MILITARY SPECIFICATION

VALVE, REGULATING, FLUID PRESSURE, TYPE C-1

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for one type of gaseous fluid pressure valve, designated Type C-1.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

O-T-236	Tetrachloroethylene (Perchloroethylene), Technical Grade
O-T-634	Trichloroethylene, Technical
BB-A-1034	Air, Compressed, for Breathing Purposes
BB-N-411	Nitrogen, Technical
QQ-P-416	Plating, Cadmium (Electrodeposited)
PPP-B-636	Boxes, Shipping, Fiberboard

Military

MIL-P-116	Preservation, Methods of
MIL-C-5541	Chemical Conversion Coating on Aluminum and Aluminum Alloys
MIL-I-6866	Inspection, Penetrant Method of
MIL-I-6868	Inspection Process, Manetic Particle
MIL-P-7105	Pipe Threads, Taper, Aeronautical National Form, Symbol ANPT, General Requirements for

MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-G-17801	Gage, Pressure, Dial Indicating, Compressed Gas Application
MIL-O-27210	Oxygen, Aviator's Breathing, Liquid and Gas
MIL-T-27730	Tape, Antiseize, Tetrafluoroethylene, with Dispenser
MIL-C-81302	Cleaning Compound, Solvent, Trichlorotrifluorethane

STANDARDS

MIlitary

MIL-STD-100	Engineering Drawing Practices
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 US Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking, and Waterproofing, with Appropriate Test Methods
MIL-STD-1359	Cleaning Methods and Procedures for Breathing Oxygen Equipment
AND10387	Drill Sizes and Drilled Hole Tolerances - Twist

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

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

National Bureau of Standards

Handbook H28	Screw Thread Standards for Federal Services

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington DC 20402.)

American Society of Mechanical Engineers

Power Test Code

19.5:4 Supplement on Instruments and Apparatus; part 5, chapter 4, Flow Measurement by Means of Standardized Nozzles and Orifice Plates

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York NY 10017.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification

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

3. REQUIREMENTS

3.1 Preproduction. This specification makes provisions for preproduction testing.

3.2 Components. The regulator shall consist of the following major components:

Description	See Requirement
Inlet filter	3.7.1
Pressure gages	3.7.2
Safety relief valve	3.7.3
Pressure adjustment control	3.7.4

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

3.4 Materials.

3.4.1 Dissimilar metals. The use of dissimilar metals in contact with each other shall be avoided. Dissimilar metals are defined in MIL-STD-889.

3.4.2 Nonmetallic material. Nonmetallic material that is easily deteriorated or otherwise easily affected adversely by continued use with oxygen shall not be used.

3.4.3 Nonferrous materials. Nonferrous materials shall be used for all parts of the valve, except where ferrous materials are essential.

3.4.4 Protective materials. When materials are used in the construction of the valve that are subject to deterioration when exposed to climatic and 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. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.5 Design and construction. The valve shall be designed for a gaseous oxygen inlet pressure of up to and including 2,640 pounds per square inch gage (psig) and to provide the outlet flow rates and pressures specified under 3.6.

3.5.1 Reliability. The regulator shall have a mean time between failure (MTBF) of not less than 435 operating cycles (0 to 450 to 0 psig) at 0.90 confidence (see 6.3.1 and 6.4).

3.5.2 Maintainability. Parts and assemblies shall be located and mounted to provide adequate clearance for repair and other maintenance and, where practicable, to permit removal and replacement of any part or assemble by removing or disconnecting only mounting bolts or other fasteners or tubing.

3.5.2.1 Intricate devices. Intricate locking devices, controls, and threaded fastenings that can be easily overtorqued by personnel lacking feel through thick gloves or numbness shall be avoided where possible.

3.5.3 Valve. The valve shall be so designed and constructed that no parts will work loose in service. It shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service.

