

MIL-F-5509D  
 16 June 1978  
~~SUPERSEDING~~  
 MIL-L-5509C  
 14 August 1973

## MILITARY SPECIFICATION

### FITTINGS, FLARED TUBE, FLUID CONNECTION

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

#### 1. SCOPE

1.1 Scope. This specification establishes the requirements for flared tube, pipe threaded, and beaded type fluid connection fittings for use in all types of fluid systems. (See 6.1).

1.2 Classification. Fittings shall be furnished in the types and styles designated by the applicable AN, MS, or other engineering standard drawings approved by the procuring activity. (See 6.2).

#### 2. APPLICABLE DOCUMENTS

- \* 2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### Federal

P-C-437	Cleaning Compound, High Pressure (Steam) Cleaner
NN-P-530	Plywood, Flat Panel
QQ-A-225/4	Aluminum Alloy Bar, Rod, Wire And Special Shapes; Rolled, Drawn, Or Cold Finished, 2014
QQ-A-225/6	Aluminum Alloy Bar, Rod, And Wire; Rolled, Drawn, Or Cold Finished, 2024
QQ-A-225/9	Aluminum Alloy Bar, Rod, Wire, And Special Shapes; Rolled, Drawn, Or Cold Finished, 7075
QQ-A-367	Aluminum Alloy Forgings

Beneficial Comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: HQ AFLC CASO/LODS, Federal Center, Battle Creek MI 49016 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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## Federal (Continued)

QQ-B-626	Brass, Leaded And Nonleaded: Rod, Shapes, Forgings, And Flat Products With Finished Edges (Bar And Strip)
QQ-B-728	Bronze Manganese; Rod, Shapes, Forgings, And Flat Products (Flat Wire, Strip, Sheet, Bar, And Plate)
QQ-P-35	Passivation Treatments For Corrosion Resisting Steel
QQ-P-416	Plating, Cadmium (Electro-deposited)
QQ-S-637	Steel Bar, Carbon, Cold Finished (Standard Quality, Free Machining)
QQ-S-763	Steel Bars, Wire, Shapes, And Forgings, Corrosion-Resisting
PPP-B-566	Boxes, Folding, Paperboard
PPP-B-585	Boxes, Wood, Wirebound
PPP-B-591	Boxes, Fiberboard, Wood-Cleated
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed And Lock-Corner
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-B-665	Boxes, Paperboard, Metal Stayed (Including Stay Material)
PPP-B-676	Boxes, Set-Up, Paperboard
PPP-C-96	Cans, Metal, 28 Gauge And Lighter

## Military

MIL-P-116	Preservation-Packaging, Methods Of Paper, Wrapping, Laminated And Creped
MIL-P-130	
MIL-S-5002	Surface Treatments And Inorganic Coatings For Metal Surfaces Of Weapons Systems
MIL-T-5066	Tubing, Carbon Steel (1025), Seamless And Welded (Aircraft Quality)
MIL-H-5440	Hydraulic Systems, Aircraft, Types I And II, Design And Installation Requirements For
MIL-P-5518	Pneumatic Systems, Aircraft; Design, Installation, And Data Requirements For
MIL-S-5626	Steel: Chrome Molybdenum (4140) Bars, Rods, And Forging Stock (For Aircraft Applications)
MIL-H-6083	Hydraulic Fluid, Petroleum Base, For Preservation And Operation
MIL-H-6088	Heat Treatment Of Aluminum Alloys
MIL-T-6736	Tubing, Chrome-Molybdenum, 4130 Steel, Seamless And Welded, Aircraft Quality

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## Military (Continued)

