

INCH-POUND

MIL-DTL-38271C(USAF)  
14 AUGUST 2020

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SUPERSEDING  
MIL-C-38271B(USAF)  
4 NOVEMBER 1994

## DETAIL SPECIFICATION

### CONNECTOR, OXYGEN MASK TO REGULATOR CRU-60/P

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

#### 1. SCOPE

##### 1.1 Scope.

This specification covers one type of connector for connecting aircraft-panel-mounted oxygen regulator delivery tube and emergency oxygen cylinder assemblies to the oxygen demand breathing mask. The connector is designated CRU-60/P and is a Critical Safety Item (CSI).

#### 2. APPLICABLE DOCUMENTS

##### 2.1 General.

The documents listed in this section are specified in sections 3 and 4 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 of documents cited in sections 3 and 4 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 AFLCMC/EZSS, 2145 Monahan Way, Bldg. 28, Wright-Patterson AFB OH 45433-7017 or emailed to [Engineering.Standards@us.af.mil](mailto:Engineering.Standards@us.af.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

AMSC 10196

FSC 1660

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**FEDERAL SPECIFICATIONS**

BB-A-1034 Compressed Air, Breathing

**COMMERCIAL ITEM DESCRIPTIONS**

A-A-59503 Nitrogen, Technical

**DEPARTMENT OF DEFENSE SPECIFICATIONS**

MIL-C-5040 Cord, Fibrous, Nylon  
MIL-DTL-7560/1 Valve Assembly, Oxygen Cylinder, Bailout  
MIL-S-7742 Screw Threads, Standard, Optimum Selected Series, General Specification For  
MIL-A-8625 Anodic Coatings For Aluminum and Aluminum Alloys  
MIL-PRF-27210 Oxygen, Aviator's Breathing, Liquid and Gas  
MS16624 Ring, Retaining, External, Basic (Tapered Section Type)  
MS22055 Hose Assemblies-Oxygen Breathing, Connector to Regulator  
MS22058 Connector, Oxygen Hose to Regulator  
MS27796 Connector-Bayonet, Three Pin, Oxygen Mask

**DEPARTMENT OF DEFENSE STANDARDS**

MIL-STD-129 Military Marking for Shipment and Storage  
MIL-STD-130 Identification Marking of U.S. Military Property  
MIL-STD-889 Dissimilar Metals  
MIL-STD-2073-1 Standard Practice for Military Packaging

**DEPARTMENT OF DEFENSE HANDBOOKS**

MIL-HDBK-470 Designing and Developing Maintainable Products and Systems, Volume I  
MIL-HDBK-781 Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production

(Copies of these documents are available online at <https://quicksearch.dla.mil/>.)

**2.2.2 Other Government documents, drawings, and publications.**

The following other Government documents, drawings, and publications 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.

## MIL-DTL-38271C(USAF)

**DRAWINGS - AIR FORCE**

44A23988	Spring-Oxygen Emergency Cylinder
44A23992	Check-Oxygen Emergency Cylinder, to Demand Mask, Adapter
44A23994	Sleeve-Oxygen Emergency Cylinder, to Demand Mask, Adapter
45A19096	Gasket-Coupling, Connector, Oxygen
45A19097	Coupling-Connector, Oxygen
45A19099	Washer-Sleeve, Connector, Oxygen
56A3696	Gasket-Connector, Oxygen
57B3623	Ring-Retaining, Demand Mask to Regulator Tube Internal
57B3657	Plate-Mounting Oxygen Mask to Regulator, Female Assembly of

(Copies of these drawings are available online at <https://jedmics.af.mil/webjedmics/index.jsp>, for users with approved access rights granted through the Joint Engineering Data Management Information and Control System (JEDMICS). Users not located on a \*.mil network may contact the JEDMICS Help Desk via email at [JEDMICS@robins.af.mil](mailto:JEDMICS@robins.af.mil) for instructions on obtaining and completing the necessary forms.)

**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.

**AMERICAN WELDING SOCIETY (AWS)**

AWS D17.1/D17.1M	Fusion Welding for Aerospace Applications (DoD adopted)
AWS D17.2/D17.2M	Resistance Welding for Aerospace Applications

(Copies of these documents are available online at <http://pubs.aws.org/>.)

**THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**

ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay) (DoD adopted)
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(Copies of this document are available online at <http://www.asme.org/>.)

**ASTM INTERNATIONAL**

ASTM F104	Standard Classification System for Nonmetallic Gasket Materials (DoD adopted)
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension (DoD adopted)

## MIL-DTL-38271C(USAF)

ASTM D624	Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers (DoD adopted)
ASTM B633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel (DoD adopted)
ASTM D1149	Standard Test Methods for Rubber Deterioration-Cracking in an Ozone Controlled Environment
ASTM D1974/D1974M	Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes
ASTM D2137	Standard Test Methods for Rubber Property – Brittleness Point of Flexible Polymers and Coated Fabrics (DoD adopted)
ASTM D5118/D5118M	Standard Practice for Fabrication of Fiberboard Shipping Boxes

(Copies of these documents are available online at <http://www.astm.org>.)

### SAE INTERNATIONAL

SAE AMS2175	Castings, Classification and Inspection of (DoD adopted)
SAE AMS2417	Plating, Zinc-Nickel Alloy (DoD adopted)
SAE-AMS-STD-595	Colors Used for Government Procurement
SAE ARP1176	Oxygen System and Component Cleaning
SAE AS29513	Packing, Preformed, Hydrocarbon Fuel Resistant, "O" Ring (DoD adopted)

(Copies of these documents are available online at <http://www.sae.org/>.)

### 2.4 Order of precedence.

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

## 3. REQUIREMENTS

### 3.1 Qualification.

The connectors 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 4.2 and 6.3).

### 3.2 Recycled, recovered, environmentally preferable materials, or biobased materials.

Recycled, recovered, environmentally preferable, or biobased 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 costs.

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**3.3 Materials.**

The materials used in the construction of the components of the connector shall be made of the lightest possible materials consistent with configuration, strength, and all other requirements specified herein. All materials shall be suitably treated to resist corrosion due to electrolytic decomposition, fungus, salt spray, and any other atmospheric condition that may be encountered during operational use or storage. The use of toxic chemicals, hazardous substances, and ozone depleting chemicals shall be avoided, whenever feasible.

**3.3.1 Metals.**

Metals shall be of the corrosion-resistant type or suitable treated to resist corrosion due to fuels, salt spray, or any atmospheric conditions likely to be met in storage or normal service.

**3.3.1.1 Dissimilar metals.**

Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other in accordance with MIL-STD-889.

**3.3.1.2 Nonmagnetic materials.**

Except where magnetic materials offer definite advantages, nonmagnetic materials shall be used for all components.

**3.3.1.3 Nonmetallic materials.**

The use of nonmetallic materials shall require the approval of the procuring activity for the specific application involved.

**3.3.2 Neoprene rubber.**

Neoprene rubber that has been formulated and processed to meet the requirements of this specification shall be used for any connector tubing. It shall be smooth and free of flash, foreign materials, tackiness, odors, or any other imperfections. The material shall have the following properties:

- a. Tensile strength, 1,500 psi minimum (see 4.5.21).
- b. Tear resistance, 230 pounds per inch (see 4.5.22).
- c. Ozone resistance (see 4.5.23).
- d. Brittle point, -40 °F minimum (see 4.5.24).

**3.3.3 Fungus resistant materials.**

Materials that are not susceptible to fungus attack shall be used to the greatest extent possible. If materials that are susceptible to fungus attack are used, they shall be treated with a fungicidal agent.

**3.3.4 Protective treatment.**

If materials that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage are used in the construction of the connector, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extreme climatic or environmental conditions shall be avoided.

**3.3.4.1 Anodizing.**

All aluminum parts shall be anodized with Type II, Class 2, color black, in accordance with MIL-A-8625. All exposed parts shall be processed after anodizing with a potassium dichromate seal.

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### **3.3.4.2 Nickel zinc plating.**

Unless made of corrosion resisting steel all steel parts shall be protected in accordance with SAE AMS2417 or ASTM B633. Cadmium coating or plating shall not be used as it is a toxic material unacceptable for use in an oxygen breathing system.

### **3.3.6 Weight.**

The materials used in the construction of the components of the connector shall be made of the lightest possible materials consistent with configuration, strength, and all other requirements specified herein.

