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MILITARY SPECIFICATION

# CONVERTER, LIQUID OXYGEN, 10 LITER, GCU-24/A

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

## 1. SCOPE

1.1 Scope. This specification covers one type of aircraft converter, GCU-24/A, used for storing and pressurizing 10 liters of liquid oxygen.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

* 2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

| | |
|---|---|
| L-P-378 | Plastic Sheet and Strip, Thin Gauge, Polyolefin |
| BB-N-411 | Nitrogen, Technical |
| PPP-B-636 | Box, Shipping, Fiberboard |
| PPP-B-640 | Box, Fiberboard, Corrugated, Triple-wall |
| PPP-F-320 | Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 1660

SPECIFICATIONS (Continued)

MILITARY

| | |
|---|---|
| MIL-P-116 | Preservation, Methods of |
| MIL-C-5501 | Cap and Plug, Protective, Dust and Moisture Seal |
| MIL-I-6181 | Interference Control Requirements, Aircraft Equipment |
| MIL-V-9050 | Valves, Oxygen, Pressure Relief, Aircraft |
| MIL-C-25516 | Connector, Electrical, Miniature, Environment Resisting Type, General Specification for |
| MIL-L-25567 | Leak Detection Compound, Oxygen Systems |
| MIL-V-25961 | Valve, Fill-Buildup-Vent, Liquid Oxygen Converter CRU-50/A |
| MIL-O-27210 | Oxygen, Aviator's Breathing, Liquid and Gas |
| MIL-T-27730 | Tape, Antiseize, Tetrafluoroethylene, With Dispenser |
| MIL-C-81302 | Cleaning Compound, Solvent, Trichlorotrifluoroethane |
| MIL-T-81533 | Trichloroethane 1, 1, 1 (Methyl Chloroform) Inhibited, Vapor Degreasing |

STANDARDS

FEDERAL

| | |
|---|---|
| FED-STD-595 | Color |

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-143 | Specifications and Standards, Order of Precedence for the Selection of |
| MIL-STD-781 | Reliability Tests-Exponential Distribution |

STANDARDS (Continued)

MILITARY (Continued)

| | |
|---|---|
| MIL-STD-810 | Environmental Test Methods |
| MIL-STD-889 | Dissimilar Metals |
| MS22068 | Coupling Assemblies, Quick Disconnect, Aircraft Liquid Oxygen Systems |
| MS90341 | Mounting bracket, Mating Portion for 5 and 10 Liter Liquid Oxygen Converters |
| MS90342 | Nut Assembly-Grooved Washer and Detented Wing |

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

* 2.1.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

* 3.1 Qualification. The converter furnished under this specification shall be a product which is qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3, 4.3.1, and 6.3).

* 3.2 First article. When specified, the converter shall be subjected to first article inspection (see 4.4 and 6.4).

3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 Materials. Materials shall conform to applicable specifications and shall be as specified herein and on applicable 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 Metal parts. All metal parts shall be of a corrosion-resistant material or treated in a manner to render them adequately resistant to corrosion.

3.4.1.1 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 Nonmetallic materials. Any nonmetallic material that is adversely affected by continued use with oxygen shall not be used.

3.4.2.1 Age. Elastomer components, 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 Protective treatment. When materials are used in the construction of the converter that 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 will 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.

3.5 Standard parts. MS and AN Standard parts shall be used where they suit the purpose.

3.6 Design and construction. The design and construction shall be in accordance with Figures 1, 2, 3, and 4. The converter shall include provisions for filling with liquid oxygen when either installed or not installed in the aircraft, and for being transported in the filled condition. The converter shall consist of the following major components:

Container
Container outer shell
Sensing element
Electrical connectors
Combination fill-buildup-vent valve
Relief valve
Overpressure safety device
Pressure control valve

3.6.1 Components and hardware. The design of the components and associated hardware shall be such that the assembly/disassembly of the converter can be accomplished without the use of any specialized tools. All components and hardware shall be designed, protected, or positioned to prevent chafing due to normal service, shipping, and handling environments. Tube assemblies and warming coils shall be a minimum of 1/16 of an inch (1.58 mm) from the container outer shell where practicable.

3.6.2 Container. The container shall be designed to contain a minimum of 10 liters of liquid oxygen measured at 1 atmosphere (101.3 kPa). The container shall be designed such that in case of contamination the container can be easily and completely cleaned by Overhaul and Repair servicing personnel and then returned to service status. If the container employs a vacuumized space as insulation, it shall be provided with a functional adsorbent. The container shall be

baffled to prevent direct exit of liquid oxygen through the vent line during initial stages of the filling operation.

3.6.3 Container outer shell. The outer shell of the container shall be provided with a rupture point having not less than a 3/8 inch (9.525 mm) diameter escape area. Pressure required to rupture the escape area shall be at least 20 percent less than the burst pressure of the outer container shell. The rupture point shall be located in such a position that in case of rupture the danger to personnel will be at a minimum.

3.6.4 Sensing element. The sensing element shall consist of an electrical capacitance having characteristics that provide for a linear relationship between electrical capacitance and volume sensed. The element shall be designed for use with indicator system components to indicate the amount of liquid oxygen in the liquid oxygen container. The sensing element shall be an integral part of the container, but may be either removable or permanently installed. The sensing element shall not be electrically grounded to the container. The interference limits shall be in accordance with MIL-I-6181.

3.6.4.1 Electrical connectors. The high impedance sensing element lead shall be terminated in a connector conforming to MIL-C-25516, B polarity. The low impedance lead shall be terminated in a connector conforming to MIL-C-25516, E polarity. The connectors shall provide waterproof connection. The connectors shall be provided with dust caps connected to the converter by a suitable chain or linkage arrangement. Storage clips shall be provided for these caps near the electrical connectors.

3.6.5 Combination fill-buildup-vent valve. The combination fill-buildup-vent valve, as a component only, shall meet the performance requirements of MIL-V-25961.

3.6.6 Relief valve. The relief valve, as a component only, shall meet the performance requirements of MIL-V-9050, Type II.

3.6.7 Pressure control valve. The pressure control valve to be used shall be a pressure closing valve.

3.6.8 Check valve. The check valve, if used, shall be spring loaded.

3.6.9 Test port. A test port with a cap and retaining chain shall be incorporated in the tubing and located in such a manner that the entire converter assembly can be pressurized through the test port.

3.6.10 Overpressure safety device. A frangible safety disc or other secondary overpressure device shall be incorporated in the plumbing of the converter at a location to insure rapid dumping of the head pressure from the converter in the event the pressure relief valve fails to open. The overpressure safety device shall be designed to remain in the open position if actuated.

3.6.11 Shock mounts. Shock mounts (if provided) and sway clearance due to shock mounting shall be within the specified envelope.

3.6.12 Antiseize tape. Antiseize tape shall be used on all male pipe thread fittings. Antiseize tape shall conform to and shall be applied as specified in MIL-T-27730. Tape shall not be used on flare tube fittings, straight threads, coupling sleeves, or on the outer side of tube flares. None of the tape shall be allowed to enter the inside of a fitting.

3.7 Performance.

3.7.1 Permanent volumetric expansion. The permanent volumetric expansion of the inner vessel, when tested as specified in 4.8.2, shall not exceed 10 percent of the volumetric expansion at the test pressure. There shall be no evidence of mechanical or material failure.

3.7.2 Pressure tests.

3.7.2.1 Inner vessel. The inner vessel, when tested as specified in 4.8.3.1, shall show no evidence of material failure.

3.7.2.2 Complete assembly. The complete converter assembly when tested as specified in 4.8.3.2, shall show no evidence of system leaks except as noted herein.

3.7.3 Filling time. The time required to fill the converter, which shall have been initially at room temperature, when tested as specified in 4.8.4, shall not exceed 6 minutes.

3.7.4 Buildup time. The time required to attain the buildup pressure of 70 psig (483 kPa), when tested as specified in 4.8.5, shall not exceed 5 minutes.

3.7.5 Dielectric strength. The leakage current of the converter sensing element, when measured as specified in 4.8.6, shall not exceed 1.0 milliampere.

3.7.6 Insulation resistance. The insulation resistance of the converter sensing element, when measured as specified in 4.8.7, shall be a minimum of 10 megohms between each electrode and converter ground, and a minimum of 20 megohms between the electrodes.

3.7.7 Sensing element calibration.

3.7.7.1 Empty converter. The capacitance of the sensing element, when tested as specified in 4.8.8.1, shall be 123.5 $\pm$ 2 picofarads.

