UN-3A	1.781	1.281	2.125	2.375	3.281	1.312	
-40	2.500	3.000-12UN-3A	2.281	1.469	2.000	2.875	3.781	1.562	
-48	3.000	3.500-12UN-3A	2.781	1.562	2.250	3.375		1.812	

Size	H +.047 -.000	J	K		M ±.015	N dia.	V ±.015	W Approx	X Approx	Y ±.015
		+ .047 - .000	Min	Max						
-12	.562	1.062	.125	.164	.922	.669	.891	.438	.562	.724
-12-16			.141	.176	1.172	.904	1.156	.625	.771	
-16	.625	1.156	.156	.221	1.484	1.138	1.438	.500	.750	.818
-20			.172	.234	1.734	1.372	1.718			
-20-24	.688	1.344	.172	.234	1.734	1.372	1.718	.750	.938	1.193
-24			.203	.322	2.359	1.841	2.250			
-32	.750	1.562	.203	.322	2.359	1.841	2.250	.750	.938	1.193
-40	.812	1.344	.234	.333	2.859	2.341	2.812	.875	1.000	.969
-48			1.500	.250	.344	3.359	2.841			

Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
.003	0.08	.250	6.35	.844	21.44	1.344	34.14	2.281	57.94
.005	0.13	.322	8.18	.875	22.23	1.372	34.84	2.341	59.46
.010	0.25	.333	8.46	.891	22.63	1.375	34.93	2.359	59.92
.015	0.38	.344	8.74	.904	22.96	1.047	26.59	2.375	60.33
.016	0.41	.438	11.13	.922	23.42	1.062	26.97	2.500	63.50
.030	0.76	.500	12.70	.938	23.83	1.078	27.38	2.750	69.85
.047	1.19	.562	14.27	.943	23.95	1.500	38.10	2.781	70.64
.062	1.57	.594	15.09	.969	24.61	1.562	39.67	2.812	71.42
.125	3.18	.609	15.47	1.000	25.40	1.718	43.64	2.841	72.16
.141	3.58	.625	15.88	1.094	27.79	1.734	44.04	2.859	72.62
.156	3.96	.669	16.99	1.138	28.91	1.750	44.45	2.875	73.03
.164	4.17	.688	17.48	1.156	29.36	1.781	45.24	3.000	76.20
.172	4.37	.719	18.26	1.172	29.77	1.812	46.02	3.281	83.34
.176	4.47	.724	18.39	1.188	30.18	1.841	46.76	3.344	84.94
.188	4.78	.750	19.05	1.193	30.30	1.844	46.84	3.359	85.32
.203	5.16	.771	19.58	1.250	31.75	2.000	50.80	3.375	85.73
.221	5.61	.812	20.62	1.281	32.54	2.125	53.98	3.781	96.04
.234	5.94	.818	20.78	1.312	33.32	2.250	57.15		

FIGURE 1. Elbow, flanged 45° - Continued.

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## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Dimensioning and tolerancing are in accordance with ASME Y14.5. Unless otherwise specified, tolerance decimals  $\pm .005$  inch (0.13 mm) and angles  $\pm 0.5^\circ$ .
4. Diameters A, D, and E shall be concentric with each other within  $\pm .010$  inch (0.25 mm) FIM.
5. Unless otherwise specified surface roughness shall not exceed 100  $\mu$ -inches (2.54  $\mu$ m) Ra in accordance with ASME B46.1. Angular tool marks up to 63  $\mu$ -inches (1.6  $\mu$ m) Ra will be allowed.
6. Reduction by forging draft angle of  $7^\circ$  is permissible.
7. Internal flow passage around bend shall be smooth and free from projections. Break all sharp edges and remove all hanging burrs and slivers which might become dislodged during use.

FIGURE 1. Elbow, flanged 45° - Continued.

## REQUIREMENTS:

Dimensions and configuration: See figure 1.

For nominal use on fuel and oil systems.

Sizes -40 and -48 are not to be used unless approved by the program office.

For tube sizes through 1 inch (25.4 mm): Maximum operating temperature 275°F (135°C), maximum pressure 1500 psi (10.3 MPa).

For tube sizes exceeding 1 inch (25.4 mm): Maximum operating temperature 275°F (135°C), maximum pressure 500 psi (3.4 MPa).

Materials shall be in accordance with SAE-AS4875 or optional material: aluminum alloy casting in accordance with SAE-AS4875.

