

MIL-C-52211A(ME)  
 5 August 1975  
 SUPERSEDING  
 MIL-P-52211(CE)  
 8 February 1962

MILITARY SPECIFICATION  
 COMPONENTS AND ASSEMBLIES FOR  
 INDUSTRIAL GAS PRODUCTION, STORAGE  
 AND TRANSPORT EQUIPMENT, PACKAGING OF

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 packaging of individual components and assemblies of industrial gas production, storage and transport equipment.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

O-P-94  
 O-T-634  
 P-C-436

P-C-437

BB-N-411  
 PPP-B-601  
 PPP-B-621  
 PPP-B-636  
 PPP-B-640

PPP-C-650

- Paper, Test; pH Indicator.
- Trichloroethylene, Technical.
- Cleaning Compound, Alkali, Boiling Vat (Soak) or Hydrosteam.
- Cleaning Compound, High Pressure (Steam) Cleaner.
- Nitrogen, Technical.
- Boxes, Wood, Cleated-Plywood.
- Boxes, Wood, Nailed and Lock-Corner.
- Boxes, Shipping, Fiberboard.
- Boxes, Fiberboard, Corrugated, Triple-Wall.
- Crate, Wood, Open and Covered.

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Military

- MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted.
- MIL-P-116 - Preservation-Packaging, Methods of.
- MIL-C-3774 - Crates, Wood; Open, 12,000- and 16,000-Pound Capacity.
- MIL-C-5543 - Cleaning Compound, Washing Machine, Aircraft Metal Parts.
- MIL-C-15074 - Corrosion Preventive, Fingerprint Remover.
- MIL-D-16791 - Detergent, General Purpose (Liquid, Nonionic).
- MIL-B-22191 - Barrier Materials, Transparent, Flexible, Heat Sealable.
- MIL-T-27602 - Trichloroethylene, Oxygen Propellant Compatible.
- MIL-T-81533 - 1, 1, 1 Trichloroethane (Methyl Chloroform) Inhibited, Vapor Degreasing.

## STANDARDS

Federal

- FED. STD. No. 595 - Colors.

Military

- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing; with Appropriate Test Methods.

(Copies of specifications and standards 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.

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## NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

## National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Tariff Order Section, 1616 P Street, NW, Washington, DC 20036.)

## UNIFORM CLASSIFICATION COMMITTEE, AGENT

## Uniform Freight Classification.

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

## 3. REQUIREMENTS

3.1 First article (preproduction pack). Unless otherwise specified (see 6.2), the supplier shall furnish a preproduction pack for examination and testing within the time frame specified (see 6.2) to prove prior to starting production packaging, that the applied packaging complies with the requirements of this specification. Examination and tests shall be as specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.3).

3.2 Material. Material shall be as specified herein and in the applicable specifications and standards. Materials not specified shall be selected by the supplier and shall be subject to all provisions of this specification.

3.2.1 Dry nitrogen. Dry nitrogen shall conform to BB-N-411, Type I, Class 1, Grade A or B.

3.2.2 Cushioning and dunnage. Cushioning and dunnage shall be nonhygroscopic and nondusting. Cushioning and dunnage that will contact unit packed components or assemblies shall be Teflon, Kel-F, Aclar, or equal, or barrier material conforming to MIL-B-22191, Type II, and only a minimum amount necessary to prevent damage to barriers shall be used inside the unit pack.

3.3 Preservation and unit packing. Preservation and unit packing shall be Level A - maximum military protection. (Level B - minimum military protection or commercial is not applicable, as the requirements specified as Level A are considered the minimum acceptable).

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3.3.1 Operating procedure. Preservation and unit packing of components and assemblies shall be performed as a continuous operation. A controlled-atmosphere room as described in 3.3.1.1 or a clean work area as described in 3.3.1.2 shall be utilized to complete these operations through sealing the components or assemblies in the barrier materials. Cleanliness Classes A, B, and C (see Appendix) and components or assemblies requiring long periods of time for processing shall require a controlled-atmosphere room. Cleanliness Classes D and E (see Appendix); or, items which require short periods of time for processing may be performed in a clean work area.

3.3.1.1 Controlled-atmosphere room. The controlled-atmosphere room shall be a positively pressurized enclosure having a well-filtered, air-conditioned atmosphere. Walls shall be constructed of standard structural materials, finished, to minimize contamination and facilitate cleaning. Work benches, tools and processing equipment shall be maintained free of grease, oil or other combustible materials and shall only be used on or for oxygen equipment. The facility shall be maintained neat and orderly, free of dirt and debris. Personnel working in this facility shall maintain themselves and their clothing in a condition which will prevent transferring contaminants to processed surfaces. (Clean white coveralls or smocks without front pockets and cover shoes are recommended attire.) A control level of 40 percent relative humidity and 73° F is desirable.

3.3.1.2 Clean work area. The clean work area shall be isolated from all manufacturing processes and shall contain only equipment necessary to process the components or assemblies. Work benches, tools and processing equipment shall be maintained free of grease, oil or other combustible materials and shall only be used on or for oxygen equipment. Personnel working in this area shall maintain themselves and their clothing in a condition which will prevent transferring contaminants to process surfaces.

3.3.2 Cleaning and drying. Cleaning and drying shall be in accordance with requirements specified herein and shall be capable of passing the acceptance criteria for applicable tests in Section 4 for the cleanliness classification required (see Appendix).

3.3.2.1 Cleaning. Surfaces of components and assemblies shall be cleaned to insure removal of rust, corrosion, soil, oil, grease, residues, and fingerprints, perspiration, or other acid and alkali residues. Internal parts of complex assemblies shall be cleaned prior to assembly and precautions shall be taken to avoid contamination thereafter. Unless otherwise specified (see 6.2), the required cleaning shall be accomplished by one or more of the following processes, provided the process is not injurious to the component or assembly. The process selected shall be determined by the condition and composition of the component or assembly and the class of cleanliness required.