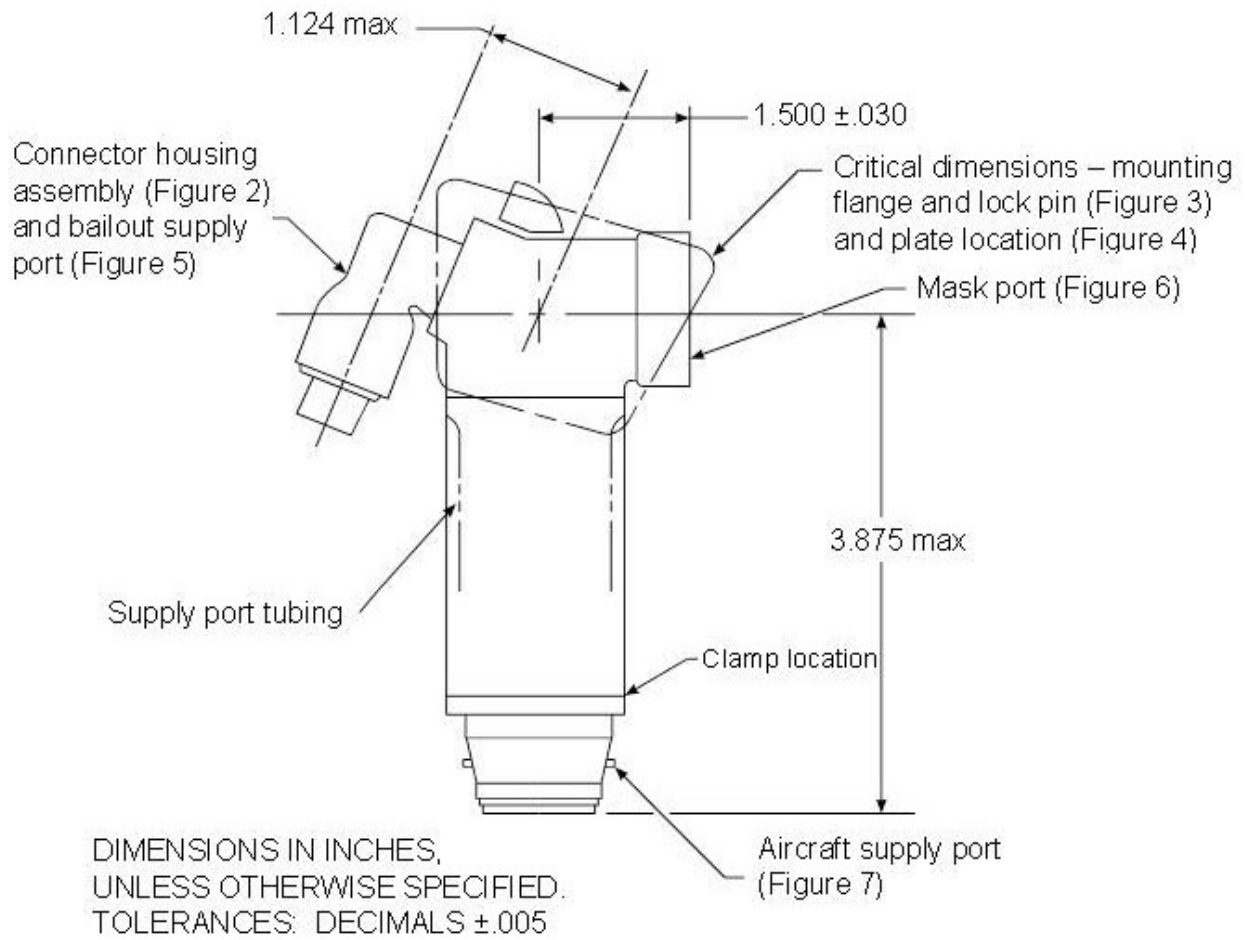
### **3.3.5 Elastomers.**

All elastomers shall be free from foreign agents that might cause objectionable odors. All elastomers used in the construction of the connector shall have been manufactured not more than 12 months before the date the connector is manufactured. If there is sufficient area, the cure date (quarter and year) shall be stamped in 0.1875 inch figures on the elastomer component. Cure dates and age limitations shall not apply to silicone.

### **3.4 Design.**

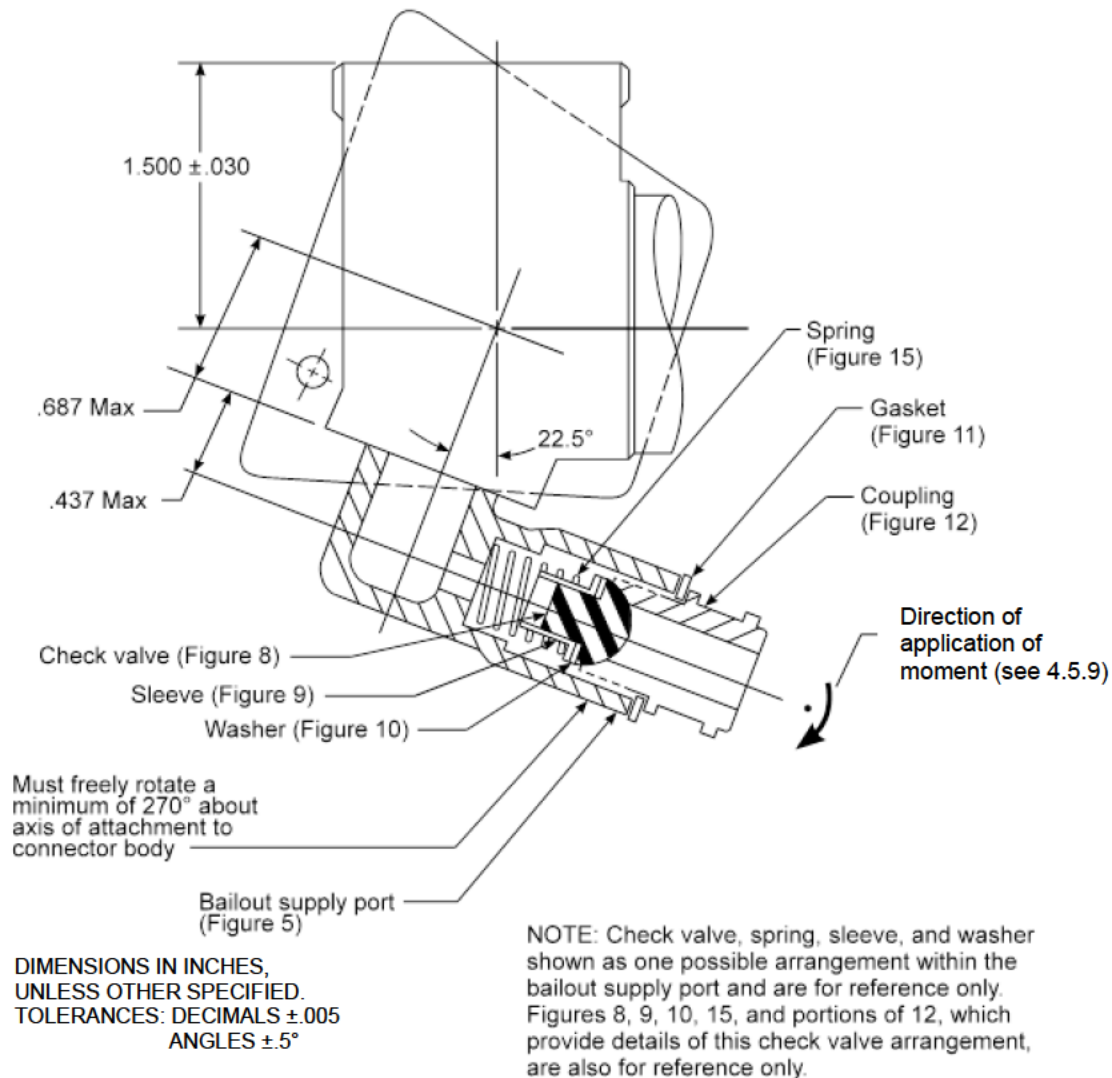
The design of the connector shall conform to AF Drawings 44A23988, 44A23992, 44A23994, 45A19096, 45A19097, 45A19099, 56A3696, and 57B3623 and to Figures 1 through 15. The aircraft supply port, (see Figure 7), shall be designed to flex or swivel, with respect to the connector housing, (see Figure 2), to facilitate separation of the mating connection assembly, MS22058-2, when it is subjected to angular forces up to 180 degrees to the longitudinal axis of the connector.

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**FIGURE 1. Connector, oxygen mask to regulator, Type CRU-60/P.**

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**NOTE:**

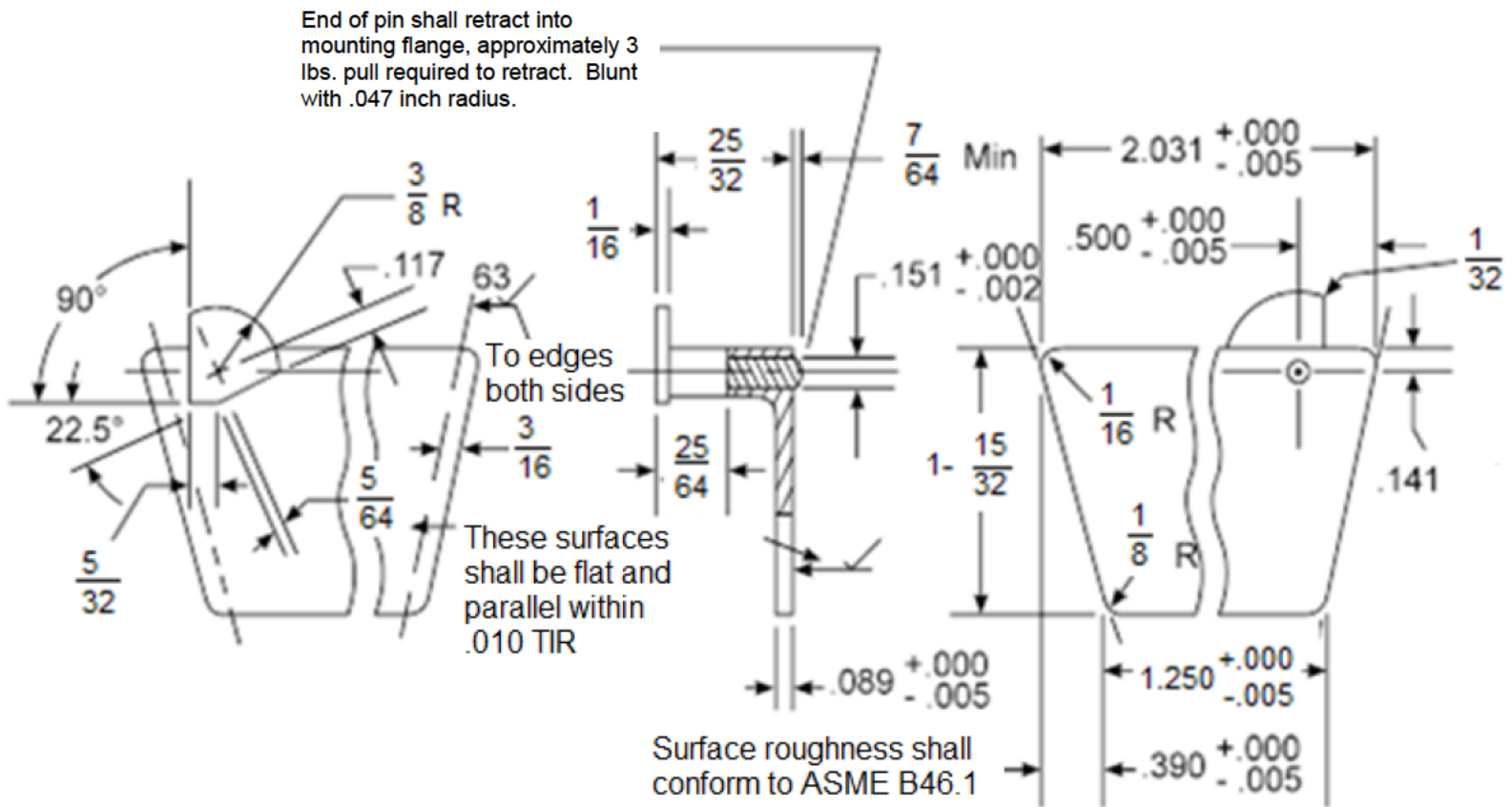
USE A SUITABLE SEALANT ON ALL THREADS TO PREVENT PARTS FROM LOOSENING UNDER 20 POUND-INCHES TORQUE.