3.7.7.2 Filled converter. The capacitance of the sensing element, when tested as specified in 4.8.8.2, shall be between the maximum and minimum limits as derived from the following equations:

$C_{max} = (2.33 \times W) + 124.7$

$C_{min} = (2.25 \times W) + 122.3$

C = Capacitance in pf

W = Exact weight of the liquid oxygen in pounds at the test point.

3.7.8 Relief valve test. The relief valve, when tested as specified in 4.8.9, shall operate between 100 and 120 psig (689 and 827 kPa) and shall allow a minimum flow of 80 lpm (0.080 cu. m/min.) at 120 psig (827 kPa) through the valve.

* 3.7.9 Evaporation loss test.

* 3.7.9.1 Initial evaporation loss in vented condition. The converter, when tested as specified in 4.8.10.1, shall not have a weight loss greater than 3.0 pounds (1.36 kg) for a 24-hour period with the unit vented to the atmosphere.

* 3.7.9.2 Second evaporation loss in vented condition. The converter, when tested as specified in 4.8.10.2, shall pass the requirements specified in 3.7.9.1.

* 3.7.9.3 Evaporation loss in pressurized condition. The converter, when tested as specified in 4.8.10.3, shall not have a weight loss greater than 7.5 pounds (3.375 kg) for a 48-hour period.

* 3.7.10 Overpressure safety.

* 3.7.10.1 Overpressure safety (standard temperature). The overpressure safety device, when tested as specified in 4.8.11.1, shall not leak at a pressure below 175 psig (1206.58 kPa), shall open within a pressure range of 200 psig (1378.95 kPa) minimum and 250 psig (1723.68 kPa) maximum, and shall allow a minimum flow of 150 lpm at opening pressure.

* 3.7.10.2 Overpressure safety (low temperature). The overpressure safety device, when tested as specified in 4.8.11.2, shall not leak at a pressure below 175 psig (1206.58 kPa), shall open within a pressure range of 200 psig (1378.95 kPa) minimum and 315 psig (2171.84 kPa) maximum, and shall allow a minimum flow of 150 lpm at opening pressure.

* 3.7.10.3 Overpressure safety (high temperature). The overpressure safety device, when tested as specified in 4.8.11.3, shall not leak at a pressure below 175 psig (1206.58 kPa), shall open within a pressure range of 175 psig (1206.58 kPa) minimum and 250 psig (1723.68 kPa) maximum, and shall allow a minimum flow of 150 lpm at opening pressure.

3.7.11 Vibration. The converter, when tested as specified in 4.8.12, shall show no evidence of mechanical or material failure and the evaporation loss shall not exceed 3.0 pounds (1.36 kg).

3.7.12 Acceleration test. The converter, when tested as specified in 4.8.13, shall show no evidence of mechanical or material failure and the evaporation loss shall not exceed 3.0 pounds (1.36 kg).

3.7.13 Shock test.

3.7.13.1 Shock test (procedure I). The converter, when tested as specified in 4.8.14 and 4.8.14.1 shall show no evidence of mechanical or material failure and the evaporation loss shall not exceed 3.0 pounds (1.36 kg).

3.7.13.2 Shock test (procedure III). The converter, when tested as specified in 4.8.14 and 4.8.14.2, shall not break free from the mounting provisions.

3.7.14 Salt fog. The converter, when tested as specified in 4.8.15, shall show no evidence of corrosion or mechanical failure.

3.7.15 Delivery rate. The converter, when tested as specified in 4.8.16, shall function normally and deliver oxygen on demand for at least 90 minutes and until not more than one pound of oxygen remains in the converter.

3.7.16 Reliability. The converter, when tested as specified in 4.8.17, shall have a specified mean time between failures (MTBF) of not less than 300 hours at the 90 percent lower confidence limit. (This is equivalent to a minimum acceptable MTBF of 200 hours, and to a reliability of 0.9933 for a 2-hour mission.)

3.7.17 Maintainability. The total corrective maintenance time, when performed as specified in 4.8.18, shall not exceed 1 hour of maintenance downtime.

3.7.18 Gunfire test. The converter, when tested as specified in 4.8.19, shall show no evidence of shattering. The installation mounting base of the converter shall withstand the forces exerted by the gunfire test.

3.8 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.9 Weight. The empty weight of the complete converter, including shock mounts if provided and the receptacle halves of the quick disconnect couplings, shall not be greater than 20 pounds (9.07 kg).

3.10 Color. The converter container shall be green, approximately matching color number 14187 of FED-STD-595. The color of all other parts shall be optional.

3.11 Cleanliness.

3.11.1 Degreasing. Prior to assembling the converter, all internal surfaces of the converter shall be degreased by flushing with a cleaning compound, MIL-C-81302 or using a vapor phase degreaser in accordance with MIL-T-81533. Components shall be cleaned by immersing, scrubbing or pressure spray with MIL-C-81302 cleaning compound or ultrasonics may be used in conjunction with vapor degreasing or MIL-C-81302 cleaning compound. After completion of the cleaning and when assembled, a General Electric, Type H, leak detector or equivalent Halide testing apparatus shall be used to determine the absence of the cleaning compound.

3.11.2 Purging. The completed converter, prior to preparation for delivery, shall be purged with hot, dry oxygen, conforming to MIL-O-27210, Type I or nitrogen conforming to BB-N-411, Type I, Class I, Grade B, until all traces of the contaminants are removed. The temperature of the purging gas shall not exceed 250°F (121°C) at the converter inlet and the purge pressure shall be 50 ± 5 psig (345 ± 34 kPa). After purging, charge the container with gaseous oxygen at 25 ± 5 psig (172 ± 34 kPa) and close all openings with approved closures.

3.12 Odors. The interior of the converter shall be substantially free from odor. The converter shall be free of toxic gases or by-products (see 6.2.1h).

3.13 Identification of product. The converter shall be marked for identification in accordance with MIL-STD-130 except that the Federal Stock Number shall be omitted and the contract and serial number shall be stamped on the nameplate.

3.13.1 Vacuum performance test plate. A metal plate shall be attached to the converter to provide spaces and columns to show results and dates of evaporation loss tests. The plate shall provide sufficient space for permanently recording results of at least 12 tests. Results and dates of all the evaporation loss tests conducted by the converter manufacturer shall be lightly but legibly recorded upon the plate by the manufacturer.

3.13.2 Warning notes. A warning note shall be located in a conspicuous place on the container. The note may be applied by decal, plate, or stencil. The following information, in 1/4 inch (6.35 mm) high red letters on a white or frosted aluminum background, shall be provided:

CAUTION
HIGH VACUUM CONTAINER
HANDLE WITH CARE

If a removable probe is employed in the container, another note shall be located on the container to designate the applicable probe number.

WARNING

USE PROBE NUMBER _____ ONLY

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

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 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 assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The examination and testing of the converter shall be classified as follows:

a. Qualification inspection. Qualification inspection consists of examinations and tests performed on samples submitted for approval as qualified products (see 3.1, 4.3, 4.3.1 and 6.3).

(1) Retention of qualification. Retention of qualification consists of periodic verification to determine compliance of the qualified product with the requirements of this specification (see 3.1, 4.3 and 4.3.2).

b. First article inspection. First article inspection consists of examinations and tests performed on samples which are representative of the production item after award of a contract to determine that the production item conforms to the requirements of this specification.

c. Quality conformance inspection. Quality conformance inspection consists of examinations and tests performed on individual products or lots to determine conformance of the products or lots with the requirements set forth in this specification.

d. Quality conformance verification inspection. Quality conformance verification inspection consists of examinations and tests performed on individual products or lots to verify conformance of the products or lots with the requirements set forth in this specification.

4.3 Qualification inspection. Qualification inspection shall consist of all the examinations and tests of this specification.

* 4.3.1 Qualification samples. Qualification samples shall consist of:

a. Two each complete converter assemblies.

b. One each inner vessel complete with all lines and fittings.

c. One each additional sample of the major components specified in 3.6 (excluding the overpressure safety device).

d. Three each overpressure safety devices (see 3.6.10).

e. A Statement of Certification (with supporting test data) from the manufacturer that the converters conform to the reliability requirements cited in paragraphs 3.7.16 and 4.8.17.

Samples shall be forwarded to a test facility set forth in the letter of authorization to submit samples (see 6.3). 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-C-19803F and number under authorization (reference authorizing letter and number, (see 6.3)).

