

INCH-POUND
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MS20762C  
 10 October 2014  
 SUPERSEDING  
 MS20762B  
 8 March 2013

# DETAIL SPECIFICATION SHEET

## ELBOW, FLARED TUBE, FLANGED, SWIVEL, 90°

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.

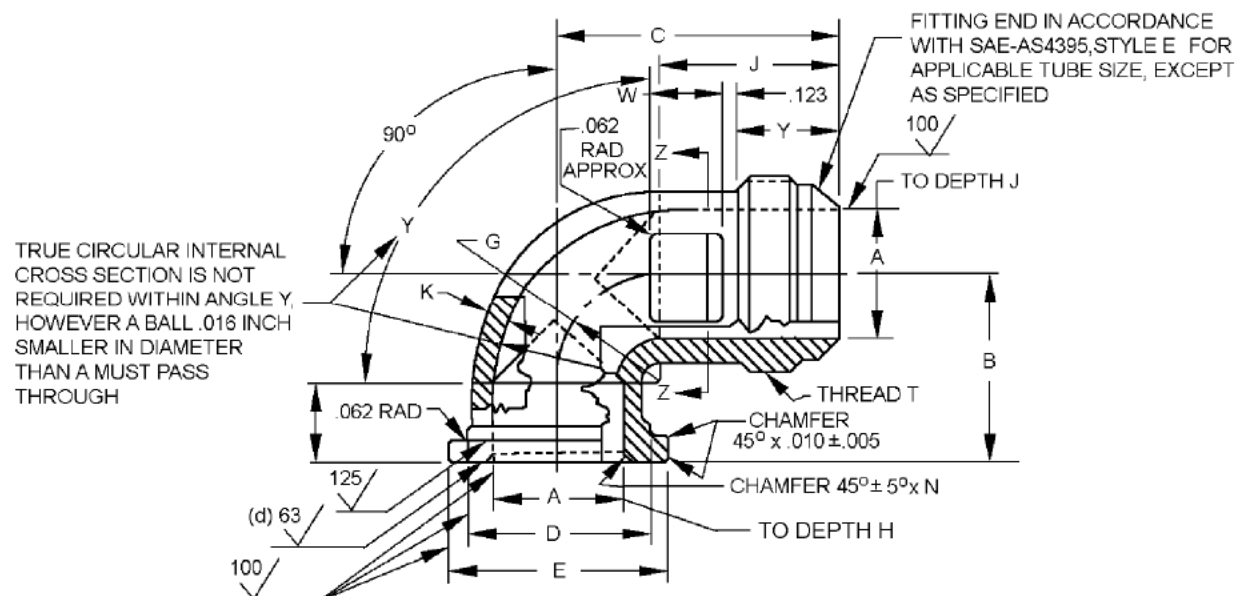
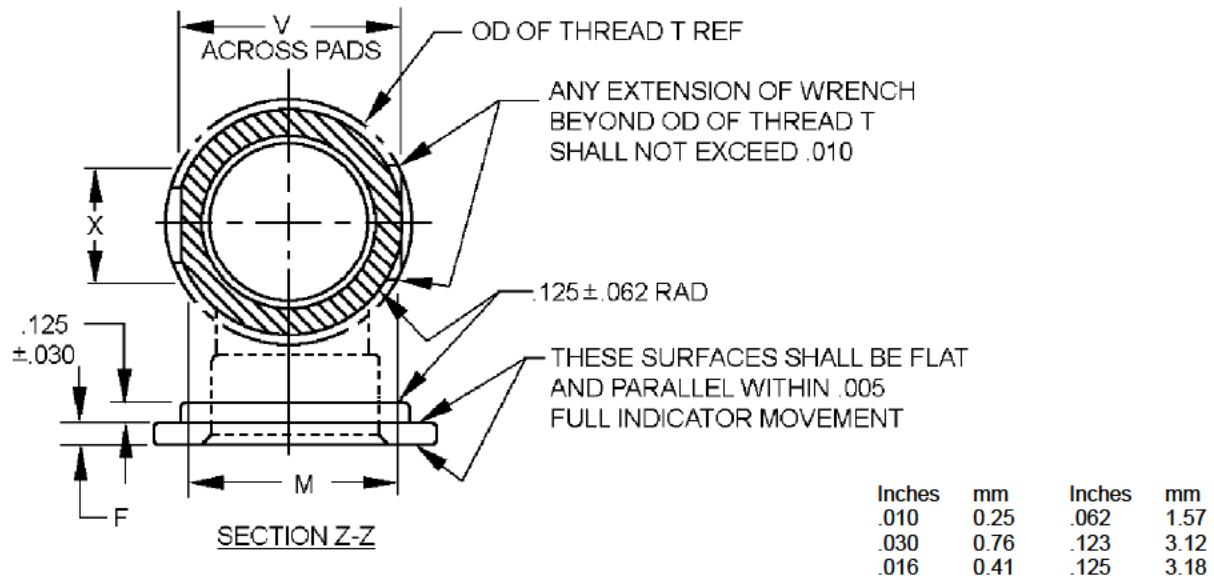


FIGURE 1. Elbow, flanged 90°.