Porosity test. Finished castings shall not leak when subjected to 100 psi (0.7 MPa) air pressure and submerged in water for 3 minutes minimum.

The connector flange to hose shall not exceed the weight limits specified in table I.

TABLE I. Weight limits. 1/

Size	Weight Max lbs (gram)		
	Al Alloy	Steel	Ti
-12	.09 (41)	.25 (113)	.15 (68)
-12-16	.11 (50)	.31 (141)	.18 (82)
-16	.13 (59)	.36 (163)	.21 (95)
-20	.23 (104)	.64 (290)	.38 (172)
-20-24	.26 (118)	.73 (331)	.43 (195)
-24	.33 (150)	.92 (417)	.55 (249)
-32	.70 (318)	1.96 (889)	1.16 (526)
-40	.90 (408)	2.52 (1143)	1.49 (676)
-48	1.20 (544)	3.36 (1524)	1.98 (898)

1/ Metric equivalents given for information only.

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Material and size designators shall be in accordance with table II.

TABLE II. Material and size designators. 1/

Size number	Size number with letter material designator						
	Steel (Blank)	Aluminum Alloy <u>2/</u> <u>3/</u>	Aluminum alloy <u>4/</u>	CRES 304 <u>5/</u>	CRES 316 <u>5/</u>	CRES 321 <u>5/</u>	Titanium
12	-12	-D12	-W12	-J12	-K12	-R12	-T12
12-16	-12-16	-D12-16	-W12-16	-J12-16	-K2-16	-R12-16	-T12-16
16	-16	-D16	-W16	-J16	-K16	-R16	-T16
20	-20	-D20	-W20	-J20	-K20	-R20	-T20
20-24	-20-24	-D20-24	-W20-24	-J20-24	-K20-24	-R20-24	-T20-24
24	-24	-D24	-W24	-J24	-K24	-R24	-T24
32	-32	-D32	-W32	-J32	-K32	-R32	-T32
40	-40	-D40	-W40	-J40	-K40	-R40	-T40
48	-48	-D48	-W48	-J48	-K48	-R48	-T48

1/ Material designators are in accordance with SAE-AS4875 the procurement specification.

2/ Aluminum alloys 2014/2024 code D are inactive for new design, use aluminum alloy 7075 code W aluminum for new design.

3/ Optional material: aluminum alloy casting 2014-T6 in accordance with (SAE-AMS-QQ-A-367 or SAE-AMS4134).

4/ Optional material: aluminum alloy casting 7075-T73 in accordance with (SAE-AMS-QQ-A-367 or SAE-AMS4124).

5/ Corrosion resistant steel (CRES) for 304, 316 and 321.

Finish. Finishes shall be as specified in table III. All platings shall be capable of meeting a minimum of 96 hours salt spray test in accordance with ASTM B117. The fittings shall show no evidence of corrosion after 96 hours of salt spray. Fluid passages, other openings and internal threads shall not be subject to the plating thickness requirement and may have bare areas provided they are protected with a light film of oil.

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TABLE III. Elbow finish code. 1/

Finish code	Material	Plating finish
Blank	Steel	Cadmium plating in accordance with SAE-AMS-C-81562, type II, class 2 or SAE-AMS-QQ-P-416, type II, class 2. dye black <u>1/</u>
	Aluminum <u>2/</u>	Anodize in accordance with MIL-A-8625, type II.
	CRES	No additional finish. Passivation in accordance with SAE-AMS2700, method 1, type 6 or 7.
	Titanium <u>3/</u>	Fluoride phosphate in accordance with SAE-AMS2486.
A	Steel	Zinc-Aluminum in accordance with ASTM F1136/F1136M, grade 3, NC.
D	Aluminum <u>2/</u>	Chemical conversion coating in accordance with NAVAIR trivalent chromium pretreatment (TCP) in accordance with MIL-DTL-5541 type II, Class 1A.
DA	Aluminum <u>2/</u>	Chemical conversion coating in accordance with, MIL-DTL-5541, type II, class 3.
G	Steel	Zinc plating with colorless passivate in accordance with ASTM B633, type V, Fe/Zn 25.
H	Steel	Zinc phosphate finish in accordance MIL-DTL-16232 type Z, class 4. <u>4/</u>
J	Steel	Zinc plating in accordance with ASTM B633; type II or III, Fe/Zn 12, or ASTM B695, type II, class 12.
R	Steel	Zinc plating in accordance with ASTM B633; type VI, Fe/Zn 12.
T	Titanium <u>3/</u>	Anodized in accordance with SAE-AMS2488, type 2.
V	Steel	Zinc-nickel in accordance with SAE-AMS2417, type 2, grade B. <u>5/</u>
W	Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875	Anodize in accordance with MIL-A-8625, type II, class 2
WC	Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875	Chemical conversion coating in accordance with, MIL-DTL-5541, type II, class 3.
WD	Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875	Anodize in accordance with MIL-A-8625, type 2.
Z	Steel	Zinc may be any zinc plating's from PIN codes H, J, R, V. <u>7/</u>
ZN	Steel	Zinc may be any zinc plating from PIN codes H, J, R, V with a colored chromate coating <u>7/</u>

