INCH - POUND

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SUPERSEDING
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MILITARY SPECIFICATION

REGULATOR, CHEST MOUNTED, POSITIVE PRESSURE, CRU-82/P

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for a positive pressure, chest mounted regulator. This regulator will be used as part of an aircraft on-board oxygen generating system (OBOGS) or an aircraft liquid oxygen system (LOX) to provide breathing gas on demand. This regulator will provide safety pressure under all conditions as well as positive pressure breathing at altitudes above 34,000 ft.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2b).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code SR3, Highway 547, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 1660

SPECIFICATIONS

FEDERAL

BB-N-411	-	Nitrogen, Technical
PPP-B-601	-	Boxes, Wood, Cleated-Plywood
PPP-B-621	-	Boxes, Wood, Nailed and Lock Corner
PPP-B-636	-	Boxes, Shipping, Fiberboard
PPP-B-640	-	Box, Fiberboard, Corrugated, Triple-Wall

MILITARY

MIL-P-116 - Preservation, Methods of
MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-O-27210 - Oxygen, Aviator's Breathing, Liquid and Gas
MIL-G-27617 - Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant

STANDARDS

FEDERAL

FED-STD-595 - Colors Used in Government Procurement

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-130 - Identification Marking of U.S. Military Property
MIL-STD-810 - Environmental Test Methods and Engineering Guidelines
MIL-STD-889 - Dissimilar Metals
MIL-STD-970 - Standards and Specifications, Order of Preference for the Selection of
MIL-STD-1359 - Cleaning Methods and Procedures of Breathing Oxygen Equipment
MS27796 - Connector-Bayonet, Three Pin, Oxygen Mask

HANDBOOKS

MILITARY

MIL-HDBK-695 - Rubber Products: Recommended Shelf Life

(Unless otherwise indicated, copies of federal and military specifications and standards, and handbooks are available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issue shall be those in effect on the date of solicitation.

DRAWINGS

NAVAL AIR SYSTEMS COMMAND

62A-116-C48 - Piezometer
1440AS101 - Regulator, Chest Mounted, Positive Pressure, CRU-82/P
62A-116-E1 - Oxygen Components Test Stand
1172AS100 - Oxygen Components Test Stand
1316AS100 - Oxygen Components Test Stand
MBEU130049 - Manifold Assembly

PUBLICATIONS

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE FOR ACQUISITION AND LOGISTICS

SD-6 - Provisions Governing Qualification (Qualified Products List)

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

2.2 Non-Government publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2b).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1149 - Rubber Deterioration-Surface Ozone Cracking in a Chamber (Flat Specimen)

Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

(Non-Government standards and other publications are normally available from organizations that prepare or distribute the documents. These documents may also be available through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The regulators furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.3 and 6.4).

3.2 First article. When specified (see 6.2), the regulator shall be subjected to first article inspection (see 6.5) in accordance with 4.4.

3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein or in applicable detail specifications, shall be selected in accordance with MIL-STD-970.

3.4 Parts, materials and processes. In the selection of parts, materials and processes, fulfillment of major design objectives shall be the prime consideration. Materials shall conform to referenced specifications and shall be as specified herein and on referenced drawings. Materials which are not covered by specifications, or which are not specifically described herein, shall be of the best quality, of the lightest practicable weight, and suitable for the purpose intended.

3.4.1 Standard parts. MS and AN standard parts shall be used where they suit the purpose. When MS or AN standard parts are used, they shall be oxygen clean.

3.4.2 Metal parts. All metal parts shall be of a corrosion resistant material or treated in a manner to render them adequately resistant to corrosion.

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

3.4.2.2 Finish. Aluminum and aluminum alloy parts shall be protected in accordance with MIL-A-8625 or MIL-C-5541.

3.4.3 Elastomer parts. Any elastomer part that is adversely affected by continued use with oxygen shall not be used.

3.4.3.1 Age. Elastomer parts except silicone shall be not more than 12 months old from the date of manufacture to the date of delivery to any Government service or to any airframe or accessory manufacturer.

3.4.3.2 Ozone resistance. The elastomer parts shall be composed of ozone resistant materials, which shall not bloom, and shall meet the specified ozone resistance performance requirements.

3.4.3.3 Storage life. Elastomeric materials selected shall have an expected shelf storage life of 8 years or more based on the guidelines of MIL-HDBK-695 when such materials will provide the required physical, mechanical, and chemical properties.

3.4.4 Organic parts. All organic parts, regardless of state or modification, used in the regulator construction shall not support fungoid growth, as defined in MIL-STD-810, Method 508.

3.4.5 Protective treatment. When materials used in the construction of the regulator are subject to deterioration when exposed to environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that shall in no way prevent compliance with the performance requirements of this specification. Protective coating which might crack, chip or scale during normal service life or under extremes of environmental conditions shall not be used.

3.4.6 Adhesives. The regulator shall not contain glue, varnish or other such coatings or adhesives to secure parts (except labels) or to seal leaks.

3.4.7 Cleanliness.

3.4.7.1 Degreasing. Prior to assembling the regulator and its subassemblies, all internal surfaces shall be degreased in accordance with MIL-STD-1359.

3.4.7.2 Lubricants. Lubricants qualified to MIL-G-27617 may be used sparingly on seals and straight threads if assembly difficulty is encountered.

3.4.8 Toxic materials. Materials that produce toxic or corrosive substances shall not be used in the construction of the regulator.

3.4.9 Workmanship. The regulators shall be uniform in quality and shall be free from irregularities, defects, oil, grease or foreign material which could adversely affect safety, performance, reliability, or durability.

3.5 Design and construction. The regulator shall be designed in accordance with envelope drawing 1440AS101. The regulator size shall be not greater than the specified envelope dimensions. A relief valve need not be included in the regulator design. If a relief valve is incorporated in the regulator design, it shall be considered as part of the regulator in terms of meeting all the requirements of this specification. Regulators which incorporate a relief valve shall be subjected to the test conditions in 4.8.4.3 and shall pass the requirements of 3.6.4.3.

3.5.1 Operation. The regulator shall be capable of providing the outlet pressures specified at the flows, inlet pressures, altitudes, acceleration levels and environmental conditions specified.

