

INCH-POUND

MIL-DTL-5070F  
10 December 2006  
SUPERSEDING  
MIL-DTL-5070E  
22 September 2000

## DETAIL SPECIFICATION

### ADAPTER, HOSE TO TUBE, PIPE, AND FLANGE, REUSABLE - HYDRAULIC, FUEL, AND OIL LINES, GENERAL SPECIFICATION FOR

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

#### 1. SCOPE

1.1 Scope. This specification covers general requirements for adapter, hose to tube, pipe, and flange, reusable - hydraulic, fuel, and oil lines.

1.2 Classification. Reusable hose adapters will be of the sizes and styles as specified on the applicable specification sheets (see [3.1](#) and [6.2](#)).

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections [3](#), [4](#), or [5](#) of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections [3](#), [4](#), or [5](#) of this specification, whether or not they are listed.

##### 2.2 Government documents.

2.2.1 Specifications standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, Attn: VAI, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to [Construction@dsccl.dla.mil](mailto:Construction@dsccl.dla.mil). Since contact information can change you, may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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## DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-5606	-	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-DTL-8794	-	Hose, Elastomeric - Hydraulic Fluid, Fuel, and Oil Resistant
MIL-DTL-8795	-	Hose Assemblies, Elastomeric - Hydraulic Fluid, Fuel, and Oil Resistant, General Specification For
MIL-PRF-83282	-	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-737
MIL-PRF-87257	-	Hydraulic Fluid, Fire Resistant; Low Temperature, Synthetic Hydrocarbon Base, Aircraft and Missile
MIL-A-8625	-	Anodic Coatings for Aluminum and Aluminum Alloys

(See supplement for list of specification sheets)

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	-	Identification Marking of US Military Property
MIL-STD-889	-	Dissimilar Metals
MS24587	-	Adapter, Straight, Tube To Hose - Reusable, Hydraulic, Fuel and Oil Lines
MS27224	-	90 Degree. Swivel Nut Assembly, Adapter, Hose To Tube, Reusable, Hydraulic, Fuel and Oil Lines
MS28741	-	Hose Assembly, Detachable End Fitting, Medium Pressure

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## ASTM INTERNATIONAL

ASTM A108	-	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A276	-	Standard Specification for Stainless Steel Bars and Shapes
ASTM A564/A564M	-	Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A580/A580M	-	Standard Specification for Stainless Steel Wire
ASTM B117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B487	-	Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section
ASTM B499	-	Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals
ASTM B567	-	Standard Test Method for Measurement of Coating Thickness by the Beta Backscatter Method
ASTM B568	-	Standard Test Method for Measurement of Coating Thickness by X-Ray Spectrometry
ASTM B633	-	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

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- |           |   |  |
|-----------|---|--|
| ASTM B695 | - | Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel   |
| ASTM B748 | - | Standard Test Method for Measurement of Thickness of Metallic Coatings by Measurement of Cross Section with a Scanning Electron Microscope |
| ASTM D380 | - | Standard Test Methods for Rubber Hose  |
| ASTM D471 | - | Standard Test Method for Rubber Property-Effect of Liquid  |

(Copies of these documents are available online at <http://www.astm.org> or from ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

## NCSL INTERNATIONAL

- |             |   |   |
|-------------|---|---|
| NCSL Z540.1 | - | Calibration Laboratories and Measuring and Test Equipment, General Requirements |
|-------------|---|---|

(Copies of these documents are available online at <http://www.ncsli.org> or from NCSL International 2995 Wilderness Place, Suite 107 Boulder, Colorado 80301-5404.)

## SAE INTERNATIONAL

- |                    |   |  |
|--------------------|---|--|
| SAE-AMS-A-22771    | - | Aluminum Alloy Forgings, Heat Treated  |
| SAE-AMS-QQ-A-200/8 | - | Aluminum Alloy 6061, Bar, Rod, Shapes, Tube, and Wire, Extruded  |
| SAE-AMS-QQ-A-225/8 | - | Aluminum Alloy 6061, Bar, Rod, and Wire, and Special Shapes; Rolled, Drawn, or Cold Finished   |
| SAE-AMS-QQ-A-225/9 | - | Aluminum Alloy 7075, Bar, Rod, and Wire, and Special Shapes; Rolled, Drawn, or Cold Finished   |
| SAE-AMS-QQ-A-367   | - | Aluminum Alloy Forgings  |
| SAE-AMS-QQ-P-416   | - | Plating, Cadmium (Electrodeposited)  |
| SAE-AMS-S-6758     | - | Steel, Chrome-Molybdenum (4130) Bars and Reforging Stock (Aircraft Quality)  |
| SAE-AMS-WW-T-700/4 | - | Tube, Aluminum Alloy, Drawn, Seamless, 5052  |
| SAE-AMS-WW-T-700/6 | - | Tube, Aluminum Alloy, Drawn, Seamless, 6061  |
| SAE AMS2486        | - | Conversion Coating of Titanium Alloys Fluoride-Phosphate Type  |
| SAE-AMS2488        | - | Anodic Treatment - Titanium and Titanium Alloys Solution pH 13 or Higher   |
| SAE-AMS2700        | - | Passivation of Corrosion Resistant Steels  |
| SAE-AMS4124        | - | Aluminum Alloy, Rolled or Cold Finished Bars, Rods, and Wire 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T7351) Solution Heat Treated, Stress Relieved by Stretching, and Overaged-UNS A97075 |
| SAE-AMS4127        | - | Aluminum Alloy, Forgings and Rolled or Forged Rings (6061-T6) Solution and Precipitation Heat Treated  |
| SAE-AMS4141        | - | Aluminum Alloy Die Forgings 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73) Solution and Precipitation Heat Treated  |
| SAE-AMS4928        | - | Titanium Alloy Bars, Wire, Forgings, Rings, and Drawn Shapes 6Al - 4V Annealed   |
| SAE-AMS5557        | - | Steel, Corrosion and Heat-Resistant, Seamless or Welded Hydraulic Tubing 18.5Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated  |

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SAE-AMS5566	-	Steel, Corrosion Resistant, Seamless or Welded Hydraulic Tubing 19Cr - 10Ni (SAE 30304) High Pressure, Cold Drawn
SAE-AMS5567	-	Steel, Corrosion Resistant, Seamless or Welded Hydraulic Tubing 19Cr - 10Ni (SAE 30304) Solution Heat Treated
SAE-AMS5639	-	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 19Cr - 10Ni Solution Heat Treated
SAE-AMS5643	-	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 16Cr - 4.0Ni - 0.30Cb - 4.0Cu Solution Heat Treated, Precipitation Hardenable
SAE-AMS5645	-	Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 18Cr - 10Ni - 0.40Ti (SAE 30321) Solution Heat Treated
SAE-AMS5647	-	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, And Rings 19Cr - 9.5Ni Solution Heat Treated
SAE-AMS5689	-	Steel, Corrosion and Heat Resistant, Wire 18Cr - 10.5Ni - 0.40Ti (SAE 30321) Solution Heat Treated
SAE-AMS5697	-	Steel, Corrosion-Resistant, Wire 19Cr - 9.5Ni (SAE 30304) Solution Heat Treated
SAE-AMS5743	-	Steel, Corrosion and Heat-Resistant, Bars and Forgings 15.5Cr - 4.5Ni - 2.9Mo - 0.10N Solution Heat Treated, Sub-Zero Cooled, Equalized, and Over-Tempered
SAE-AMS6360	-	Steel Tubing, Seamless 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) Normalized or Stress Relieved
SAE-AMS6361	-	Steel Tubing, Seamless 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) 125 ksi (862 MPa) Tensile Strength
SAE-AMS6362	-	Steel Tubing, Seamless 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) 150 ksi (1034 MPa) Tensile Strength
SAE-AMS6370	-	Steel, Bars, Forgings, and Rings 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130)
SAE-AMS6381	-	Steel, Mechanical Tubing 0.95Cr - 0.20Mo (0.38 - 0.43C) (SAE 4140)
SAE-AMS6382	-	Steel, Bars, Forgings, and Rings 0.95Cr - 0.20Mo (0.38 - 0.43C) (SAE 4140) Annealed
SAE-ARP603	-	Impulse Testing of Hydraulic Hose Tubing and Fitting Assemblies
SAE-ARP908	-	Torque Requirements, Installation and Qualification Test, Hose and Tube Fitting
SAE-AS4841	-	Fittings, 37 Degree Flared, Fluid Connection
SAE-J1966	-	Lubricating Oil, Aircraft Piston Engine (Nondispersant Mineral Oil)

(Copies of these documents are available online at <http://www.sae.org> or from the SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. Adapters or components furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3).