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## 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.

FIGURE 1. Elbow, flanged 90° - Continued.TABLE I. Dimensions. 1/ 2/ 3/ 4/

Dash number	Tube	Thread T	A	B	C	D	E	F	G	H
Steel	OD	SAE-AS8879	± .003	+ .047 - .000	+ .047 - .000	+ .000 - .005	+ .000 - .005	+ .000 - .005	Radius reference	+ .047 - .000
			DIA.			DIA.	DIA.			
-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	1.500		.719	
-20	1.250	1.625-12UNJF -3A	1.078	1.500	2.375	1.500	1.844	.188	.875	.625
-20-24				1.562	2.562		2.125		1.000	.650
-24	1.500	1.875-12UNJF -3A	1.312	1.688	2.688	1.750	2.125		1.312	.750
-32	2.000	2.500-12UNJF -3A	1.781	2.042	3.375	2.375	2.750		1.582	.812
-40	2.500	3.000-12UNJF -3A	2.281	2.375	3.500	2.875	3.201			
-48	3.000	3.500-12UNJF -3A	2.781	2.625	3.675	3.375	3.701		1.812	

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TABLE I. Dimensions - Continued. 1/ 2/ 3/ 4/

Dash number	J	K		M	N	V	W	X	Y	Weight max		
Steel	+ .047 - .000	Min	Max	± .015		± .015	Approx	Approx	± .015	Al Alloy	Steel	Ti
				DIA.	DIA.							
-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	1.130	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

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3/ Aluminum alloy 2014 and 2024 parts are cancelled. Use Aluminum alloy 7075 parts for new design.  
Cancelled parts may be used till stock is exhausted.

4/ Diameters A, D and E shall be concentric with each other within .010 inch (0.25mm) full indicator movement.

Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
0.003	0.08	0.203	5.16	0.530	13.46	0.818	20.78	1.156	29.36	1.562	39.67	2.042	51.87	2.750	69.85
0.005	0.14	0.221	5.61	0.562	14.27	0.844	21.44	1.172	29.77	1.582	40.18	2.062	52.37	2.781	70.64
0.015	0.38	0.234	5.94	0.594	15.09	0.875	22.23	1.188	30.18	1.620	41.15	2.125	53.98	2.812	71.42
0.047	1.19	0.250	6.35	0.600	15.24	0.891	22.63	1.193	30.30	1.644	41.76	2.250	57.15	2.841	72.16
0.120	3.05	0.300	7.76	0.609	15.47	0.900	22.86	1.250	31.75	1.650	41.91	2.260	57.40	2.875	73.03
0.125	3.18	0.320	8.13	0.625	15.88	0.904	22.96	1.260	32.00	1.688	42.88	2.281	57.94	2.880	73.15
0.141	3.58	0.322	8.18	0.650	16.51	0.922	23.42	1.281	32.54	1.690	42.93	2.309	58.65	3.000	76.20
0.144	3.66	0.333	8.46	0.669	16.99	0.938	23.83	1.312	33.32	1.710	43.43	2.341	59.46	3.201	81.31
0.150	3.81	0.340	8.64	0.688	17.48	0.943	23.95	1.344	34.14	1.734	44.04	2.375	60.33	3.344	84.94
0.156	3.96	0.344	8.74	0.719	18.26	0.969	24.61	1.370	34.80	1.750	44.45	2.500	63.50	3.375	85.73
0.172	4.37	0.360	9.14	0.724	18.39	1.000	25.40	1.372	34.85	1.781	45.24	2.562	65.07	3.389	86.08
0.176	4.47	0.362	9.19	0.740	18.80	1.020	25.91	1.406	35.71	1.812	46.02	2.625	66.68	3.500	89.90
0.180	4.57	0.420	10.67	0.750	19.05	1.047	26.59	1.438	36.53	1.841	46.76	2.659	67.54	3.675	93.35
0.188	4.78	0.450	11.43	0.771	19.58	1.078	27.38	1.484	37.69	1.938	49.23	2.680	68.07	3.701	94.01
0.200	5.08	0.500	12.70	0.812	20.62	1.130	28.70	1.500	38.10	2.000	50.80	2.688	68.28	3.840	97.54

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## REQUIREMENTS:

Design and construction:

Dimensions and configuration: See figure 1 and table I.

Dimensioning and tolerancing are in accordance with ASME Y14.5.

For nominal use on fuel and oil systems.

Materials. Materials and designators shall be in accordance with SAE-AS4875 or ASTM B108/B108M.

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

TABLE II. Material designators and dash numbers for tube sizes. <sup>1/</sup>

Dash number	Steel (Blank)	Aluminum Alloy <sup>2/</sup> <sup>5/</sup> 2014/2024	Aluminum Alloy 7075	CRES 304 <sup>3/</sup>	CRES 316 <sup>3/</sup>	CRES 321 <sup>3/</sup>	Titanium <sup>4/</sup>
-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

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

<sup>2/</sup> 2014/2024 code D are inactive for new design, use 7075 code W aluminum for new design.