3.5.2 Connections. The regulator shall require no input or output connections other than those indicated on drawing 1440AS101. The regulator shall require no electrical power.

3.5.3 Mounting. The regulator shall require no mounting or support other than as indicated on drawing 1440AS101.

3.5.4 Inlet fitting. The inlet fitting shall be in accordance with drawing 1440AS101. The fitting shall be installed such that it can be easily removed and replaced. The inlet fitting shall contain a filter as specified in 3.5.5.

3.5.5 Filters. A filter capable of filtering materials 70 microns in size shall be provided in the inlet fitting to prevent foreign particles from entering the regulator while in service. The filter shall be installed such that it can be removed and replaced as part of the inlet fitting. Similar size screens and filters shall also be provided in all ambient pressure sensing ports.

3.5.6 Odor. The interior of the regulator shall be free from odor.

3.5.7 Moisture. The design shall include provisions for preventing moisture from entering and collecting within the regulator.

3.5.8 Plugs. All openings in the regulator shall be closed with plastic caps or plugs to prevent foreign matter from entering the regulator during shipping and storage.

3.5.9 Weight. The weight of the oxygen regulator shall be not greater than 10.5 ounces.

3.5.10 Interchangeability. All parts, subassemblies and assemblies having the same part number shall be dimensionally and mechanically interchangeable.

3.5.11 Aneroid adjustment. The regulator shall be designed so that the aneroid can be easily adjusted. Aneroid bleed holes shall be visible, accessible, and capable of being blocked.

3.5.12 Identification of product. The regulator shall be identified in accordance with MIL-STD-130.

3.5.13 Serial numbers. The regulator shall be identified by an individual serial number which shall be assigned by the manufacturer. Serialization shall

be by block of consecutive numbers to cover the entire acquisition quantity (see 6.2).

3.5.14 Color. The color of the regulator shall be black, approximately matching color number 37038 of FED-STD-595.

3.5.15 Relief valve. A relief valve is optional to the regulator design. If a relief valve is incorporated in the regulator design, the regulator shall pass the requirements of 3.6.4.3 when tested as specified in 4.8.4.3.

3.6 Performance.

3.6.1 Visual examination.

3.6.1.1 Regulator. The regulator, when inspected in accordance with 4.8.1.1 shall have no more than the number of defects listed in Table I.

3.6.1.1.1 Dimensions. The regulator, when inspected in accordance with 4.8.1.1.1, shall conform to Drawing 1440AS101.

3.6.1.2 Packaging. The packaging, when inspected in accordance with 4.8.1.2, shall have no more than the number of defects listed in Table I.

3.6.2 Outer pressures.

3.6.2.1 Dynamic pressure. The outlet pressure of the regulator, when tested as specified in 4.8.2.1, shall be in accordance with the limits specified in Table II.

3.6.2.2 Steady state pressure.

3.6.2.2.1 Performance. The outlet pressure of the regulator, when tested as specified in 4.8.2.2.1, shall be in accordance with the limits specified in Table III.

3.6.2.2.2 Performance sampling. The outlet pressure of the regulator, when tested as specified in 4.8.2.2.2, shall be in accordance with the limits specified in Table IV.

3.6.3 Noise level. The noise level of the regulator, when tested as specified in 4.8.3, shall be not greater than the limits specified in Table V.

3.6.4 Leakage.

3.6.4.1 Body leakage. The regulator, when tested as specified in 4.8.4.1, shall not show any evidence of leakage through the body. The designed bleed flow rate shall not exceed 0.750 liters per minute (lpm).

3.6.4.2 Demand valve leakage - outward. The outlet pressure of the regulator, when tested as specified in 4.8.4.2, shall be in accordance with the limits in Table III. The outlet pressure after the 3 minute period shall be within ± 0.1 inch of water of the initial outlet pressure.

3.6.4.3 Relief valve. When the regulator is tested as specified in 4.8.4.3, flow through the relief valve shall be less than 0.1 lpm at 20 inches of water and greater than .01 lpm at 27 inches of water. The relief valve shall vent a minimum of 45 lpm at an applied pressure no greater than 40.7 inches of water (3 inches of mercury). The relief valve leakage shall not exceed 0.1 lpm at a

pressure of 18 inches of water. The regulator shall show no sign of material or mechanical failure during or after testing. Regulators which do not incorporate a relief valve need not meet this requirement.

3.6.5 Overload.

3.6.5.1 Outlet. The regulator, when tested as specified in 4.8.5.1, shall show no evidence of material or mechanical failure during or after exposure.

3.6.5.2 Inlet. The outlet pressure of the regulator, when tested as specified in 4.8.5.2, shall be not greater than 2.5 inches of water at any time during the test.

3.6.6 Altitude cycling. The regulator, when tested as specified in 4.8.6, shall operate as required and the outlet pressure shall be in accordance with the limits specified in Table IV. The regulator shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2 , 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.7 Extreme temperatures.

3.6.7.1 High temperatures. The regulator, when tested as specified in 4.8.7.1, shall operate as required and the outlet pressure shall be within +0.0/-1.0 inch of water of the limits specified in Table IV. The regulator shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.7.2 Low temperature. The regulator, when tested as specified in 4.8.7.2, shall operate as required and the outlet pressure shall be within +1.0/-0.0 inch of water of the limits specified in Table IV. The regulator shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.7.3 Temperature shock. The regulator, when tested as specified in 4.8.7.3, shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.8 Vibration. The regulator, when tested as specified in 4.8.8, shall operate as required and the outlet pressure shall be in accordance with the limits specified in Table IV. The regulator shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and

shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.9 Acceleration. The regulator, when tested as specified in 4.8.9, shall operate as required and the outlet pressure shall be in accordance with the limits specified in Table IV. The regulator shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.10 Shock. The regulator, when tested as specified in 4.8.10, shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.11 Humidity. The regulator, when tested as specified in 4.8.11, shall show no evidence of mechanical or material failure or evidence of corrosion during or after exposure other than superficial staining or tarnish. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.12 Salt fog. The regulator, when tested as specified in 4.8.12, shall show no evidence of mechanical or material failure or evidence of corrosion during or after exposure other than superficial staining or tarnish. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.13 Dust (fine sand). The regulator, when tested as specified in 4.8.13, shall show no evidence of mechanical or material failure during or after exposure. After exposure, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.14 Endurance. The regulator, when tested as specified in 4.8.14, shall operate as required and the outlet pressure shall be in accordance with the limits specified in Table II. The regulator shall show no signs of material or mechanical failure during or after simulation. After simulation, the regulator shall be tested as specified in 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2 and shall pass the respective requirements of 3.6.1.1, 3.6.2.2.2, 3.6.4.1, and 3.6.4.2. If the regulator design incorporates a relief valve, the regulator shall be tested as specified in 4.8.4.3 and pass the requirements of 3.6.4.3 after exposure.