* 3.5.4 Valve features. The valve shall be clean, dry, and free from oil, grease, and other foreign matter. It shall contain no materials which will ignite when brought into direct contact with oxygen under high pressures. The valve shall not contain or be assembled with any compounds or materials which could cause undesirable odors or toxic fumes in the gas stream through the regulator. Prior to assembling the regulator, all internal surfaces shall be degreased by flushing with a cleaning compound, MIL-C-81302, or using a vapor degreaser in accordance with O-T-236 or O-T-634. Components shall be cleaned by immersing, scrubbing or pressure spray with MIL-C-81302 cleaning compound or ultrasonics may be used in conjunction with a vapor degreaser or MIL-C-81302 cleaning compound. After completion of the cleaning and when assembled. General Electric Type H Leak Detector or equivalent Halide testing apparatus shall be used to determine the absence of the cleaning solvents. The cleaning and cleanliness shall be according to 5.6, 6.1, 6.3 and 6.7 of MIL-STD-1359.

3.6 Performance. The valve shall be capable of reducing oxygen at a pressure of 2,000 psig to a suitable low pressure of 50 to 500 psig.

3.6.1 Maximum outlet pressure. The valve shall be capable of satisfactory operation with inlet pressures up to 2,640 psig maximum. The maximum delivery pressure shall not exceed 550 psig.

3.6.2 Flow capacity. At an ambient temperature of 70° Fahrenheit (F) and at standard sea level (29.92 inches Mercury (HG)), the valve shall have a delivery rate of not less than 75 cfm of free oxygen when the pressure at the inlet is 500 psig and the delivery pressure is 400 psig.

3.6.3 Orientation. The valve shall operate satisfactorily, as specified herein, in any position in which it is mounted

3.6.4 Atmospheric conditions. The valve shall be capable of satisfactory operation at any ambient temperature from -65° to +160°F inclusive, and at any elevation from sea level to 5,000 feet. The valve shall withstand storage temperatures of -80° to +160°F.

3.6.5 Hum or vibration. The valve shall not sustain hum or vibration within its operating range of pressure and flow.

3.6.6 Static pressurization. The high-pressure and low-pressure zones of the valve, exclusive of pressures gages and safety relief devices shall withstand pressurization up to and including 4,400 psig without leakage or permanent deformation of internal or external components.

3.7 Details of components.

3.7.1 Inlet filter. A 200-mesh (0.0029 ±0.0003 inch opening) screen, or equivalent filter, shall be provided in the inlet connection to prevent foreign particles from entering the valve. The filter shall be readily removable for inspection and cleaning purposes.

3.7.2 Pressure gages. The valve shall be provided with two pressure gages. One gage shall indicate inlet pressures from 0 to 3,000 psig, and the other shall indicate delivery pressures from 0 to 600 psig. The gages shall conform to MIL-B-17801, types A and B, except the type A inlet pressure gage shall have a 0 to 3,000 psig scale and the type B delivery pressure gage a 0 to 600 psig scale. The dial shall be 2-1/2 inches in diameter. (See 3.13.2)

3.7.3 Safety relief valve. A resealing-type safety relief valve shall be provided in the delivery side of the valve to prevent excessive buildup of pressure in this chamber. Venting of the safety valve shall start at a delivery pressure of not less than 475 psig and shall reach a rate of not less than 25 cubic feet per minute (cfm) gaseous fluid before the delivery pressure exceeds 535 psig. The valve shall reseal after venting at a pressure of not less than 400 psig.

* 3.7.4 Pressure adjustment control. The pressure adjustment control shall be a 3 to 4 inch long T-handle, or equivalent control located on the front of the valve where it will be readily accessible to an operator. The control shall be readily operable with one hand by a person wearing arctic mittens, to adjust the outlet pressure to any value between the limits specified in 3.6.

3.8 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.9 Threads.

3.9.1 Screw threads. Unless otherwise specified, all machine screw threads shall conform to the unifie/ series of Handbook H28. Class 2A or 2B shall be acceptable on these threads. The following threads (not included specifically in Handbook H28) shall be acceptable: 2-7/8-14-NS2, 1-5/8-20-NS2, 7/8 18-NS2, and 17/32-28-NS2.