AF DRAWING 45A19096, USE ASTM F104 F712100 – E22-MG RUBBERIZED GASKET IN LIEU OF HH-P-46.

**FIGURE 2. Connector housing assembly.**



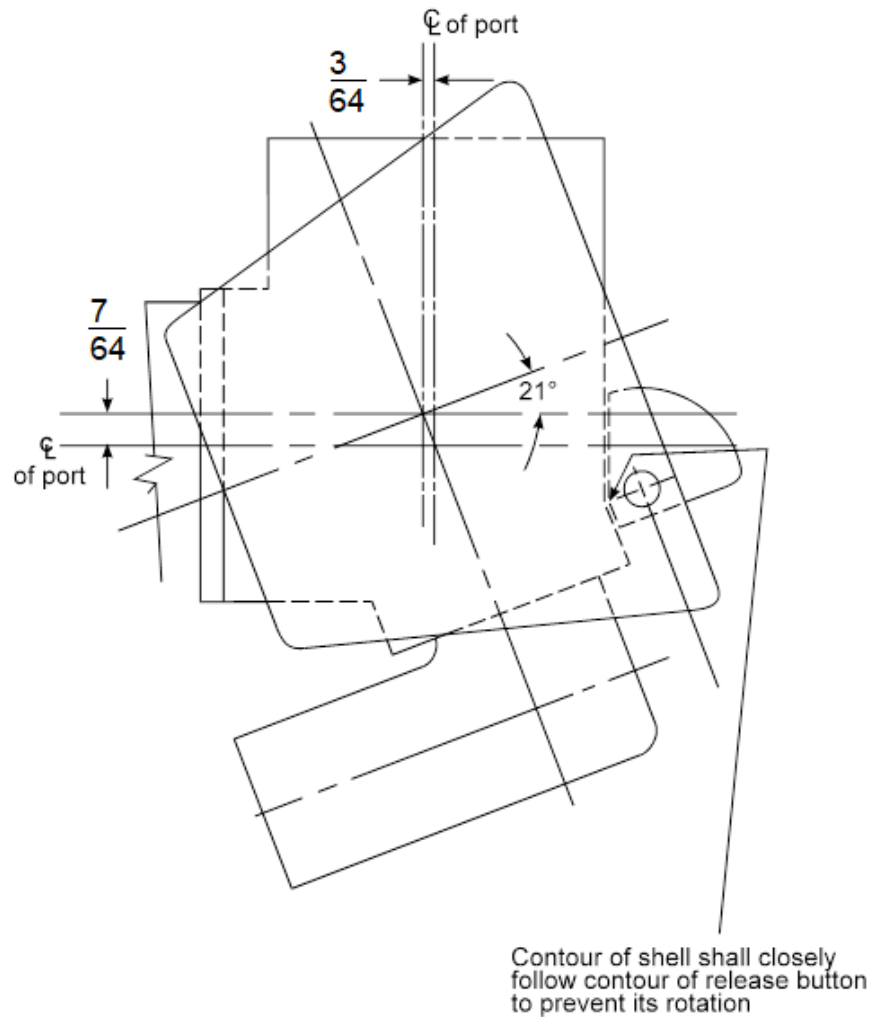
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DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$   
ANGLES  $\pm .5^\circ$   
FRACTIONS  $\pm 1/64$

FIGURE 3. Critical dimensions - mounting flange and locking pin.

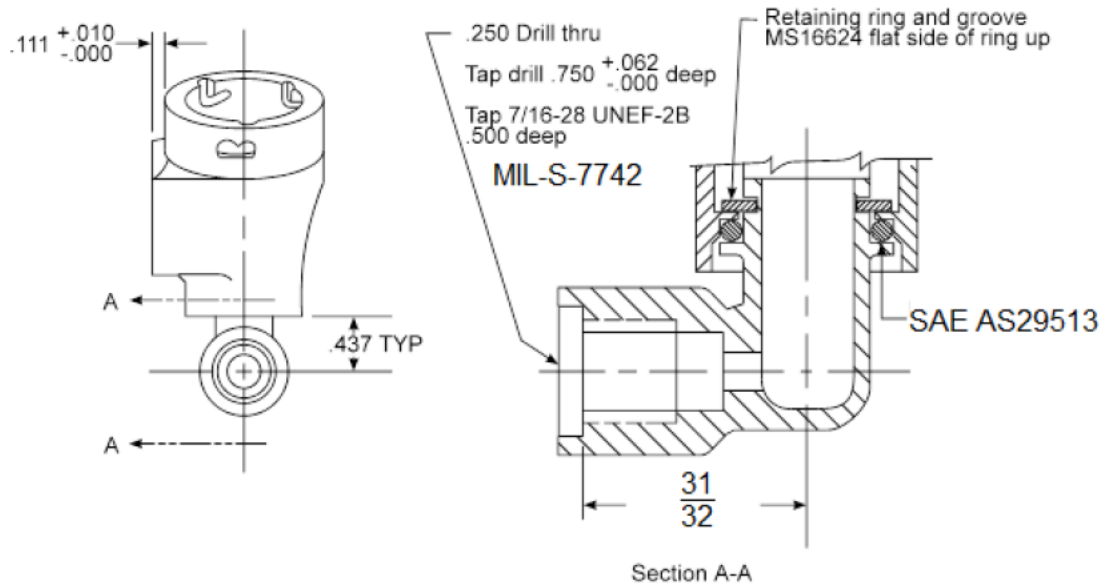
MIL-DTL-38271C(USAF)



DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: FRACTIONS  $\pm 1/64$   
ANGLES  $\pm .5^\circ$

**FIGURE 4. Plate location.**

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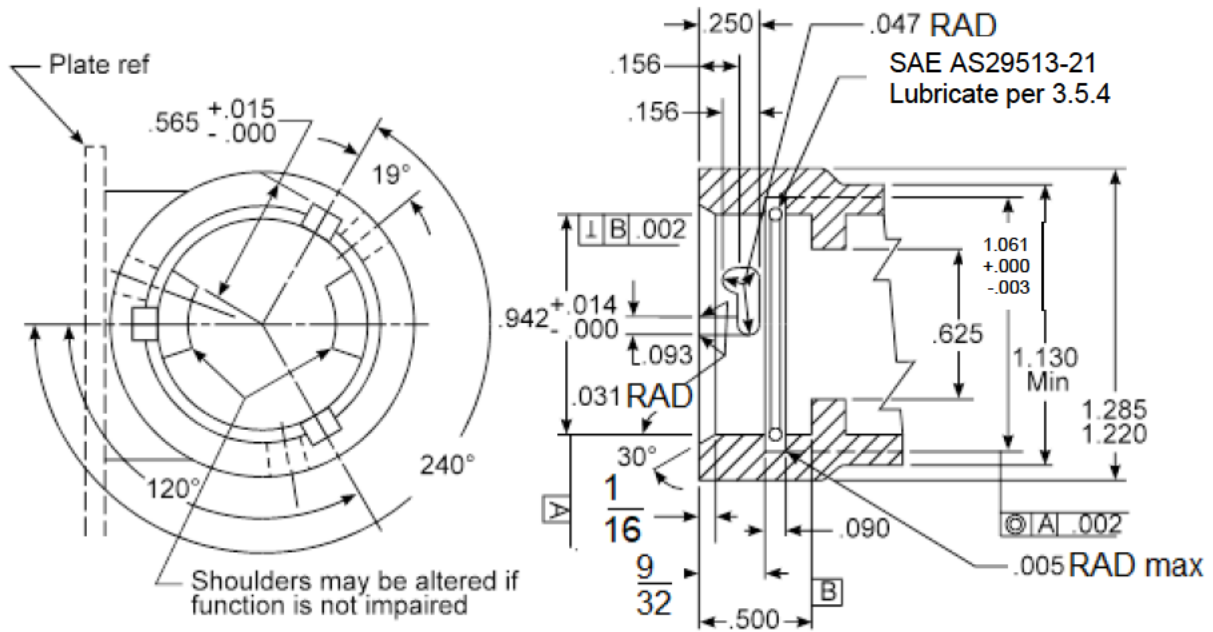


Note: All diameters to be concentric within .002 TIR

DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS .005  
FRACTIONS  $\pm 1/64$

**FIGURE 5. Bailout supply port.**

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Edges and fillets radii .010 unless otherwise specified.