3.6.15 Underwater. The regulator, when tested as specified in 4.8.15, shall pass the requirements in Table VI.

3.6.16 Ozone-resistance. The elastometer test slabs, when tested as specified in 4.8.16, shall show no evidence of checking, cracking or other damage.

3.6.17 Oxygen regulator purge. When tested as specified in 4.8.17, the regulator shall not ignite and there shall not be any evidence of charring or deterioration.

3.6.18 Inlet fitting removal. When tested as specified in 4.8.18, the inlet fitting shall contain a filter and the regulator shall show no signs of material failure.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of Sections 3 and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

a. Qualification inspection (see 4.3).
b. First article inspection (see 4.4).
c. Quality conformance inspection (see 4.5).
d. Quality conformance verification inspection (see 4.6).

4.3 Qualification inspection. Qualification inspection shall be as specified in Table VII, in the order specified.

4.3.1 Qualification samples. Qualification samples shall consist of four complete regulators, three elastomer slabs, and two sets of the manufacturer's drawings for the samples submitted (see 6.4). The elastomer slabs shall be 6 by 6 by 0.075 inch and composed of the identical ozone resistant composition and cure that was used in manufacturing the elastometer components. Samples shall be forwarded to a test facility set forth in the letter of authorization to submit samples (see 6.4). The samples shall be plainly identified by securely attached durable tags marked with the following information:

- Sample submitted by (name), (date) for qualification inspection in accordance with the requirements of MIL-R-85523A(AS)
- Number under authorization (reference authorizing letter and number) (see 6.4).

4.3.2 Retention of qualification. The retention of qualification shall consist of periodic verification to determine compliance of the qualified regulator with the requirements of this specification. The time and method of periodic verification shall be specified by the activity responsible for the Qualified Products List and shall be included in the Notice of Qualification letter.

4.4 First article inspection. First article inspection shall be as specified in Table VIII, in the order specified.

4.4.1 First article samples. Unless otherwise specified, as soon as practicable, after award of the contract or purchase order, the manufacturer shall submit four complete regulators and three elastomer slabs. The elastomer slabs shall be 6 by 6 by 0.075 inch and composed of the identical ozone resistant composition and cure that was used in manufacturing the elastomer components. The samples shall be representative of the construction, workmanship, components and materials to be used during production. When a manufacturer is in continuous production of these units from contract to contract, submission of further first article samples on a new contract may be waived at the discretion of the acquisition activity (see 6.2d). Approval of the first article samples or the waiving of the first article inspection does not waive the requirements of submitting to the quality conformance inspection. The first article inspection samples shall be furnished to the Government as directed by the contracting officer (see 6.2e).

4.4.2 First article information. Upon completion of the first article inspection, all the applicable inspection reports, recommendations and pertinent comments will be forwarded by the Government activity responsible for the inspection program (see 6.2e) to the contracting activity. Disposition of samples shall be as follows:

a. One approved sample will be initially returned to the contractor for use in monitoring production.

b. One approved sample will be retained by the test facility for reference during quality conformance verification and shall be returned to the contractor with samples from the final production lot.

c. The remaining samples will be consumed or destroyed during the inspection program and shall not be considered as part of the quantity to be delivered under the acquisition document.

4.5 Quality conformance inspection. The sampling and inspection levels and the acceptance criteria shall conform to MIL-STD-105 and Table I. Quality conformance inspection shall be as specified in Table I, in the order specified.

4.5.1 Sampling.

4.5.1.1 Inspection lot.

4.5.1.1.1 Regulator. An inspection lot size shall be expressed in units of one regulator made under essentially the same conditions and from the same materials and components. The sample unit shall be one regulator.

4.5.1.1.2 Packaging. An inspection lot size shall be expressed in terms of fully prepared shipping containers, containing regulators, fully prepared for delivery just prior to closure, made from essentially the same materials and components. The sample unit shall be one shipping container, containing regulators, fully prepared for delivery with the exception that it need not be sealed.

4.6 Quality conformance verification.

4.6.1 Quality conformance verification inspection. Quality conformance verification inspection shall be as specified in Table XIII, in the order specified.

4.6.2 Quality conformance verification inspection. At the option of the Government and upon completion of the quality conformance inspection (see 4.5), random samples shall be selected for quality conformance verification inspection at an inspection level I of MIL-STD-105. Each regulator, selected as a sample unit, shall be identified by its assigned serial number (see 3.5.13) and shall be forwarded to a laboratory designated at the time of award for testing (see 6.2.f). The serial numbers of the units in the lot, represented by the sample units, shall be furnished to the inspection facility. Transportation costs for shipping samples to and from the inspection facility shall be borne by the contractor. Accepted regulators will be returned to the manufacturer for inclusion in the lot.

4.6.3 Quality conformance verification approval. Upon completion of the quality conformance inspection, the Government activity responsible for conducting the quality conformance verification program (see 6.2.f) shall report the results of the tests and examinations to the inspection and acceptance activity specified in the acquisition document. Final acceptance of the lot from which the sample units were selected shall be based upon successful completion of the inspection program by the cognizant Quality Assurance Representative/Specialist at the contractor's facility.