3.3 Materials. Materials shall be as identified herein or as approved by the qualifying activity. When a definite material is not specified, a material shall be used which will enable the hose or hose assembly to meet the requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee of acceptance of the finished product.

3.3.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle cost.

3.3.2 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. Dissimilar metals such as brass, copper or steel (except corrosion-resisting steel) shall not be used in intimate contact with aluminum or aluminum alloy. Corrosion-resisting steel shall be passivated in accordance with SAE-AMS2700. Protective measures for dissimilar metals shall be in accordance with MIL-STD-889.

3.3.3 Fitting Material. Metal used for fittings shall be as specified in table I.

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TABLE I. Requirements for metals.

Metal	Form	Specification	Type
Aluminum alloy	Bars	SAE AMS-QQ-A-200/8	6061-T651
		SAE AMS-QQ-A-225/8	6061-T6
		SAE AMS-QQ-A225/9	7075- T73, T7351
		SAE AMS4124	7075-T7351
	Forgings	SAE AMS4127	6061-T6
		SAE AMS-A-22771	7075-T73
			T6, T62, or T651
		SAE AMS-QQ-A-367	7075-T73
		SAE AMS4141	7075-T73
	Seamless tubing	SAE AMS-WW-T-700/4	5052, type I
		SAE AMS-WW-T-700/6	6060-T6, type I
Stainless steel	Bars and forgings	ASTM A276	304, 316, or 321
		ASTM A564/A564M	XM-12 (15-5 PH) UNS S15500 or 603 (17-4 PH) UNS S17400
		SAE AMS5639	SAE 30304; UNS S30400
		SAE AMS5645	SAE 30321; UNS S32100
		SAE AMS5647	304L; UNS S30403
		SAE AMS5643	17-4PH
		SAE AMS5743	AM-355
	Tubing	SAE AMS5566	Type 1 or 2
		SAE AMS5557	Type 1 or 2
		SAE AMS5567	SAE 30304
	Wire	SAE AMS5689	SAE 30321; UNS S32100
		SAE AMS5697	SAE 30304; UNS S30400
		ASTM A580/A580M	Type 302, 304, 305, or 321
Steel	Bars	ASTM A108	1018, 1020, 1137, 1144, 12L14
		SAE AMS-S-6758	4130
	Forgings	SAE AMS6382	4130
		SAE AMS6370	4130
	Tubing	SAE-AMS6360	4130
		SAE-AMS6361	
		SAE-AMS6362	
		SAE-AMS6381	4140
Titanium	Bars	SAE-AMS4928	6Al-4V annealed
	Forgings	SAE-AMS4928	6Al-4V annealed

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3.3.4 Finish.3.3.4.1 Steel fitting finish (except stainless steel).

- a. Cadmium plating. Cadmium plating shall be in accordance with SAE-AMS-QQ-P-416, type II class 2. 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.
- b. Zinc plating. Zinc plating shall be in accordance with ASTM B633; type II or III, Fe/Zn 5, or ASTM B695, type II, class 5. Both zinc platings specified in ASTM B633 type III and ASTM B695 type II shall meet the same 96 hour salt spray test endurance as ASTM B633 type II zinc plating.

3.3.4.1.1 Plating thickness verification. Plating thickness shall be measured in accordance with [4.8.13](#) and shall meet the requirements of 3.3.4.1.

3.3.4.2 Aluminum alloy. Aluminum shall be anodized in accordance with MIL-A-8625, type II, class 2.

3.3.4.3 Stainless steel fittings passivation. Stainless steel shall be passivated in accordance with SAE-AMS2700.

3.3.4.4 Titanium. Titanium shall be anodized in accordance with SAE-AMS2488, type 2 or fluoride phosphated in accordance with SAE-AMS2486.

3.3.4.5 Color identification. Color identification shall be in accordance with SAE-AS4841.

3.4 Interface. Adapters shall interface with hose conforming to MIL-DTL-8794 and hose assemblies conforming to MIL-DTL-8795 and MS28741 for use in hydraulic, fuel, and oil lines.

3.5 Performance.

3.5.1 Proof pressure. The adapters, when coupled to the hose as an assembly shall be subjected to proof pressure tests specified in [4.8.2](#). The hose assembly shall show no evidence of leakage, burst, deformation, movement relative to the hose, or separation from the hose.

3.5.2 Leakage. The adapters, when coupled to the hose as an assembly shall be subjected to the leakage tests specified in [4.8.3](#). The hose assembly shall not burst, show no evidence of leakage, or separate from the hose at any pressure less than the burst pressure specified in [table II](#). Adapters shall not deform or move relative to the hose at any pressure less than 70 percent of the burst pressure specified in [table III](#).

3.5.3 Burst pressure. The adapters, when coupled to the hose as an assembly subjected to the burst pressure testing of [4.8.4](#). The hose assembly shall not burst and there shall be no evidence of leakage or separation of the hose and adapter at any pressure less than the burst pressure specified in [table II](#).

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TABLE II. Burst pressure.

Dash number (size)	Length of hose assemblies for tests inches (cm) <u>1/</u>	Burst pressure psi (bar)
-3 <u>2/</u>	14 (35.56)	4,000 (275.79)
-4	14 (35.56)	12,000 (827.37)
-5	16 (40.64)	10,000 (689.48)
-6	18 (45.72)	9,000 (620.53)
-8	21 (53.34)	8,000 (551.58)
-10	23.5 (59.69)	7,000 (482.63)
-12	27.5 (69.85)	6,000 (413.69)
-16	18 (45.72)	3,200 (220.63)
-20	18 (45.72)	2,500 (172.37)
-24	18 (45.72)	2,000 (137.90)
-32	18 (45.72)	1,400 (96.53)
-40	18 (45.72)	1,000 (68.95)
-48	18 (45.72)	800 (55.16)

1/ Except as otherwise specified in the individual test description.

2/ Size -3 adapters shall not be used with size -3 hose in hydraulic applications.

3.5.4 Bulge. The adapters, when coupled to the hose as an assembly shall be tested in accordance with 4.8.5. The hose assembly shall not cause a bulge in the inner tube of the hose to reduce the inside diameter of the hose to less than the C dimension shown on figure A-1.

3.5.5 Hydraulic impulse. The adapters, when coupled to the hose as an assembly subjected to the hydraulic impulse test specified in 4.8.6 shall meet the following requirements:

- a. Adapters of sizes -4 through -16 shall withstand not less than 200,000 dynamic hydraulic impulse cycles at a nominal rate of 70 pulses per minute at 125 percent of the operating hydraulic pressure specified in table III without leakage, deformation, or separation from a hose.
- b. Adapters of sizes greater than -16 and through -32 shall withstand not less than 100,000 dynamic hydraulic impulse cycles at a nominal rate of 70 pulses per minute at 100 percent of the operating hydraulic pressure specified in table III without leakage, deformation, or separation from a hose.



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TABLE III. Physical requirements for adapters assembled with hose conforming to MIL-DTL-8794. 1/ 2/

Dash number (size)	Length of hose assemblies for tests inches (cm) 3/	Minimum bend radius at inside of hose bend inches (mm)	Hydraulic		Fuel		Oil		
			Operating pressure psi (bar)	Proof pressure psi (bar)	Operating pressure psi (bar)	Proof pressure psi (bar)	Operating pressure psi (bar)	Surge pressure psi (bar)	Proof pressure psi (bar)
-3 4/	14 (35.56)	3 (76.20)	N/A 4/	N/A 4/	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-4	14 (35.56)	3 (76.20)	3,000 (206.84)	6,000 (413.69)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-5	16 (40.64)	3.375 (85.73)	3,000 (206.84)	5,000 (344.75)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-6	18 (45.72)	4 (101.60)	2,000 (137.90)	4,500 (310.26)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-8	21 (53.34)	4.625 (117.48)	2,000 (137.90)	4,000 (275.79)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-10	23.5 (59.69)	5.5 (139.70)	1,750 (120.66)	3,500 (241.32)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-12	27.5 (69.85)	6.5 (165.10)	1,500 (103.42)	3,000 (206.84)	1,000 (68.95)	1,500 (103.42)	50 (3.45)	400 (27.58)	600 (41.37)
-16	18 (45.72)	N/A	800 (55.16)	1,600 (110.32)	750 (51.71)	1,000 (68.95)	50 (3.45)	400 (27.58)	600 (41.37)
-20	18 (45.72)	N/A	600 (41.37)	1,250 (86.18)	500 (34.47)	750 (51.71)	50 (3.45)	400 (27.58)	600 (41.37)
-24	18 (45.72)	N/A	500 (34.47)	1,000 (68.95)	250 (17.24)	375 (25.86)	50 (3.45)	400 (27.58)	600 (41.37)
-32	18 (45.72)	N/A	350 (24.13)	700 (48.26)	200 (13.79)	300 (20.68)	50 (3.45)	400 (27.58)	600 (41.37)
-40	18 (45.72)	N/A	N/A	N/A	200 (13.79)	300 (20.68)	N/A	N/A	N/A
-48	18 (45.72)	N/A	N/A	N/A	200 (13.79)	300 (20.68)	N/A	N/A	N/A

1/ Dimensions are in inches.