4.3.2 Retention. The retention of qualification shall consist of periodic verification to determine compliance of the qualified converter 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 consist of the following examinations and tests:

Visual examination
Dimensions
Permanent volumetric expansion
Pressure tests
Filling time
Buildup time
Dielectric strength
Insulation resistance
Relief valve test
Sensing element calibration
Evaporation loss tests
Overpressure safety
Delivery rate

4.4.1 First article samples. Unless otherwise specified, as soon as practicable, after the award of the contract or order, the manufacturer shall submit two complete converters, one inner vessel (complete with all lines and fittings) and one overpressure safety device. 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 the new contract may be waived at the discretion of the acquiring activity (see 6.2.1d). Approval of the first article samples or the waiving of the first article inspection does not preclude 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 (6.2.1e).

* 4.4.1.1 First article information. Upon completion of the first article inspection program, pertinent comments and recommendations will be forwarded by the Government activity responsible for conducting the inspection program (see 6.2.1e) to the contracting officer. One approved converter will be returned to the manufacturer for use in monitoring production. The other sample will be consumed or destroyed in the first article inspection and shall not be considered as part of the quantity to be delivered under the contract.

4.5 Quality conformance inspection. The sampling and inspection levels shall conform to MIL-STD-105. Quality conformance inspection shall consist of the following examinations and tests:

Visual examination
Dimensions
Permanent volumetric expansion
Pressure tests
Filling time
Buildup time
Dielectric strength
Insulation resistance
Relief valve test
Sensing element calibration
Evaporation loss tests
Overpressure safety
Delivery rate (room temperature)
Packaging

4.5.1 Sampling.

4.5.1.1 Inspection lot.

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

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

4.5.1.2 Sampling for tests and examinations of converters. The sample size, acceptance criteria, tests, and examinations required for the converters shall be as specified in table I and 4.6.

TABLE I. Sample size, acceptance criteria, tests, and examination of the converters.

| Inspection | Method | Sample size | Acceptance criteria |
|---|---|---|---|
| Visual examination (See classification of defects) | 4.8.1.1 | Every converter for critical defects. Inspection Level II for minor defects. | Reject all units with any critical defects. An Acceptance Quality Level of 2.5 defects per hundred units for minor defects. |
| Dimensions | 4.8.1.1.1 | Inspection Level S-2 | Acceptance number zero, rejection number 1. |
| Permanent volumetric expansion | 4.8.2 | Inspection Level S-4 | Acceptance number zero, rejection number 1. |
| Pressure test | 4.8.3 | Every converter | Reject all defective units. |
| Filling time | 4.8.4 | Every converter | Reject all defective units. |
| Buildup time | 4.8.5 | Every converter | Reject all defective units. |
| Dielectric strength | 4.8.6 | Inspection Level S-2 | Acceptance number zero, rejection number 1. |
| Insulation resistance | 4.8.7 | Every converter | Reject all defective units. |
| Relief valve test | 4.8.9 | Every converter | Reject all defective units. |
| Sensing element calibration (empty converter) | 4.8.8.1 | Every converter | Reject all defective units. |

TABLE I. (Continued)

| Inspection | Method | Sample size | Acceptance criteria |
|---|---|---|---|
| Sensing element calibration (filled converter) | 4.8.8.2 | Inspection Level S-2 | Acceptance number zero, rejection number 1. |
| Evaporation loss tests | 4.8.10 | Every converter | Reject all defective units. |
| Overpressure safety | 4.8.11 | Inspection Level S-2 | Acceptance number zero, rejection number 1. |
| Delivery rate (room temperature) | 4.8.16.1 | Inspection Level S-2 | Acceptance number zero, rejection number 1. |
| Packaging | 4.8.1.2 | Inspection Level S-2 | Total Acceptable Quality Level of 4.0 percent defective. |

4.6 Quality conformance verification inspection.

* 4.6.1 Applicable to the Naval Air Systems Command. Upon completion of the tests and examinations specified in 4.5.1.2, a random sample, one for every 50 or fraction thereof, shall be selected from each lot of converters by the Government quality assurance representative without any additional testing. Each converter selected as a sample unit shall be forwarded to a laboratory designated at the time of award (see 6.2.1f and 6.5.1), for the following tests and examinations.

TESTS AND EXAMINATIONS

Visual examination
Complete assembly pressure test
Evaporation loss in vented condition
Evaporation loss in pressurized condition
Delivery rate (room temperature)
Filling time
Buildup time
Dielectric strength test
Insulation resistance
Sensing element calibration

The tests may be conducted in any order, except that the complete assembly pressure test shall be conducted first. The serial numbers of the units in the lot, represented by the sample units, shall be furnished with the data accompanying the samples to the laboratory. The Government activity responsible for conducting the quality conformance verification program

(see 6.2.1f) shall report the results of the tests and examinations to the designated 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; applying the applicable acceptance criteria specified in table I. Supplemental information relating to costs of test, resubmission of samples, etc. is outlined in 6.5.1.

4.6.2 Applicable to the Air Force. For purchases by the Air Force, the sampling tests, examination, and acceptance criteria shall be the same as specified in 4.6.1. The name and address of the quality conformance verification inspection laboratory, approval activity, and other pertinent information (see 4.6.1 for information) shall be as specified by the contracting officer (see 6.2.1f).

4.7 Test conditions.

4.7.1 Oxygen. Unless otherwise specified, the oxygen used in testing the converters shall conform to MIL-O-27210, Type I, or Type II.

4.7.2 Temperature and pressure. Unless otherwise specified, tests shall be conducted at local ambient temperatures and barometric pressure. Corrections shall be made to provide agreement with the temperature and pressure calibration of the instruments. Inspection data provided by any instrument not calibrated to normal temperature and pressure (NTP) conditions shall be corrected to determine NTP requirements. NTP conditions are 29.92 inches of mercury (101.3 kPa) and 70°F (21.1°C).

4.7.3 Test equipment. The delivery rate tests shall be performed on a breathing machine capable of fulfilling all tests requirements of this specification.

4.7.3.1 Master capacitance bridge. The master capacitance test bridge employed for capacitance testing the sensing element shall have an accuracy of 0.2 percent or 0.2 pf, whichever is greater. In all subsequent tests and measurements specified herein, the tolerance of the measuring equipment shall be added to the specified tolerance for the given test or measurement.

4.8 Inspection methods.

4.8.1 Visual examination.

4.8.1.1 Converter. Every converter shall be examined visually (for critical defects) to determine conformance to this specification. The classification of defects, table II, shall be used to classify the defects found.

4.8.1.1.1 Dimensions. The converter shall be checked dimensionally to determine conformance to the dimensions specified herein.

TABLE II. Classification of defects for visual examination of the converter.

| Critical | Minor |
|---|---|
| 1. Material inperfections - foreign matter embedded. | 201. Marking - missing, insufficient, incorrect, illegible, or not permanent. |
| 2. Surface - unclean, rough, misaligned, or containing cracks, nicks, or other flaws. | 202. Color not as specified. |
| 3. Any component missing, malformed, fractured, or otherwise damaged. | |
| 4. Any component loose or otherwise not securely retained. | |
| 5. Incorrect assembling or improper positioning of components. | |
| 6. Any functioning part that works with difficulty. | |
| 7. Faulty workmanship or other irregularities. | |

4.8.1.2 Packaging. Each of the fully prepared shipping containers, containing converters selected as a sample unit from the lot shall be examined to determine that the packaging, packing, and marking conform to this specification. The classification of defects, table III, shall be used to classify the defects found.

4.8.2 Permanent volumetric expansion. This test shall be conducted before the outer vessel is added. The inner vessel, complete with all lines and fittings, shall be subjected to a hydrostatic or pneumatic test in a water jacket in which the vessel is totally submerged and free to expand in all directions. The difference in temperature between the water in the jacket and the water or gas in the vessel shall not exceed $5^{\circ}F$ ($2.8^{\circ}C$). The test pressure shall be at least 200 psig (1379 kPa) and shall be maintained for at least one minute or sufficiently longer to insure complete expansion of the vessel. Any internal pressure previously applied shall not exceed 90 percent of the test pressure. The pressure gage shall permit readings to an accuracy of one percent. The expansion gage shall permit readings to an accuracy of one percent or 0.1 cc. The expansion shall be recorded in cc. The water in the

expansion gage shall come to rest quickly. If the water in the expansion gage drops below its original position or does not come to rest quickly after the pressure is released, the test shall be repeated. The inner vessel shall pass the requirements specified in 3.7.1.

TABLE III. List of defects for packaging.

| Item | Defects |
|---|---|
| Exterior and interior markings | Missing, incorrect, incomplete, illegible improper size, location, sequence; or method of application; markings not the same on the interior and exterior containers. |
| Packaging and packing materials | 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 strappings, etc., bulging or distortion of the containers. |
| Exterior and interior weight or content | Number per container is more or less that required; gross or net weight exceeds the requirements. |

4.8.3 Pressure tests.

4.8.3.1 Inner vessel. The test shall be conducted before the outer vessel is added. The inner vessel shall be charged to a pressure of 200 ± 5 psig (1379 ± 35 kPa) and maintained for at least one minute. The inner vessel shall pass the requirements specified in 3.7.2.1.

