

INCH-POUND

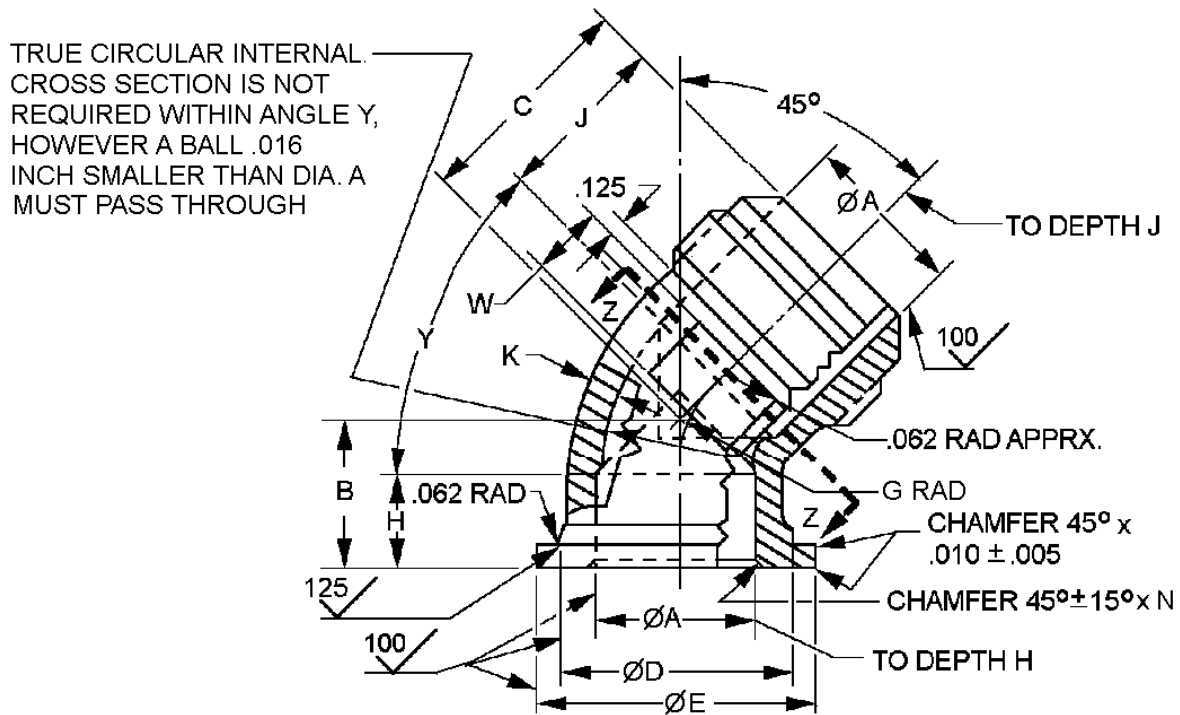
MS20761C  
w/AMENDMENT 3  
24 September 2018  
SUPERSEDING  
MS20761C  
w/AMENDMENT 2  
9 May 2018

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.