MIL-S-6758	Steel, Chrome-Molybdenum (4130) Bars And Reforging Stock (Aircraft Quality)
MIL-H-6875	Heat Treatment Of Steels (Aerospace Practice, Process For)
MIL-P-7105	Pipe Threads, Taper, Aeronautical National Form, Symbol ANPT, General Requirements For
MIL-A-8625	Anodic Coatings, For Aluminum And Aluminum Alloys
MIL-S-8879	Screw Threads, Controlled Radius Root With Increased Minor Diameter: General Specification For
MIL-L-10547	Liners, Case, And Sheet, Overwrap; Water-Vaporproof Or Waterproof, Flexible
MIL-B-13239	Barrier Material, Waterproofed, Flexible, All Temperatures, Heat Sealable
MIL-P-17667	Paper, Wrapping, Chemically Neutral (Non_Corrosive)

## STANDARDS

## Federal

PED-STD-66	Steel: Chemical Composition And Hardenability
PED-STD-151	Metals; Test Methods

## Military

MIL-STD-105	Sampling Procedures And Tables For Inspection By Attributes
MIL-STD-129	Marking For Shipment And Storage
MIL-STD-889	Dissimilar Metals
MS24385	Fitting End, Flared Tube Connection, Precision Type, Standard Dimensions
MS24386	Fitting End, Bulkhead Flared Tube Connection, Precision Type, Standard Dimensions
MS33649	Bosses, Fluid Connection-Internal Straight Thread
MS33656	Fitting End, Standard Dimensions For Flared Tube Connection And Gasket Seal
MS33657	Fitting End, Standard Dimensions For Bulkhead Flared Tube Connection
MS33658	Fitting End, Hose Connection, Standard Dimensions For

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Military (Continued)

MS33677                      Fitting End, Taper Pipe Thread,  
Standard Dimensions For

(For additional applicable MS and AN standards for fittings covered by this specification, see Supplement 1.)

PUBLICATIONS

Air Force - Navy Aeronautical Bulletin

ANA431                      AN Fittings, Classification of,  
Defects of

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from procuring activity or as directed by the contracting officer.)

- 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago IL 60606.)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

ANSI B46.1                      Surface Texture - Surface Roughness,  
Waviness, and Lay

(Copies of the above publication may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York NY 10018.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC.

AMS 2241                      Tolerances, Corrosion And Heat  
Resistant Steel Bars And Wire And  
Titanium And Titanium Alloy Bars  
And Wire  
AMS 2486                      Conversion Coating of Titanium  
Alloys, Fluoride Phosphate Type  
AMS 4928                      Titanium Alloy Bars And Forgings,  
6AL-4V, Annealed, 120,000 PSI (827  
MPa) Yield

(Copies of the above publications may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale PA 15096.)

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### 3. REQUIREMENTS

3.1 Material. Fittings shall be fabricated of materials listed in Table I, as specified on the applicable drawings.

3.1.1 Steel. All steel shall be made by the basic oxygen open hearth or electric furnace process.

3.1.2 Heat treatment.

3.1.2.1 Aluminum alloy. Aluminum alloy fittings and nuts shall be supplied in the final temper as shown in Table II. When fitting material is purchased in other than the final temper, the desired temper is attained by aging the starting temper as shown in Table II at the specified temperature for the prescribed time. Except for aging time and temperature, process control shall be in accordance with MIL-H-6088.

3.1.2.2 Steel. When required, steel shall be heat treated in accordance with MIL-H-6875.

3.1.3 Internal strain of copper-base alloys. Fittings fabricated from copper-base alloys shall have no internal strain as revealed by the test specified in 4.4.3.

3.1.4 Physical properties. Unless otherwise specified on the applicable drawings, the hardness of the finished carbon steel parts with plating removed shall be Rockwell B-92 to C-31. For carbon steel fittings below a hardness of Rockwell C-20, hardness tests shall be made using the Rockwell B scale, in which case the hardness shall be within the range of B-92 to B-99. Physical properties of copper-base alloy forgings shall be governed by the properties of the material as received. Titanium alloy parts shall be free of oxygen enriched surfaces.