4.7 Test conditions.

4.7.1 Gas. Unless otherwise specified, the gas used in testing the regulator shall be oil-free nitrogen, 99.95 percent pure, in accordance with BB-N-411 Type I, Grade A, Class 1 or oxygen in accordance with MIL-O-27210, Type I. The gas used in the oxygen regulator purge test shall be oxygen in accordance with MIL-O-27210, Type I.

4.7.2 Temperature and pressure. Unless otherwise specified, tests shall be conducted at local ambient temperature and barometric pressure. Test instruments shall be calibrated or adjusted according to their required usage in conducting individual tests. Temperature and pressure shall be recorded at the time of inspection and, when required, the test results shall be corrected to normal temperatures and pressure (NTP) conditions. NTP conditions are 29.92 inches of mercury (101.3 kPa) and 70°F (21.1°C). In the case of pressure drop measurements, the flow setting for conducting the test shall be corrected to NTP conditions before the test is conducted.

4.7.3 Adjustment of inlet supply pressure. At the start of steady tests, the initial inlet pressure applies only to zero flow conditions. When the

pressure reducing regulator device is not in the same ambient conditions as the oxygen breathing regulator, means shall be provided to determine the pressure at the ambient conditions of the breathing regulator. When flow is started, the inlet supply pressure shall not be allowed to drop more than 2 pounds per square inch gauge (psig) for inlet pressure above 8 psig. When flow is started, under no condition shall the inlet supply pressure be allowed to drop below 5 psig.

4.7.4 Orientation. The regulator shall operate as specified herein with the regulator oriented in any position. Acceleration testing shall be conducted using the orientations specified in Figure 5.

4.7.5 Inlet pressure. Unless otherwise specified, the regulator shall be operated with an inlet pressure from 5 to 120 psig. A flow shall not be drawn from the regulator when the inlet pressure is below 5 psig.

4.7.6 Vibratory control. Flutter dampers shall not be used to control or eliminate output flow fluctuation.

4.7.7 Test equipment.

4.7.7.1 Test stand. All steady state flow and pressure tests should be performed on a test stand model 62A-116-E1, 1172AS5100, or 1316AS100 or equivalent. Regulators, when tested on other stands, shall be capable of fulfilling all flow and pressure test requirements of this specification when tested on the specified test stands. The outlet of the regulator shall be connected to the test stand by an oxygen mask hose connector.

4.7.7.2 Piezometer assembly. The outlet pressure shall be measured using a piezometer assembly conforming to drawing 62A116C48. The piezometer shall be connected to the outlet of the regulator as shown in Figure 1. The regulator outlet pressure shall be measured at the piezometer union shown in drawing 62A116C48. Regulators, when tested with other piezometers, shall be capable of achieving the same pressures and flows as regulators tested with the specified piezometer.

4.7.7.3 Noise level test set-up. The test set-up for the noise level test shall be in accordance with Figure 2. The set-up shall include the following:

a. Digital frequency analyzer
b. Condenser microphone with 1 inch free field
c. Condenser microphone preamplifier
d. Graphic level recorder with voltage control paper drive
e. Operation 2120 and 1614-10 synchronous or charge cable

4.7.7.4 Breathing simulator. All dynamic breathing tests should be performed on a KRUG International breathing simulator model TS8225-PC or equivalent. Regulators, when tested on other simulators, shall be capable of fulfilling all flow and pressure test requirements of this specification when tested on the specified breathing simulator. The simulator shall breathe through an MBU-14/P oxygen mask secured to a head from with an airtight mask seal and connected to the regulator by an oxygen hose connector conforming to MS27796. Inlet pressure to the regulator shall be supplied through the regulator-to-seat hose (24894/55072-3), seat kit hose (24894/55072-5), seat kit manifold assembly (MBEU130049), and oxygen panel connector (24894/55054-7) from a reservoir held at constant pressure.

4.7.7.5 Underwater test set-up. Underwater testing shall be in accordance with Figure 4.

4.8 Methods of inspection.

4.8.1 Visual examination.

4.8.1.1 Regulators. The regulator shall be examined visually for defects to determine conformance to this specification. Defects shall be defined in accordance with Table IX. The regulator shall pass the requirements specified in 3.6.1.1.

4.8.1.1.1 Dimensions. The regulator selected as a sample unit from the lot, shall be checked dimensionally to determine conformance to the dimensions specified on Drawing 1440AS101.

4.8.1.2 Packaging. Each of the fully prepared shipping containers, containing regulators, selected as a sample unit from the lot, shall be examined to determine that the packaging, packing and marking conform to this specification. Defects shall be defined in accordance with Table X. The packaging shall pass the requirements specified in 3.6.1.2.

4.8.2 Outlet pressures.

4.8.2.1 Dynamic pressure. The regulator shall be connected to an air pressure source to provide inlet pressures as specified in Table II. A sinusoidal breathing simulator shall be connected to the regulator outlet port as specified in 4.7.7.4. The breathing simulator shall be set to the connections specified in Table II and the regulator outlet pressures shall be recorded in accordance with Figure 3. The regulator shall pass the requirements specified in 3.6.2.1.

4.8.2.2 Steady state pressure.

4.8.2.2.1 Performance. The regulator shall be connected to a pressure source to provide inlet pressures as indicated in Table III. The regulator shall be subjected to the inlet pressures, altitudes, and flowrates (see 4.7.7.1) specified in Table III and the regulator outlet pressures shall be recorded, without the use of a restrictor. The regulator shall pass the requirements specified in 3.6.2.2.1.

4.8.2.2.2 Performance sampling. The regulator shall be connected to a pressure source to provide inlet pressures as indicated in Table IV. The regulator shall be subjected to the inlet pressures, altitudes and flowrates (see 4.7.7.1) specified in Table IV and the regulator outlet pressures shall be recorded, without the use of a restrictor. The regulator shall pass the requirements specified in 3.6.2.2.2.

4.8.3 Noise level. The regulator shall be installed as shown in Figure 2. The regulator shall then be subjected to an inlet pressure of 30 psig, with an outlet flow of 100 lpm. The noise level shall be measured (see 4.7.7.3) at the 1/3 octave band center frequencies specified in Table V. The test shall be repeated for an inlet pressure of 80 psig. The regulator shall pass the requirements specified in 3.6.3.