The mask port shall mate properly with MS27796.

"O" ring groove finish:

DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$   
ANGLES  $\pm .5^\circ$   
FRACTIONS  $\pm 1/64$

sides	$\sqrt{63}$	machine finish
bottom	$\sqrt{32}$	per ASME B46.1

FIGURE 6. Mask port.

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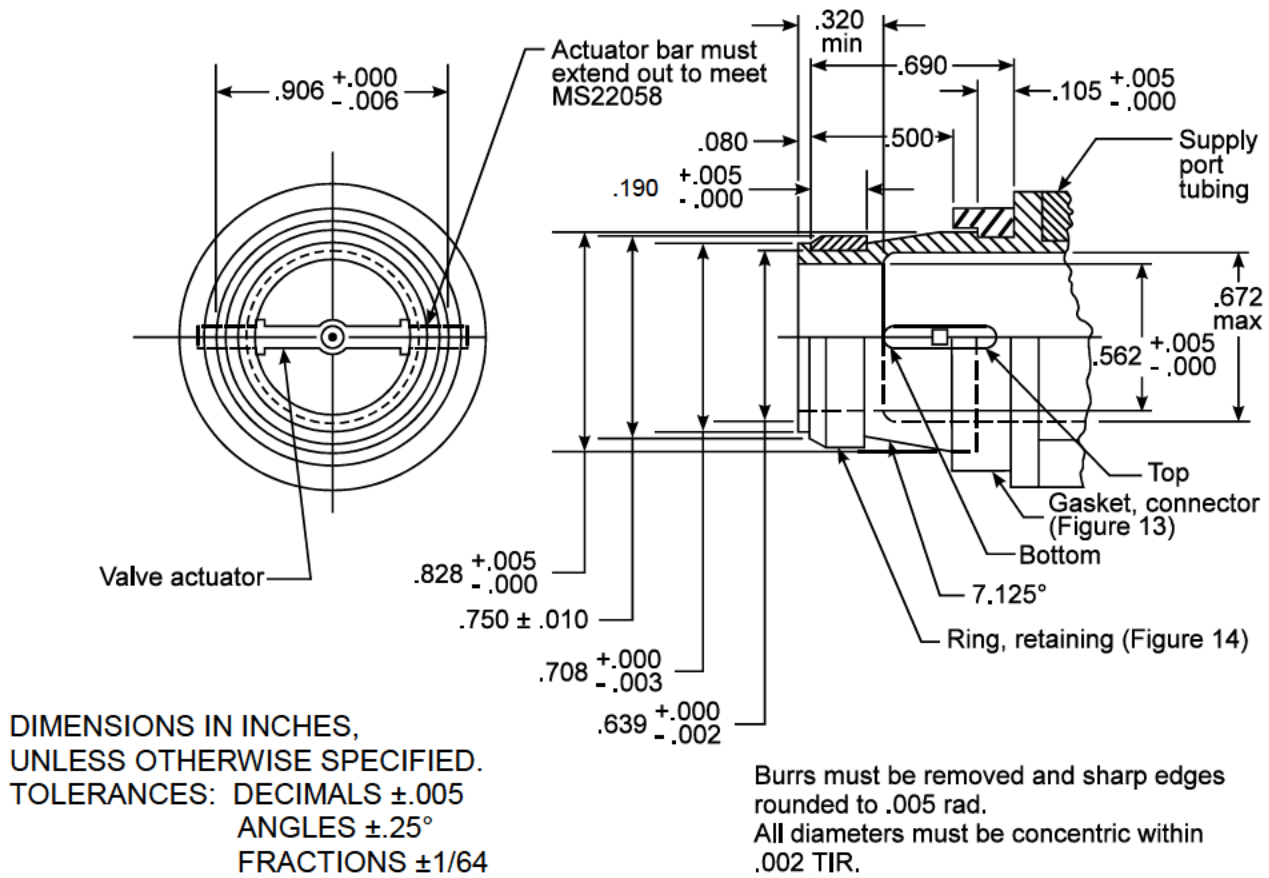
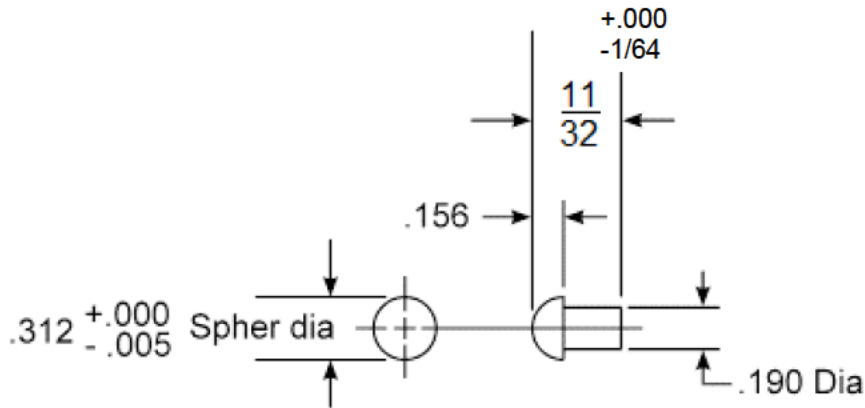


FIGURE 7. Aircraft supply port.

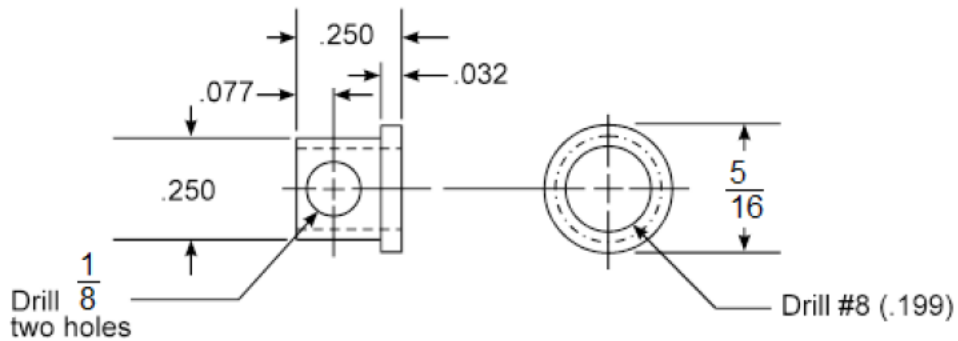
MIL-DTL-38271C(USAF)



DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$

FOR REFERENCE ONLY

FIGURE 8. Bailout supply port check valve (see AF Drawing 44A23992).

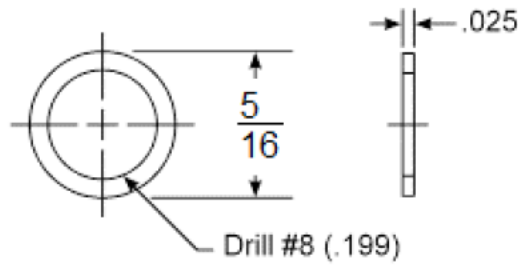


DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$   
FRACTIONS  $\pm 1/64$

FOR REFERENCE ONLY

FIGURE 9. Sleeve (see AF Drawing 44A23994).

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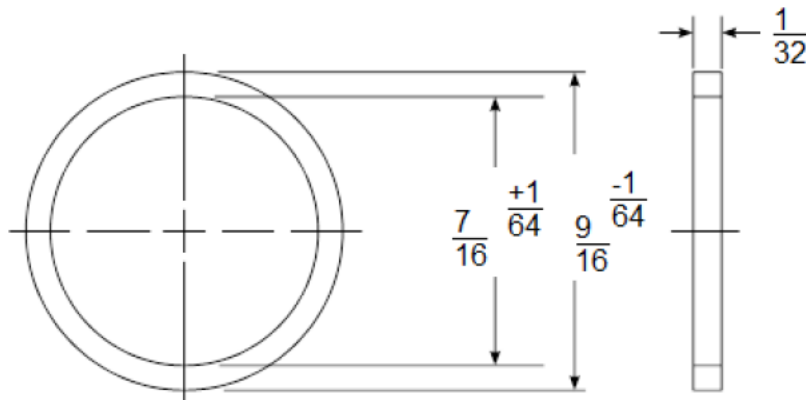


DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.

FOR REFERENCE ONLY

Finish: No burrs allowed.

FIGURE 10. Washer (see AF Drawing 45A19099).