3.1.5 Except when specifically allowed on the applicable drawings, no castings of any type shall be used.

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Type of part	Material	Form	Specification
Straights	Aluminum alloy	Bars, shapes, and rods	QQ-A-225/4 (2014) Temper T6 QQ-A-225/6 (2024) --- Temper T6 or T851 QQ-A-225/9 (7075) Temper T73
Shapes		Forgings	QQ-A-367 (2014) Temper T6 QQ-A-367 (7075) Temper T73
Straights and shapes	Copper-base	Bars, rods, and forgings	1/ QQ-B-726 Half hard
Straights		Bars and rods	QQ-B-626 Composition 22 Half hard
Shapes		Forgings	QQ-B-626 Composition 21
Straights	Steel	Tubing, seamless	MIL-T-6736 (4130)
		Tubing, seamless	MIL-T-5066 (C-1025)
Straights and shapes	Steel	Bars, rods, and forgings	QQ-S-637 (C-1137) QQ-S-637 (C-1141) MIL-S-6758 (4130) MIL-S-5626 (4140)
Straights and shapes	Corrosion-resisting and heat-resisting steels	Bars, rods, and forgings	2/ QQ-S-753 Class 304, 316, or 347
Straights and shapes	Titanium alloy	Bars, rods, and forgings	3/ AMS 4028 (6AL-4V annealed)

- 1/ With bronze forgings, a soft temper will be permitted in the finished part.  
 2/ These alloys shall conform to FED-STD-66.  
 3/ Titanium hex bars shall be cold finished with tolerances per AMS 2241.

Material	Starting temper	Time (hrs)	Temperature (°F)	Final temper
QQ-A-225/4 (2014)	T4	8 to 12	340 to 360	T6
QQ-A-367 (2014)	T4	8 to 12	340 to 360	T6
QQ-S-225/6 (2024)	T42	16 to 20	370 to 380	T62
QQ-A-225/6 (2024)	T351	12 to 14	370 to 380	T851
QQ-A-225/9 (7075)	---	-----	-----	T73

3.2 Design and dimensions. The design and dimensions of the fittings shall be in accordance with the applicable drawings. The bosses and tube and hose ends of fittings shall be in accordance with MS24385, MS24386, MS33649, MS33656, MS33657, MS33658, or MS33677, as applicable. Dimensional requirements are applicable after heat treatment and protective finishing.

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3.2.1 Shape and form restrictions. Abrupt reductions of section shall be avoided. Small external sections adjoining relatively heavy body sections shall be shaded into the heavier sections by means of ample fillets. Sharp corners or inadequate fillets, excessive undercuts, or excessive grooves at the junction of such small sections with large sections of fittings shall be considered cause for rejection. Unless otherwise specified, drawing tolerances shall apply to fillet and corner radii.

### 3.2.2 Passages.

3.2.2.1 Drill offset. On straight fittings where the fluid passage is drilled from each end, the offset between the drilled holes at the meeting point of the drills shall not exceed 0.015 inch. It shall be possible to pass through the fluid passage a ball whose diameter is 0.020 less than the minimum diameter specified for the passage. This does not mean that the drilled passage may be smaller than that required by the detail drawings.

3.2.2.2 On angle fittings, the cross-sectional area at the junction of the fluid passages shall be not smaller than the cross-sectional area of the smaller passage.

3.2.2.3 Wall thickness. Except as otherwise specified, the wall thickness at any point on the fitting shall be not less than the thickness established by the dimensions and tolerances for the inside and outside diameters and eccentricities specified in the applicable drawings.

3.2.3 Threads. Pipe threads shall conform to MIL-P-7105. Straight threads shall be of unified form and shall conform to MIL-S-8879, except as specified herein. Threads may be cut, ground, or rolled.

3.2.3.1 External threads (if rolled). The grain flows in rolled threads shall be continuous and shall follow the general thread contour, with the maximum density at the thread root as shown on Figure I. Laps and seams, whose depths are within the limits of Table III, are acceptable on the crest, and the nonpressure thread flank above the pitch diameter. Laps and seams are not acceptable on any part of the pressure thread flank, in the thread root, or on the nonpressure thread flank extending from above to below the pitch diameter. Stress cracks are unacceptable.