4.8.4 Leakage.

4.8.4.1 Body leakage. The regulator shall be subjected to an inlet pressure of 30 psig with the outlet capped. Overall leakage shall be measured either by a suitably corrected flow meter in the inlet line, or by collecting all outward leakage from the regulator. The test shall be repeated for an inlet pressure of 80 psig. The leakage shall be recorded and pass the requirements specified in 3.6.4.1.

4.8.4.1.1 Adjustment for bleed flow. If the regulator incorporates a design bleed flow that vents through the body, an adjustment to the body leakage requirement shall be allowed. Any flow over the designed bleed flow specified in 3.6.4.1 shall be considered leakage for the body leakage test.

4.8.4.2 Demand valve leakage - outward. The inlet of the regulator shall be subjected to a pressure of 30 psig while maintaining zero flow conditions at ground level. After a 3 minute period, the outlet pressure of the regulator shall be measured. The test shall be repeated for an inlet pressure of 80 psig. The regulator shall pass the requirements specified in 3.6.4.2.

4.8.4.3 Relief valve. The regulator shall be supplied with an inlet pressure of 30 psig. A pressure of 20 inches shall be applied to the regulator outlet. Flow through the relief port shall be recorded. The applied pressure at the regulator outlet shall be increased to 27 inches. Flow through the relief port shall be recorded. The applied outlet pressure shall be increased until flow through the relief port exceeds 45 lpm. The applied pressure shall be recorded. The applied pressure shall be reduced to 18 inches of water and the flow through the relief port shall be recorded. The regulator shall pass the requirements specified in 3.6.4.3.

4.8.5 Overload.

4.8.5.1 Outlet. The inlet and all other orifices shall be capped and a pressure of 20 inches of water shall be applied to the outlet of the regulator and maintained for 2 minutes. The regulator shall pass the requirements specified in 3.6.5.1.

4.8.5.2 Inlet. While maintaining a zero flow condition at ground level, a pressure of 150 psig shall be applied to the inlet of the regulator for 3 minutes. The regulator shall pass the requirements specified in 3.6.5.2.

4.8.6 Altitude cycling. While maintaining a flow between 25 and 100 lpm, a pressure of 30 psig shall be applied to the inlet of the regulator and the regulator shall be exposed to simulated altitudes of ground level to 50,000 ft. for a total of 50 cycles. One cycle shall consist of ground level to 50,000 ft. to ground level. The ascent rate shall be 500 feet per second (ft./sec.) and the descent rate shall be 1000 feet per second (1000 ft./sec.). Upon completion of this procedure, the regulator shall be subjected to the inlet and flow conditions of Table IV. The regulator shall pass the requirements specified in 3.6.6

4.8.7 Extreme temperatures.

4.8.7.1 High temperature. The regulator shall be conditioned at a temperature of 160° ± 5°F for 3 hours. After conditioning and while still at this temperature, the regulator shall be subjected to the conditions of Table IV and pass the requirements specified in 3.6.7.1.

4.8.7.2 Low temperature. The regulator shall be conditioned at a temperature of -65° ± 5°F for 3 hours. After conditioning, and while still at

this temperature, the regulator shall be subjected to the conditions of Table IV and shall pass the requirements specified in 3.6.7.2.

4.8.7.3 Temperature shock. The regulator shall be subjected to the temperature shock test of MIL-STD-810, Method 503. The inlet, outlet and bleed ports shall be capped during the exposure. The low temperature shall be -65° ± 5°F and the high temperature shall be 160° ± 5°F. The regulator shall pass the requirements specified in 3.6.7.3.

4.8.8 Vibration. The regulator shall be hard mounted to the vibration fixture, with a pressure of 30 psig applied to the inlet of the regulator and an outlet flow of 50 lpm. The regulator shall be vibrated for 3 hours in each of the three major axes at a frequency from 500 to 2500 to 500 cycles per minute at a sweep rate of 15 minutes, and a double amplitude of 0.018 to 0.020 inch. During vibration, the regulator shall pass the requirements specified in 3.6.8.

4.8.9 Acceleration. The regulator shall be mounted to the acceleration fixture, with a pressure of 30 psig applied to the inlet of the regulator and an outlet flow of 50 lpm. The regulator shall be subjected to an acceleration force of 7g in six different directions. One force shall be applied at a time in the direction specified in Figure 5. During the application of each acceleration force, the regulator shall pass the requirements specified in 3.6.9.

4.8.10 Shock. The regulator shall be subjected to the following shock testing. The height of the drop shall be 29.0 ± 1.0 inches. The regulator shall be released from a quick-release or drop tester. The floor or barrier receiving the impact shall be two-inch plywood backed by concrete. The regulator shall be dropped 10 times on various random faces, edges and corners. The regulator shall pass the requirements specified in 3.6.10.

4.8.11 Humidity. The regulator shall be subjected to the humidity test of MIL-STD-810, Method 507, Procedure II. The inlet, outlet and bleed port shall be capped during the exposure. The regulator shall pass the requirements specified in 3.6.11.

4.8.12 Salt fog. The regulator shall be subjected to the salt fog test of MIL-STD-810, Method 509, Procedure I, except the salt fog shall be as specified in Table XI. The inlet, outlet and bleed ports shall be capped during the exposure. The regulator shall pass the requirements specified in 3.6.12.

4.8.13 Dust (fine sand). The regulator shall be subjected to the dust test of MIL-STD-810, Method 510, Procedure I. The inlet, outlet and bleed ports shall be capped during the exposure. The regulator shall pass the requirements specified in 3.6.13.

4.8.14 Endurance. The regulator shall be connected to an air pressure source to provide an inlet pressure of 30 psig. A sinusoidal breathing simulator (see 4.7.7.4) shall be connected to the regulator outlet port. The breathing simulator shall be set to the conditions specified in Table XII and the regulator outlet pressures shall be recorded in accordance with Figure 3. The regulator shall be subjected to 250,000 breathing cycles or endurance testing at the frequencies, peak flowrates and number of cycles specified in Table XII. The regulator shall pass the requirements specified in 3.6.14.