3.9.2 Pipe threads. Pipe threads shall conform to MIL-P-7105.

3.9.3 Thread compounds. When thread compounds are required for thread seal or antiseize purposes, tetrafluoroethylene antiseize tape conforming to MIL-T-27730 shall be used on the male threads.

* 3.10 Configuration. The envelope and inlet and outlet dimensions shall be as shown in Figure 1. Gages whall be located and oriented as shown. The common vertical position of the gages is optional within the overall vertical envelope. The handle vertical position is optional within the vertical envelope. The relief valve is located optionally within the entire envelope. Mounting provisions shall provide for attaching the valve in at least two places to a 1/8 to 1/2 inch thick panel shown in Figure 2. Mounting shall consist of or be equivalent to two 5/6 inch diameter steel studs. Necessary nuts and washers shall be included.

3.11 Weight. The weight of the regulator shall not exceed 10 pounds.

3.12 Finishes and protective coatings.

3.12.1 Aluminum-alloy parts. Aluminum-alloy parts shall be covered with an anodic film conforming to MIL-A-8625, except as follows:

3.12.1.1 Dials, small holes, and case inserts need not be anodized.

3.12.1.2 Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with MIL-C-5541.

3.12.1.3 Where the primary purpose of the treatment is to afford a suitable paint base, chemical treatment in accordance with MIL-C-5541 may be used in lieu of anodizing.

3.12.1.4 Castings containing nonaluminum alloy integral inserts may be treated with a chemical film in accordance with MIL-C-5541 in lieu of anodizing.

3.12.1.5 When abrasion resistance is a factor, chemical films in accordance with MIL-C-5541 shall not be used in lieu of anodizing.

3.12.2 Cadmium plating. Cadmium plating shall be in accordance with QQ-P-416 type II or III, as applicable, and of a class that is adequate to achieve the degree of protection required.

3.12.3 The exterior of the valve shall be finished in accordance with the standard commercial practice covering such articles.

3.13 Operational markings.

3.13.1 Inlet and outlet connections. The inlet and outlet connections of the valve shall be clearly and permanently marked.

3.13.2 Pressure gage dials. The dial of each pressure gage specified in 3.7.2 shall be conspicuously marked as follows:

OXYGEN - USE NO OIL

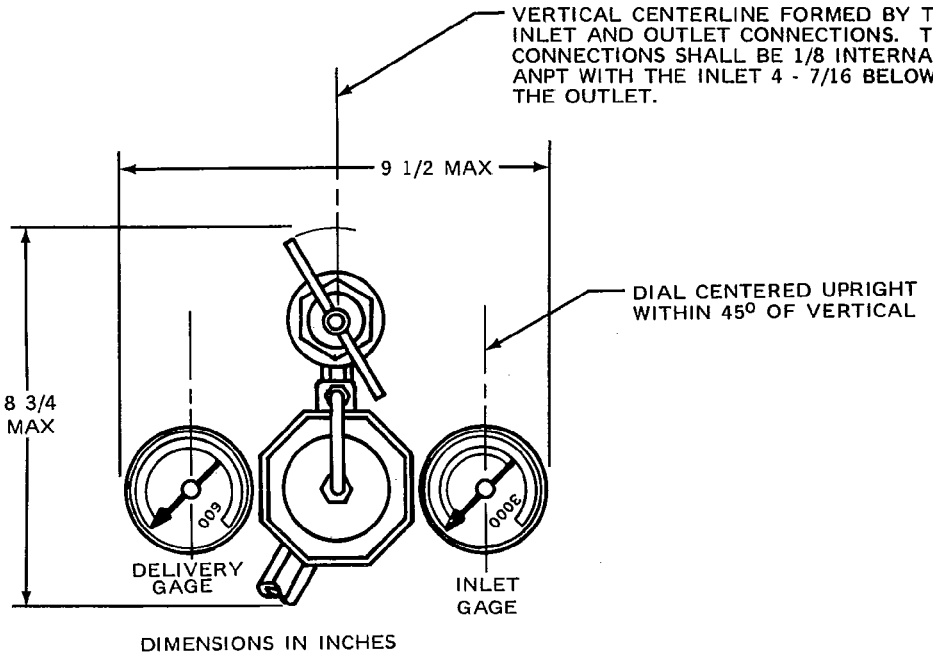

FIGURE 1. Valve - front view, typical.