### 3.3 Finish.

3.3.1 Aluminum alloy fittings. Aluminum alloy fittings, sleeves, and nuts shall be anodized in accordance with MIL-A-8625, Type II, Class 2. Duplex sealing with a sodium dichromate solution to enhance corrosion resistance may be specified on the applicable drawings.

3.3.1.1 Surface condition. The surface of aluminum alloy parts, after anodic and dichromate treatment, shall be free from pits and discontinuities such as scratches or breaks, and shall be uniform in appearance. Discoloration will not be cause for rejection.

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TABLE III

Depth of Laps, Seams, Surface Irregularities,  
and Discontinuities in Rolled Threads

Fitting Size	Depth (inch) (max)
-2	0.006
-3	.006
-4	.007
-5	.007
-6	.008
-8	.009
-10 thru -32	.010

3.3.2 Carbon steel fittings. Carbon steel fittings, sleeves, and nuts, shall be cadmium plated in accordance with QQ-P-416, Type II, Class 2. All carbon steel fittings, nuts and sleeves shall be in accordance with MIL-H-6083.

steel fittings, nuts, and sleeves shall be in accordance with MIL-S-5002. Passivation shall be per QQ-P-35, Type I.

3.3.4 Copper-base alloy fittings. Plating of copper-base alloy fittings in accordance with QQ-P-416, Type II, Class 3 is optional. Specific finish requirements for this material shall be as specified by the procuring activity (see 6.2).

- 3.3.5 Titanium alloy fittings. Titanium alloy fittings and nuts shall be fluoride phosphate coated per AMS 2486.

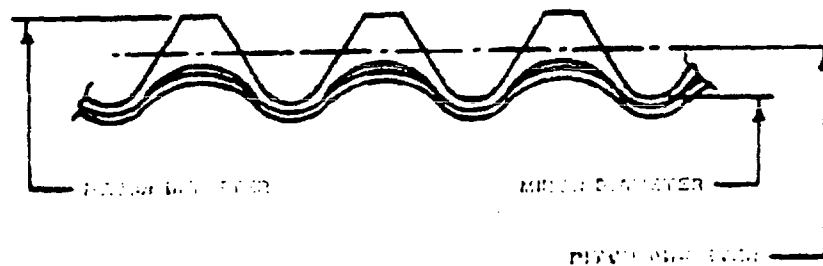


FIGURE 1. THREAD PROFILE



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3.4 Identification of product. All fittings, nuts, and sleeves shall be marked in accordance with the following instructions. The marking shall be applied in a location not detrimental to the fitting and shall not be detrimental to the corrosion protection of the fitting.

- 3.4.1 AN or MS symbol, manufacturer's trademark. Unless otherwise specified, all fittings and nuts shall be marked with the letters AN or MS and the manufacturer's identification or trademark. Sleeves must be trademarked. Letters AN or MS on sleeve are optional.
- 3.4.2 Material identification. Corrosion-resistant steel fittings, nuts, and sleeves shall be marked with the letter "J" if made from Class 304, the letter "K" if made from Class 316, or the letter "S" if made from Class 347 corrosion-resistant steel. All 7075-T73 aluminum alloy parts shall be marked with the letter "W." The letter "D" on all other aluminum alloy parts is optional. All titanium alloy parts shall be marked with the letter "T."
- 3.4.3 Marking for part number size. A numerical equivalent to the dash number indicating size is optional. All fittings and nuts larger than 3/8-inch tube size (except AN929) shall be marked with the part number, exclusive of size. AN929 fittings may have the nut marked AN818. Marking of part number on sleeves is optional.
- 3.4.4 Size, method, and location of marking. Marking shall be accomplished by embossing or impression stamping on the fitting, nut, or sleeve in a location not detrimental to the part or its corrosion protection. When items cannot be physically marked because of lack of space or because marking would have a deleterious effect, the data specified herein shall be marked on the container in addition to the identification marking information required by MIL-STD-129.
- 3.4.5 Color identification. In addition to the markings specified in 3.4.1, 3.4.2, 3.4.3, and 3.4.4, the AN and MS fittings, nuts, and sleeves shall be identified by the following colors:

Aluminum alloy 2014 and 2024	- Blue
7075	- Brown
Steel	- Black
Copper-base alloys	- Natural cadmium plate, if applicable
Corrosion-resistant steel	- None
Titanium alloy	- Gray (result of fluoride phosphate coating)

3.5 Weight. The maximum weight of fittings shall not exceed the values on the applicable drawings.

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3.6 Workmanship. Machine surfaces of fittings, sleeves, and nuts shall be free from burrs and longitudinal or spiral tool marks. Unless a finer finish is specified on applicable drawings, sealing surfaces shall be smooth, except that annular tool marks up to 100 microinches arithmetical average (AA), as defined in ANSI B46.1, will be acceptable. All other machined surfaces shall not exceed 125 AA. Unmachined surfaces, such as forging surfaces and bar stock flats, shall be free from blisters, fins, folds, seams, laps, cracks, segregations, spongy areas, or other defects which would adversely affect their serviceability, and except for forging parting lines, shall not exceed 250 AA. Surface defects may be explored and if they can be removed so they do not appear on re-etching and the required section thickness can be maintained, they shall not be cause for rejection.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

#### 4.2 Sampling.

4.2.1 Sampling for nondestructive tests. Sampling for material, threads, finish, weight, dimensions, marking, surface defects, durability of finish, and workmanship shall be at random in accordance with MIL-STD-105, Inspection Level S-3 with an AQL of 4.0 percent, unless otherwise specified in ANA Bulletin No. 431.

\* 4.2.2 Sampling for destructive tests. Sampling for tensile strength (4.4.2), internal strain of copper-base alloys (4.4.3), and expansion test of carbon steel sleeves (4.4.4) shall be performed in accordance with MIL-STD-105, Inspection Level S-3, with an AQL of 4.0 percent. Sampling for oxygen enriched surfaces (4.4.6) shall be performed in accordance with MIL-STD-105, Inspection Level S-1, with an AQL of 4.0 percent.

4.2.3 Lot. A lot shall consist of all the fittings of a given part number, made from the same batch of material, and submitted for inspection at the same time.

4.2.4 Material certification. Records of chemical composition, analysis and mechanical property tests showing conformance to the material requirements of this specification shall be available to the Government Inspection for each lot of fittings.

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4.3 Examination of product. All fittings shall be carefully examined visually to determine conformance to the requirements for workmanship, finish, marking, and surface defects (see 3.2.3, 3.3, 3.4, 3.4.1, 3.4.2, 3.4.3, and 3.6).

4.3.1 Weight, threads, finish and dimensions. The fittings shall be checked for conformance to this specification and the applicable drawing with respect to weight, threads, finish, and dimensions. Classification of defects is defined in ANA Bulletin No. 431.

4.4 Tests.

4.4.1 Weight and dimensions. Conformance of the fittings to the weight and dimensional requirements of the applicable drawing shall be determined by any suitable method.

4.4.2 Tensile strength of steel fittings. Unless otherwise specified on the applicable drawings, the tensile strength of steel fittings shall be determined by hardness tests of the fittings. Rockwell hardness readings shall be taken on a smooth flat surface of any unthreaded portion of the fitting from which the plating has been removed. Hardness-tensile strength relationships are specified in FED-STD-151.

4.4.3 Internal strain of copper-base alloys. Fittings fabricated from copper-base alloys, as specified herein, shall be immersed in an aqueous solution containing 100 grams of mercurous nitrate and 13 milliliters nitric acid (sp.gr. 1.43) per liter. After 15 minutes, the specimen shall be removed and examined for cracks. Any evidence of cracks indicates internal strain and shall be cause for rejection.