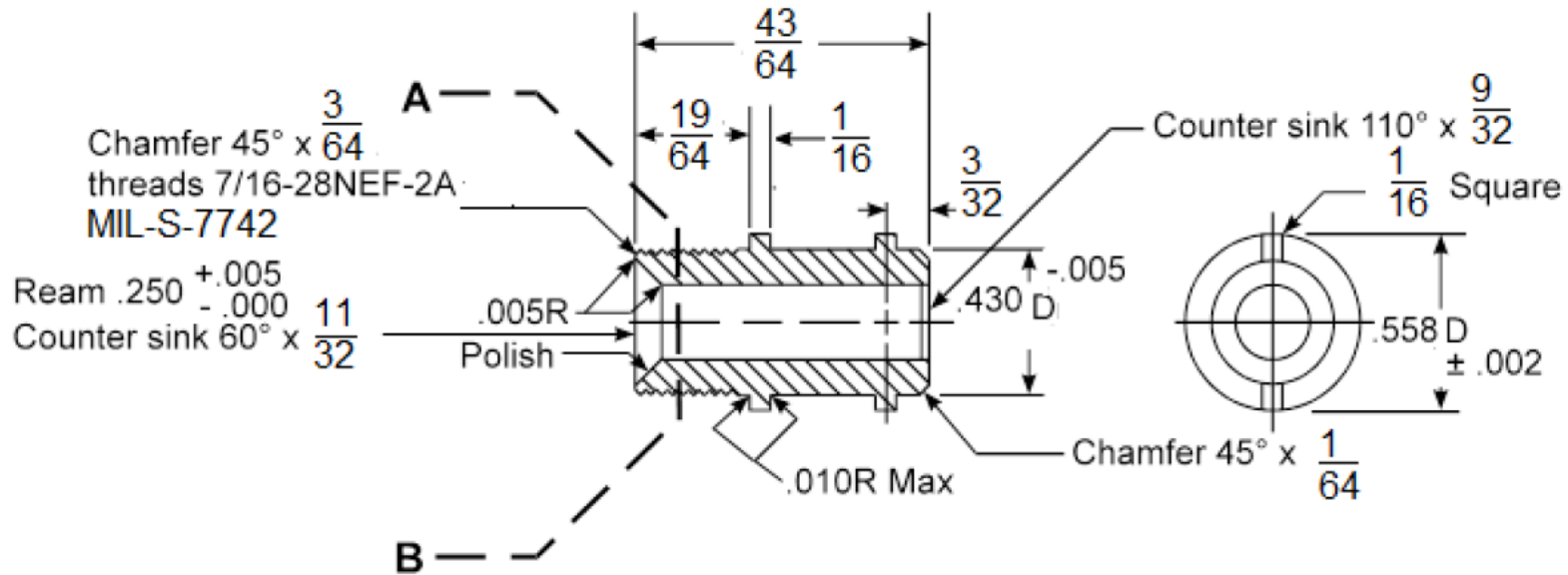


DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.

FOR REFERENCE ONLY

FIGURE 11. Gasket (see AF Drawing 45A19096).

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DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: FRACTIONS  $\pm 1/64$

PORTION LEFT OF LINE A-B  
IS FOR REFERENCE ONLY

FOR REFERENCE ONLY

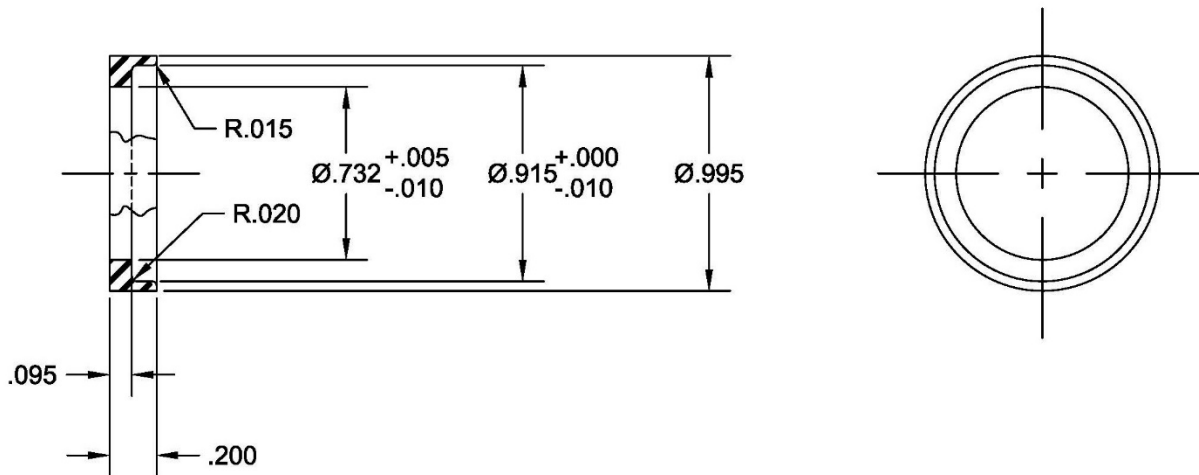
Finish: ASTM B633.

No burrs allowed

FIGURE 12. Coupling (see AF Drawing 45A19097).



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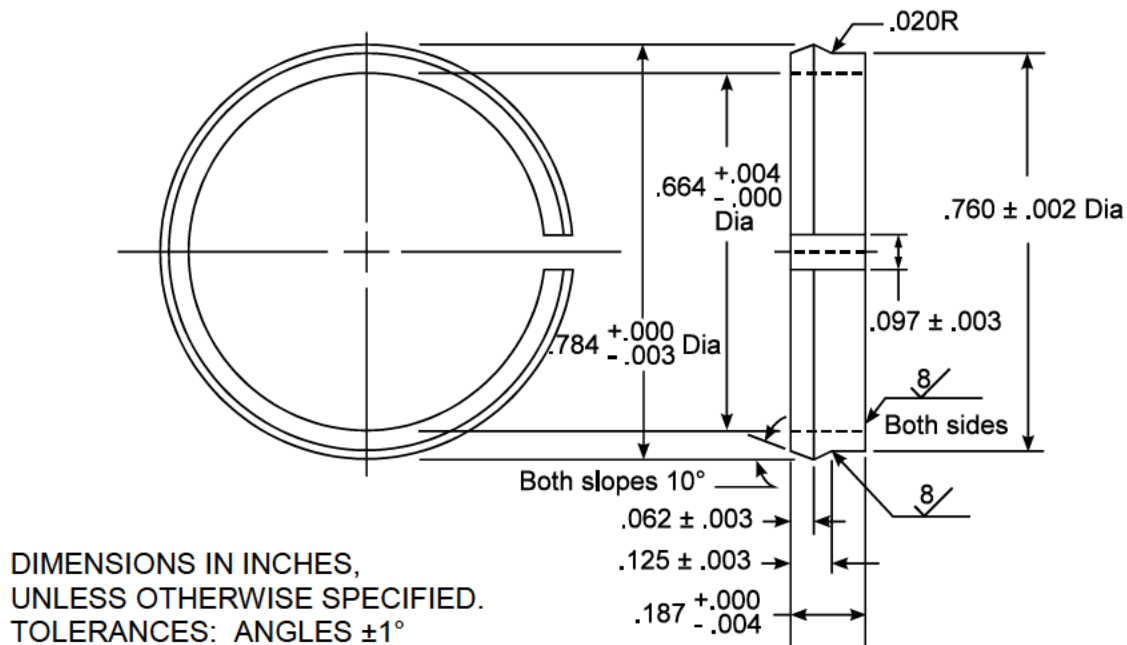


DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$

FOR REFERENCE ONLY

FIGURE 13. Gasket, connector (see AF Drawing 56A3696).

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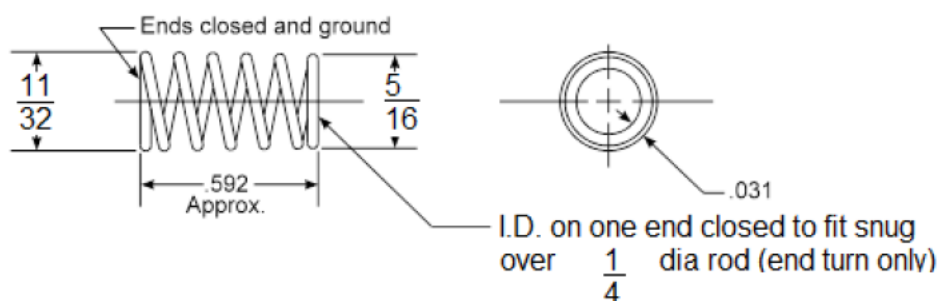
Finish: ASME B46.1,  $\sqrt{125}$  all surfaces except as noted.

No burrs or sharp edges allowed.

**FOR REFERENCE ONLY**

**FIGURE 14. Ring, retaining (see AF Drawing 57B3623).**

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DIMENSIONS IN INCHES,  
UNLESS OTHERWISE SPECIFIED.  
TOLERANCES: DECIMALS  $\pm .005$   
FRACTIONS  $\pm 1/64$

FOR REFERENCE ONLY

**FIGURE 15. Spring (see AF Drawing 44A23988).**

### 3.4.1 Aircraft supply port.

The aircraft supply port of the connector shall have a restrictor valve that will permit the user to breathe normally through the connector when the restrictor valve is inserted into a connector conforming to MS22058. The restrictor valve shall be guided internally to prevent tilting of the valve mechanism. The guide shall not cause jamming of the valve. The valve actuator shall be positively locked to the restrictor valve. When disconnected, the valve shall permit inhalation, but a noticeable resistance shall be introduced to indicate that disconnection has occurred. The body of the connector shall contain a spring-loaded relief valve that is adjusted to allow oxygen from the bailout cylinder to escape (connector is not connected to aircraft supply) whenever the mask pressure exceeds a pressure equal to 12 inches of water more than ambient pressure. The relief valve may vent small flows before the mask pressure reaches 12 inches of water more than ambient pressure. Two slots located on opposite sides of the supply connector shall accommodate the valve actuator (see Figure 7). The length of the slots shall be determined by the travel of the valve. The male end housing shall be an all metal one-piece construction.

### 3.4.2 Bailout supply attachment.

The side bailout supply attachment shall be designed to engage the MIL-DTL-7560/1 (Fitting Assembly -20) type connector and shall contain a check valve conforming to AF Drawing 45A19099 (see Figure 2). The bailout supply port shall be installed on the connector so that it can be rotated freely and does not leak. A locking mechanism within the connector housing shall provide positive means for retaining the attachment on the connector conforming to Figure 5. Rotation of the connector shall not create or cause shavings within the housing.