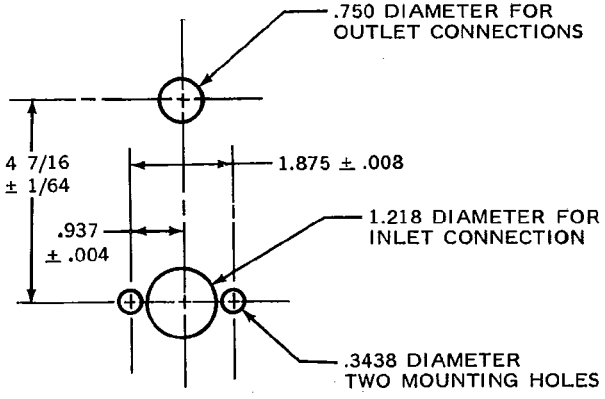

FIGURE 2. Panel dimensions.

3.14 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.15 Workmanship. The valve including all parts and accessories, shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs, sharp edges, and accuracy of dimensions. Workmanship shall be in accordance with high-grade commercial practice for this type of equipment.

4. QUALITY ASSURANCE PROVISIONS

* 4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 confrom to prescribed requirements.

4.2 Classification of tests. The inspection and testing of the valve shall be classified as follows:

a. Preproduction testing — See 4.4

b. Acceptance tests — See 4.5

* 4.3 Test conditions. Whenever the pressure and temperature existing at the time of the test are not specified, it is understood that the test is to be made at standard atmospheric pressure (29.92 inches Mercury) and at room temperature (approximately 70°F). When tests are made with atmospheric pressure or room temperature differing materially from the above values, proper allowance shall be made for the difference from the specified condition. The gas to be used to conduct the preproduction tests shall be oxygen in accord ance with MIL-O-27210, Type I. The gas to be used for acceptance tests shall conform to one of the following:

Oxygen MIL-O-27210, Type I
Nitrogen BB-N-411, Type I, Class I, Grade B
Air BB-A-1034, Grade A or C

WARNING: Equipment used with oxygen must be kept clean and free of oil or other flammable compounds, and if even slightly contaminated, must be thoroughly cleaned with nonflammable solvent or cleaner before being used with oxygen. Explosion and fire may result unless these precautions are taken.

4.3.1 Instrumentation.

4.3.1.1 Pressures. Pressures and pressure differentials shall be measured by means of Bourdon-type gages or other devices capable of complying with 4.3.2.5.1. Wherever practicable, the gages furnished as part of the valve assembly shall be utilized. Pressures shall be recorded in pounds per square inch gage.

4.3.1.2 Temperatures. Temperatures shall be measured by appropriately located thermometers or thermocouples used with calibrated potentiometers. Temperatures shall be recorded in degrees Fahrenheit.

4.3.1.3 Barometric pressures. Barometric pressures shall be measured by a properly calibrated mercurial or aneroid barometer.

4.3.1.4 Gas flow rates. Gas flow rates shall be measured with standardized nozzles or orifices as specified in ASME Power Test Code PTC 19.5:4. Gas flow rates shall be recorded as standard (29.92 inches HG and 70°F) cfm.

4.3.2 Test data.

4.3.2.1 Correction of data. If the tests specified herein cannot be conducted under the specified conditions, the tests may, upon approval of the procuring activity, be conducted under other conditions and the performance under the specified conditions calculated from the test results obtained. The manner of calculation shall be demonstrated, and actual test data proving the correctness of the calculation methods shall be presented for review by the procuring activity.

4.3.2.2 Operational data. Operational data shall be recorded as specified under the individual tests.

4.3.2.3 Psychrometric data. Wet- and dry-bulb temperature readings shall be recorded when specified for an individual test, and shall be taken at the specified intervals.