4.8.15 Underwater. The regulator shall be connected to an air pressure source to provide an inlet pressure of 80 psig. The regulator shall be subjected to the water depths and flowrates (see 4.7.7.5) specified in Table VI. The regulator shall pass the requirements specified in 3.6.15.

4.8.16 Ozone-resistance. The three elastomer test slabs submitted for qualification inspection shall be tested for ozone-resistance. The test apparatus shall be in accordance with ASTM D 1149-91. 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 60 minutes. The test slabs shall be examined under a 10X magnification and pass the requirements specified in 3.6.16.

4.8.17 Oxygen regulator purge. The regulator shall be connected to a regulated source of oxygen (4.7.1). An inlet pressure of 120 psig shall be applied and the regulator shall free flow for 1 to 3 minutes. The regulator shall pass the requirements of 3.6.17.

4.8.18 Inlet fitting. The inlet fitting of the regulator shall be removed to examine the inlet filter. The inlet fitting shall be reinstalled on the regulator. The regulator shall pass the requirements of 3.6.18.

5. PACKAGING

5.1 Preservation. Unless otherwise specified in the contract or order, preservation shall be Level A, using Method IIb of MIL-P-116, with one regulator per unit package (see 6.2.1f). Preservatives shall not be used. All openings in the regulator shall be closed with suitable closure to prevent entry of dirt or foreign matter during shipment and storage.

5.2 Packing. Packing shall be Level A, B, or C, as specified in the contract or order (see 6.2.1f).

5.2.1 Level A. Each unit, packaged as specified in 5.1, shall be packed for shipment in containers conforming to PPP-B-601 or PPP-B-621, Overseas Type.

5.2.2 Level B. Each unit, packaged as specified in 5.1, shall be packed for shipment in containers conforming to PPP-B-601 or PPP-B-621, Domestic Type; fiberboard boxes conforming to PPP-B-636 or PPP-B-640, Weather Resistant may be used provided that the gross weight is not greater than the applicable specification limitation.

5.2.3 Level C. Units, preserved as specified in 5.1, shall be packed for shipment in exterior type shipping containers conforming to rules and regulations pertaining to mode of transportation and acceptable to carrier at the lowest possible tariff rate that shall ensure safe delivery. Contractor's commercial/industrial packing procedure may be used when the above criteria are met.

5.3 Marking. The exterior and interior containers shall be marked in accordance with MIL-STD-129. In addition, the following precautionary marking shall be required on each unit package and shipping container:

CAUTION

DO NOT ALLOW PETROLEUM CONTAMINANTS OF ANY KIND TO BE USED/STORED ON OR ABOUT THESE CONTAINERS.

5.4 Special requirements. All wrappings, cushioning, dunnage and containers used in preservation, packaging and packing of regulators shall be completely free of contamination by oil or grease.

6. NOTES

6.1 Intended use. The regulator covered by this specification is intended for use in supplying breathing gas to aircrewmen in the operation of an aircraft.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification, including any amendments
b. Issue of DODISS to be cited in the solicitation and if required the specific issue of indiviual documents referenced (see 2.1 and 2.2)
c. Applicable QPL, Government designation and manufacturer designation.
d. Whether first article inspection is required (see 4.4).
e. Name and address of the first article inspection laboratory (see 4.4) and the name of the Government activity responsible for conducting the first article inspection program (see 4.4).
f. Name and address of the quality conformance verification inspection facility (see 4.6) and the name of the Government activity responsible for conducting the quality conformance verification inspection program (see 4.6).
g. Applicable levels of preservation, packaging, and packing (see 5.1 and 5.2).
h. Data item required (see 6.2.2).
i. Quantity of regulators.

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DOD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.4.2, 4.5, 4.6	DI-NDTI-80809	Test/Inspection Report	10.2.7

The above DID's were those cleared as of the date of this solicitation. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List (QPL-85523) whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, 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. The activity responsible for the Qualified Products List is: Commander, Naval Air Systems Command, Washington, D.C. 20361; however, information pertaining to qualification of products should be obtained from the Commander, Naval Air Warfare Center Aircraft Division, Code 6031, Box 5152, Warminster, Pennsylvania 18974-5091.

6.5 First article. The contracting officer should include specific instructions in acquisition documents, regarding arrangements for examinations, tests end approval of the first article.

6.6 Laboratory information. The successful bidder will be furnished with the name of the quality conformance verification inspection laboratory and the Government activity responsible for conducting the inspection program at the time of award. Samples from a rejected lot shall not be resubmitted for tests and examinations without the approval of the contracting officer.

6.7 Changes from previous issues. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.8 Subject term (keyword) listing.

Breathing gas
Pressure breathing
Oxygen system
Sea level operation
Altitude operation

Preparing activity
Navy - AS
(Project No. 1660-N656)

TABLE I. Quality conformance inspection (see 4.5).

Inspection 1/	Procedure	Sampling 2/	Acceptance criteria
Visual examination Regulator	4.8.1.1	Every regulator	Reject units with critical defects Accept 2.5 minor defects per 100 units
Dimensions	4.8.1.1.1	Inspection level II for minor defects	Reject defective units
Overload Outlet	4.8.5.2	Every regulator	Reject defective units
Inlet	4.8.5.1	Every regulator	Reject defective units
Outlet pressure Steady state pressure	4.8.2.2.2	Every regulator	Reject defective units
Noise level	4.8.3	Every regulator	Reject defective units
Leakage Body leakage	4.8.4.1	Every regulator	Reject defective units
Demand valve leakage-outward	4.8.4.2	Every regulator	Reject defective units
Packaging	4.8.1.2	Inspection level S-2	Accept 4.0 defect per 100 units

1/ The results of all inspections shall be identifiable by the assigned serial numbers (3.5.1.3).

2/ The sample size shall be based only on the applicable sample size code letter corresponding to the specified inspection level of MIL-STD-105.

TABLE II. Dynamic outlet pressure conditions and requirements (see 3.6.2.1).