2/ Metric equivalents are given for information only.

3/ Except as otherwise specified in the individual test description.

4/ Size -3 adapters shall not be used with size -3 hose in hydraulic applications.

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3.5.6 Torque. The adapters, when coupled to the hose as an assembly shall be subjected to the torque requirements of 4.8.7. The adapters shall not leak, fail, or deform after having been tightened to the maximum torque limit in SAE ARP908 applicable for the material used. There shall be no evidence of leakage of the adapter or adapter-to-hose interface. Upon disconnection of the adapter after completing repeated torquing, the swivel nut shall be free enough to permit turning on the nipple by hand.

3.5.7 Low operating temperature. The adapters, when coupled to the hose as an assembly and tested in accordance with 4.8.8 shall be capable of operating over the low temperature range without leakage, deformation, or separation from the hose.

3.5.8 Fuel immersion. The adapters, when coupled to the hose as an assembly shall be subjected to fuel immersion in accordance with 4.8.9. The hose assembly shall not leak after immersion in hydrocarbon-based fuels.

3.5.9 Lubricating oil circulation. The adapters, when coupled to the hose as an assembly, shall be tested as specified in 4.8.10. The hose assembly shall be capable of circulating oil at fluid temperatures up to +250°F (121.11°C) and under surge conditions of +325°F (162.78°C) without leakage while operating at the oil operating pressure specified in table III.

3.5.10 Salt spray (steel fittings only see 3.3.4.1). When tested as specified in 4.8.11 the fittings shall show no evidence of corrosion after 96 hours of salt spray.

3.5.11 Reusability. Adapters shall be reusable (see 4.8.12).

3.6 Special tools. Adapters shall not require any special tools other than a mandrel for assembly with a hose. The mandrel may, if necessary, be used on sizes -3 through -12 adapters only, in which case the bore diameter of the adapters shall conform to dimension B on figure A-1. If used, the mandrel shall be straight and the diametrical clearance between the mandrel outside diameter (OD) and the adapter bore shall be not greater than .008 inch (0.20 mm).

3.7 Identification of product. When applicable adapters and components shall be marked for identification in accordance with MIL-STD-130 and in accordance with the applicable specification sheet (see 3.1).

3.8 Workmanship. Adapters shall be free from cracks, laps, seams, burrs, longitudinal and spiral tool marks, or any other defects that may detrimentally affect their intended use.

#### 4. VERIFICATION

4.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540.1 or equivalent.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.3 Inspection conditions. All inspections shall be performed in accordance with the test conditions specified herein. Room temperature shall be +68°F to +78°F (20°C to 25.56°C).

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4.3.1 Test fluid. Unless otherwise specified in the test method paragraph, the test fluid shall be water; lubricating oil conforming to SAE J1966, grade 50; hydraulic fluid MIL-PRF-5606, MIL-PRF-87257, MIL-PRF-83282; or ASTM reference fuel B in accordance with ASTM D471. Water is an acceptable test fluid only for the leakage, proof pressure, and burst tests. If water is used, the test article must be thoroughly dried before use in further testing or prior to delivery.

4.3.2 Oil-aging. For tests that require a hose assembly to be oil-aged, the hose assembly shall be completely immersed in hydraulic fluid, MIL-PRF-5606, MIL-PRF-87257, or MIL-PRF-83282, within a non-pressurized closed container or reflux condenser (to prevent distillation of the volatile matter in the fluid) and maintained at a temperature of  $+160^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $71.11^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$ ) for 7 days prior to the start of the test. During the aging period, the bore of the hose assembly shall be open and no air shall be entrapped therein. Replenish the test fluid after aging 10 hose assemblies.

4.3.3 Air-aging. Tests that require a hose assembly to be air-aged, the hose assembly shall be maintained in air at a temperature of  $+160^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $71.11^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$ ) for 7 days prior to the start of the test.

4.4 Qualification inspection. Qualification inspection shall be performed on units produced with equipment and procedures used in production.

4.4.1 Samples for qualification. Samples for qualification shall be representative of the products proposed to be furnished to this specification. Samples, consisting of 13 hose assemblies using adapters of each size and of the configuration specified, shall be subjected to qualification testing specified in table V. The test sequence for samples is specified in table VI. For qualification testing of adapters

4.4.2. Hose assemblies for adapter testing. The hose assemblies used for adapter testing shall be assembled using hose in accordance with MIL-DTL-8794 of the applicable size in accordance with the adapter manufacturer's instructions. Hose assemblies shall be examined to verify that there has been no degradation of the hose or adapters resulting from the assembly process. Unless otherwise specified, hose assembly lengths shall be as specified in [table II](#) or [table III](#).

4.4.2.1 Hose for qualification of adapters. The hose shall be furnished from at least two manufacturers. The hose from each manufacturer shall be divided equally as practical and adapters shall be assembled on the various manufacturers' hoses.

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TABLE V. Qualification inspection.

Inspection	Requirement paragraph	Test method paragraph
Examination of product	3.1, 3.2, 3.3.3, 3.4, 3.7, and 3.8	4.8.1
Plating thickness	3.3.4.1.1	4.8.13
Proof pressure	3.5.1	4.8.2
Leakage	3.5.2	4.8.3
Burst	3.5.3	4.8.4
Bulge	3.5.4	4.8.5
Hydraulic impulse	3.5.5	4.8.6
Torque	3.5.6	4.8.7
Proof pressure	3.5.1	4.8.2
Low operating temperature	3.5.7	4.8.8
Proof pressure	3.5.1	4.8.2
Fuel immersion	3.5.8	4.8.9
Proof pressure	3.5.1	4.8.2
Lubrication oil circulation	3.5.9	4.8.10
Salt spray	3.5.10	4.8.11
Reusability	3.5.11	4.8.12
Proof pressure	3.5.1	4.8.2
Bulge	3.5.4	4.8.5
Burst pressure	3.5.3	4.8.4

TABLE VI. Test sequence.

Test samples	Assembly type	Test sequence - paragraph numbers			
1 and 2	Hose assembly using MIL-DTL-8794 hose and MS27224 adapters (see 6.3, 4.5.3, 4.5.4)	4.8.1	4.8.2	4.8.3	4.8.4
3 through 8 1/		4.8.1	4.8.2	4.8.5	4.8.6
9		4.8.1	4.8.2	4.8.7	4.8.2
10 and 11		4.8.1	4.8.2	4.8.8	4.8.2
12		4.8.1	4.8.2	4.8.9	4.8.2
13		4.8.1	4.8.2	4.8.10	---
see note 2/		4.8.12	4.8.2	4.8.5	4.8.4

1/ These hose assemblies shall use adapters in accordance with MS24587.

2/ The adapter for the reusability test of 4.8.12 shall be selected from among hose assemblies 3 through 8, and shall have previously passed the tests specified for those hose assemblies.

4.4.2.1 Failures. One failure shall be cause for refusal to grant qualification approval.

4.4.3 Requalification. If an adapter design is modified in any way, the modified form shall be subjected to and pass the same qualification tests as the original design.

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4.4.4 Qualification by similarity. Qualification testing may be performed on MS27224 hose-to-tube 90° adapters only or MS24587 for selected tests. A manufacturer who has successfully completed these qualification testing requirements may also be considered qualified to supply adapters of other configurations (elbow and flange fittings) of any bend less than the tested article covered by this specification in that same size. Such qualification may be based on certification of similarity provided by the manufacturer. In the event that a manufacturer does not manufacture adapters conforming to either MS27224 or MS24587, the manufacturer shall accomplish qualification testing on the style and size of adapter to be supplied and the similarity certification will apply to adapters of any bend less than the tested article.

4.4.5 Disposition of test specimens. Test specimens that have been subjected to qualification testing shall not be delivered on a contract or purchase order.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of sampling tests as specified in table VII.

4.5.2 Sampling tests. Sampling tests shall consist of the tests specified in table VII. These tests shall be performed on a production lot basis. Random samples from the production lot (see 4.5.2.1) without regard to quality shall be selected in the inspection sample quantity specified in table VIII to form an inspection lot. If one or more defects are found in a sample from the inspection lot, then the production lot shall be inspected for the particular defect and the defects removed. A second inspection sample shall be selected from the production lot and all sampling tests again performed. If one or more defect items are found in the second inspection sample, the production lot shall be rejected and shall not be supplied to this specification.

