INCH-POUND
MS20762D
1 March 2016
SUPERSEDING
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10 October 2014

DETAIL SPECIFICATION SHEET

ELBOW, FLARED TUBE, FLANGED, SWIVEL, 90 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.

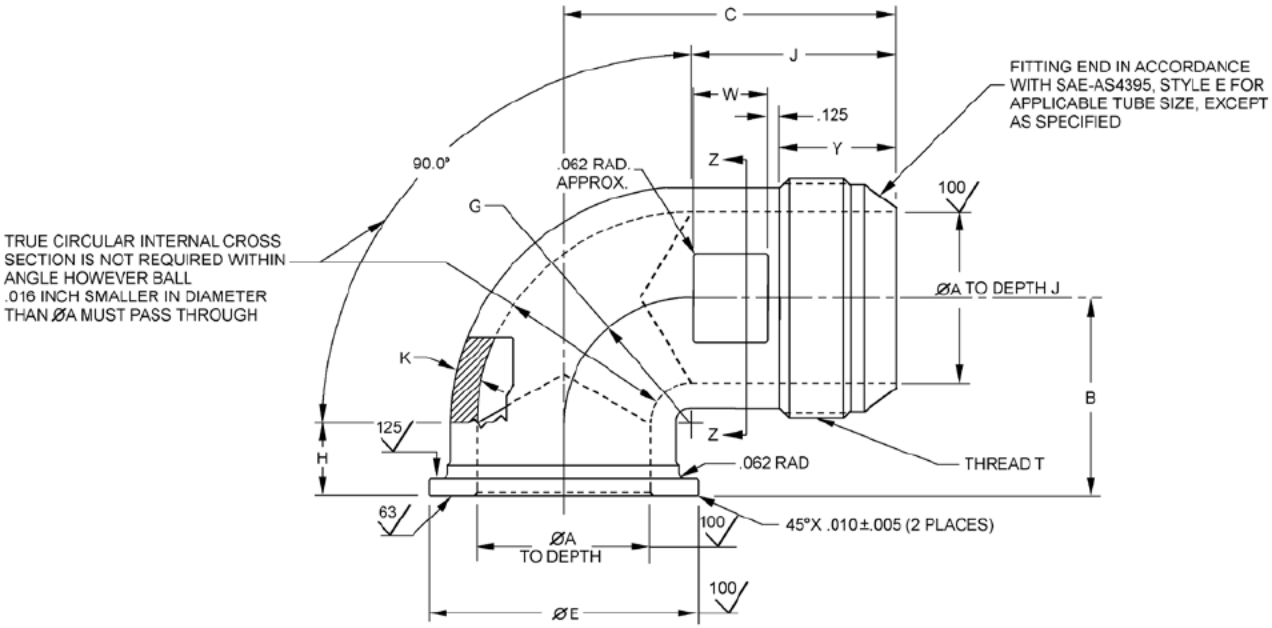
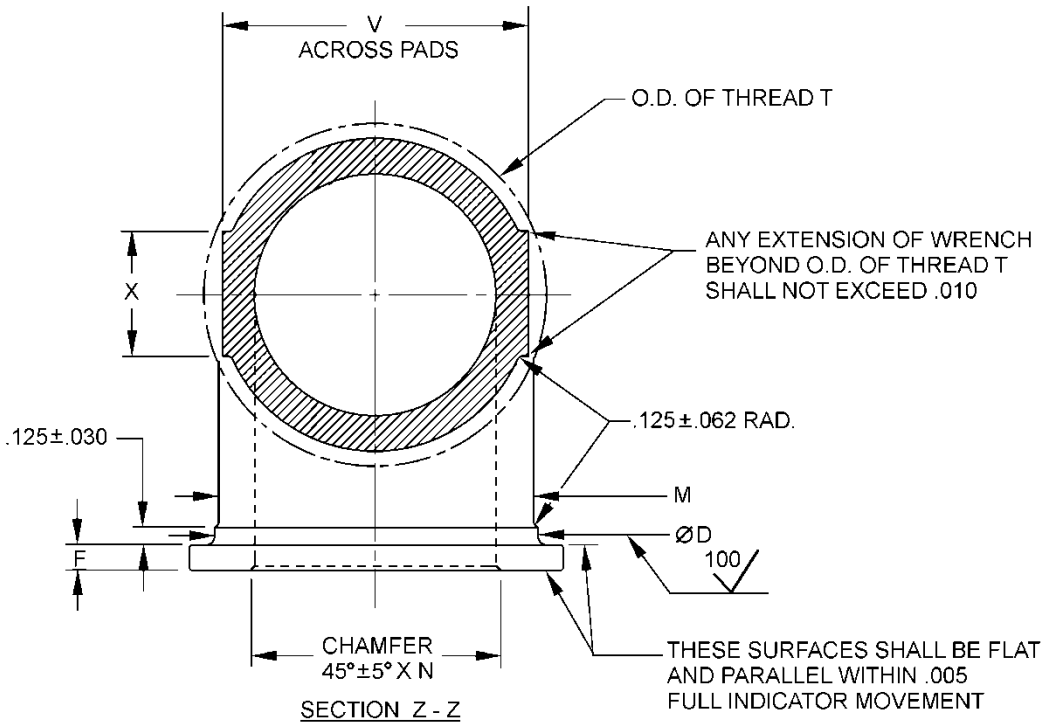


FIGURE 1. Elbow, flanged 90°.