1/ Cadmium shall not be used in oxygen or potable water systems.

2/ Aluminum alloys 2014 and 2024 shall be dyed light blue.

3/ Titanium shall not be used in oxygen systems. A pretreatment, a modification of the fluoride treatment, or a post treatment shall be applied so the final color of the fittings shall be similar to FED-STD-595 colors 36076 through 36293.

4/ Hexavalent chromium free. Finish shall be ROHS compliant.

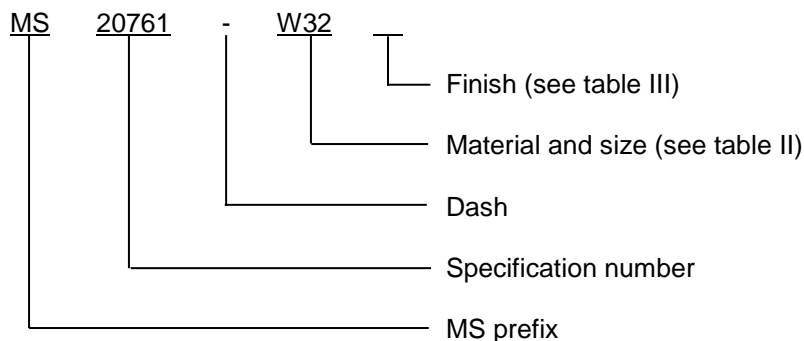
5/ The zinc-nickel alloy plate shall contain 12% to 16% nickel. The coating thickness shall be 315μ inches (8μm) minimum coating thickness.

6/ Unless otherwise specified aluminum alloy 7075 shall be dyed brown.

7/ Not for use in Aircraft.

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Part or Identifying Number (PIN): The PIN consists of prefix "MS" the specification sheet number, a letter for material and size code and a blank or letter for finish. Unassigned PIN's shall not be used.



Example of PIN: MS20761-W32 is a 45° elbow, 7075 aluminum alloy, 2.000 inch (50.80 mm) tube diameter, and 2.750 (69.85 mm) flange, "blank" code for Al is "anodize in accordance with MIL-A-8625, type II dyed brown.

Marking. The complete PIN shall be permanently marked on an unfinished surface.

Guidance on use of alternative parts with less hazardous or nonhazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit and function requirements of their application.

Supersession data: Aluminum alloys 2014 and 2024 "D" designator is inactive for new design. For new design use aluminum alloy 7075 "W" designator.

Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue, due to the extent of the changes.

Referenced documents. In addition to SAE-AS4875, this document references the following:

FED-STD-595/36076	FED-STD-595/36280	SAE-AMS-QQ-A-367
FED-STD-595/36081	FED-STD-595/36293	SAE-AMS-QQ-P-416
FED-STD-595/36099	MIL-A-8625	SAE-AMS2417
FED-STD-595/36118	MIL-DTL-5541	SAE-AMS2486
FED-STD-595/36134	MIL-DTL-16232	SAE-AMS2488
FED-STD-595/36152	ASME B46.1	SAE-AMS2700
FED-STD-595/36170	ASME Y14.5	SAE-AMS4124
FED-STD-595/36173	ASTM B117	SAE-AMS4134
FED-STD-595/36176	ASTM B633	SAE-AS4395
FED-STD-595/36231	ASTM B695	SAE-AS4875
FED-STD-595/36251	ASTM F1136/F1136M	
FED-STD-595/36270	SAE-AMS-C-81562	

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CONCLUDING MATERIAL

Custodians:

Army - AV  
Navy - AS  
Air Force - 99  
DLA - CC

Preparing activity:

DLA - CC

(Project 4730-2016-031)

Review activities:

Army - AR, MI  
Navy - MC, SA  
Air Force - 71

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