4.4.4 Expansion test of carbon steel sleeves. Sleeves shall be selected as required by 4.2 and submitted to an expansion test. The test shall be performed with a tapered arbor and a holding device as shown in Figure 2. The arbor shall be loaded as required by the values given in Table IV. The head of the sleeve shall be expanded by the load applied through the tapered arbor. The maximum expansion of the outside diameter shall be measured with the load applied. This measurement shall be taken in at least two places 90 degrees apart on the diameter. This average measurement shall be recorded and compared with the minor diameter of the threads of the nut (AN818). The average expanded diameter shall not exceed the minimum minor diameter of the threads. This test is in addition to and does not supplant the required dimensional inspection of carbon steel sleeves, which shall be conducted prior to the expansion test.

4.4.5 Durability of finish. Dyed fittings shall withstand immersion in a cleaning solution containing 5 to 6 ounces of a cleaner conforming to P-C-43 per gallon of solution at a temperature of 160° to 170° Fahrenheit (F) for 5 minutes. The color shall not rub off when wiped lightly with a clean cloth.

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- 4.4.6 Oxygen enriched surfaces on titanium fittings. Titanium alloy parts with unmachined hex, round, or forged surfaces shall be selected as required by 4.2; samples shall be sectioned, mounted, polished, suitably etched, and examined at 100X magnification for evidence of oxygen enriched surfaces.

TABLE IV

Load Values for Standard MS20819  
Equivalent Carbon Steel Sleeves

Size - Load in pounds (plus or minus 10 pounds)			
-2	1,700	-8	4,200
-3	2,200	-10	4,100
-4	1,950	-12	7,400
-5	1,950	-16	8,400
-6	2,050	-20	11,700
		-24	15,350
		-28	16,950
		-32	18,700

- 4.5 Rejection and retest. Rejected lots shall be resubmitted for retest and acceptance in accordance with MIL-STD-105. Those fittings subjected to individual examination other than tests (see 4.3) and failing to meet the requirements shall be rejected. Copper-base alloy fittings that have been subjected to the internal strain test (4.4.3) and steel fittings which have been subjected to the hardness test (4.4.2) shall be discarded, whether they pass the test or not.
- 4.6 Packaging inspection. Preservation-packaging, packing, and container marking shall be examined for conformance to Section 5. Sampling shall be performed in accordance with MIL-STD-105, Inspection Level S-3, with an AQL of 4.0 percent. Classification of defects shall be as shown in Table V.

TABLE V

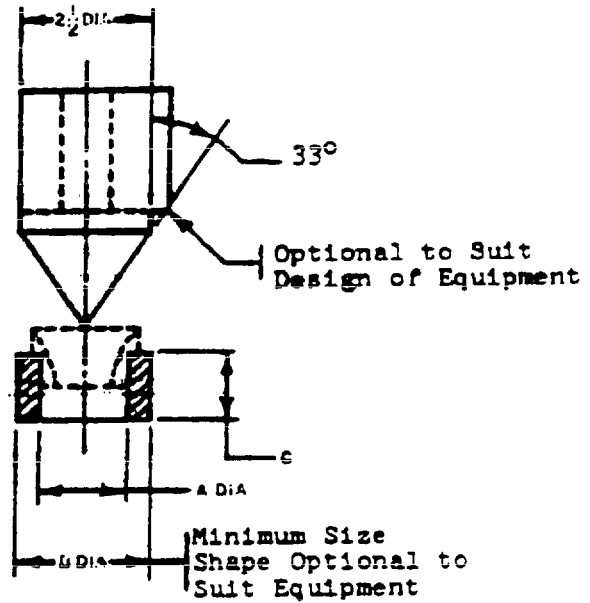
Classification of Defects for Packaging

Item	Defects
Exterior and interior markings	Missing, incorrect, incomplete, illegible, of improper size, location, sequence, or method of application
Materials	Any nonconforming component; component missing, damaged, or otherwise defective
Workmanship	Inadequate assembly of components
Exterior and interior weight or content	Number per container is more or less than stipulated; gross or net weight exceeds the requirement