### 3.4.3 Alignment.

The alignment of fitting and mating surfaces shall be accurate to a degree that permits the proper functioning of the unit in the environmental conditions expected to be encountered during the service life of the unit.

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**3.5 Construction.**

The connector shall be constructed so that no parts will become loose in service. It shall be built to withstand the strains, jars, vibrations, and any other conditions incident to shipment, storage, installation, and service.

**3.5.1 Dovetail mounting flange.**

The connector shall have a male dovetail flange (see Figures 1, 2, 3, and 4). The flange shall have a manual lock and release that shall be readily accessible for use.

**3.5.2 Omni-directional aircraft supply port.**

If neoprene rubber tubing is used to connect the aircraft supply port to the connector housing it shall be constructed as specified (see 3.5.2.1).

**3.5.2.1 Neoprene rubber tubing.**

The tubing shall be constructed of neoprene rubber that shall meet the requirements specified herein. The tubing shall be attached at each end by a hose clamp conforming to Scott Aviation Part No. 266-632 or equivalent is acceptable at the discretion of the acquisition activity. To limit the stretch of the tube, a nylon cord, 100 pound test, Type 1A in accordance with MIL-C-5040 shall be used inside the tube between the hose end fittings. The cord shall be designed to prevent gouging or cutting of the tube or excessive wear of the cord or the cord attachment points. When the aircraft supply connector is subjected to lateral or torsional movement, the tubing shall not crimp, collapse, or be pinched between the cord and the supply port or connector body. The flexible cord inside the tube shall be attached to the body and aircraft supply port in such a manner as to permit easy removal and replacement of the hose without special tools.

**3.5.2.2 Neoprene rubber cover.**

A neoprene rubber cover, 0.625 inches wide, made of the same material as the hose shall be installed over the clamp at the connector housing of the tube. The rubber covers shall have a tight fit to prevent slippage.

**3.5.3 Welding.**

Welding shall be accomplished in accordance with either SAE-AMS-W-6858 or AWS-D17.1/D17.1M or both and shall be carefully performed to insure that all welded joints have proper penetration, proper bead, and proper strength.

**3.5.4 Lubrication.**

Permanent type lubrication that will last the expected life of the connector and that meets the approval of the procuring activity shall be used.

**3.5.4.1 Cleanliness.**

Parts of the connector that shall be free of oil, grease, debris, and any other contaminant that creates a hazard in an oxygen environment. Lubrications used in the components of the connector that might be subject to exposure to oxygen shall be of the type approved by the Air Force for this purpose.

**3.5.5 Castings.**

Castings shall be of high quality, clean, sound, and free of holes, porosity, cracks, and any other defects. Castings shall be designed and inspected in accordance with SAE AMS2175.

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**3.5.6 Threads.**

Unless otherwise specified, straight threads conforming to National Fine Thread Series, Class 2 (NF-2) or Unified Thread Series, Class 2A or 2B of MIL-S-7742 shall be used.

**3.5.7 Screw assemblies.**

Assembly screws and bolts shall be tight. Tight shall be defined to mean that the screw or bolt cannot be appreciably tightened further without damage to the screw, bolt, or screw threads.

**3.5.8 Installation of threaded parts.**

All threaded parts shall be positively installed by self-locking nuts, or any other approved methods so that the threaded parts will not work loose in service.

**3.5.9 Soldering and brazing.**

Soldering and brazing shall be carefully performed to insure that all joints have proper penetration, proper bead, and proper strength.

**3.6 Performance.****3.6.1 Disconnection force.**

The mating connector conforming to MS22058 shall disconnect from the aircraft supply port when loads of 12 to 20 pounds are applied in any random direction up to 180 degrees to the longitudinal axis (see 4.5.2 and 4.5.2.1).

**3.6.2 Leakage – room temperature.**

When subjected to an internal pressure of 5 psi, leakage of the connector shall not exceed 0.01 liters per minute (LPM) at room temperature (see 4.5.3).

**3.6.3 Relief valve setting.**

With oxygen applied to the mask end of the connector, the developed pressures within the connector shall be less than 12 inches of water at a flow rate of 2.5 LPM, between 11 and 15 inches of water at a flow rate of 12 LPM, and between 12 and 18 inches of water at a flow rate of 50 LPM (see 4.5.4).

**3.6.4 Flow rate through bailout supply attachment.**

A minimum flow rate of 17 LPM shall be obtained through the bailout supply attachment when a fitting conforming to MIL-DTL-7560/1A Fitting Assembly -20) is attached and a pressure of 12 ±1 inches of water is applied within the connector housing (see 4.5.5).

**3.6.5 Pressure drop through connector.**

With the valve actuator located at the bottom of the slots and pressure or suction applied to the connector to obtain a flow rate of 15 LPM from the regulator to the mask end, the pressure drop through the connector shall be in the range of 4 to 6 inches of water (see 4.5.6).

**3.6.6 Leakage - extreme temperature.**

When an internal pressure of 1 psi is applied to the connector in the range of 160 ±2 °F to -65 ±2 °F, total leakage of the connector shall not exceed 0.01 LPM (see 4.5.7).

**3.6.7 Pressure drop through connector with jig.**

With the connector connected to a jig, with the valve actuator located at the top of the slots, and with pressure applied to the jig to obtain flow rates in the range of 0 to 135 LPM from the regulator end to the mask end, the pressure drop through the assembly shall not exceed the values

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specified in Table I (see 4.5.8).

**TABLE I. Pressure drop in assembly.**

<b>Flow Rate of Oxygen (LPM)</b>	<b>Pressure Drop (Inches of Water)</b>
135	1.40
90	0.60
70	0.36
50	0.18
30	0.06

**3.6.7.1 Pressure drop through flexed connector.**

The performance specified (see 3.6.7) shall be repeated at the 135 LPM flow rate while the connector is subjected to torsional and bending forces. The pressure drop through the connector shall not exceed 1.6 and 2.0 inches of water, respectively, when subjected to torsional and bending forces (see 4.5.8.1).

**3.6.8 Structural.**

When a moment of 500 pound-inches is applied to the bailout supply, the connector shall not break nor become disassembled, and no mating surfaces shall be damaged (see 4.5.9).

**3.6.9 Pull test.**

The mounting flange of the connector shall withstand, without damage or separation, the application of a longitudinal axial pull in the direction of the aircraft supply port of not less than 200 pounds for 5 seconds. The aircraft supply port shall be tested similarly to 100 pounds (see 4.5.10).

**3.6.10 Tightness of threaded ports.**

All ports which are threaded into the connector housing or bailout supply port elbow shall withstand 20 pound-inches of torsional loads for not less than 1 minute without loosening the threaded ports when tested as specified in 4.5.11.

**3.6.11 Reliability.**

The connector shall have a minimum Mean Time Between Failure (MTBF) of 870 hours at a (single tailed) confidence level of 0.90 (to provide a minimum reliability of 0.98 for a mission length of 16-hours) when tested as specified in 4.5.12.

**3.6.11.1 Longevity.**

The connector shall have a minimum operating life span of not less than 2,700 hours before wearout failures occur or the equipment consistently fails to meet the specified MTBF index. Parts requiring replacement within this period of time, and the normal operating period of such parts, shall be reported by the contractor to the procuring activity (see 4.5.18).

**3.6.11.2 Maintainability.**

The total mean active maintenance downtime, as defined in MIL-HDBK-470, in the maintenance of the connector shall be the minimum possible as determined by maintainability verification as defined herein (see 4.5.17).

**3.6.12 Disconnect life.**

After 1,000 insertions and disconnections, the disconnection force shall be within the range of 12

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to 20 pounds and shall not have increased or decreased more than 10 percent of the original disconnection force. The restrictor valve shall close completely during each disconnection (see 4.5.13).

**3.6.13 Low temperature exposure.**

After continuous exposure for 48 hours to a temperature of  $-85 \pm 5$  °F, the connector shall pass the tests specified (see 4.5.14).

**3.6.14 High temperature exposure.**

After continuous exposure for 7 hours to a temperature of 160 °F, the connector shall pass the tests specified (see 4.5.15).

**3.6.15 Drop tests.**

After the connector has been subjected to 50 random free falls, all parts of the connector shall be intact and the connector shall then pass the tests specified (see 4.5.16). Damage to the hose end of the connector should be disregarded.

**3.6.16 Submerged liquid.**

The final assembled connector shall be tested for leaks in a submerged liquid prior to delivery. Total leakage shall not exceed 0.01 LPM (see 4.5.19).

**3.6.17 Odor.**

The connectors shall have no objectionable odors (see 4.5.20).

**3.7 Part numbering of interchangeable parts.**

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-HDBK-61 shall govern the manufacturer's part numbers and changes thereto.

**3.8 Weight.**

The weight of the complete connector shall not exceed 7.0 ounces.

**3.9 Color.**

The color of the tube shall be aviation black conforming to color chip number 37038 of SAE-AMS-STD-595. Hose clamps shall be unpainted and unless otherwise specified the color of the remainder of the connector shall be black.

**3.10 Identification of product.**

The connectors shall be marked for identification in accordance with MIL-STD-130.

**3.11 Workmanship.**

The connector shall be made in accordance with the best shop practices for this type of equipment. The connector shall be free from burrs, sharp edges, rough grinding marks, uneven surfaces caused by forming operations, and any other defects. Particular attention shall be paid to accuracy of dimensions, radii fillets, marking of assemblies, thoroughness of welding, brazing, swaging, soldering, alignment of parts, and tightness of assembly of screws and bolts. All interior and exterior surfaces of the connector shall be smooth and consistent with the requirements of this specification.

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### **3.12 Packaging.**

#### **3.12.1 Preservation.**

Preservation shall be accomplished in accordance with Level A, MIL-STD-2073-1.