4.3.2.4 Barometric pressure data. Barometric pressure shall be measured and recorded when specified for an individual test, and shall be obtained at the intervals specified therefor.

4.3.2.5 Tolerances.

4.3.2.5.1 Gage pressure tolerance. Data on gage pressure shall be accurate to within 2 percent.

4.3.2.5.2 Temperature tolerance. Data on temperatures shall be accurate to within 2°F.

4.3.2.5.3 Barometric pressure tolerance. Data on barometric pressure shall be accurate to within 0.01 inch HG.

4.3.2.5.4 Gas flow rate tolerance. Data on gas flow rates shall be accurate to within 1 percent.

4.3.3 Inspection, servicing and adjustments. Inspections, servicing, and adjustments shall be performed as specified by the manufacturer unless such instructions are contrary to those necessary for compliance with the requirements specified herein.

4.3.4 Observations. During the progress of all tests, the performance of the valve shall be observed to determine whether it complies with requirements specified herein.

4.3.5 Preparation for test. The valve shall be prepared for test by assembly, adjustment, and servicing as specified in the instruction manual covering the instrument.

4.3.6 Pressure test record. A record of the pressures at which each valve component is tested and the length of time during which it is tested and the length of time during which it is subjected to the pressures shall be retained for review by the procuring activity.

4.4 Preproduction testing (see 6.2).

4.4.1 Test samples. Three valves shall be fabricated from random samples of component parts and assemblies using production processes and procedures and subjected to the preproduction tests specified in 4.4.3.

4.4.2 Test report. A preproduction test report in accordance with MIL-STD-831 shall be prepared, and three complete copies of the report furnished to the procuring activity.

4.4.2.1 Reliability and maintainability information. The following information shall be included as an attachment accompanying the preproduction test report (same quantity and quality of copies) or shall be included as part of the report:

a. All failures, maintenance, servicing, irregular operations, and other similar events of the testing shall be identified by a brief description of the action and by the accumulated operating hours, cycles, or position in the test procedure, as appropriate. Test conditions during failures or irregular operations.

b. Description of the engineering reasoning behind, and of any tests conducted to determine assignable causes for, all failures and irregular operations.

c. Description of the engineering reasoning behind any corrections made, to be made on production items, or proposed to be made, and the predicted effectiveness of these corrections to improve the reliability, operability, maintainability, and usefulness of the regulator.

d. Test activity or contractor comments on features that make unduly difficult or repetitive any maintenance, servicing, or adjustments that were performed or that are anticipated in field use.

e. Test activity or contractor comments on features that, if modified, should improve the usefulness of the item.

f. Test activity or contractor comments on field conditions or procedures to be avoided or cultivated to increase the reliability and useful life of the item.

g. The manhours (±5 percent of actual experience) required for each maintenance or servicing action performed during the tests. A brief description of the qualifications and experience of the personnel involved shall be included and shall be adequate to allow comparison to the personnel anticipated in similar field work.

h. Estimates of the manhours anticipated for other servicing and maintenance actions anticipated in field use. A brief description of the qualification and skills required to accomplish these servicing and maintenance actions shall be included.

i. Reference to other documents that have supplied or will supply any of the above information to the procuring activity.

4.4.3 Preproduction tests. The preproduction tests shall consist of all tests described under 4.6.

4.5 Acceptance tests. The acceptance tests shall consist of the following:

Individual tests	See 4.5.1
Sampling plans and tests	See 4.5.2

4.5.1 Individual tests.

4.5.1.1 Spring-loaded relief valve test. Each spring-loaded relief valve shall be subjected to the test specified in 4.6.1.

4.5.1.2 Regulator tests. Each valve shall be subjected to the following tests as described under 4.6:

Examination of product	See 4.6.2
Functional check	See 4.6.3
Leakage test	See 4.6.4
Maximum delivery pressure test	See 4.6.5
Flow capacity test	See 4.6.6
Regulator safety relief valve vent test	See 4.6.7

4.5.2 Sampling plans and tests.

* 4.5.2.1 Regulator sampling and tests. Valves shall be tested from each lot (see 6.3.3) by random selection in accordance with MIL-STD-105, Inspection Level II and Acceptance Quality Level (AQL) of 1.0 percent. Allocation of samples and testing shall be in accordance with the following schedule.