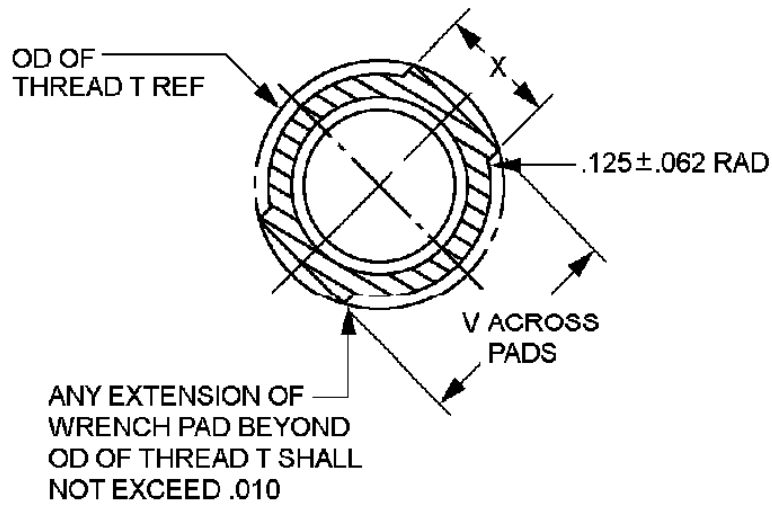
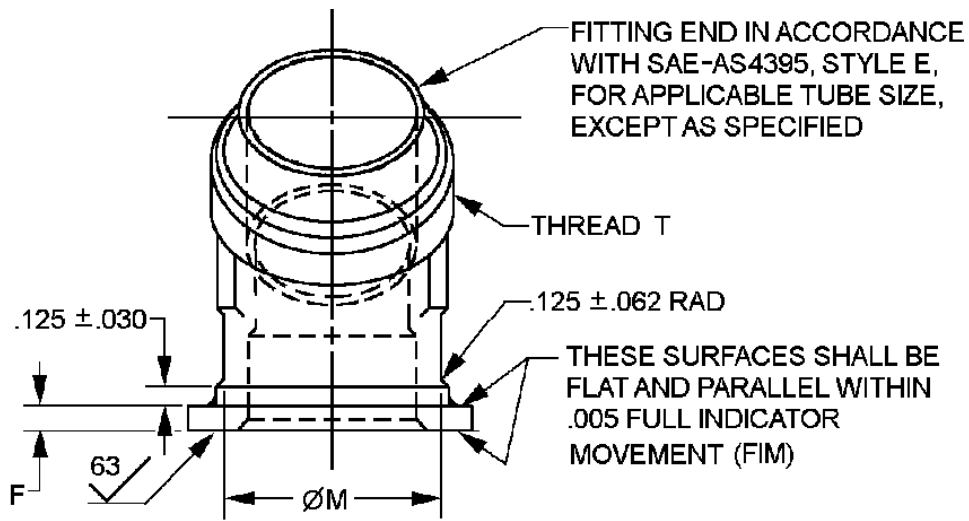
See notes at end of figure

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

FIGURE 1. Elbow, flanged 45°.



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SECTION Z-Z

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

See notes at end of figure.

FIGURE 1. Elbow, flanged 45° - Continued.

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Size	Tube OD	Thread T SAE-AS8879	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	1.0625-12UNJ-3A	.609	.812	1.312	.938	1.250	.156	.594
-12-16							1.500		
-16	1.000	1.3125-12UNJ-3A	.844	.875	1.375	1.188			
-20	1.250	1.6250-12UNJ-3A	1.078	1.000	1.500	1.500	1.844	.188	.875
-20-24				1.062			2.125		
-24	1.500	1.8750-12UNJ-3A	1.312	1.094	1.750	1.750			
-32	2.000	2.500-12UNJ-3A	1.781	1.281	2.125	2.375	2.750	.188	1.312
-40	2.500	3.000-12UNJ-3A	2.281	1.469	2.000	2.875	3.281		1.562
-48	3.000	3.500-12UNJ-3A	2.781	1.562	2.250	3.375	3.781		1.812

Size	H +.047 -.000	J +.047 -.000	K		M ±.015	N dia.	V ±.015	W Approx.	X Approx.	Y ±.015
			Min	Max						
-12	.562	1.062	.125	.164	.922	.669	.891	.438	.562	.724
-12-16			.141	.176	1.172	.904	1.156			
-16	.625	1.156						.156	.221	1.484
-20			.688	1.344	.172	.234	1.734			
-20-24	.750	1.562						.203	.322	2.359
-24			.812	1.344	.234	.333	2.859			
-32	.812	1.500						.250	.344	3.359
-40			.812	1.500	.250	.344	3.359			
-48	.812	1.500						.250	.344	3.359

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	34.85	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		

See notes at end of figure.

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).

Unless otherwise specified, materials shall be 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 are 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 for new design.

3/ Optional material: Aluminum alloy casting 2014-T6 in accordance with SAE-AMS-QQ-A-367 or SAE-AMS4134 or aluminum casting alloy 356 or A356 in accordance with ASTM B108/B108M.