TABLE VII. Sampling tests.

Title	Requirement	Inspection
Examination of product	<a href="#">3.1</a> , <a href="#">3.2</a> , <a href="#">3.3.3</a> , <a href="#">3.4</a> , <a href="#">3.7</a> , and <a href="#">3.8</a>	<a href="#">4.8.1</a>

TABLE VIII. Inspection sample.

Production lot size	Sample size
1 to 8	All
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1,200	27
1,201 to 3,200	35
3,201 to 10,000	38
10,001 to 35,000	46

4.5.2.1 Production lot. A production lot shall consist of the quantity of adapter assemblies or adapter components of one type and size manufactured on the same production lines by means of the same production techniques, materials, controls, and design during the same production run.

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4.5.3 Periodic tests.

4.5.3.1 Periodic 1 (P1) tests. P1 tests shall consist of the tests specified in table IX in the performed in the order shown.

4.5.3.2 Periodic 2 (P2) tests. P2 tests shall consist of the tests specified in table IX performed in the order shown.

4.5.4 Periodic.

4.5.4.1 Periodic 1 (P1) sampling . P1 testing shall be performed on 3 assemblies (6 adapters) for each size of each specification at least once per year regardless of the total number of fittings produced. The only exception is that periodic 1 testing does not need to be performed for a specific size of a specific specification if there has been no production during the past year for that size and specification. The following details shall apply:

- a. At least three of the six fittings shall be of the greatest bend angle produced during the period.
- b. The six fittings selected will be as representative as possible of those produced during the period in terms of the fitting materials (example: all steel fittings, combination steel and aluminum fittings, etc.) and joint configurations (one piece, brazed joint, welded joint, mechanical joint, etc.).

4.5.4.2 Periodic 2 (P2) sampling. P2 testing shall be performed on two adapters at least once per year, regardless of the total number of adapters produced. The only exception is periodic 2 testing does not need to be performed for a specific style if there has been no production during the past year for that style. The following details shall apply:

- a. The fittings may be of any bend angle and joint configuration.
- b. The two fittings selected from each specification sheet shall be as representative as possible for the metals used for the threaded parts if the parts have been produced from more than one type of metal (example: aluminum threads, steel threads, etc.)
- c. The size of the two fittings shall be determined based on the size of the fittings produced during the period and based on an engineering decision of the size produced that would be most likely to fail if there was a defect.

TABLE IX. Periodic tests. 1/

Title	Requirement	Inspection	Quality control inspection	
			P1 tests	P2 tests
Proof pressure	3.5.1	4.8.2	X	
Burst pressure	3.5.3	4.8.4	X	
Leakage	3.5.2	4.8.3	X	
Torque	3.5.6	4.8.7	---	X
Plating thickness	3.3.4.1.1	4.8.13		X

1/ If there are no reported failures after two consecutive intervals then periodic testing can be done at 24 months intervals. If there are no reported failures after the next 24 month interval, then periodic testing can be done at 36 months intervals.

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4.5.4.3 Periodic hose assembly testing. Required periodic tests at the hose assembly or adapter level that were already performed at the bulk hose level by the same manufacturer of both products may be eliminated if documented approval has been obtained from the qualifying activity.

4.5.4.4 Disposition of sample units. Samples units, which have been subjected to periodic tests P1 and P2, shall not be delivered on the contract or purchase order.

4.5.5 Nonconformance.

4.5.5.1 Failures. If a sample fails to pass P1 or P2 inspection (see table IX), the manufacturer shall immediately notify the qualifying activity and cognizant inspection activity of such failure. The manufacturer shall take corrective action on the materials or processes or both as warranted, on all units of product which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials and processes, and which are considered subject to the same failure.

4.5.5.2 Acceptance and shipment. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After the corrective action has been taken P1 or P2 inspection as applicable (see table IX) shall be repeated on additional samples. At the discretion of the qualifying activity this may included all inspections, or the inspection which the original sample failed. Individual and sampling and periodic inspections, if applicable, may be reinstituted. However final acceptance of the adapters or hose assemblies shall be withheld until the sampling and periodic inspection has shown that the corrective action was successful.

4.6 Additional QPL test and reporting requirements.

4.6.1 Retention of qualification. To retain qualification, the contractor shall submit a test report to the qualifying activity at 12 month intervals. The qualifying activity shall establish the initial reporting date. Each report shall consist of a summary of test and inspection results required by this specification that were performed during the 12 month reporting interval. As a minimum, the report shall include the following:

- a. Number of lots produced and tested, including lot and sample sizes for each lot.
- b. Identify which tests were performed.
- c. Quantities passed.
- d. Quantities failed.
- e. All reworked sampling lots shall be accounted for and identified. A summary of corrective action taken shall be included.

4.7 Loss of product qualification.

4.7.1 Failure to meet test requirements. The manufacturer shall immediately notify the qualifying activity at any time during the 12-month reporting period when the qualified product fails to meet the test and inspection requirements of this specification. The manufacturer shall identify and indicate what corrective action will be taken to correct the problem. Failure to take corrective action acceptable to the qualifying activity may result in removal of the product from the QPL.

4.7.2 Failure to submit summary test data report. Failure to submit a report within 30 days after the end of the 12 month reporting period may result in loss of qualification for the product.

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4.7.3 Change to manufacturing process, materials or equipment. The manufacturer shall notify the qualifying activity, in writing, of any changes in the manufacturing process, materials, or equipment used to manufacture a qualified product list (QPL) product. Subsequently, the qualifying activity shall notify the manufacturer, in writing, if a full re-qualification, partial re-qualification, or no additional testing is required as a result of these changes.

4.7.4 No production during reporting period (12 months). When no production occurs during the reporting period, a report shall be submitted to the qualifying activity certifying that the manufacturer still has the capability and facilities necessary to produce the QPL product.

4.8 Test methods.

4.8.1 Examination of product. Adapters, and their related reports, shall be examined to determine conformance to this specification and the applicable specification sheet with respect to materials, finish, dimensions, interfaces, tolerances, identification marking, and workmanship (see [figures A-3 through A-8](#)). The concentricity gage shown on [figure A-2](#) shall be used only for the inspection of sockets. See [3.1](#), [3.2](#), [3.3.3](#), [3.4](#), [3.7](#), and [3.8](#).

4.8.2 Proof pressure (see 3.5.1). All hose assemblies shall be proof pressure tested in accordance with ASTM D380 and shall meet the requirements of [3.5.1](#). The following details shall apply:

- a. Hose assembly shall be unaged.
- b. Hose assemblies shall be subjected to the hydraulic proof pressure, except -3 to fuel proof pressure, specified in [table III](#) for a period of not less than 1 minute.
- c. The hose assembly shall show no evidence of leakage, burst, deformation, movement relative to the hose, or separation from the hose.

4.8.3 Leakage (see 3.5.2). Hose assemblies when subjected to the leakage test shall meet the requirements of [3.5.2](#). The following details shall apply:

- a. A pair of unaged hose assemblies shall be subjected to 70 percent of the burst pressure specified in [table II](#) for 5 minutes.
- b. The pressure shall then be reduced to zero, after which the pressure shall again be raised to 70 percent of the specified burst pressure and held for an additional 5 minutes.
- c. There shall be no evidence of adapter leakage, burst, deformation, movement relative to the hose, or separation from the hose.

4.8.4 Burst pressure (see 3.5.3). Hose assemblies when subjected to burst pressure in accordance with ASTM D380 shall meet the requirements of [3.5.3](#). The following details shall apply:

- a. A pair of unaged hose assemblies shall be subjected to the burst pressure specified in [table II](#) within 24 hours after assembly of the adapters to the hose.
- b. The burst pressure test shall be conducted in accordance with the straight bursting test of ASTM D380, except that pressure shall be applied at a rate between 15,000 pounds per square inch (psi) and 25,000 psi (1034.21 bar and 1723.69 bar) per minute.
- c. During this test, one end of the hose assembly shall be free.



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4.8.5 Bulge (see 3.5.4). Hose assemblies when tested to bulge testing shall meet the requirements of 3.5.4. The following details shall apply:

- a. Samples. 4 hose assemblies of the length specified in table III shall be subjected to bulge testing.
  - (1) Two assemblies shall be oil aged (see 4.3.2).
  - (2) Two assemblies shall be air aged (see 4.3.3).
- c. The adapter shall be coupled to the hose and the hose inner tube shall be measured for bulging.
- b. Ball gages shall be as specified in table X for the applicable hose size.
- c. Holding the hose in a vertical orientation, the gage is inserted into the end of the hose assembly at the bulge inspection point C shown on figure A-1.
- d. The ball gage shall fall through the section at the end of the adapter in the hose under its own weight without lubrication and without forcing the ball gage through the adapter-to-hose interfacing section.