Test	Sample Number 1	Sample Number All Others
Low temperature test (4.6.8)	X	X
High temperature test (4.6.9)	X	X
Vibration test (4.6.10)	X	
Endurance test (4.6.11)	X	X
Individual tests (4.5.1)	X	X
Hydrostatic Pressure test (4.6.12)	X	X
Inlet filter test (4.6.13)	X	X

* 4.5.2.2 Regulator rejection. In the event the number of sample valves failing to meet any of the specified tests exceeds the AQL, the entire lot shall be rejected.

4.5.2.3 Continuance of individual tests. For production and operational reasons individual tests or other sampling plans may be continued pending the investigation of a sampling test failure. Final acceptance of the entire lot or valves on hand, or produced later, whichever the case may be, shall not be made until it is determined that all valve assemblies meet all the requirements of the specification.

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

4.6 Test methods.

4.6.1 Safety relief valve test. Prior to installation on the valve each safety relief valve shall be subjected to a gradually increasing pressure of clean, dry oil-free air, oxygen, or nitrogen at its inlet until it starts to discharge. The pressure shall then be reduced until the valve completely reseals. This procedure shall be repeated until the valve has started to discharge, and reseated, not less than twice. Following this testing, the valve shall be checked for leakage by application of a soap film across the outlet and over all outside surfaces with not less than 450 psig pressure being applied at the valve inlet. Failure of the valve to open or reseal within the specified limits or an indiciation of leaking during the soap film test shall be cause for rejection.

* 4.6.2 Examination of product. The valve shall be inspected to determine whether it complies with the requirements specified herein with respect to dimensions, workmanship, finish, marking, material and cleanliness. Cleaning and cleanliness shall meet the requirements of 5.6, 6.1, 6.3 and 6.7 of MIL-STD-1359 (see 3.11.2). The valve shall be subjected to a thorough inspection to determine quality, ease of adjustment, alignment, and functioning of all parts.

4.6.3 Functional check. All mechanical parts shall be checked for free and proper functioning.

4.6.4 Leakage tests. Oxygen at a pressure of 2,000 ±200 psig shall be applied to the inlet of the valve, and the regulator outlet tested for leakage. The leakage shall not exceed 0.02 liter per minute. The pressure-adjusting screw shall be released in this test. With the same inlet pressure the valve outlet connection shall be blocked off, and the pressure-adjusting screw adjusted to an indicated delivery pressure of 450 psig. All joints of the valve shall be tested for leakage. There shall be no evidence of leakage during this test.

4.6.5 Maximum delivery pressure test. With an oxygen pressure of 2,000 ±200 psig applied to the inlet, with the outlet connection suitably plugged, and the safety relief valve prevented from venting (by removal from the valve if necessary), the maximum delivery pressure shall be determined. The latter pressure shall be not less than 500 psig nor more than 550 psig.

4.6.6 Flow capacity test. The valve shall be tested for outlet flow to determine compliance with the requirements specified in 3.6.2.

4.6.7 Valve safety relief valve vent test. With an oxygen inlet pressure of 2,000 ±200 psig applied to the inlet, the pressure-adjusting screw released, and the outlet connection valved to permit a small bleed flow, the pressure-adjusting screw shall be operated to slowly raise the delivery pressure until the safety relief valve starts to vent. The pressure-adjusting screw shall be operated to slowly reduce the delivery pressure until the relief valve completely reseals. This procedure shall be accomplished not less than two times. The relief valve shall start to vent at a pressure of not more than 500 psig nor less than 475 psig or the valve shall be considered to have failed this test. The flow rate and resealing pressure shall meet the requirements of 3.7.3.