##### **3.12.1.1 Level A.**

###### **3.12.1.1.1 Cleaning.**

The connector shall be thoroughly cleaned in accordance with SAE ARP1176. All oils, grease, or any other combustible fluid or compound, organic particles that can oxidize or react with oxygen, shreds of easily oxidizable metals, and non-combustible particles that could become entrained and cause ignition due to impact with vulnerable components that might adversely affect the operation of the connector shall be removed during and after final assembly.

###### **3.12.1.1.2 Drying.**

The connector shall be dried in accordance with SAE ARP1176.

###### **3.12.1.1.3 Preservative application.**

Preservative shall not be used.

###### **3.12.1.1.4 Unit packs.**

Unless otherwise specified by the contracting activity connectors shall be packaged in quantity unit pack of each one. Each connector shall be preserved as specified in MIL-STD-2073-1, Method 33. (see 3.12.1).

### **3.12.2 Packaging.**

Packaging shall be Level B as specified (see 5.1).

#### **3.12.2.1 Level B.**

Connectors preserved as specified (see 3.12.1), shall be packaged in containers in accordance with ASTM D5118/D5118M, weather-resistant, unless otherwise specified by the contracting activity. Containers shall be of uniform shape and size and contain identical quantities. The container closure shall be in accordance with ASTM D1974/D1974M.

#### **3.12.3 Marking.**

All unit and shipping containers shall be marked in accordance with MIL-STD-129. In addition, the precautionary marking in SAE ARP1176, shall appear on the unit and shipping container.

## **4. VERIFICATION**

### **4.1 Classification of inspections.**

The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.3).
- b. Conformance inspection (see 4.4).



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**4.2 Inspection conditions.****4.2.1 Atmospheric conditions.**

Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of 28 to 32 inches of mercury, at a temperature of  $77 \pm 18$  °F, and at a relative humidity of 80 percent or less. When tests are conducted with atmospheric pressure or temperature substantially different from these values, proper allowance shall be made for the change in instrument reading.

**4.2.2 Gas.**

The gas used in testing the connectors shall be oxygen conforming to Type I of MIL-PRF-27210, or nitrogen conforming to A-A-59503, Type I, Grade B, Class 1. As an alternative, compressed air conforming to BB-A-1034, compressed source II, Grade B may be used. The water content shall be 0.2 milligrams per liter at dew point -65 °F or 26.3 parts per million. If nitrogen or air is used, appropriate density correction factors shall be applied to the flowmeter and to the performance of the connector.

**4.2.3 Inspection attitude.**

Unless otherwise specified, the connector shall be inspected in the normal operating attitude.

**4.3 Qualification inspection.**

Qualification inspection shall consist of all tests specified (see 4.5).

**4.3.1 Test report for the qualifying activity.**

The contractor shall furnish three copies of a test report to the qualifying activity. The test report shall contain detailed statements, identified by the applicable paragraph number of this specification, of compliance or noncompliance with each requirement of this specification (see 6.3).

**4.3.2 Test samples for the qualifying activity.**

The contractor shall furnish four connectors to the qualifying activity. The connectors tested by the contractor may be submitted. The test samples shall be identified with the manufacturer's part number and such information as specified by the qualifying activity.

**4.3.2.1 Neoprene rubber test sample.**

The supplier shall submit sample units of four, 6×6×0.75 inch slabs identical in composition and cure to the connector hose.

**4.4 Conformance inspection.**

Conformance inspection shall consist of:

- a. Individual inspection (see 4.4.1).
- b. Sampling inspection (see 4.4.2).

**4.4.1 Individual inspection.**

Each connector shall be subjected to the following inspections as specified (see 4.5):

- a. Examination of product (see 4.5.1).
- b. Disconnection force (0 degrees, 45 degrees, and 90 degrees to normal)

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- axis) (see 4.5.2).
- c. Leakage-room temperature (see 4.5.3).
- d. Relief valve setting (see 4.5.4).
- e. Flow rate through bailout supply attachment (see 4.5.5).
- f. Pressure drop through connector (see 4.5.6).
- g. Submerged liquid test (see 4.5.19).

**4.4.2 Sampling inspection.****4.4.2.1 Lot.**

A lot shall consist of 1,000 connectors, or fraction thereof, manufactured under essentially the same conditions and submitted for inspection at substantially the same time.

**4.4.2.2 Sampling plan.**

Four connectors shall be selected at random from each lot, or fraction thereof, and shall be subjected to the following inspection as specified (see 4.5):

- a. Leakage - extreme temperature (see 4.5.7).
- b. Pressure drop through connector with jig (see 4.5.8).
- c. Structural (see 4.5.9).
- d. Pull test (see 4.5.10).
- e. Tightness of threaded ports (see 4.5.11).
- f. Disconnect life (see 4.5.13).
- g. Odor (see 4.5.20).
- h. Packaging requirements (see 3.12 and 5.1).

**4.4.2.2.1 Rejection and reinspection.**

When one or more items from a lot fail to meet the specification, acceptance of all items in the lot shall be withheld until the extent and cause of failure have been determined. The contractor shall explain fully to the Government representative the cause of failure and the action taken to preclude recurrence. After correction, all of the sampling tests shall be repeated.

**4.4.2.2.2 Individual inspection may continue.**

For production reasons, individual test or other sampling plans may be continued pending the investigation of a sampling test failure. But final acceptance of the entire lot or lots produced later shall not be made until it is determined that all items meet all the requirements of the specification.

**4.4.3 Defects in items already accepted.**

The investigation of a test failure could indicate that defects may exist in items already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and the method of correcting them.

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**4.5 Methods of inspection.****4.5.1 Examination of product.**

Each connector shall be visually examined to determine conformance with this specification with respect to materials, workmanship, finish, markings, and tightness or locking of threaded parts. There shall be no evidence of cuts, nicks, or holes in the connector hose.

**4.5.2 Disconnection force (0, 45, and 90 degrees to the normal axis).**

A jig that is acceptable to the procuring activity and that has the internal dimensions of the connector specified in MS22058 shall be used for this test. Forces sufficient to disconnect the jig from the aircraft supply port shall be applied at 0, 45, and 90 degrees to the normal axis of the aircraft supply port. This test shall be performed three times; the angles shall be measured in three randomly selected planes. The force required to effect disconnection shall be as specified (see 3.6.1).

**4.5.2.1 Disconnection force (180 degrees to normal axis).**

The inspection specified (see 4.5.2) shall be repeated using a force sufficient to disconnect the jig from the aircraft supply port at an angle of 180 degrees to the normal axis of the aircraft supply port. This test shall be performed three times, and the angles shall be measured in three planes randomly selected. The force required to effect disconnection shall be as specified (see 3.6.1).

**4.5.3 Leakage - room temperature.**

A jig that is acceptable to the procuring activity and that has the internal dimensions of the connector specified in MS22058 shall be used for this test. The mask connection port shall be blocked by the insertion of a blanked-off bayonet connector externally conforming to MS27796. An internal pressure of 5 psi at normal room temperature shall be applied to the connector while it is subjected to a pull of 1.5 to 2 pounds applied to cause disconnection. The leakage shall be as specified (see 3.6.2), leakage in excess of that shall be cause for rejection.

**4.5.4 Relief valve setting.**

Pressure shall be applied to the oxygen-mask end of the connector. At a flow rate of 2.5 LPM, the developed pressure shall be as specified (see 3.6.3). At a flow rate of 12 LPM, the developed pressure shall be as specified (see 3.6.3). At a flow rate of 50 LPM, the developed pressure shall be as specified (see 3.6.3). A piezometer ring located 1.50 to 2.50 inches from the mask end of the connector shall be used to read the pressure.

**4.5.5 Flow rate through bailout supply attachment.**

The aircraft supply connector shall be capped and a fitting conforming to MIL-DTL-7560/1 Fitting Assembly -20 shall be attached to the bailout supply attachment. Oxygen shall be applied to the mask connector port and a pressure of  $12 \pm 1$  inches of water shall be applied within the housing. The flow measured through the bailout supply attachment shall be as specified (see 3.6.4).

**4.5.6 Pressure drop through connector.**

With the valve actuator located at the bottom of the slots, pressure or suction shall be applied to the connector to obtain a flow rate of 15 LPM from the regulator end to the mask end. The pressure drop through the connector shall be as specified (see 3.6.5). The pressure tap shall be a piezometer ring located approximately 2 inches from the end of the connector. The tap shall be located on the mask side if suction is used and on the regulator side if pressure is used. The flow duct shall be constructed to assure a straight flow for at least 6 inches after leaving the connector if suction is used or for at least 6 inches immediately before entering the connector if pressure is used. The connector housing shall be mounted in a vertical position and its location shall permit

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free flow into the connector if suction is used and free flow out of the connector if pressure is used.

**4.5.7 Leakage - extreme temperature.**

A jig that is acceptable to the procuring activity shall be used for this test. An internal pressure of 1 psi shall be applied in the temperature range of  $160 \pm 2$  °F to  $-65 \pm 2$  °F. The mask connection port shall be blocked by the insertion of a blanked-off bayonet connector externally conforming to MS27796. The leakage shall be as specified (see 3.6.6), leakage in excess of that shall be cause for rejection. No pull shall be applied during this test.

**4.5.8 Pressure drop through connector with jig.**

The connector shall be connected to a jig having the internal dimensions shown on MS22058. With the valve actuator located at the top of the slots, pressure shall be applied to the jig to obtain flow rates in the range of 0 to 135 LPM from the regulator end to the mask end. The pressure drop through the assembly shall be measured by a piezometer ring located 2 inches from the applicable end of the connector. For use of the piezometer ring (see 4.5.6). Pressure drops through the assembly in excess of the values specified (see 3.6.7), shall be cause for rejection.