TABLE X. Ball gages. 1/

Dash number (size)	Ball Diameter inches (mm)	Volume (in <sup>3</sup> )	Weight (grams)	Weight (ounces)
-3	0.08 (2.03)	0.000268082	0.034180499	0.001205683
-4	0.132 (3.35)	0.001204259	0.153543075	0.005416078
-5	0.2 (5.08)	0.004188787	0.5340703	0.018838796
-6	0.26 (6.60)	0.009202764	1.173352449	0.041388834
-8	0.35 (8.89)	0.022449279	2.862283014	0.100964171
-10	0.45 (11.43)	0.047712898	6.083394511	0.214585658
-12	0.575 (14.61)	0.099540952	12.69147137	0.447678961
-16	0.781 (19.84)	0.249431534	31.80252055	1.12180211
-20	1.015 (25.78)	0.547515454	69.80822043	2.462415167
-24	1.25 (31.75)	1.022652995	130.3882568	4.599315372
-32	1.719 (43.66)	2.659658553	339.1064656	11.9615058
-40	2.178 (55.32)	5.409683809	689.7346856	24.3297013
-48	2.803 (71.20)	11.531025049	1470.2056936	51.8594476

1/ Steel balls are used to ensure that hoses are free of debris and bulging rubber.

4.8.6 Hydraulic impulse (see 3.5.5). Hose assemblies when subjected by hydraulic impulse testing in accordance with SAE ARP603 shall meet the requirements of 3.5.5. The following details shall apply:

- a. Samples. Six hose assemblies of the length specified in table III shall be subjected to hydraulic impulse testing. Oil and air aged samples from the bulge test may be used.
  - (1) Two assemblies shall be oil-aged (see 4.3.2).
  - (2) Two assemblies shall be air-aged (see 4.3.3).
  - (3) Two assemblies shall be unaged.
- b. All hose assemblies shall be subjected to and successfully withstand the applicable hydraulic proof pressure, see 4.8.2, specified in table III prior to impulse testing.
  - (1) Hose assemblies sizes -4 through -16.
    - a. Shall be connected to a manifold and installed in an impulse test machine that shall produce dynamic impulses in the manifold of the magnitude and frequency in accordance with SAE ARP603.

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- b. The peak pressure shall be 125 percent of the hydraulic operating pressure specified in [table III](#).
- (2) Hose assemblies size -20 through -32.
  - a. Shall be connected to a manifold and installed in an impulse test machine that shall produce dynamic impulses in the manifold of the magnitude and frequency in accordance with SAE ARP603.
  - b. The hose assembly shall be subjected to a peak pressure of 100 percent of the hydraulic operating pressure specified in [table III](#).
- c. In all cases, the backpressure shall be a maximum of 75 psi (5.17 bar). There shall be no evidence of leakage or separation of the adapter from the hose.
- d. The fluid used for this test shall conform to MIL-PRF-5606, MIL-PRF-87257 or MIL-PRF-83282, except that the test fluid may contain up to 25 percent by volume of SAE J1966, grade 50, lubricating oil.
- e. The fluid shall be held to a temperature of 120°F ±10°F (48.89°C ± 5.56°C) measured at the test manifold.
  - (1) Hose sizes -4 through -12, when installed on the impulse test machine, shall be bent into a "U" shape with a bend radius as specified in [table III](#).
  - (2) Hose sizes -16 through -32 may be installed straight.
- f. Both ends of the bent hose assembly shall be connected to a rigid support and one end of the straight hose assembly shall be free.
  - (1) Sizes -4 through -16 shall be subjected to 200,000 impulse cycles
  - (2) sizes -20 through -32 shall be subjected to 100,000 impulse cycles.
- g. There shall be no evidence of leakage or separation of the hose from the adapter.
- h. Impulse testing of sizes -40 and -48 is not required.

4.8.6.1 Hydraulic impulse hose failure. The hose should not fail, especially away from the adapter, if this type of failure does occur the adapter shall not be considered to have failed. In cases of failure of this type, the adapter shall be removed from the end of the hose closest to the break. The defective end of the hose shall be removed and the adapter replaced on the longer remaining piece of hose. The testing of the adapter may then proceed, even if this requires the hose to remain straight, until the required number of impulses is obtained.

4.8.7 Torque (see 3.5.6). The adapters of a hose assembly shall be subjected to repeated torque testing as specified in SAE ARP908 and shall meet the requirements of 3.5.6. The following details shall apply:

- a. The torque values used shall be those specified in SAE ARP908 as applicable for the material used.
- b. There shall be no evidence of failure of the adapter assembly, or failure of the swivel nut to remain free enough to permit turning on the nipple by hand.
- c. The hose assembly shall then be subjected to the hydraulic proof pressure (see 4.8.2) specified in [table III](#) for a minimum of 5 minutes.

4.8.8 Low operating temperature (see 3.5.7). Hose assemblies subjected to low operating temperature shall meet the requirements of 3.5.7. The following details shall apply:

- a. Two hose assemblies shall be filled with hydraulic fluid conforming to MIL-PRF-5606, MIL-PRF-87257 or MIL-PRF-83282 and shall be placed in a cold test chamber.
- b. The temperature shall be lowered to -65°F ±5°F (-53.89°C ±2.78°C) and held for 24 hours.
- c. The hose assemblies shall be subjected to the proof pressure test, see 4.9.2, immediately after removal from the cold test chamber.

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4.8.9 Fuel immersion (see 3.5.8). Hose assemblies subjected to fuel immersion shall meet the requirements of 3.5.8. The following details shall apply:

- a. A hose assembly having a minimum of 9 inches (22.86 cm) of free hose between the adapters shall be immersed in fluid conforming to ASTM D471, ASTM reference fuel B, for 72 hours at room temperature.
- b. Upon completion of this period, the hose assembly shall be removed from the fluid and immediately subjected to a static pressure for 5 minutes at the proof pressure, see 4.8.2, specified for fuel in table III.
- c. There shall be no evidence of leakage of the adapter or adapter-to-hose interface.

4.8.10 Lubricating oil circulation (see 3.5.9). A hose assembly subjected to lubricating oil circulation testing shall meet the requirements of 3.5.9. The following details shall apply:

- a. The test fluid used for this test shall be SAE J1966, grade 50; or hydraulic fluid conforming to MIL-PRF-5606, MIL-PRF-87257 or MIL-PRF-83282.
- b. Hose assemblies smaller than size -24 shall have 9 inches (22.86 cm) of free-length hose between adapters. Hose assemblies of size -24 and larger, the ratio of free length hose between adapters to the nominal hose size in inches shall be six to one.
- c. The following sequence of steps shall be performed:
  - (1) The hose assembly shall be filled with test fluid while at room temperature. The hose assembly shall remain filled for the total testing. The hose assembly shall be installed in a temperature-controlled box. The temperature of the ambient air shall be reduced to  $-40^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $-40^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$ ) and held for a minimum of 3 hours. Circulation of the fluid shall then be started at the specified operating pressure for oil in table III at a minimum flow rate of 3 gallons per minute. A 400-psi (27.58 bar) surge pressure shall be applied for the first 30 seconds of fluid circulation while the ambient temperature is at  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ).
  - (2) The temperature of the fluid shall then be increased within 1 hour to the specified circulation temperature of  $250^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $121.11^{\circ}\text{C} \pm 2.78^{\circ}\text{C}$ ). The ambient air temperature shall be increased to  $140^{\circ}\text{F} \pm 10^{\circ}\text{F}$  ( $60^{\circ}\text{C} \pm 5.56^{\circ}\text{C}$ ).
  - (3) Circulation shall be continued for a minimum of 20 hours. The temperature of the fluid shall be raised to  $325^{\circ}\text{F}$ ,  $+0$ ,  $-5^{\circ}\text{F}$  ( $162.78^{\circ}\text{C}$ ,  $+0$ ,  $-2.78^{\circ}\text{C}$ ) and held for 15 minutes during the last 30 minutes of each 20-hour cycle. The ambient air temperature shall be maintained at  $140^{\circ}\text{F} \pm 10^{\circ}\text{F}$  ( $60^{\circ}\text{C} \pm 5.56^{\circ}\text{C}$ ). Fluid circulation shall then be stopped.
- d. Steps (1), (2), and (3) shall be accomplished a total of 10 times to obtain a minimum of 200 hours fluid circulation.
- e. Upon completion of the above test sequence, the hose assembly shall be subjected to the proof pressure test (see 4.8.2) at the proof pressure specified for oil in table III and held for 5 minutes. There shall be no evidence of leakage of the adapter or adapter-to-hose interface.