Size	Tube OD	Thread T SAE-AS8879	A Dia. ± .003	B +.047 -.000	C +.047 -.000	D Dia. +.000 -.005	E Dia. +.000 -.005	F +.000 -.005	G Rad. Ref.	H +.047 -.000
-12	.750	1.0625-12UNJF-3A	.609	1.156	1.938	.938	1.250	.156	.594	.562
-12-16					2.000		1.500			
-16	1.000	1.3125-12UNJF -3A	.844	1.281	2.125	1.188			.719	
-20	1.250	1.625-12UNJF -3A	1.078	1.500	2.375	1.500	1.844		.875	.625
-20-24				1.562	2.562		2.125	.188		.650
-24	1.500	1.875-12UNJF -3A	1.312	1.688	2.688	1.750			1.000	
-32	2.000	2.500-12UNJF -3A	1.781	2.042	3.375	2.375	2.750		1.312	.750
-40	2.500	3.000-12UNJF -3A	2.281	2.375	3.500	2.875	3.201		1.582	.812
-48	3.000	3.500-12UNJF -3A	2.781	2.625	3.675	3.375	3.701		1.812	

Size	J +.047 -.000	K		M Dia. ± .015	N Dia.	V ± .015	W Approx.	X Approx.	Y ± .015	Weight max		
		Min	Max							Al Alloy	Steel	Ti
-12	1.344	.125	.144	.922	.669	.891	.500	.562	.724	.12	.34	.20
-12-16	1.406									.15	.42	.25
-16		.141	.176	1.172	.904	1.156	.562	.625	.771	.18	.50	.30
-20	1.500	.156	.221	1.484	1.138	1.438	.625	.750	.818	.32	.90	.53
-20-24	1.650									.36	1.00	.60
-24		.172	.234	1.734	1.372	1.710	.688		.943	.45	1.26	.74
-32	2.062	.203	.322	2.309	1.841	2.250	.750	.938	1.193	1.02	2.88	1.69
-40	1.938	.234	.333	2.659	2.341	2.812	.875	1.000	.969	1.37	3.84	2.26
-48	2.042	.250	.344	3.389	2.841	3.344	1.000		1.047	1.62	5.10	2.68

FIGURE 1. Elbow, flanged 90° - Continued.

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Internal flow passage around bend shall be smooth and free from projections.
4. Unless otherwise specified tolerances shall be ±.005 inches (0.13 mm) and angles ±.5°.
5. Unless otherwise specified surface roughness shall not exceed 100µ-inches (2.54µm) Ra in accordance with ASME B46.1. Angular tool marks up to 63 µ-inches (1.6µm) Ra will be allowed.
6. Diameters A, D, and E shall be concentric with each other within .010 inch (0.25mm) full indicator movement.
7. Reduction by forging draft angle of 7° is permissible.
8. Dimensioning and tolerancing are in accordance with ASME Y14.5.

Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
0.003	0.08	0.180	4.57	0.450	11.43	0.812	20.62	1.156	29.36	1.582	40.18	2.125	53.98	2.841	72.16
0.005	0.13	0.188	4.78	0.500	12.70	0.818	20.78	1.172	29.77	1.620	41.15	2.250	57.15	2.875	73.03
0.010	0.25	0.200	5.08	0.530	13.46	0.844	21.44	1.188	30.18	1.644	41.76	2.260	57.40	2.880	73.15
0.015	0.38	0.203	5.16	0.562	14.27	0.875	22.23	1.193	30.30	1.650	41.91	2.281	57.94	3.000	76.20
0.016	0.41	0.221	5.61	0.594	15.09	0.891	22.63	1.250	31.75	1.688	42.88	2.309	58.65	3.201	81.31
0.030	0.76	0.234	5.94	0.600	15.24	0.900	22.86	1.260	32.00	1.690	42.93	2.341	59.46	3.344	84.94
0.047	1.19	0.250	6.35	0.609	15.47	0.904	22.96	1.281	32.54	1.710	43.43	2.375	60.33	3.375	85.73
0.062	1.57	0.300	7.76	0.625	15.88	0.922	23.42	1.312	33.32	1.734	44.04	2.500	63.50	3.389	86.08
0.120	3.05	0.320	8.13	0.650	16.51	0.938	23.83	1.344	34.14	1.750	44.45	2.562	65.07	3.500	89.90
0.125	3.18	0.322	8.18	0.669	16.99	0.943	23.95	1.370	34.80	1.781	45.24	2.625	66.68	3.675	93.35
0.141	3.58	0.333	8.46	0.688	17.48	0.969	24.61	1.372	34.85	1.812	46.02	2.659	67.54	3.701	94.01
0.144	3.66	0.340	8.64	0.719	18.26	1.000	25.40	1.406	35.71	1.841	46.76	2.680	68.07	3.840	97.54
0.150	3.81	0.344	8.74	0.724	18.39	1.020	25.91	1.438	36.53	1.938	49.23	2.688	68.28		
0.156	3.96	0.360	9.14	0.740	18.80	1.047	26.59	1.484	37.69	2.000	50.80	2.750	69.85		
0.172	4.37	0.362	9.19	0.750	19.05	1.078	27.38	1.500	38.10	2.042	51.87	2.781	70.64		
0.176	4.47	0.420	10.67	0.771	19.58	1.130	28.70	1.562	39.67	2.062	52.37	2.812	71.42		