4.8.3.2 Complete assembly. The complete converter assembly, including all fittings and tube connections, shall be subjected to a pneumatic pressure of 95 psig (655 kPa) applied through the test port. While the test pressure is maintained, all fittings and connections shall be examined for leaks by application of leak test compound conforming to MIL-L-25567. The complete converter assembly shall pass the requirements specified in 3.7.2.2. Care shall be taken to remove all traces of the leak test compound from the converter assembly after the test is performed.

4.8.4 Filling time. The time required to fill the converter to its specified capacity by transfer of liquid oxygen using standard transfer equipment shall be determined. The filling pressure at the converter filler valve shall be maintained at 30 psig (207 kPa). The time required to fill the converter shall be within the time specified in 3.7.3.

4.8.5 Buildup time. The time required to attain buildup pressure shall be determined with a converter that has been empty for a minimum of 30 minutes. Fill the converter with liquid oxygen to design capacity and immediately after filling the converter, actuate the pressure generating system. The time required to attain buildup pressure shall be within the time specified in 3.7.4.

4.8.6 Dielectric strength. The sensing element shall be installed in an empty converter and the dielectric strength of the sensing element shall be measured at a voltage of 500 volts, rms, at a commercial frequency. The voltage shall be maintained for a period of 10 seconds between each lead wire and the converter ground, and between the two lead wires. The sensing element of the converter shall pass the requirements specified in 3.7.5.

4.8.7 Insulation resistance. The sensing element shall be installed in an empty converter and the insulation resistance of the sensing element shall be measured at 50 volts, direct current, between each electrode and the converter ground, and between the electrodes. The sensing element of the converter shall pass the requirement specified in 3.7.6.

4.8.8 Sensing element calibration.

4.8.8.1 Empty converter. The sensing element shall be installed in an empty converter and the capacitance of the sensing element measured. The capacitance shall be within the limits specified in 3.7.7.1.

4.8.8.2 Filled converter. The converter assembly shall be filled to rated capacity with liquid oxygen. The liquid oxygen shall then be removed in five increments of 5.1 $\pm$ 0.2 pounds (2.31 $\pm$ 0.09 kg). The capacitance of the sensing element shall be measured with the converter filled and at each increment. The capacitance shall be within the limits specified in 3.7.7.2.

4.8.9 Relief valve test. A pressure source capable of being varied from 0 to 150 psi (0 to 1034 kPa) shall be connected to the converter test port. The pressure in the converter shall be slowly increased until the relief valve of the converter actuates, continue increasing pressure to 120 psi (827 kPa). The opening pressure of the relief valve and the flow rate through the valve shall be within the limits specified in 3.7.8.

4.8.10 Evaporation loss tests. The evaporation loss tests in the vented condition may be conducted on the container only. The weight losses shall be recorded on the vacuum performance test plate as specified in 3.13.1.

* 4.8.10.1 Initial evaporation loss in vented condition. The container shall be filled with liquid oxygen to rated capacity and allowed to stand in vented condition for a minimum period of two hours

for equilibrium to be established. After which, with the unit vented to the atmosphere, the loss in weight for a 24-hour period shall be recorded. The container shall pass the requirement specified in 3.7.9.1.

* 4.8.10.2 Second evaporation loss in vented condition. After a lapse of at least 30 days from the above test, the vented evaporation loss test shall be conducted in the same manner and the evaporation loss for a 24-hour period recorded. The container shall pass the requirements specified in 3.7.9.2.

* 4.8.10.3 Evaporation loss in pressurized condition. Upon completion of the vented evaporation loss tests, the complete converter assembly including all components shall be subjected to a 48-hour evaporation loss test in the pressurized condition. The converter shall be placed in the pressurized condition and the initial weight reading shall be taken immediately after the converter has been filled. The loss in weight for a 48-hour period shall be recorded. The converter assembly shall pass the requirements specified in 3.7.9.3.

* 4.8.11 Overpressure safety. The overpressure safety test shall be performed on the overpressure safety device prior to installation on the converter. The inlet of the overpressure safety device shall be subjected to a gradually increasing pressure until opening occurs.

* 4.8.11.1 Overpressure safety (standard temperature). The overpressure safety device shall be conditioned at 72 $\pm$ 5°F (22 $\pm$ 3°C) for three hours. After conditioning, and while still at this temperature, the safety device shall be tested as specified in 4.8.11. The safety device shall pass the requirements specified in 3.7.10.1.

* 4.8.11.2 Overpressure safety (low temperature). The overpressure safety device shall be conditioned at -200 $\pm$ 5°F (-129 $\pm$ 3°C) for three hours. After conditioning, and while still at this temperature, the safety device shall be tested as specified in 4.8.11. The safety device shall pass the requirements specified in 3.7.10.2.

* 4.8.11.3 Overpressure safety (high temperature). The overpressure safety device shall be conditioned at 260 $\pm$ 5°F (127 $\pm$ 3°C) for three hours. After conditioning, and while still at this temperature, the safety device shall be tested as specified in 4.8.11. The safety device shall pass the requirements specified in 3.7.10.3.

* 4.8.12 Vibration. The converter shall be attached by its mounting plate to a rigid test fixture capable of transmitting the vibration conditions specified herein. The vibration test shall be conducted at room temperature with the converter filled with liquid oxygen and in the buildup condition. Tests shall be conducted under both resonance and cycling conditions as specified in paragraphs 4.8.12.1 and 4.8.12.2. Vibration displacement, velocity or acceleration shall be

measured and interpreted at the specific applied instantaneous test frequency. The vibration test table shall actually move through the displacement corresponding to the required acceleration at all frequencies. Local impacting of loose components which results in high "noise" content of the applied vibration shall not be considered as vibration input. If such "noise" is encountered, a low pass frequency filter which cuts off at approximately twice the test frequency shall be employed to reject the "noise." After the vibration test, the converter shall be filled with liquid oxygen and then vented to the atmosphere for a 24-hour period. The converter shall pass the evaporation loss requirements specified in 3.7.11. The converter shall then be subjected to and pass the delivery rate test specified in 4.8.16.1.

* 4.8.12.1 Resonance. Resonant modes of the converter shall be determined by varying the frequency of applied vibration slowly through the specified range at vibratory accelerations not exceeding those shown in figure 6. Individual resonance surveys shall be conducted with vibration applied along each axis of any set of three mutually perpendicular axes of the converter. The converter shall be vibrated at the indicated resonant conditions for the periods shown in the vibration test schedule, table IV, and with the applied double amplitudes of vibratory accelerations in figure 6. These periods of vibration shall be accomplished with vibration applied along each of the three mutually perpendicular axes of vibration. When more than one resonance is encountered with vibration applied along any one axis, each resonance shall be sustained for the period shown in the applicable portion of the vibration test schedule. If more than four resonances are encountered with vibration applied along any one axis, the four most severe resonances shall be chosen for test.

TABLE IV. Vibration test schedule.

(Times shown refer to one axis of vibration)

| Number of resonances | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Total vibration time at resonance 1/ | - | 30 Min | 1 hr | 1-1/2 hr | 2 hr |
| Cycling time | 3 hr | 2-1/2 hr | 2 hr | 1-1/2 hr | 1 hr |

1/ 30 minutes at each resonance

* 4.8.12.2 Cycling. The converter shall be vibrated under the cycling conditions specified herein for the applicable periods listed in the vibration test schedule (see 4.8.12.1). The frequency shall be cycled between 5 to 500 cps and return in 15-minute cycles at an applied double amplitude of 0.036 inch or an applied acceleration of ± 10 g whichever is the lower "g" value. The rate of change of frequency shall be logarithmic.

4.8.13 Acceleration test. The converter, with the probe assembled, shall be filled to rated capacity with liquid oxygen, allowed to reach operating pressure under no flow conditions, and then subjected to an acceleration test in accordance with Method 513, Procedure II of MIL-STD-810. The forward-backward and lateral forces applied shall be 10 g. The vertically downward force applied shall be 14 g. The vertically upward force applied shall be 6 g. After the acceleration test, the converter shall be vented to the atmosphere for a 24-hour period. The converter shall pass the evaporation loss requirements and the structural requirements specified in 3.7.12. The converter shall then be subjected to and pass the delivery rate (room temperature) test.

4.8.14 Shock test. The converter, filled to rated capacity with liquid oxygen and with the probe assembled, shall be subjected to the shock test specified in MIL-STD-810, Method 516.2, Procedures I and III, Figure 516.2-2.