4.8.11 Salt spray test (see 3.5.10). Fittings when subjected to salt spray testing shall meet the requirements of 3.5.10. Salt spray apparatus and solution shall be in accordance with ASTM B117.

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4.8.12 Reusability (see 3.5.11). Hose assemblies shall be subjected to reusability testing and shall meet the requirements of 3.5.11. The following details shall apply:

- a. A hose assembly used in qualification inspection (see table III) shall be disassembled following its required tests and reassembled using a new hose section.
- b. The reassembled hose assembly shall then be subjected to proof pressure (see 4.8.2), bulge testing (see 4.8.5), and burst pressure (see 4.8.4) in that sequence.

4.8.13 Verification of fitting plating thickness cadmium or zinc. Verification of under plating and finish plating shall be measured in accordance with ASTM B499, ASTM B567, or ASTM B568, a cross-sectioning method, such as that specified by ASTM B487 or ASTM B748, can also be used as a referee method to confirm the precision when thicknesses of 30 microinches (0.76  $\mu\text{m}$ ) or above are used. The zinc plating thickness may also be measured in accordance with ASTM B633 or ASTM B695 as applicable. The following details shall apply:

- a. When applicable a minimum of 3 points shall be measured on the fitting surface. Fitting may be rotated, but measurement points shall be progressively further from the last point. Readings shall not be averaged. Measurements shall be as follows:
  - (1) 1 measurement shall be taken at a point on the front radius and rear radius.
  - (2) 3 measurements shall be taken in the middle areas.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The reusable adapters covered by this specification are intended for use with hose conforming to MIL-DTL-8794 in fabricating flexible hose assemblies following such practices as in MIL-DTL-8795. The hose assemblies are intended for use in hydraulic, fuel, and oil lines. Flanged type fittings covered by MS27228, MS27230, and MS27232 are normally intended to be used only on fuel and oil lines. The adapters covered by this specification are militarily unique because of the systems operating in an environment from -65°F to +250°F (-53.89°C to +121.11°C) and must meet the 96 hour salt spray requirement. Commercial products are not manufactured to operate at these extreme temperatures and would experience catastrophic failure.

6.1.1 Oxygen hose. The adapters described in this specification are not intended for use on oxygen hoses.

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6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Applicable specification sheet number, title, and date.
- c. Applicable specification sheet PIN.
- d. Packaging requirements (see 5.1.)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No.5070 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, P.O. Box 3990, ATTN: DSCC-VQ, Columbus, Ohio 43218-3990 or emailed to [vqp.chief@dla.mil](mailto:vqp.chief@dla.mil).

6.3.1 Provisions governing qualification (SD-6). Copies of "Provisions Governing Qualification" are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.

6.4 Environmentally preferable materials. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table XI lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

TABLE XI. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and compounds	Lead and compounds	Toluene
Carbon Tetrachloride	Mercury and compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl Keytone	Trichloroethylene
Chromium and compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and compounds	Nickel and compounds	

6.5 Guidance on use of alternative parts with less hazardous or non-hazardous 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.

6.6 Subject term (key word) listing.

Assembly  
Cadmium  
Fitting  
Fluid connector  
Nipple  
Socket  
Zinc

6.7 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.

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APPENDIX A

A.1 SCOPE

A.1.1 Scope. This appendix details the test gages to be used for adapter hose assemblies and defines the inspection characteristics for various tube configurations. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

A.2. APPLICABLE DOCUMENTS

A.2.1 General. The documents listed in this section are specified in this appendix of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in this appendix of this specification, whether or not they are listed.

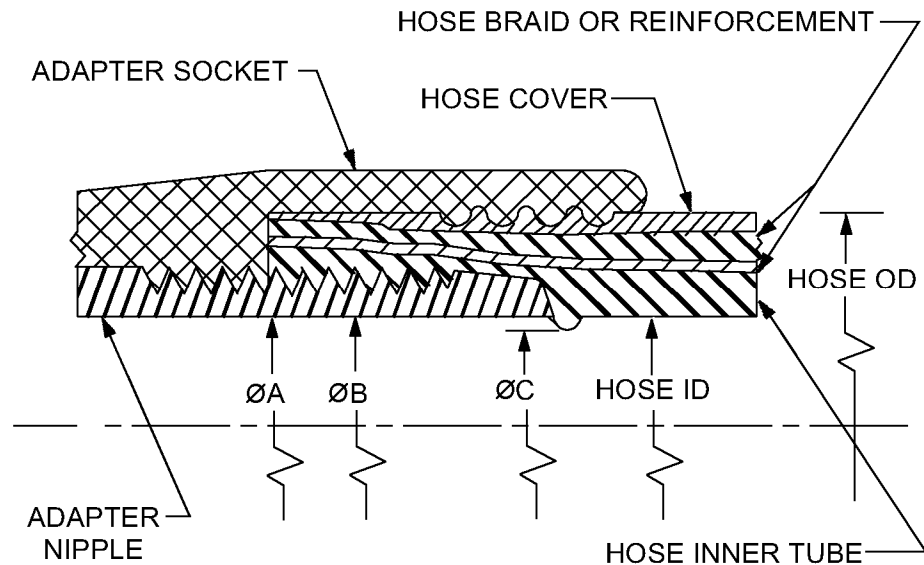
A.2.2 Government documents.

DEPARTMENT OF DEFENSE STANDARDS

MS24590	-	Socket, Adapter, Hose To Tube, Reusable, Hydraulic, Fuel and Oil Lines, 3/16 Through 3/4 Inch Tubing Size
MS24591	-	Socket, Adapter, Hose To Tube, Reusable, Hydraulic , Fuel and OIL Lines, 1 Through 2 Inches Tubing Size
MS27234	-	Elbow, Tube, 90° Used on MS27224 and MS27228 Hose to Tube Adapters
MS27235	-	Elbow, Tube, 45°, Used On MS27226 and MS27230 Hose to Tube Adapters
MS27236	-	Shoulder - Designed For 45° and 90°. Swivel Nut Hose To Tube Adapters, Reusable, Hydraulic, Fuel and Oil Lines
MS27237	-	Shoulder, Swivel Flange, Adapter, Hose To Tube, Hydraulic Fuel and Oil Lines, 1/2 through 3 IN. Tubing Sizes
MS27238	-	Wire, Nut Retaining, Designed For Adapter, Hose To Tube, Reusable, Hydraulic, Fuel and Oil Lines

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

A.2.3 Order of precedence. In the event of a conflict between the text of this appendix and the references cited herein, the text of this appendix shall take precedence.

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Adapter size number	Hose size number	A diameter (reference) (mm)	B <sup>1/</sup> diameter +.005, -.000 (+0.13 mm)	C <sup>2/</sup> diameter minimum (mm)
-3	-3	.123 (3.12)	.123 (3.12)	.080 (2.03)
-4	-4	.157 (3.99)	.170 (4.32)	.132 (3.35)
-5	-5	.219 (5.56)	.232 (5.89)	.200 (5.08)
-6	-6	.281 (7.14)	.295 (7.49)	.260 (6.60)
-8	-8	.383 (9.73)	.390 (9.91)	.350 (8.89)
-10	-10	.469 (11.91)	.484 (12.29)	.450 (11.43)
-12	-12	.578 (14.68)	.608 (15.44)	.575 (14.61)
-16	-16	.781 (19.84)	.813 (20.65)	.781 (19.84)
-20	-20	1.031 (26.19)	1.045 (26.54)	1.015 (25.78)
-24	-24	1.276 (32.41)	1.279 (32.49)	1.250 (31.75)
-32	-32	1.745 (44.32)	1.748 (44.40)	1.719 (43.66)
-40	-40	2.209 (56.11)	N/A	2.178 (55.32)
-48	-48	2.834 (71.98)	N/A	2.803 (71.20)

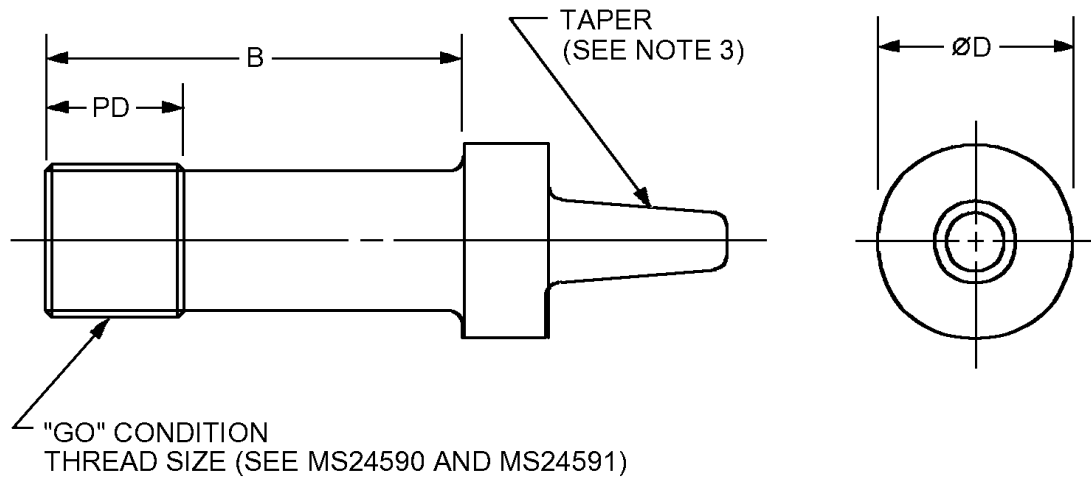
<sup>1/</sup> B diameter is applicable to an adapter that requires a mandrel for assembling adapters to the hose.