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Arbor  
Suitable for Size  
1/8 through 2 Inches

Die  
Varying Sizes  
Per Chart



Dimensions in Inches

Size	A +.003 -.000 DIA	B DIA MIN	C MIN
2	.180	.75	.46
3	.242		.50
4	.305		.56
5	.374		.56
6	.440		.59
8	.570		1.25
10	.698	1.75	.34
12	.834		.68
16	1.089		.75
20	1.347	2.00	.84
24	1.617	2.25	1.01
28	1.890	3.00	1.00
32	2.167		1.01

Figure 2. Fixture for Testing Sleeves

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• 5. PACKAGING

• 5.1 Preservation-packaging. Preservation-packaging shall be level A or C, as specified (see 6.2).

• 5.1.1 Level A.

• 5.1.1.1 Fittings unit containers. All fittings, except nuts, sleeves, and caps, shall be unit packaged in accordance with Method IC-1 of MIL-P-116, except as modified herein. The quantity per unit package shall be one. After bagging, fittings greater than 3-1/2 inches in any dimension shall be individually over-packed in cartons conforming to PPP-B-566, PPP-B-636, PPP-B-665, or PPP-B-676. If it is necessary to wrap the fittings prior to inserting in bags to prevent damage, fittings shall be wrapped with barrier materials conforming to MIL-P-130 or MIL-P-17667.

• 5.1.1.1.1 Alternate unit protection. Five fittings of one type and size, up to and including 1-1/2 inches in any dimension, shall be packaged in perforated tear-apart cartons in accordance with Method III of MIL-P-116. Each carton shall have interior separations capable of supporting and separating each individual fitting in such a manner as to prevent movement or contact of the fittings with each other. All surfaces of the carton coming in direct contact with the item shall be coated with a neutral barrier capable of withstanding slight abrasion. Fittings over 1-1/2 inches shall be packaged individually in accordance with 5.1.1.1.

• 5.1.1.1.2 Fittings intermediate containers. Unit packages shall be packaged in intermediate containers conforming to PPP-B-566, PPP-B-636, PPP-B-665, or PPP-B-676. The quantity of unit packages per intermediate container shall be as specified in Table VI, except that intermediate containers are not required for fittings individually packed in unit cartons in accordance with 5.1.1.1.

TABLE VI

Size (Inches)	Quantity of Packages	
	Quantity of Unit Packages per Intermediate Container	Quantity of Tear-Apart Cartons per Intermediate Container
1/8 through 1/4	100	20
5/16 through 1/2	25	10
5/8 through 1	10	5
1-1/4 through 3-1/2	5	1

• 5.1.1.1.3 Nuts, sleeves, and caps unit containers. Nuts, sleeves, and caps of one type and size shall be unit packaged in accordance with Method IC-1 of MIL-P-116, or in friction-top hermetically sealed cans conforming to PPP-C-96. The quantity per unit container shall be as specified in Table VII.