**4.5.8.1 Pressure drop through flexed connector.**

The test specified (see 4.5.8) shall be repeated, using a flow rate of 135 LPM and adding a hose assembly conforming to MS22055B36 to the aircraft oxygen supply port of the connector. The distal end of the hose shall be twisted 360 degrees in each direction about its longitudinal axis, and the pressure drop through the connector shall be as specified (see 3.6.7.1) when the connector assembly is subjected to the maximum twists. With the longitudinal axis of the connector horizontal and with hose assembly MS22055B36 unsupported, the pressure drop through the connector shall be as specified (see 3.6.7.1).

**4.5.9 Structural.**

While the bailout port is rotated through two each complete alternating rotations in the connector, a moment as specified (see 3.6.8) shall be applied to the bailout supply in the direction shown on Figure 2. There shall be no flaking of materials, breakage of parts, or displacement of the retaining ring from its groove.

**4.5.10 Pull test.**

The connector shall be mounted in a mounting flange conforming to AF Drawing 57B3657. The mounting flange of the connector shall be subjected to a longitudinal axial pull as specified (see 3.6.9), without damage or separation. The aircraft supply port shall be tested similarly as specified (see 3.6.9). Upon completion of the test, the connector shall be subjected to and meet the requirements of the tests specified (see 4.4.1).

**4.5.11 Tightness of threaded ports.**

All ports which are threaded into the connector housing or the bailout supply port elbow shall be subjected to a torsional load as specified (see 3.6.10). Loosening of the threaded ports during this inspection shall be cause for rejection.

**4.5.12 Reliability.**

At room temperature, four connectors shall be subjected to simulated breathing cycles at a rate of between 10 and 20 breathing cycles per minute. Cyclic breathing of the connectors shall be accomplished with peak flow rates of 30 LPM, inhalation and exhalation, with the restrictor valve in the open position. During 20 percent of the time the connectors are subjected to breathing cycles, they shall be vibrated at a frequency ranging from 500 to 2,500 cycles per minute, at double amplitude of not less than 0.018 inch nor more than 0.020 inch. The connector shall be

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vibrated alternately on each of the three axes for 6 hours on each axis. At least once every 24 hours of the breathing cycle test, each connector shall be subjected to and shall meet the inspection requirements as specified (see 4.5.3, 4.5.4, and 4.5.6). No parts shall be replaced as preventive maintenance during reliability testing. Four connectors should be tested by the contractor for reliability in accordance with MIL-HDBK-781, and two of the four connectors should be continued through a longevity test in accordance with MIL-HDBK-781 and 4.5.8. Duration of the reliability test (MTBF demonstration) shall not be less than three times the specified MTBF on each item. If more than seven failures are experienced during the test, the sample has failed and shall be rejected. A failure is defined as the occurrence of any condition, which will interfere with meeting the performance levels specified herein.

**4.5.13 Disconnect life.**

A jig having the internal dimensions specified in MS22058 shall be used for this test, and the internal dimensions of the jig shall not change during this test. The mating connector MS22058 shall be inserted and disconnected from the aircraft supply port at the rate of approximately 1 cycle per second until 1,000 cycles have been completed. The separation forces shall be applied at 45 degree alternating angles to the connector centerline. At the beginning of the test, the average pounds of pull of five readings taken at 5-second intervals shall be determined; this average shall be within the range specified (see 3.6.12). At the conclusion of 1,000 cycles, the average pounds of pull of five readings at 5-second intervals shall be determined; this average reading shall be within  $\pm 10$  percent of the original average. The disconnection force shall be within the range specified (see 3.6.12), after 1,000 insertions. The restrictor valve shall fully close during each disconnection. Failure of the restrictor valve to close completely during each disconnection shall be cause for rejection. After this test, the connector shall be subjected to the tests specified (see 4.4.1).

**4.5.14 Low temperature exposure.**

The connector shall be subjected continuously for 48 hours to a temperature of  $-85 \pm 5$  °F. This exposure shall be at non-operating conditions, such as ambient pressure and zero flow rate. After the 48 hour period of exposure, the connector shall be stabilized to room temperature and shall be subjected to the tests specified (see 4.4.1).

**4.5.15 High temperature exposure.**

The connector shall be subjected continuously for 7 hours to a temperature of not less than 160 °F. This exposure shall be at non-operating conditions, such as ambient pressure and zero flow rate. After the 7-hour period of exposure, the connector shall be stabilized to room temperature and shall be subjected to the tests specified (see 4.4.1).

**4.5.16 Drop tests.**

The connector shall be subjected to 50 random free falls from a height of 2 feet to a concrete slab or similar firm surface. The connector shall be visually inspected, and all parts of the connector shall still be intact. Damage to the hose end of the connector shall be disregarded. After the conclusion of this test, the connector shall be subjected to the tests specified (see 4.5.3, 4.5.4, and 4.5.6).

**4.5.17 Maintainability verification.**

MIL-HDBK-470 should be used to verify the maintainability requirements of the connector, demonstrating a Mean Time to Repair (MTTR) of 15 minutes, with 90 percent of all maintenance action to require less than 30 minutes.

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**4.5.18 Longevity verification.**

The operating life span shall be verified by extending the reliability test to reach 2,700 hours of operation by each connector. If more than four failures occur during the last half (six MTBFs equivalent) of the reliability test, all failure data will be submitted to the procuring agency for evaluation for possible wear-out failures. Evidence of wear-out failures shall be criteria for rejection of the sample.

**4.5.19 Submerged liquid.**

The final assembled connector shall be submerged in a liquid and tested for leaks at 5 psi prior to delivery. Total leakage in excess of 0.01 liter per minute shall be cause for rejection.

**4.5.20 Odor.**

Gaseous oxygen shall be allowed to pass through the assembled connector at a rate not greater than 10 LPM for 1 minute. A smell test shall be conducted in a manner that shall prevent exterior odors from influencing the test. If 2 out of 6 persons judge the hose to have an objectionable odor the connector will be unacceptable (see 3.6.17).

**4.5.21 Tensile strength.**

Testing shall be in accordance with ASTM D412, Test Method A Dumbbell, Die C (see 3.3.2a).

**4.5.22 Tear resistance.**

Testing shall be in accordance with ASTM D624, Type B, Die B (see 3.3.2b).

**4.5.23 Ozone resistance.**

Two neoprene test slabs, 6×6×0.075 inches, shall be tested for ozone resistance (see 3.3.2c) with apparatus in accordance with ASTM D1149. The test slabs shall be elongated 20 percent, placed in an ozone free atmosphere for 24 hours, then placed in the ozone chamber. The chamber shall be adjusted to 100 ±2 °F and to give an exposure of ozone concentration of 120 ±10 parts by volume of ozone per million parts by volume of air. The air ozone velocity in the chamber shall be at least 2 feet per second. The material shall be exposed to these conditions for 1 hour. The test slabs shall be examined under 10X magnification. There shall be no evidence of checking, cracking, or other damage.

**4.5.24 Brittle point.**

Testing shall be in accordance with ASTM D2137, Test Method A (see 3.3.2d).

**4.6 Requirements cross-reference matrix.**

Table II provides a cross reference matrix of the requirements tested or verified above.

**TABLE II. Requirements cross-reference matrix.**

Requirement	Verification	Requirement	Verification
3.1	4.2, 6.3	3.6.8	4.5.9
3.3.2a	4.5.21	3.6.9	4.5.10
3.3.2b	4.5.22	3.6.10	4.5.11
3.3.2c	4.5.23	3.6.11	4.5.12
3.3.2d	4.5.24	3.6.11.1	4.5.18
3.6.1	4.5.2, 4.5.2.1	3.6.11.2	4.5.17
3.6.2	4.5.3	3.6.12	4.5.13
3.6.3	4.5.4	3.6.13	4.5.14
3.6.4	4.5.5	3.6.14	4.5.15

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3.6.5	4.5.6	3.6.15	4.5.16
3.6.6	4.5.7	3.6.16	4.5.19
3.6.7	4.5.8	3.6.17	4.5.20
3.6.7.1	4.5.8.1		

## 5. PACKAGING

### 5.1 Packaging.

For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel 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 service's system commands. 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 connector covered by this specification is intended for use on military aircraft for connecting oxygen masks and emergency oxygen supplies to regulator delivery hoses.

### 6.2 Acquisition requirements.

Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Identification of product (see 3.10).
- c. Packaging requirements (see 3.12 and 5.1).

### 6.3 Associated Data Item Descriptions (DIDs).

This specification has been assigned an Acquisition Management Systems Control (AMSC) number authorizing it as the source document for the following DIDs. When it is necessary to obtain the data, the applicable DIDs must be listed on the Contract Data Requirements List (DD Form 1423).

<u>DID Number</u>	<u>DID Title</u>
DI-NDTI-80809	Test/Inspection Report

The above DIDs were current as of the date of this specification. The ASSIST database should be researched at <https://quicksearch.dla.mil> to ensure that only current and approved DIDs are cited on DD Form 1423.

### 6.4 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. 38271

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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 AFLCMC/WNUS, 235 Byron St., Suite 19A, Robins AFB GA 31098. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil/>.

**6.5 Subject term (key word) listing.**

- Aircraft port
- Bailout
- Bayonet
- Casting
- Elastomers
- Flange
- Mounting plate
- Neoprene
- Supply port
- Threads
- Welding

**6.5 Changes from previous issue.**

Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

**CONCLUDING MATERIAL**

Custodian:  
Air Force - 11

Preparing activity:  
Air Force - 11

(Project 1660-2014-005)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/>.