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

5/ Corrosion resistant steel (CRES).

Finish. Finishes shall be as specified in table III. All plating's 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 red 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 V, Fe/Zn 12, or ASTM B695, type II, class 12. <u>7/</u>
R	Steel	Zinc plating in accordance with ASTM B633; type V, Fe/Zn 12. <u>7/</u>
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 G, H, J, R, V. <u>7/</u>
ZN	Steel	Zinc may be any zinc plating from PIN codes G, H, J, R, V with a colored chromate coating <u>7/</u>

1/ Cadmium shall not be used in oxygen or potable water systems. Cadmium is prohibited from use in NAVSEA owned shipboard 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 SAE-AMS-STD-595 colors 36076 through 36293.

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

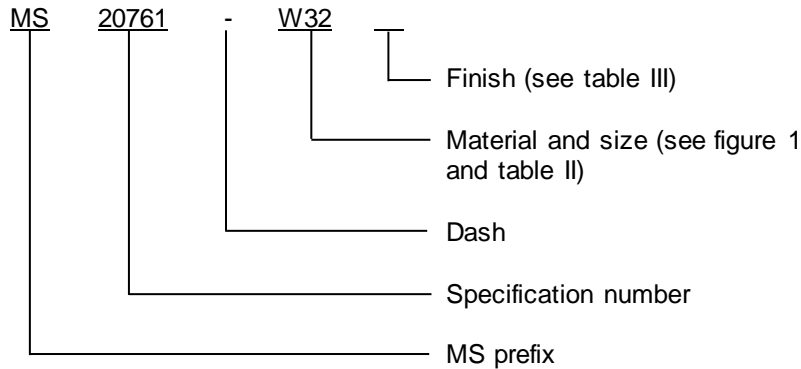
5/ The zinc-nickel alloy plate shall contain 12% to 16% nickel. The coating thickness shall be 315µ inches (8µm) minimum coating thickness.

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

7/ Not for use in aircraft. Requires approval from the Program Office for all applications. Zinc-plated materials should be avoided in hydraulic systems with water-glycol fluids. Reference ASTM MNL37 - Fuels and Lubricants Handbook, "water glycol fluids are highly alkaline due to the presence of amine based corrosion inhibitors. As a result, these fluids can attack zinc, cadmium, magnesium, and non-anodized aluminum, forming sticky or gummy residues. Consequently, these metals should be avoided when selecting system components.

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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, 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.

Cadmium is prohibited from use in NAVSEA owned shipboard systems in accordance with the requirements of T9070-AL-DPC-020/077-2.

Class I and II ozone depleting substances (ODS) shall not be used in MS20761 or any referenced procedures.

Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

Referenced documents shall be of the issue in effect on date of invitations for bid.

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

Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. 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.

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

MIL-A-8625	SAE-AMS-STD-595/36099	SAE-AMS-QQ-A-367
MIL-DTL-5541	SAE-AMS-STD-595/36118	SAE-AMS-QQ-P-416
MIL-DTL-16232	SAE-AMS-STD-595/36134	SAE-AMS2417
ASME B46.1	SAE-AMS-STD-595/36152	SAE-AMS2486
ASME Y14.5	SAE-AMS-STD-595/36170	SAE-AMS2488
ASTM B108/B108M	SAE-AMS-STD-595/36173	SAE-AMS2700
ASTM B117	SAE-AMS-STD-595/36176	SAE-AMS4124
ASTM B633	SAE-AMS-STD-595/36231	SAE-AMS4134
ASTM B695	SAE-AMS-STD-595/36251	SAE-AS4395
ASTM F1136/F1136M	SAE-AMS-STD-595/36270	SAE-AS8879
ASTM MNL37	SAE-AMS-STD-595/36280	T9070-AL-DPC-020/077-2
SAE-AMS-STD-595/36076	SAE-AMS-STD-595/36293	
SAE-AMS-STD-595/36081	SAE-AMS-C-81562	

CONCLUDING MATERIAL

Custodians:

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

Preparing activity:

DLA - CC

(Project 4730-2018-086)

Review activities:

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

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 <https://assist.dla.mil>.