* 4.6.8 Low temperature test. The valve shall be subjected to a temperature of -65°F for a period of 3 hours. After the 3-hour period and while still at the specified temperature, the valve shall be subjected to the individual inspection. An overall leakage of not more than 0.10 cfm free oxygen shall be permitted during this test. Sampling tests at -65°F shall consist of 4.6.3 and 4.6.4.

4.6.9 High temperature test. The valve shall be connected to an inlet pressure of 2,000 ±200 psig and shall be subjected to a temperature of 160°F for a period of 7 hours. After the 7-hour period, the valve shall be brought to room temperature and subjected to the individual inspection (see 4.5.1).

* 4.6.10 Vibration test. The valve shall be subjected to vibration for a period of 3 hours on a suitable designed vibration stand. The vibration shall be a plane oriented at 45 degrees to the valve stem centerline. It shall have a double amplitude of from 0 to 0.125 inch, and a continuously variable frequency of 600 to 1,000 cpm. After the 3-hour period, vibration shall be stopped and the valve subjected to the individual inspection.

4.6.11 Endurance test. With an oxygen pressure of 2,000 ±200 psig applied to the inlet, the pressure-regulating screw shall be cycled 1,000 times between 0 and 450 psig. There shall be no failure of binding of the mating threads, and the adjusting screw shall be capable of one-hand manual operation. The valve shall then be subjected to the individual inspection.

4.6.12 Hydrostatic pressure test. The high-pressure and low-pressure zones of the valve, exclusive of pressure gages and safety relief devices, shall be hydrostatically tested at not less than 4,400 psig, and the test pressure maintained in each zone for not less than one nor more than ten minutes. Following the hydrostatic testing, the valve shall be disassembled and inspected. Signs of leakage during the test or indication of permanent deformation of internal or external components shall be cause for rejection.

4.6.13 Inlet filter test. The inlet filter performance of the valve shall be determined by introduction of not less than 2 grams of clean, dry, oil-free brass powder or filings, of such size that 100 percent will pass through 150 mesh (0.0041 ±0.0004 inch opening) and be retained on 200 mesh (see 3.7.1), into the inlet line upstream from the valve. With an oxygen pressure of 1,000 ±200 psig applied at the inlet, the valve shall operate for a period of 20 minutes at a delivery pressure of 400 ±25 psig at a flow

rate of not less than 25 scfm. At the conclusion of this test, the valve shall be disassembled. Microscopic examination indicating particles larger than 200 mesh on or imbedded in valve internal parts downstream of the filter shall be considered cause for rejection.

4.6.14 Odor test. The valve shall be connected to a source (cylinder) of known odor-free gaseous oxygen conforming to MIL-O-27210 having a pressure of not less than 550 psig. The connection shall be made to the cylinder in such a manner that a sample of gas upstream of the valve and a sample of gas passing through the valve can be compared by smelling. Pure oxygen is odorless and tasteless. Gas passing through the valve having an odor present as compared to gas from the cylinder upstream of the valve shall be considered failure of the odor test and cause for rejection.

4.6.15 Servicing and maintenance test. All normal preventive maintenance and servicing operations specified in the maintenance and instruction handbook prepared by the contractor shall be performed to determine their adequacy, ease of accomplishment, and the accessibility of parts and assemblies for performance of same, unless such instructions are contrary to those necessary for compliance with the requirements specified herein. Insofar as practicable, these operations shall be conducted as part of the normal preventive maintenance, servicing, and inspection performed in accomplishing the testing specified herein. Interference or obstructions to servicing or preventive maintenance shall be reported in detail on the test data sheets. The clock time and the manhours required for each task shall be measured.

4.6.16 Mechanical check. Upon completion of the above tests, a critical inspection shall be made of components to determine their operability and any damage or undue wear incurred during the tests. Teardown and parts measurement shall be made only in those cases where service life is in question. Where teardown and parts measurement are performed, wear or distortion that exceeds limits permitted by the manufacturer for new parts shall be cause for considering the part or parts affected as having failed to complete the test satisfactorily. The clock time and manhours required for actual access, removal, and disassembly shall be measured for all teardowns made.