<sup>2/</sup> C diameter indicates maximum permissible bulge of inner tube when hose is assembled with adapters.

## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are for information only.

FIGURE A-1. Minimum diameters of hose inner tube when adapters are assembled with hose conforming to MIL-DTL-8794.

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Size of socket to be inspected: <u>1/</u>	B ±.015 (0.38 mm)	D +.0002 -.0000 (+0.005 mm)	PD <u>2/</u>
MS24591-3	.844 (21.44)	.4853 (12.327)	.2141 (5.438)
MS24591-4	.938 (23.83)	.5453 (13.851)	.2607 (6.622)
MS24591-5	1.000 (25.40)	.6253 (15.883)	.3418 (8.682)
MS24591-6	1.094 (27.79)	.7153 (18.169)	.3978 (10.104)
MS24591-8	1.500 (38.10)	.8053 (20.4545)	.5354 (13.599)
MS24591-10	1.625 (41.28)	.9853 (25.0266)	.6604 (16.774)
MS24591-12	1.969 (50.01)	1.1453 (29.091)	.7800 (19.812)
MS24590-16	1.625 (41.28)	1.2753 (32.393)	1.0264 (26.071)
MS24590-20	1.625 (41.28)	1.5403 (39.124)	1.2764 (32.421)

1/ This gage need not be used with sizes -24 and larger.

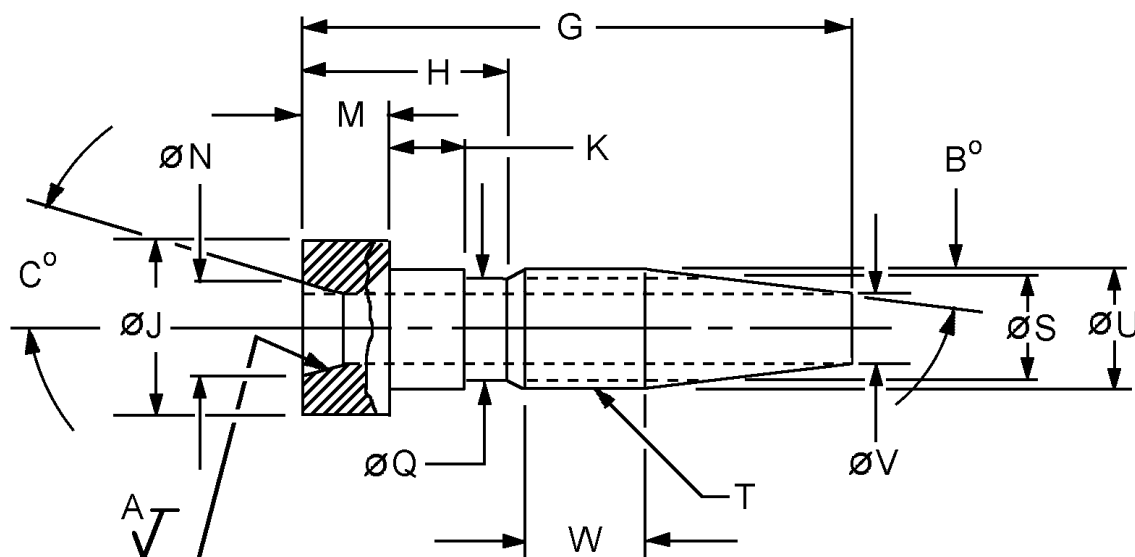
2/ PD is the depth of thread engagement for a "Go" condition.

## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are for information only.
3. All tapers are .250 inch in 12 inches ±.0001/in (6.35 mm in 30.48 cm ±0.003 mm).

FIGURE A-2. Socket concentricity gage.

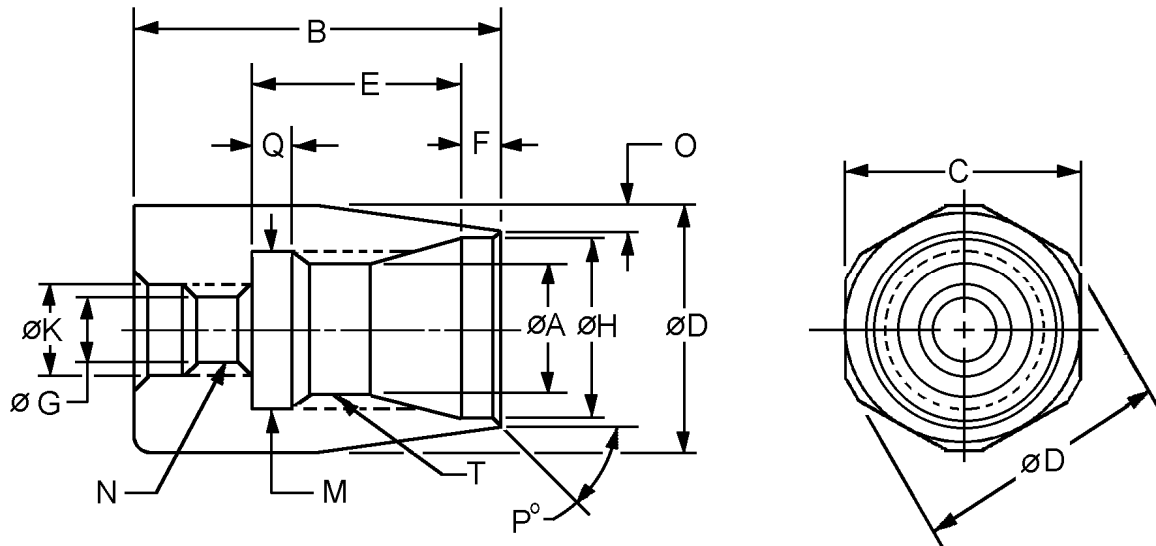


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- A - Cone seat surface finish
- B - Nose angle
- C - Cone seat angle
- G - Overall length
- H - Length from cone seat end to thread
- J - Nipple head OD
- K - Width of thread relief
- M - Width of nipple head
- N - Cone seat diameter
- Q - Thread relief OD
- S - Nose gage point (thread ID)
- T - Thread size
- U - Thread OD
- V - Through ID
- W - Minimum thread length

FIGURE A-3. Inspection characteristics for nipples.