Breath volume (liters/breath)	Flowrate Average Peak (liters/min)		Breathing frequency (breaths/min)	Regulator outlet pressure (inch H_2O)
1.0	15.9	50	15.9	0.5 to 1.5
2.0	15.9	50	8.0	0.5 to 1.5
1.0	23.9	75	23.9	0.7 to 2.0
2.0	23.9	75	12.0	0.7 to 2.0
1.0	31.8	100	31.8	1.0 to 2.5
2.0	31.8	100	15.9	1.0 to 2.5
1.5	47.7	150	31.8	1.5 to 3.5
2.0	47.7	150	23.9	1.5 to 3.5
3.0	47.7	150	15.9	1.5 to 3.5
1.5	57.3	180	38.2	2.0 to 4.5
2.0	57.3	180	28.7	2.0 to 4.5
3.0	57.3	180	19.1	2.0 to 4.5
1.5	63.7	200	42.5	2.5 to 5.0
2.0	63.7	200	31.9	2.5 to 5.0
3.0	63.7	200	21.2	2.5 to 5.0

Note:

1. The regulator shall be tested at minimum inlet pressures of 5,8,15,30 and 80 +2/-0 psig at each of the above conditions, except as follows:

   a. At an inlet pressure of 5 psig, flowrates above 75 lpm shall not be required.
   b. At an inlet pressure of 8 psig, flowrates above 100 lpm shall not be required.

2. Regulator inlet pressure, peak flow and outlet pressure shall be as defined in Figure 3.

3. Breathing inhalation and exhalation shall be sinusoidal (see 4.7.7.4).

4. The duration of testing shall be at least 1 minute.

TABLE III. Steady state outlet pressure conditions and requirements (see 3.6.2.2.1).

Outlet flowrate (liters/min)	Altitude (x1000 ft)	Outlet pressure (inches H_2O)
0, 50	0, 15, 30	0.5 to 1.5
75	0, 15, 30	0.7 to 2.0
100	0, 15, 30	1.0 to 2.7
180	0, 15, 30	2.0 to 4.5
0, 50	34	0.5 to 2.7
75	34	0.7 to 3.2
100	34	1.0 to 3.7
180	34	2.0 to 5.7
0, 50, 75, 100, 180	36	3.0 to 6.0
0, 50, 75, 100, 180	40	8.0 to 11.0
0, 50, 75, 100, 180	45	13.0 to 16.0
0, 50, 75, 100, 180	50	16.0 to 20.0

Note:

1. The regulator shall be tested at inlet pressures of 5,8,15,30,90 and 120 psig at each of the above conditions, except as follows:

    a. At an inlet pressure of 5 psig, flowrates above 75 lpm shall not be required.
    b. At an inlet pressure of 8 psig, flowrates above 100 lpm shall not be required.

2. Fluctuations in output flow shall not be permitted.

3. The conditions and requirements listed above pertain to first article and qualification testing as described in 4.8.2.2.1 and 3.6.2.2.1, respectively. Conditions and requirements for quality conformance inspection, quality conformance verification inspection, environmental exposure testing, and post environmental exposure are listed in Table IV.

TABLE IV. Steady state outlet pressure conditions and requirements (see 3.6.2.2.2).

Outlet flowrate (liters/min)	Altitude (x1000 ft)	Outlet pressure (inches H_2O)
0	0, 30	0.5 to 1.5
75	0, 30	0.7 to 2.0
180	0, 30	2.0 to 4.5
0	34	0.5 to 2.7
75	34	0.7 to 3.2
180	34	2.0 to 5.7
0, 75, 180	36	3.0 to 6.0
0, 75, 180	45	13.0 to 16.0
0, 75, 180	50	16.0 to 20.0

Note:

1. The regulator shall be tested at inlet pressures of 8,30 and 120 psig at each of the above conditions, except as follows:

    a. At an inlet pressure of 5 psig, flowrates above 75 lpm shall not be required.
    b. At an inlet pressure of 8 psig, flowrates above 100 lpm shall not be required.

2. The conditions and requirements listed above pertain to the following testing.

    a. Quality conformance inspection.
    b. Quality conformance verification inspection.
    c. Environmental exposure inspection.
    d. Post-environmental inspection.

3. First article and qualification test conditions and requirements of 4.8.2.2.1 and 3.6.2.2.1 are listed in Table III.

4. Fluctuations in output flow shall not be permitted

TABLE V. Noise level conditions and requirements (see 3.6.3).

1/3 octave band center frequency	noise level (db) reference 1/	reference 2/
320	95	30
400	95	30
500	95	30
630	95	30
800	95	30
1000	95	30
1250	95	30
1600	95	30
2000	95	30
2500	95	30
3150	95	30
4000	95	30
5000	95	30
6300	95	30

1/ Noise level referenced to 2.0×10^{-4} dyne/cm^2(0.47×10^{-12}W/m^2)
2/ Noise level referenced to 2.9×10^{-4} dyne/cm^2(1.00×10^{-12}W/m^2)

TABLE VI. Underwater outlet pressure conditions and requirements (see 3.6.15).

Outlet flowrate (liters/min)	Water Depth (inches H_2O)	Maximum outlet pressure (inches H_2O) 1/
0 and 100	12	23
0 and 100	24	35
0 and 100	36	47
0 and 100	48	59
0 and 100	60	71
0 and 100	72	83

1/ Maximum outlet pressure shall be measured relative to ambient above the water.

TABLE VII. Qualification inspection (see 4.3).