FIGURE 1. Elbow, flanged 90° - Continued.

REQUIREMENTS:

Design and construction: 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.

Materials shall be in accordance with SAE-AS4875 or optional material: aluminum alloy casting in accordance with ASTM B108/B108M.

Surfaces. All machined surfaces shall be finished to 250 µin Ra (.00635mm), unless otherwise specified.

Fitting surface shall be free of all burrs and slivers.

Material designators and dash numbers for tube sizes see table I.

Porosity test. Finished castings shall not leak when subjected to 100 psi (700 kPa) air pressure and submerged in water for 3 minutes.

TABLE I. Material designators and dash numbers for tube sizes. 1/

Steel (Blank)	Aluminum "D" Alloy 2014/2024 2/ 3/	Aluminum "W" Alloy 7075 4/	CRES 304 5/	CRES 316 5/	CRES 321 5/	Titanium 6/
-12	-D12	-W12	-J12	-K12	-R12	-T12
-12-16	-D12-16	-W12-16	-J12-16	-K2-16	-R12-16	-T12-16
-16	-D16	-W16	-J16	-K16	-R16	-T16
-20	-D20	-W20	-J20	-K20	-R20	-T20
-20-24	-D20-24	-W20-24	-J20-24	-K20-24	-R20-24	-T20-24
-24	-D24	-W24	-J24	-K24	-R24	-T24
-32	-D32	-W32	-J32	-K32	-R32	-T32
-40	-D40	-W40	-J40	-K40	-R40	-T40
-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.
6/ Titanium shall not be used in oxygen systems.

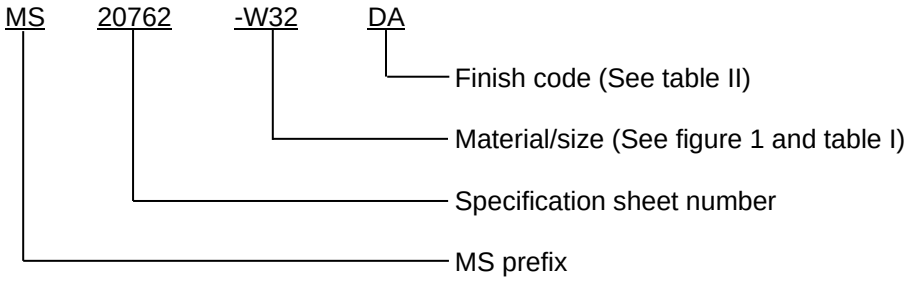
Finish. Finishes shall be as specified in table II. All platings shall be capable of meeting a minimum of 96 hours salt spray test in accordance with ASTM B117. The fittings shall show no evidence of corrosion after 96 hours of salt spray. Fluid passages, other openings and internal threads shall not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

TABLE II. 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. 1/
	Aluminum 2/	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 3/	Fluoride phosphate in accordance with SAE-AMS2486.
A	Steel	Zinc-Aluminum in accordance with ASTM F1136/F1136M, grade 3, NC.
D	Aluminum 2/	Chemical conversion coating in accordance with NAVAIR trivalent chromium pretreatment (TCP) in accordance with MIL-DTL-5541 type II, Class 1A.
DA	Aluminum 2/	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. 4/
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 3/	Anodized in accordance with SAE-AMS2488, type 2.
V	Steel	Zinc-nickel in accordance with SAE-AMS2417, type 2, grade B. 5/
W	Aluminum alloy 7075-T73 or T7352 6/ in accordance with SAE-AS4875	Anodize in accordance with MIL-A-8625, type II, class 2, dye brown.
WC	Aluminum alloy 7075-T73 or T7352 6/ 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 6/ 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. 7/
ZN	Steel	Zinc may be any zinc plating from PIN codes H, J, R , V with a colored chromate coating 7/

1/ Cadmium shall not be used in oxygen or potable water systems.
2/ Aluminum alloys 2014 and 2024 shall be dyed light blue.
3/ 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.

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



PIN example: MS20762-D32DA indicates a 2 inch 7075 aluminum elbow with chemical conversion coating in accordance with MIL-DTL-5541 type II, class 3.

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

CONCLUDING MATERIAL

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

Preparing activity:
DLA - CC

(Project 4730-2016-025)

Review activities:
Army - AR, MI
Navy - MC, SA
Air Force - 71

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