4.8.14.1 Shock test (procedure I). After the shock test, procedure I, the converter shall be vented to the atmosphere for a 24-hour period. The converter shall pass the evaporation loss requirements and the structural requirements specified in 3.7.13.1. The converter shall then be subjected to and pass the delivery rate (room temperature) test.

4.8.14.2 Shock test (procedure III). The converter shall pass the structural requirements specified in 3.7.13.2.

4.8.15 Salt fog. The converter, with its ports adequately plugged and the probe assembled, shall be subjected to the salt fog test specified in MIL-STD-810, Method 509.1, Procedure I. The converter shall pass the requirements specified in 3.7.14. The converter shall then be subjected to and pass the following tests:

a. Visual examination.

b. Delivery rate (room temperature) (4.8.16.1).

c. Complete assembly pressure test (4.8.3.2).

d. Sensing element calibration (4.8.8).

e. Evaporation loss (4.8.10.1).

4.8.16 Delivery rate. The evaporation tubing shall consist of 100 $\pm$ 5 feet (30.48 $\pm$ 1.52 m) of 5/16 inch (7.94 mm) outside diameter aluminum tubing. The supply port of the converter shall be connected to a breathing machine through the evaporation tubing. The breathing machine shall be set up to simulate the complete breathing characteristics of three human subjects, breathing in the flow patterns shown in figure 5. The converter shall be filled to rated capacity prior to the test. After 3 minutes of stabilization, the converter pressure at the supply port shall remain between 55 and 90 psig (379 and 620 kPa) throughout the test. A pressure drop below 55 psig (379 kPa) during the first three minutes of the test is acceptable.

4.8.16.1 Delivery rate (room temperature). The converter assembly shall be conditioned at room temperature for 3 hours. After conditioning and while still at this temperature, the converter shall be tested as specified in 4.8.16. The converter shall pass the requirements specified in 3.7.15.

4.8.16.2 Delivery rate (low temperature). The converter assembly shall be conditioned at a temperature of -65 $\pm$ 2°F (-53.9 $\pm$ 1.1°C) for 3 hours. After conditioning and while still at this temperature, the converter shall be tested as specified in 4.8.16. The converter shall pass the requirements specified in 3.7.15.

4.8.16.3 Delivery rate (high temperature). The converter assembly shall be conditioned at a temperature of 260 $\pm$ 2°F (126.7 $\pm$ 1.1°C) for 3 hours. After conditioning and while still at this temperature, the converter shall be tested as specified in 4.8.16. The converter shall pass the requirements specified in 3.7.15.

* 4.8.17 Reliability. The converter shall be subjected to the delivery rate testing at room temperature (see 4.8.16.1). A failure shall be identified as any malfunction which causes the converter to deliver an insufficient flow of oxygen or to maintain an improper operating pressure. No parts shall be replaced as preventive maintenance during reliability testing. The converter shall be checked at least once every 24 hours during reliability testing to determine if a failure has occurred. Acceptance shall be based on the accept-reject criteria of Test Plan II of MIL-STD-781. Recording, data handling and reporting procedures shall be in accordance with MIL-STD-781. The converter shall pass the requirements specified in 3.7.16.

4.8.18 Maintainability. Maintainability tests shall be performed to show compliance with 3.7.17. All corrective maintenance tasks for expected failure modes shall be conducted by simulating failures. Each maintenance task shall be performed at least three times to determine average values. Only field level maintenance tasks shall be considered. The demonstration shall include the procedure to troubleshoot, fault isolation, removal (based only on the installation provisions of the item), fault correction, adjustment and realignment, final test, and replacement, but shall exclude supply and administrative time. Upon completion, the converter shall be operated to demonstrate normal functioning and will deliver oxygen on demand. The converter shall pass the requirements specified in 3.7.17.

4.8.19 Gunfire test. The converter containing all plumbing and components shall be mounted on a frame capable of withstanding the maximum force to which the converter will be subjected by the gunfire test. The converter shall be filled to rated capacity with liquid oxygen and the nominal operating pressure of the converter maintained. The converter shall be fired upon from a distance of approximately 50 yards (45.7 m) by a .50 caliber armorpiercing incendiary bullet which

has been tumbled. The bullet shall strike the converter in the liquid phase. There shall be no evidence of shattering, and the converter assembly shall remain in one piece except components in a direct line of fire. Shattering is defined as fragmentation of basic materials. Separation of small components from the converter when they are located in the immediate vicinity of the impact area is satisfactory. The converter shall pass the requirements specified in 3.7.18.

5. PACKAGING

5.1 Preservation. Preservation shall be levels A, B or C, as specified by the procuring activity (see 6.2.1g).

5.1.1 Levels A and B. Each converter shall be preserved and packaged in accordance with Method III of MIL-P-116. Cleaning shall be accomplished in accordance with industry practice for liquid oxygen (LOX) service. Petroleum derivative solvents shall not be used for cleaning. The converter assembly shall have all threaded ports, orifices and fittings capped with metal fittings only, conforming to Military Specification MIL-C-5501 or commercially equivalent metal caps, fittings, etc. When installing aluminum caps or plugs, caution shall be exercised in the application/tensioning of same to preclude the shearing of particles from the softer metal fittings. After cleaning, wrap or bag the converter in .0004 gage polyethylene, conforming to Federal Specification L-P-378. Corrugated fiberboard conforming to Federal Specification PPP-F-320, Class Domestic, shall be used as dunnage in the form of pads, cells, sleeves or die-cuts to protect the converter in an individual close-fitting box conforming to Federal Specification PPP-B-636. The container closure shall be accomplished in accordance with applicable procedures specified in the appendix thereto.

5.1.2 Level C. The converter shall be individually packaged in a manner that will prevent physical damage or environmental deterioration during transit from the shipping point to the original consignee. As a minimum, each converter must have all threaded ports, orifices and fittings capped with metal fittings only, conforming to Military Specification MIL-C-5501, or commercially equivalent caps, fittings, etc. When installing aluminum caps or plugs, caution shall be exercised in the application/tensioning of same to preclude shearing particles off of the softer metal fittings.

5.2 Packing. Packing shall be level A, B or C as specified by the procuring activity (see 6.2.1g). Insofar as practicable, shipping containers shall effect a close fit, contain identical quantities and be of uniform dimensional configuration.

5.2.1 Level A. The converter packaged as specified in 5.1.1 shall be packed for shipment in fiberboard, corrugated, triple wall box conforming to Federal Specification PPP-B-640, Class 2 (weather resistant) Style E. The closure, sealing and reinforcing (banding) of the container shall be accomplished in accordance with the procedures specified in the appendix of the container specification.

5.2.2 Level B. The converter packaged as specified in 5.1.1 shall be packed for shipment as specified in 5.2.1, except that the fiberboard shipping container conforming to PPP-B-640 shall be Class 1 (non-weather resistant), Style E.

5.2.3 Level C. The converter packaged as specified in 5.1.1 shall be packed for shipment in a manner that will afford protection against damage during transit from the shipping point to the original consignee. Containers used shall be in accordance with Uniform Freight Classification Rules, or regulations of the other carriers applicable to the mode of transportation utilized.

5.3 Marking. Each unit and shipping container 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 wrapping, cushioning, dunnage and containers used in preservation, packaging, and packing of oxygen converters shall be completely free of contamination by oil or grease.

6. NOTES

6.1 Intended use. The converter covered by this specification is intended to be used in military aircraft liquid oxygen systems for storing and pressurizing liquid oxygen for subsequent conversion to the gaseous phase as required for aircrewman breathing during flight.

6.2 Ordering data.

* 6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification, including any amendments.

b. Applicable Government part number.

c. Applicable Qualified Products List.

d. Whether first article inspection is waived (see 4.4.1).

e. Name and address of the first article inspection laboratory (see 4.4.1) and the name of the Government activity responsible for conducting the first article inspection program (see 4.4.1.1).

f. Name and address of the quality conformance verification inspection laboratory (see 4.6.1) and the name of the Government activity responsible for conducting the quality conformance verification inspection program (see 4.6.1).

g. Applicable levels of preservation, packaging, and packing (see 5); including marking requirements (see 5.3) and special requirements (see 5.4).

h. The contractor shall submit verifiable evidence that the converter system is free from any objectionable odor, toxic gases or by-products (see 3.12 and 6.2.2).

i. Items of data required (see 6.2.2).