4.6.16.1 Steel parts subject to high stress in operation and that are suspected of having defects shall also be subjected to magnetic particle inspection (magnaflux) and shall exhibit no indications of damage attributable to the tests, or shall be considered as having failed the test. Grinding checks and subsurface indications of laps or seams shall not be cause for rejection. Magnetic particle inspection shall be performed in accordance with MIL-I-6868.

4.6.16.2 Nonmagnetic parts suspected of defects shall be subjected to inspection with fluorescent penetrant (black light) and shall exhibit no breaks or other defects that would impair their life or usefulness. Penetrant inspection shall be performed in accordance with MIL-I-6866.

4.6.17 Reliability demonstration and test. Satisfactory completion of all tests required herein shall be considered to demonstrate acceptable compliance with the quantitative reliability requirements of this specification.

4.7 Inspection of preparation for delivery. Preservation, packaging, packing, and marking shall be inspected to determine conformance to the requirements of Section 5 herein.

5. PACKAGING

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

5.1.1 Level A. Each valve, cleaned for oxygen service in accordance with industry practice and 3.5.4, shall be preserved and packaged in accordance with MIL-P-116, method IC1, no preservative, and placed in a snug-fitting container conforming to grade W6C of PPP-B-636.

5.1.2 Level C. Each valve cleaned for oxygen service in accordance with industry practice, shall be preserved and packaged in a manner which will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the first receiving activity. The supplier may use his commercial practice providing it meets this requirement.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A. Valves, preserved and packaged as specified in 5.1.1, shall be packed in weather-resistant shipping containers conforming to PPP-B-636. The grade of each shipping container, determined by the gross weight and size, shall comply to the applicable special requirements table of the specification. Interior cushioning, blocking, bracing, and waterproofing shall be in accordance with MIL-STD-1186. Closure and strapping shall be in accordance with the container specification. Containers shall be of uniform shape and size and of minimum cube and tare.

5.2.2 Level B. Valves shall be packed the same as specified for level A, except that waterproofing is not required and domestic containers may be used.

5.2.3 Level C. Packages that require overpacking for acceptance by the carrier shall be placed in exterior-type shipping containers in a manner that will insure safe transportation at lowest rate to the point of delivery. Containers shall comply with Uniform Freight Classification Rules, or regulations of other carriers as applicable to the mode of transportation.

5.3 Marking. Interior and exterior containers shall be marked in accordance with MIL-STD-129. In addition to any other marking required by order or contract (see 6.2), unit packages shall be marked as follows:

CLEANED FOR OXYGEN SERVICE

6. NOTES

6.1 Intended use. The Type C-1 valve is intended for use in oxygen recharging trailers, to regulate the transfer of oxygen from supply cylinders to aircraft oxygen systems.

6.2 Ordering data. Procurement document documents should specify the following:

a. Title, number, and date of this specification.

b. Location and conditions for preproduction testing (see 4.4).

c. Level of preservation, packaging, and packing required (see 5.1 and 5.2).

d. Special shipment marking (see 5.3).

6.3 Definitions. For the purpose of this specification, the following definitions will apply:

6.3.1 MTBF. MTBF is defined as the average (arithmetic mean) of the operating time between failures or the mean-time-between failure. Note that the point estimate of MTBF from demonstration data (the sum of the test operating time divided by the number of counted failures) is larger than the MTBF minimum demonstrated at a specified confidence as described below. Note also, that the MTBF minimum considered acceptable and to be demonstrated is often lower than the MTBF reasonably expected and attainable within the current state-of-the-art. MTBF is often used as an expression representing MCBF, mean-cycles-between-failure.

6.3.2 Free Oxygen gas. Free oxygen gas, as specified in this specification, shall be interpreted to mean oxygen gas at 70°F and 29.92 inches HG.

6.3.3 Lot. A lot shall consist of items manufactured under essentially the same conditions and submitted for inspection at substantially the same time.

6.4 Reclaimed materiels. The use of reclaimed materiels shall be encouraged to the maximum extent possible.

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

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