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TABLE VII

Quantity per Unit Container

Size (Inches)	Number
1/8 to 1/2	100
5/8 to 1-1/4	25
1-1/2 to 3	5
over 3	1

- 5.1.2 Level C. All fittings, nuts, sleeves, and caps shall be packaged as necessary to prevent damage or deterioration during shipment.
- 5.1.3 Preservative application. No preservative compound shall be applied to the fittings, except that cadmium plated steel parts shall be dipped in oil as specified in 3.3.2.
- 5.1.4 Cleaning. Before packaging, all parts shall be free from grease, oil, dirt, or any other foreign matter except as noted in 5.1.3.
- 5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).
- 5.2.1 Level A. Fittings packaged as specified herein shall be packed in overseas-type shipping containers conforming to PPP-B-585, PPP-B-591, PPP-B-601, PPP-B-621, or PPP-B-636. Shipping containers, insofar as possible, shall contain the same number of articles, shall be uniform in shape and size and snugly packed, shall be of minimum cube and tare consistent with the protection required, and shall contain identical quantities. The gross weight of the fully packed exterior shipping container shall not exceed approximately 200 pounds, except fiberboard containers, which shall not exceed the weight limitations of the applicable container specification. Plywood, when used, shall be type I or II, class 2, of NN-P-530. Strapping and closures shall be in accordance with the appendix to the applicable container specification. Containers conforming to PPP-B-585 or PPP-B-621 shall be provided with a case liner conforming to MIL-L-10547, except that material shall conform to MIL-B-13239, and shall be sealed in accordance with the appendix to MIL-L-10547. No case liner is required when material conforming to class 2 of PPP-B-636 is used as an intermediate container.
- 5.2.2 Level B. Fittings packaged as specified herein shall be packed in domestic-type shipping containers conforming to PPP-B-585, PPP-B-591, PPP-B-601, PPP-B-621, or PPP-B-636. Closures shall be in accordance with the appendix to the applicable container specification. Fiberboard, when used, shall have a minimum Mullen test of not less than 275 pounds. The gross weight of the shipping container, when packed for shipment, shall not exceed 200 pounds; fiberboard containers shall not exceed the weight limitations specified in the applicable container specification.

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- \* 5.2.3 Level C. Packages which require overpacking for acceptance by the carrier shall be packed in commercial exterior shipping containers in a manner that will insure safe transportation at the lowest rate to the point of delivery. Containers shall be in accordance with Uniform Freight Classification Rules or regulations of other common carriers as applicable to the mode of transportation.
- \* 5.3 Marking of shipments. If tear-apart containers are used, each section of the unit container shall be marked with the part number of the item. In addition to any other special marking required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129.

## 6. NOTES

- \* 6.1 Intended use. Fittings covered by this specification are intended for use in all types of fluids and are considered critical for procurement purposes. Pipe thread fittings are generally restricted on their applicable drawings to oxygen systems and ground service equipment. Flared tube fittings of aluminum from -2 through -12 size and carbon steel, titanium, and corrosion-resistant steel fittings from -2 through -16 size are intended to meet the requirements of MIL-H-5440, Type II, Class 3000 pounds per square inch (psi) and MIL-P-5518, Type A or B, Class 2 (3000 psi). Larger size fittings through -32 size are intended for Class 1500 psi and Class 1 (1500 psi). Other specialized items also use this procurement specification. Titanium fittings and nuts shall not be used on oxygen systems. Dissimilar metals as defined by MIL-STD-889 shall not be used in direct contact with each other.

6.1.1 Supplemental information. The above listed capabilities for flared fittings are for reliable fitting joints as defined in 3.2 based upon tests and operational experience using AN and MS fittings, nuts, and sleeves. Using nonstandard design joints (i.e., thicker walled nuts or fittings, special seals), burst pressures of 20,000 to 25,000 psi have been obtained with correspondingly high proof pressures. Fittings may be used at more severe conditions than intended but just as with external conditions (load, vibration, corrosion, etc.) the design and supporting test data are the designer's responsibility and must receive prior approval from the procuring activity.

- \* 6.2 Ordering data. Procurement documents should specify the following:
  - a. Title, number, and date of this specification.
  - b. Part number required (see 1.2 and 3.2).
  - c. Plating, if desired for copper-base alloy parts (see 3.3.4).
  - d. Applicable levels of preservation-packaging and packing required (see 5.1 and 5.2).



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6.3 International standardization. Certain provisions of this specification are the subject of international standardization agreement ABC Air Standard 17/15. When amendment, revision, or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the international agreement concerned.

- \* 6.4 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) 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.

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 Navy - AS  
 Air Force - 99

Preparing Activity:  
 Air Force - 99

Agent:  
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Review Activities:  
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International Interest: (see 6.3)

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