* 6.2.2 Data requirements. When this specification is used in a acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9(n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraph:

| Paragraph | Data requirement | Applicable DID |
|---|---|---|
| 4.4.1.1 | First Article Inspection Reports | DI-T-5329 - Inspection Test Reports |

6.3 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 whether or not such products have actually been so listed by that date. The attention of contractors 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 might be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Commander, Naval Air Systems Command, Department of the Navy, Washington, DC 20360; however, authorization for qualification of products shall be obtained from the Commanding Officer, Naval Air Development Center, Warminster, Pennsylvania 18974, (Code 6031). Prior to submission of the samples for qualification inspection, the manufacturer shall submit a request to the Naval Air Development Center (Code 6031) indicating a date on which the samples can be forwarded and also request an authorization number to accompany the samples.

6.3.1 Drawings. When requested, the manufacturer shall submit engineering drawings and inspection reports in accordance with SD-6.

* 6.4 First article. When a first article inspection is required, the item will be tested and should be a first article sample. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, test and approval of the first article.

6.5 Laboratory information.

* 6.5.1 Applicable to Naval Air Systems Command. The successful bidder will be furnished with the name of the quality conformance verification inspection laboratory. The costs of the tests and examinations on samples initially submitted from a lot, as required by 4.6.1 shall be borne by the Government. Samples from a rejected lot shall not be resubmitted for tests and examinations, as required by 4.6.1, without the approval of the contracting officer. The costs of the tests and examinations on samples resubmitted from a reworked lot or from a new lot which is necessitated by the rejection of a previous lot shall be borne by the manufacturer. Upon completion of testing, the samples will be returned to the contractor, at the contractor's expense.

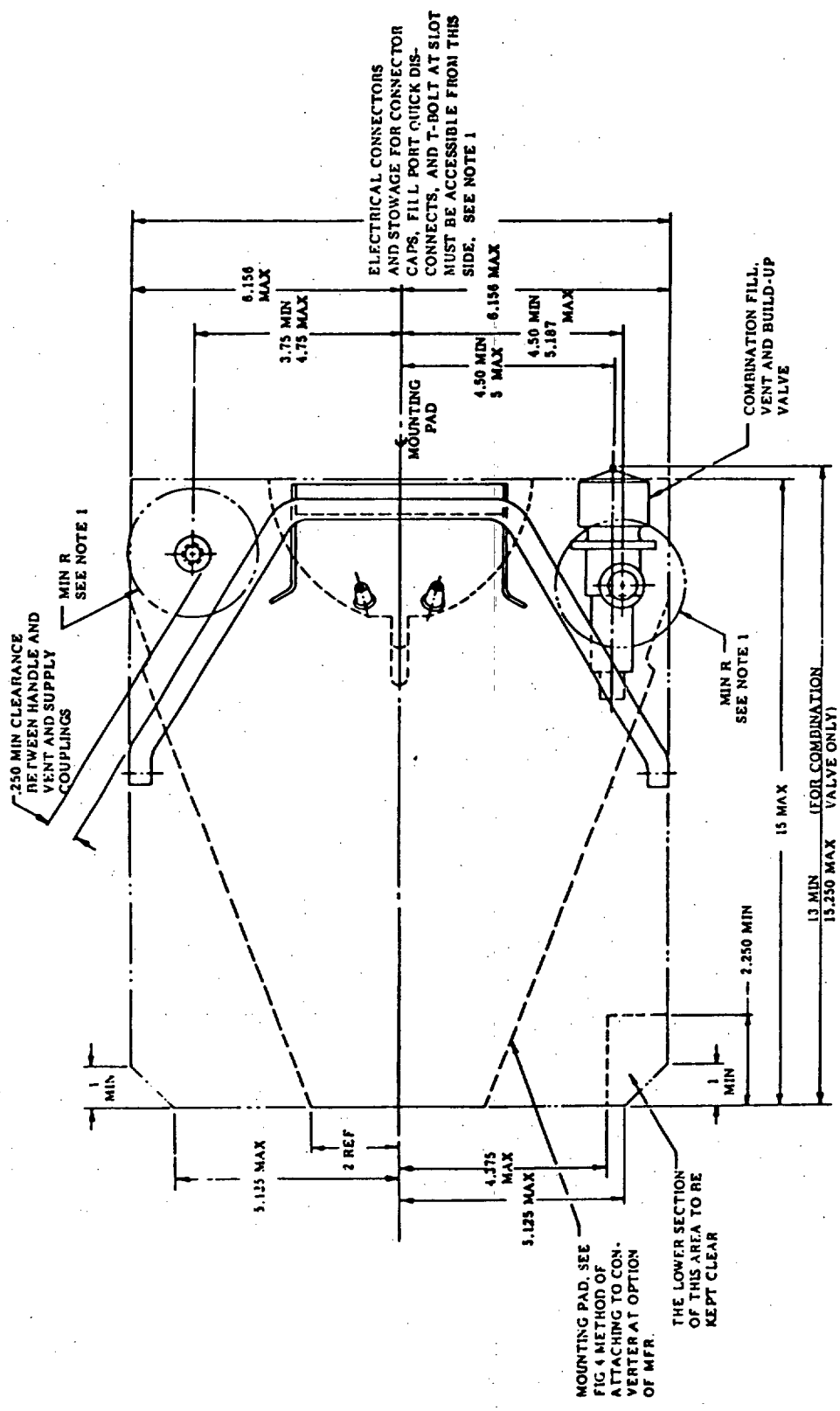
6.5.2 Applicable to the Air Force. For purchases by Air Force, the pertinent information for this paragraph (see 6.5.1 for information) shall be as specified by the contracting officer (see 6.2.1f).

6.6 International standardization. Certain provisions of this specification are the subject of international standardization agreement (ASCC Air Std 14/3). When amendment, revision or cancellation of this specification is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreement or make other appropriate accommodations.

6.7 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Navy - AS
Air Force - 99

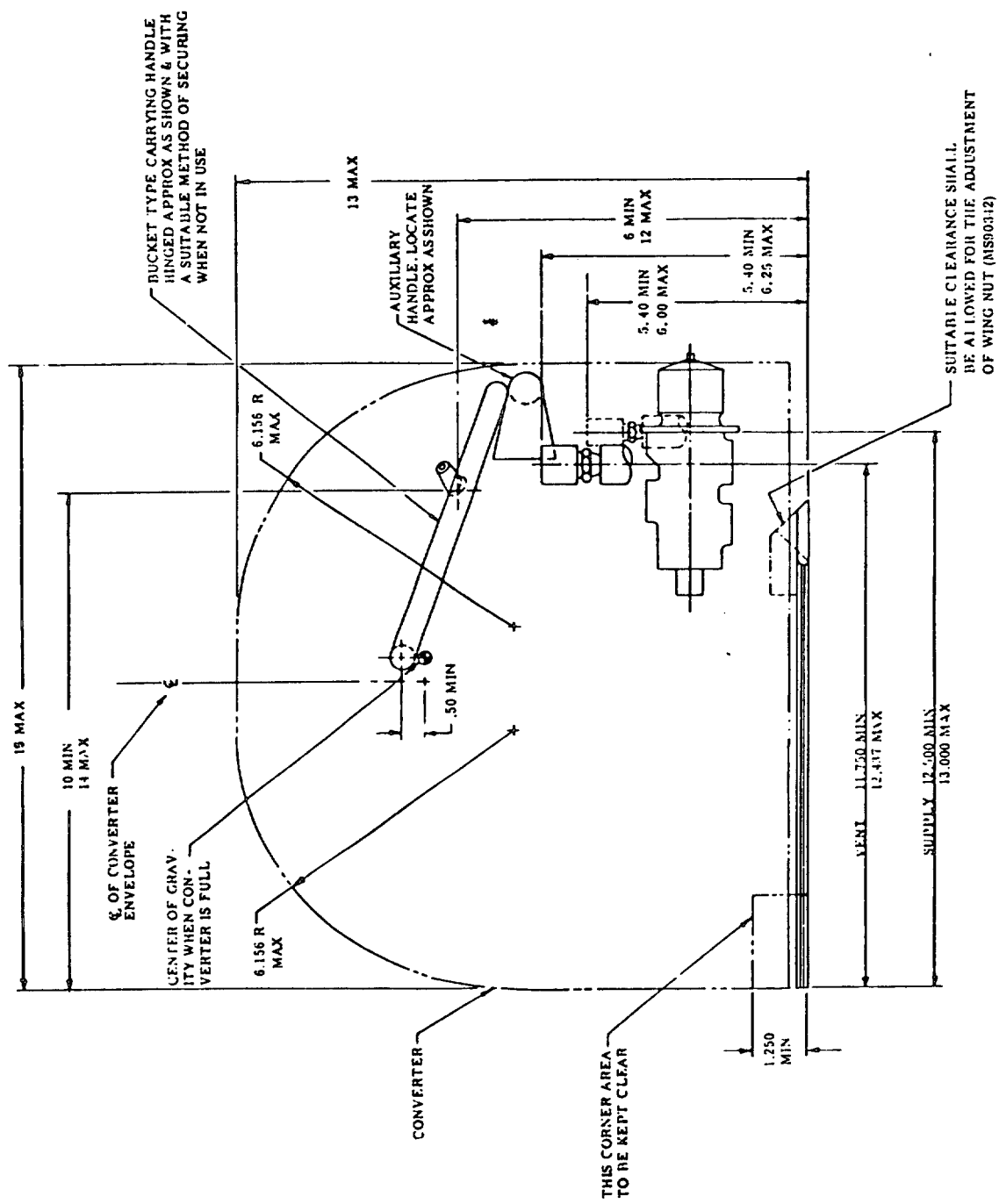
Preparing activity:
Navy - AS
(Project No. 1660-0462)




NOTES:

1. 1 1/2 inch min. radius from center line of supply and vent ports shall be provided for glove clearance for mating and disconnecting couplings. Radius is not restricted to maximum envelope of converter.
2. All components shall be within the maximum specified envelope.
3. Unless otherwise specified, dimensions in inches.