<sup>3/</sup> Corrosion resistant steel (CRES) for 304, 316 and 321.

<sup>4/</sup> Titanium shall not be used in oxygen systems.

<sup>5/</sup> Optional material: aluminum alloy casting in accordance with ASTM B108/B108M.

Finishes. Finishes for the elbow shall be in accordance with SAE-AS4875.

Finish designators shall be as specified in table III.

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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 3 or SAE-AMS-QQ-P-416, type II, class 2.
	Aluminum <u>2/</u>	Anodize in accordance with MIL-A-8625, type II.
	CRES	No additional finish. Passivation in accordance with SAE-AMS2700, type 6 or 7.
	Titanium	Fluoride phosphated in accordance with SAE-AMS2486.
A	Steel	Aluminum-nickel in accordance with ASTM F1136/F1136M, grade 3, NC.
D	Aluminum <u>2/</u>	Anodize above with NAVAIR trivalent chromium pretreatment (TCP) in accordance with MIL-DTL-81706, type II, class 1A.
DA	Aluminum <u>2/</u>	Chemical conversion coating in accordance with, MIL-DTL-5541, type II, class 3.
CN	Steel	Cadmium plating in accordance with SAE-AMS-C-81562, type II, class 3 or SAE-AMS-QQ-P-416, type II, class 2 with NAVAIR TCP in accordance with MIL-DTL-81706, type II, class 1A.
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 1. <u>4/</u>
J	Steel	Zinc plating in accordance with ASTM B633; type II or III, Fe/Zn 5, or ASTM B695, type II, class 5.
N	Steel	NAVAIR TCP in accordance with MIL-DTL-81706, type II, class 1A.
R	Steel	Zinc plating in accordance with ASTM B633; type VI, Fe/Zn 5.
T	Titanium <u>3/</u>	Anodized in accordance with SAE-AMS2488, type 2.
V	Steel	Zinc-nickel in accordance with SAE-AMS2417, type 1.
W	Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875	Anodize in accordance with MIL-A-8625, type 2, dye brown.
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.
Z	Steel	Zinc may be any zinc plating's from PIN codes H, J, R, V. <u>5/</u>
ZN	Steel	Zinc may be any zinc plating's from PIN codes H, J, R, V with NAVAIR TCP in accordance with MIL-DTL-81706, type II, class 1A. <u>5/</u>

1/ All finished materials shall withstand 96 hours salt spray test minimum.

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

Unless otherwise specified aluminum alloy 7075 shall be dyed brown.

3/ Color equivalent to numbers in accordance with FED-STD-595/36076, FED-STD-595/36081, FED-STD-595/36099, FED-STD-595/36118, FED-STD-595/36134, FED-STD-595/36152, FED-STD-595/36170, FED-STD-595/36173, and FED-STD-595/36176.

4/ Hexavalent chromium free.

5/ Not for use in Aircraft.

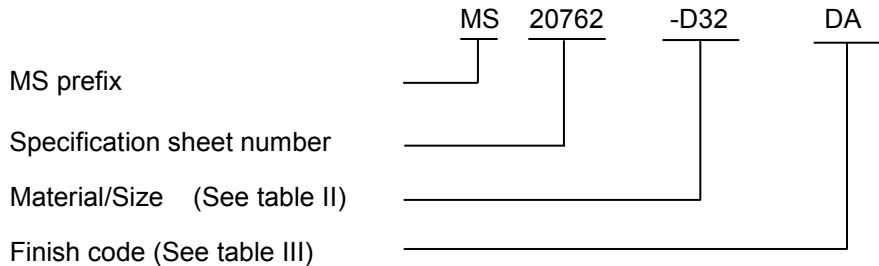
6/ Unless otherwise specified aluminum alloy 7075 shall be dyed brown.

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Surfaces. All machined surfaces shall be finished to 250  $\mu$ in Ra (.00635mm), unless otherwise specified.

Fitting surface shall be free of all burrs and slivers.

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. 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-AS4875, this document references the following:

ASTM B108/B108M	MIL-DTL-16232	FED-STD-595/36152	SAE-AMS2700
ASTM B633	MIL-DTL-81706	FED-STD-595/36170	SAE-AS4395
ASTM B695	FED-STD-595/36076	FED-STD-595/36173	SAE-AS8879
ASTM F1136/F1136M	FED-STD-595/36081	FED-STD-595/36176	SAE-AMS-QQ-P-416
ASME Y14.5	FED-STD-595/36099	SAE-AMS2417	SAE-AMS-C-81562
MIL-DTL-5541	FED-STD-595/36118	SAE-AMS2486	
MIL-A-8625	FED-STD-595/36134	SAE-AMS2488	

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CONCLUDING MATERIAL

Custodians:

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

Preparing activity:

DLA - CC

(Project 4730-2014-083)

Review activities:

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

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