Inspection	Paragraph	
	Requirement	Procedure

Visual examination		
Regulator	3.6.1.1	4.8.1.1
Dimensions	3.6.1.1.1	4.8.1.1.1
Outlet pressure		
Dynamic pressure	3.6.2.1	4.8.2.1
Steady state pressure	3.6.2.2.1	4.8.2.2.1
Noise level	3.6.3	4.8.3
Leakage		
Body leakage	3.6.4.1	4.8.4.1
Demand valve leakage-outward	3.6.4.2	4.8.4.2
Relief valve 2/	3.6.4.3	4.8.4.3
Overload		
Outlet	3.6.5.1	4.8.5.1
Inlet	3.6.5.2	4.8.5.2
Post overload 1/		
Altitude cycling	3.6.6	4.8.6
Post altitude cycling 1/		
High temperature	3.6.7.1	4.8.7.1
Post high temperature 1/		
Low temperature	3.6.7.2	4.8.7.2
Post low temperature 1/		
Temperature shock	3.6.7.3	4.8.7.3
Post temperature shock 1/		
Vibration	3.6.8	4.8.8
Post vibration 1/		
Acceleration	3.6.9	4.8.9
Post acceleration 1/		
Shock	3.6.10	4.8.10
Post shock 1/		
Humidity	3.6.11	4.8.11
Post humidity 1/		
Salt Fog	3.6.12	4.8.12
Post salt fog 1/		

TABLE VII. Qualification inspection (continued)

Inspection	Paragraph	
	Requirement	Procedure
Dust (fine sand)	3.6.13	4.8.13
Post dust 1/		
Endurance	3.6.14	4.8.14
Post endurance 1/		
Repeat of noise level	3.6.3	4.8.3
Repeat of outlet pressure		
Dynamic pressure	3.6.2.1	4.8.2.1
Steady state pressure	3.6.2.2.1	4.8.2.2.1
Repeat of leakage		
Body leakage	3.6.4.1	4.8.4.1
Demand valve leakage-outward	3.6.4.2	4.8.4.2
Oxygen Purge	3.6.17	4.8.17
Underwater	3.6.15	4.8.15
Inlet Fitting	3.6.18	4.8.18
Ozone resistance	3.6.16	4.8.16

1/ These post environmental test shall include 4.8.1.1, 4.8.2.2.2, 4.8.4.1, and 4.8.4.2. If the regulator design incorporates a relief valve, 4.8.4.3 shall also be included.

2/ Testing shall be performed only if the regulator design incorporates a relief valve.

TABLE VIII. First article inspection (see 4.4).

Inspection	Paragraph	
	Requirement	Procedure

Visual examination		
Regulator	3.6.1.1	4.8.1.1
Dimensions	3.6.1.1.1	4.8.1.1.1
Overload		
Outlet	3.6.5.1	4.8.5.1
Inlet	3.6.5.2	4.8.5.2
Outlet pressure		
Dynamic pressure	3.6.2.1	4.8.2.1
Steady state pressure	3.6.2.2	4.8.2.2.1
Noise level	3.6.3	4.8.3
Leakage		
Body leakage	3.6.4.1	4.8.4.1
Demand valve leakage-outward	3.6.4.2	4.8.4.1

TABLE IX. Classification of defects for visual examination of the regulator (see 4.8.1.1).

Critical

1. Material imperfections, foreign matter embedded.
2. Surface unclean, rough misaligned, cracked, nicked or otherwise flawed.
3. Any component missing, malformed, fractured or otherwise damaged.
4. Any component loose or otherwise not securely retained.
5. Incorrectly assembled or improperly positioned components.
6. Any functioning part that works with difficulty.
7. Faulty workmanship or other irregularities.
8. Weight greater than specified.
9. Any component with evidence of grease or oil.
10. Gasket or seal improperly positioned or unevenly compressed.
11. Gaps between surfaces that should be sealed.
12. Evidence of offensive odor or toxic substances.
13. Evidence of the collection of moisture inside the regulator.
14. Evidence of adhesives other than to secure labels.

Minor

201. Marking missing, insufficient, incorrect, illegible or not permanent.
202. Color not as specified.
203. Evidence of excessive use of lubricants.
204. Missing inlet/outlet caps or plugs.

TABLE X. List of defects for packaging (see 4.8.1.2).

Item	Defects
Exterior and interior markings	Missing, incorrect, incomplete, illegible; of improper size, location, sequence or method of application; markings not the same on the interior and exterior containers.
Packaging and packing material	Any non-conforming component; any component missing, damaged or otherwise defective.
Workmanship	Inadequate application of the components such as incomplete closure of the unit package, intermediate package, container flaps, loose strapping. etc.; bulging or distortion of the container.
Exterior and interior	Number per container is more or less than weight or content required; gross or net weight exceeds the requirements.

TABLE XI. Salt fog solution (see 4.8.12).

Salt	Concentration (grams per liter)
Sodium chloride	24.540
Magnesium chloride	11.110
Sodium sulfate	4.094
Calcium chloride	1.159
Potassium chloride	0.695
Sodium bicarbonate	0.201
Potassium bromide	0.101
Strontium chloride	0.042
Boric acid	0.027
Sodium fluoride	0.003

TABLE XII. Dynamic endurance (see 4.8.14). 1/

Test cycles 3/ (cycles)	Tidal volume (liters)	Flowrate Average Peak (liters/min) 2/		Breathing frequency (cycle/min)
25,000	2.0	7.3	180	28.7
50,000	2.0	15.9	50	8.0
175,000	2.0	31.8	100	15.9

1/ This test shall be run for a total of 250,000 cycles.

2/ 70°F, 14.7 pounds per square inch atmospheric (psia)

3/ A complete cycle includes the flow period during breathing simulation inhalation and the no flow period during breathing simulator exhalation.

TABLE XIII. Quality conformance verification inspection (see 4.6.1).

Inspection	Requirement paragraph	Test Method Paragraph	Sample size
Visual			
Regulator	3.6.1.1	4.8.1.1	Every regulator
Dimensions	3.6.1.2	4.8.1.2	Every regulator
Overload			
Outlet	3.6.5.2	4.8.5.2	Every regulator
Inlet	3.6.5.1	4.8.5.1	Every regulator
Outlet pressure			
Steady state	3.6.2.2.2	4.8.2.2.2	Every regulator
Noise level	3.6.3	4.8.3	Every regulator
Leakage			
Body leakage	3.6.4.1	4.8.4.1	Every regulator
Demand valve leakage outward	3.6.4.2	4.8.4.2	Every regulator

Figure 1. Location of piezometer (62A116C48).

Figure 2. Noise level test set-up.

Notes:

1. Minimum regulator pressure shall be set to +2/-0 psig of the specified value at the time of peak flow rate.

2. Regulator outlet shall be recorded at the time of peak flow rate.

Figure 3. Dynamic test measurements.

Figure 4. Underwater test set-up.

Figure 5. Direction of applied forces.