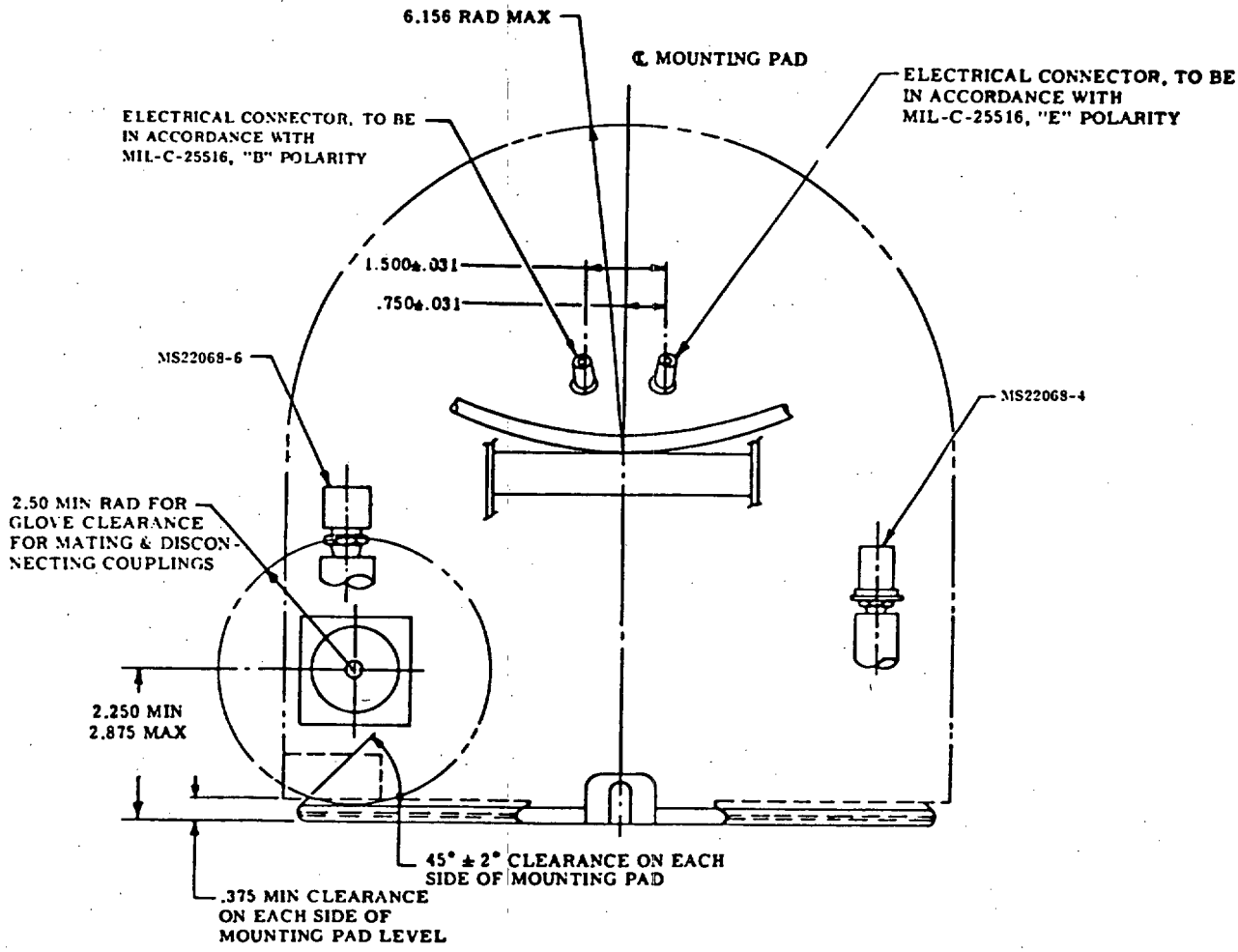
FIGURE 1. Top view




NOTES:

1. 1 1/2 inch min. radius from center line of supply and vent ports shall be provided for glove clearance for mating and disconnecting couplings. Radius is not restricted to maximum envelope of converter.
2. All components shall be within the maximum specified envelope.
3. Unless otherwise specified, dimensions in inches.

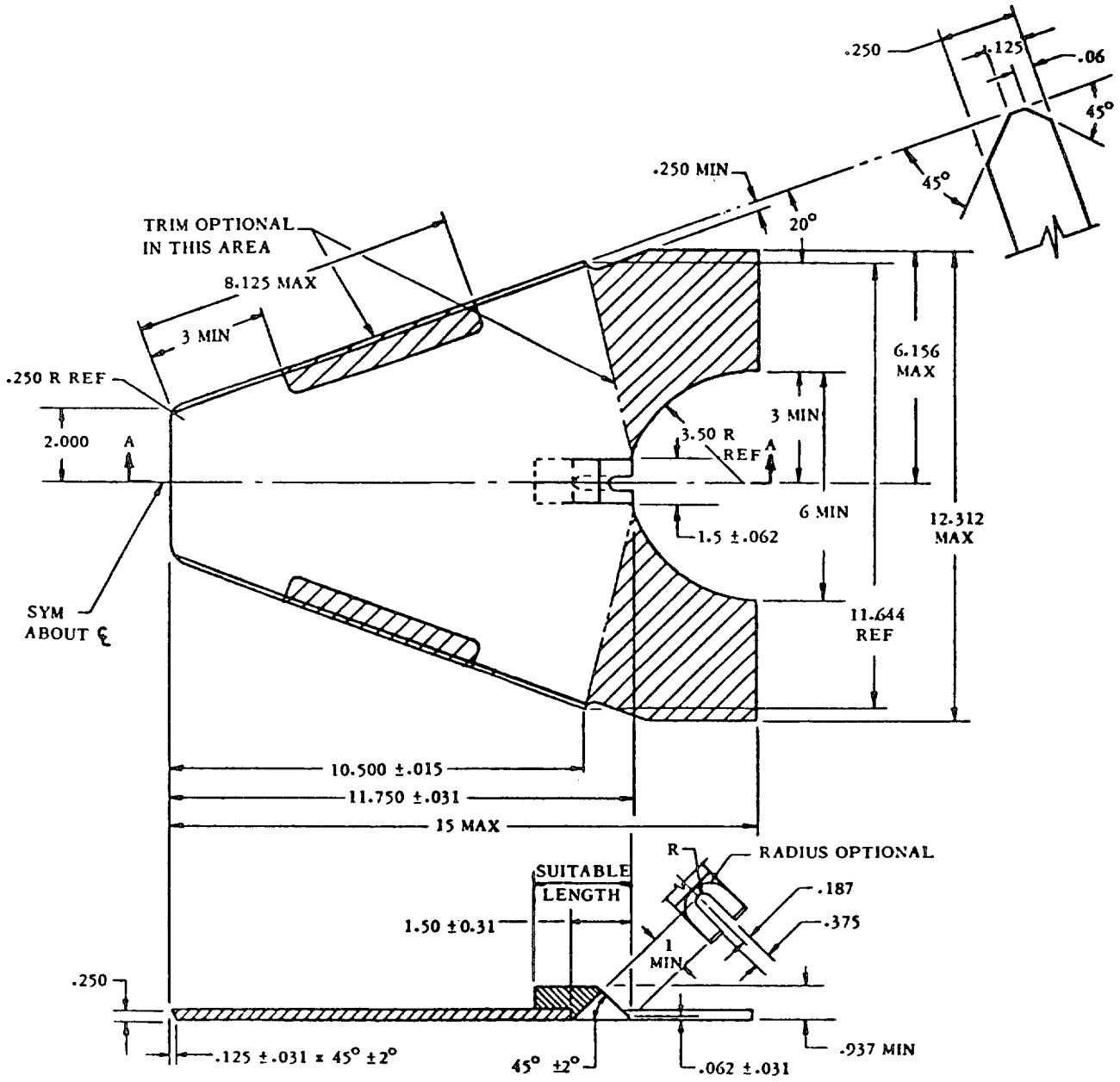
FIGURE 2. Side view.