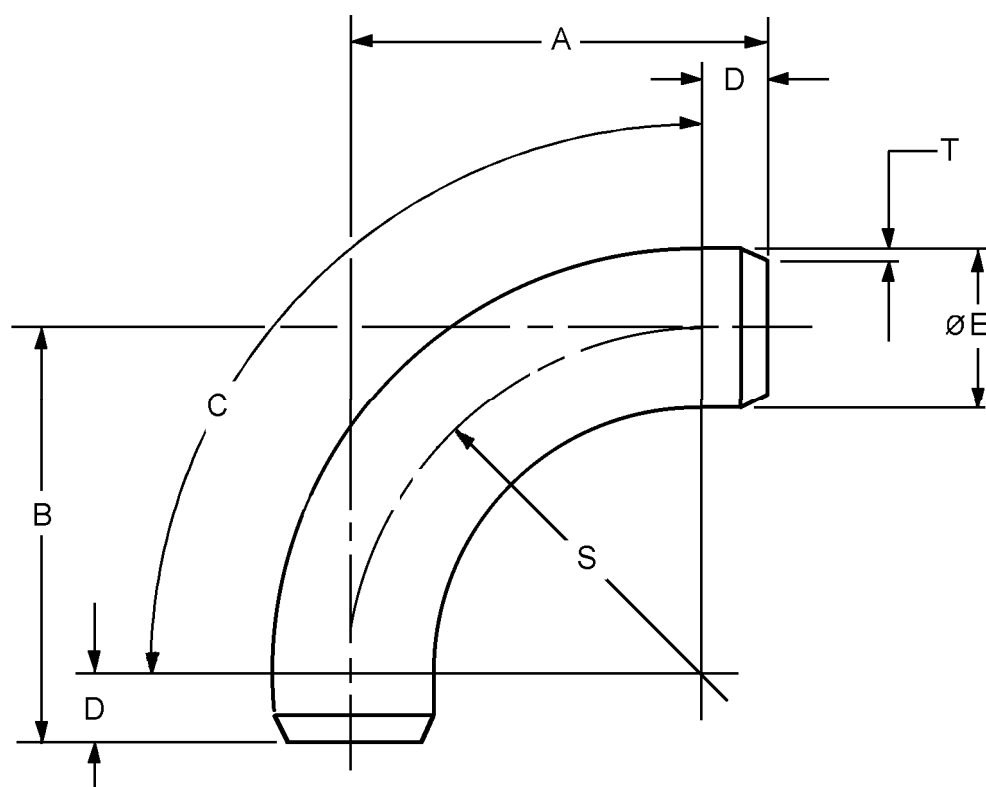
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- A - Left-hand thread ID
- B - Overall length
- C - Hex size
- D - Machined OD of hex
- E - Location of recess
- F - Counterbore depth
- G - Right-hand thread ID
- H - Skirt ID
- K - Counterbore ID
- M - Recess diameter
- N - Right-hand thread size
- O - Linear difference of OD taper angle
- P - Internal taper angle at hose end
- Q - Width of recess
- T - Left-hand thread size and form

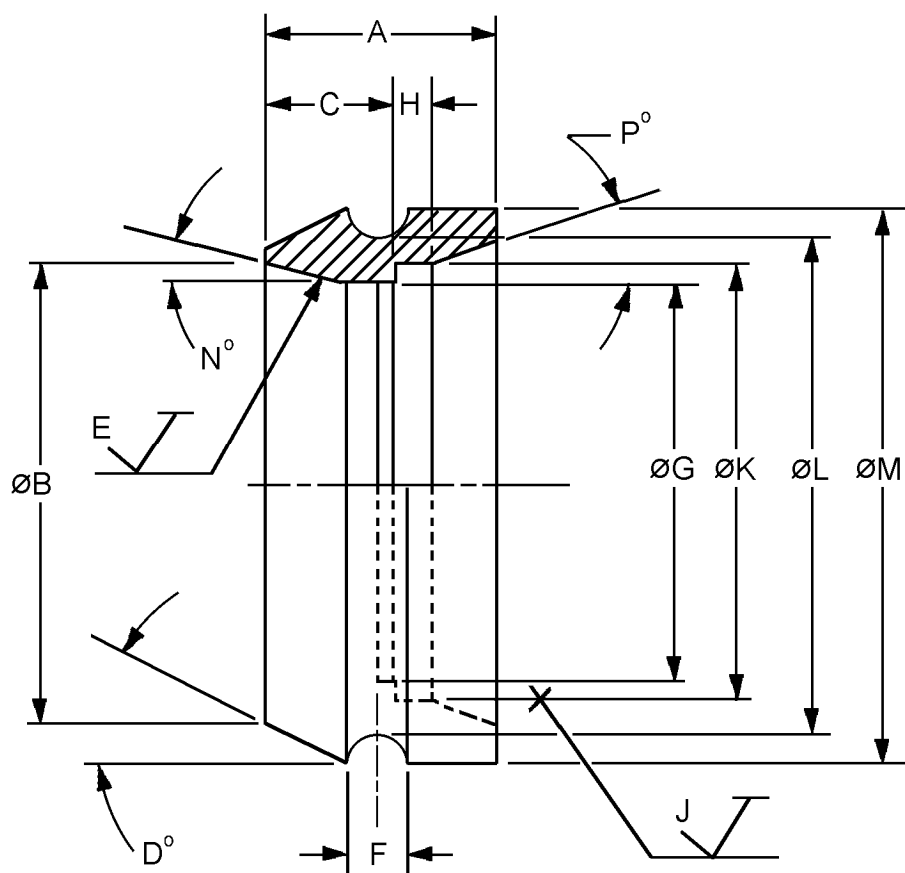
FIGURE A-4. Inspection characteristics for sockets.

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- A - Length of leg
- B - Length of leg
- C - Degree of bend
- D - Length of straight portion (both ends)
- E - OD of tube
- S - Radius of bend
- T - Wall thickness

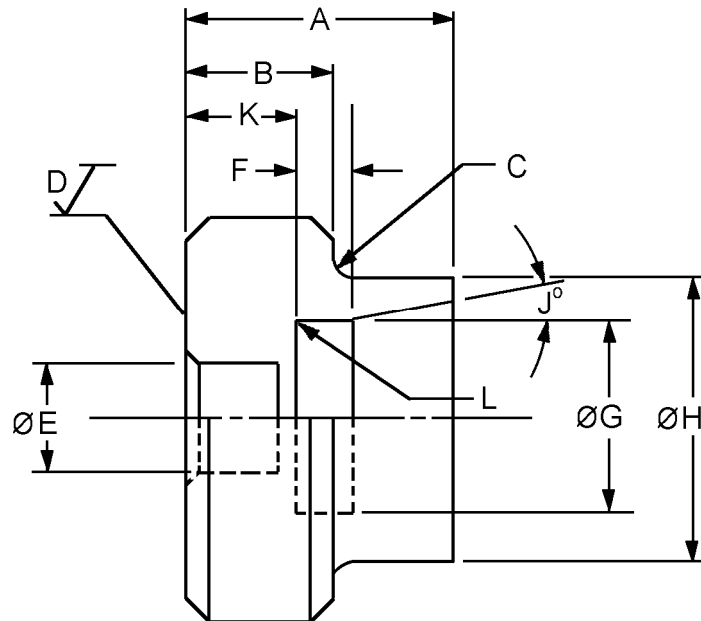
FIGURE A-5. Inspection characteristics for MS27234 and MS27235 tubes.

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- A - Overall length
- B - Maximum ID at cone seat
- C - Depth of shoulder extending from end of tube
- D - Relief angle
- E - Seat surface
- F - Width of wire relief
- G - Minimum ID
- H - Tube support length
- J - Surface finish for K ID
- K - Tube accommodating ID
- L - Wire relief groove ID
- M - Outside diameter
- N - Seat angle
- P - Brazing accommodation angle

FIGURE A-6. Inspection characteristics for MS27236 shoulder.

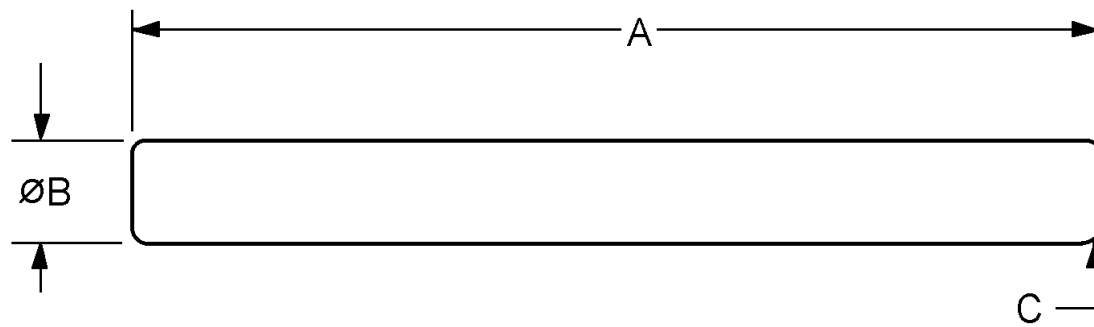
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- A - Overall length
- B - Flange shoulder height
- C - Radius
- D - Surface finish
- E - Inside diameter
- F - Tube support length
- G - Diameter for OD of tube
- H - OD of shank portion
- J - Brazing accommodation angle
- K - Depth of ID E
- L - Inside radius

FIGURE A-7. Inspection characteristics for MS27237 shoulder.

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- A - Wire length
- B - Wire diameter
- C - Radius

FIGURE A-8. Inspection characteristics for MS27238 wire.

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CONCLUDING MATERIAL

Custodians:

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

Preparing activity:

DLA - CC

(Project 4730-2005-036)

Review activities:

Army - AT, MI  
Navy - CG, MC, SA  
Air Force - 11, 71

Industry associations:

SAE G3

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.daps.dla.mil>.