NOTES:

1. All components shall be within the specified maximum envelope.
2. Unless otherwise specified, dimensions in inches.

FIGURE 3. Front view




SECTION A-A

NOTES:

1. This mounting base is designed to mate with the mounting bracket shown on MS90341.
2. Unless otherwise specified, dimensions in inches. Tolerances: Decimals ± .010, Angles ± 1/2°.

FIGURE 4. Mounting base.

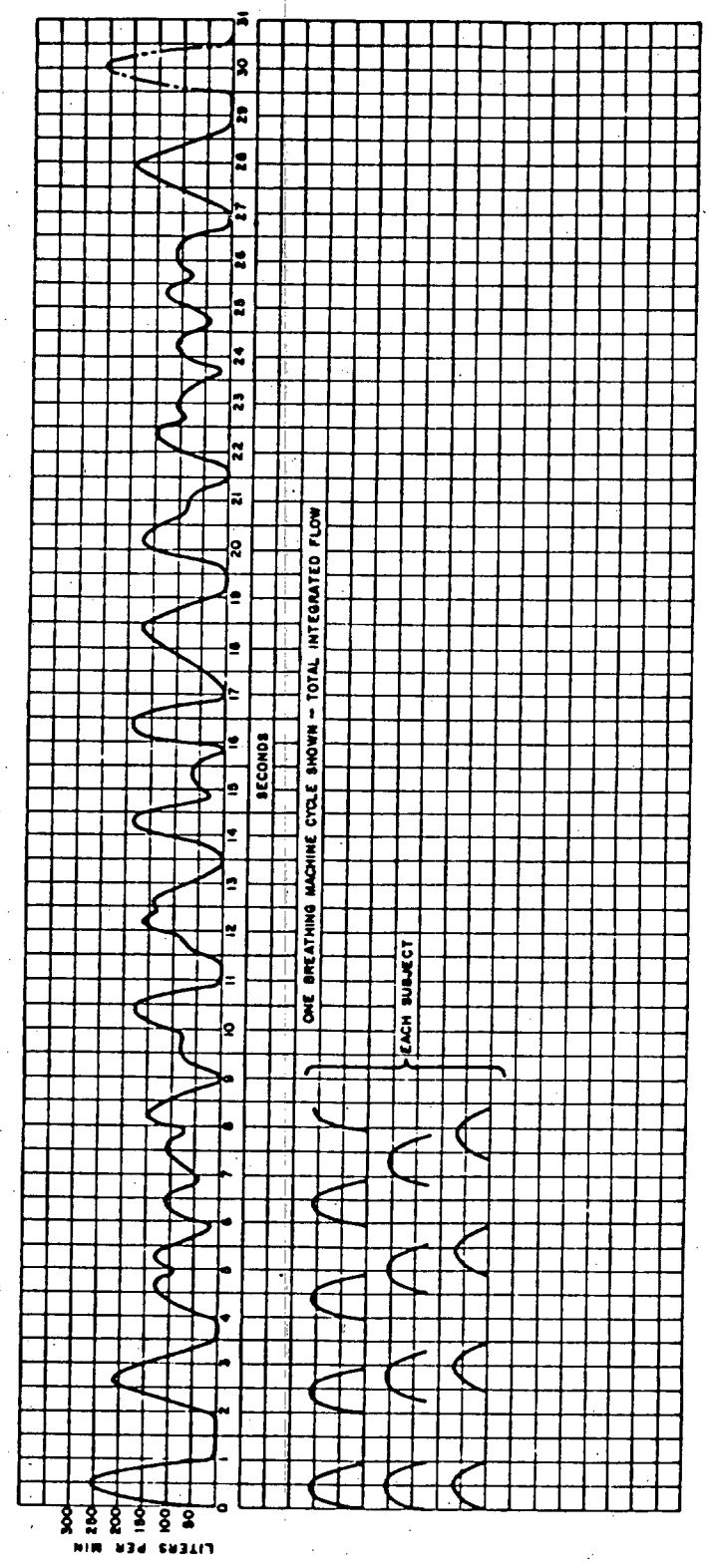
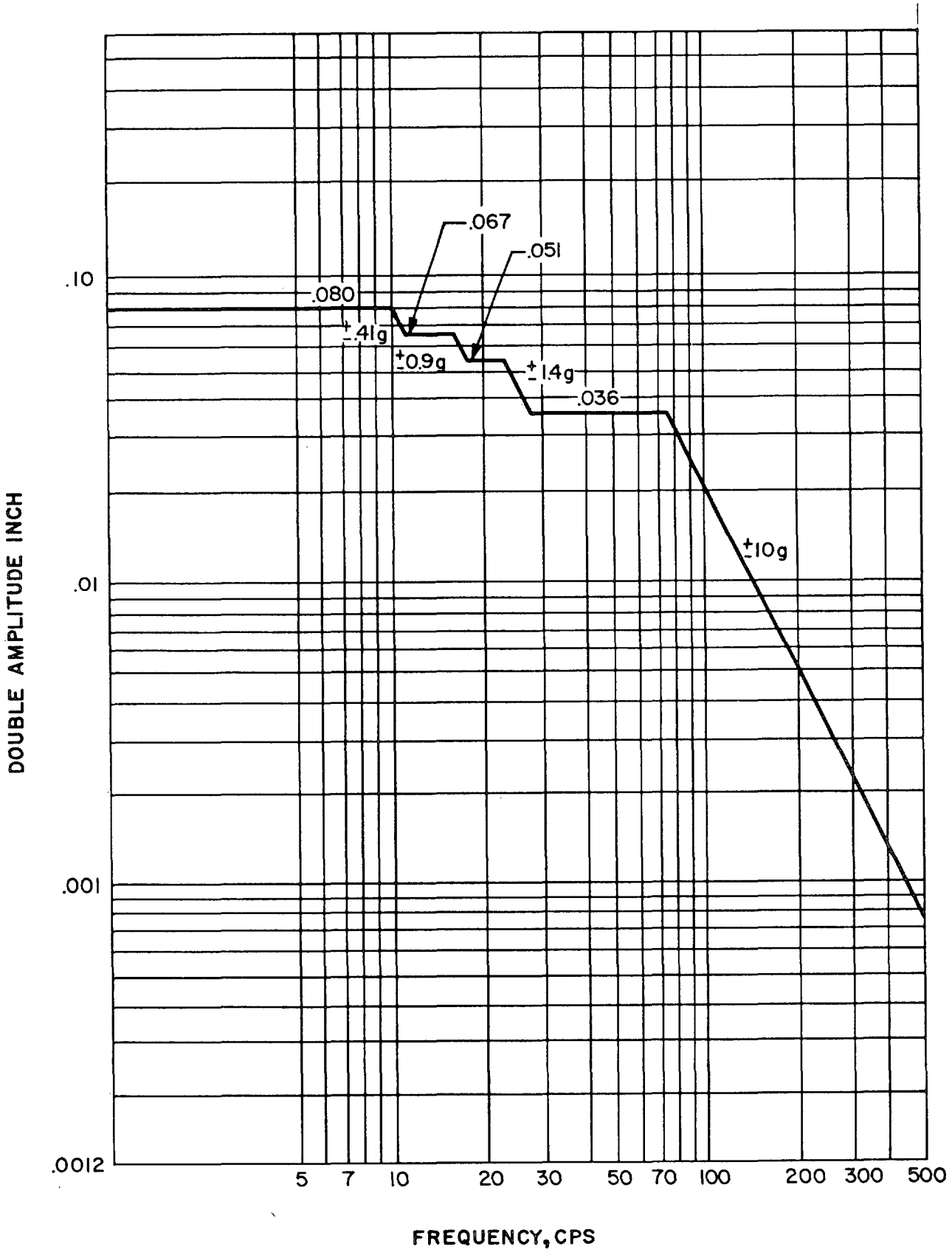



FIGURE 5. Delivery rate flow pattern, three subjects, moderate work.




* FIGURE 6. Range curve for converter vibration.

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