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3.3.2.1.1 Vapor degreasing. Cleaning shall be effected by subjecting the component or assembly to the vapor from stabilized trichloroethylene conforming to O-T-634 or 1, 1, 1 trichloroethane conforming to MIL-T-81533 until no further solvent condensation occurs. This process shall be followed by a thorough rinse in fingerprint remover conforming to MIL-C-15074. Following the application of the fingerprint remover, all surfaces shall be thoroughly rinsed with clean trichloroethylene.

3.3.2.1.2 Solvent degreasing. Cleaning shall be effected by washing all surfaces of the component or assembly using trichloroethylene conforming to MIL-T-27602, 1, 1, 1 trichloroethane conforming to MIL-T-81533 or a commercial oxygen safe cleaning solvent at ambient temperatures. If the cleaning solvent contains more than 1 percent of oil after the component or assembly is cleaned and drained of all solvent, the degreasing process shall be repeated with clean solvent. This process shall be followed by a thorough rinse in fingerprint remover conforming to MIL-C-15074. Following the application of the fingerprint remover, all surfaces shall be thoroughly rinsed with clean solvent. (Note: Carbon tetrachloride shall not be used as a cleaning agent.)

3.3.2.1.3 Alkaline cleaning. Cleaning shall be effected by immersion, soaking, flushing, or subjecting the component or assembly to a pressure spray using alkaline cleaner conforming to MIL-C-5543 or P-C-436 and rinsing in clean water at a temperature above 180° F.

3.3.2.1.4 Steam cleaning. Cleaning shall be effected by subjecting the component or assembly to a stream of steam or to a stream of steam with an added cleaning compound conforming to P-C-437, followed by steam alone.

3.3.2.1.5 Detergent cleaning (for O-rings, gaskets, etc.). Cleaning shall be effected by washing all surfaces of the components using a 4 percent detergent solution (mix 6 ounces of detergent solution to 1 gallon of water) for 30 minutes at 120° F. Washing shall be followed with several rinses using distilled water. Detergent shall conform to MIL-D-16791, Type 1.

3.3.2.1.6 Ultrasonic cleaning. Cleaning shall be effected by subjecting the component or assembly to an ultrasonic-cleaning process. Water base detergent solutions or organic solvents shall be used as the cleaning media. Water base detergent solutions shall be used for cleaning simple, unchanneled components. Detergent conforming to MIL-D-16791, Type 1, shall be used in preparing a water base solution of 1/2 to 1 ounce of detergent per gallon of demineralized water. Trichloroethylene conforming to MIL-T-27602 or trichloroethane conforming to MIL-T-81533 shall be used as the organic solvent. Organic solvent cleaning shall be followed by several rinses with clean solvent and detergent cleaning by several rinses with distilled water.

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3.3.2.2 Drying processes. Immediately after cleaning, the components or assemblies shall be dried by one of the following processes, as applicable.

3.3.2.2.1 Dry nitrogen. Components or assemblies shall be purged until dry with hot nitrogen (140° F minimum), which has been filtered through a 40 micron, absolute-rated filter.

3.3.2.2.2 Oven drying. Components or assemblies shall be placed in a ventilated circulating-air oven maintained at a temperature of 160° F, plus or minus 5° F, until dry.

3.3.2.2.3 Infrared. Components or assemblies shall be exposed to a direct infrared source until dry.

3.3.2.2.4 Vacuum evacuation. Components or assemblies capable of withstanding a vacuum without damage shall be dried by vacuum evacuation and shall be considered dry when the vacuum is maintained at 0.5 inch of mercury for a minimum of 5 minutes.

3.3.3 Unit packing. Immediately after cleaning and drying, the components or assemblies shall be unit-packed in accordance with one of the following methods. Components or assemblies which only require protection on interior surfaces, such as hoses, tubing, etc., shall be unit-packed Method A. Components or assemblies which employ moving parts, such as compressors, pumps, valves, etc., shall be unit-packed Method C. All other components or assemblies not fitting the above categories shall be unit-packed Method B. The method selected shall be capable of passing the tests and examinations specified in Section 4.

3.3.3.1 Method A. Immediately after drying, the interior of the component or assembly shall be purged with dry nitrogen. Preservatives shall not be applied to the component or assembly. Small threaded openings into components or assemblies shall be sealed with corrosion-resisting steel or compatible metal caps or plugs that will assure an airtight seal. Small unthreaded openings into components or assemblies shall be sealed with high-density polyethylene caps or plugs that will assure an airtight seal. Flanged openings shall be sealed with polyethylene discs not less than 1/16 inch thick and a bolted blank flange of aluminum or corrosion-resisting steel not less than 1/4 inch thick, bolted through each hole and with lock nuts torqued to avoid warping and to assure an airtight seal. Like material shall be used for bolts in contact with corrosion-resisting steel. When specified (see 6.2), the interior of the component or assembly shall be pressurized at 3 psi with dry nitrogen prior to sealing.



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3.3.3.2 Method B. The component or assembly shall be purged with dry nitrogen. Preservatives shall not be applied to the component or assembly. Components or assemblies having sharp edges or projections shall have these areas wrapped with cushioning as specified herein to protect the bag or barrier from damage. The component or assembly shall be heat-sealed in a bag fabricated from barrier material conforming to MIL-B-22191, Type II, which shall then be preserved in accordance with MIL-P-116, Method IA, submethod as applicable. When Submethod IA-16 is utilized, the initial barrier bag shall be constructed as specified in MIL-P-116 for the floating barrier.

3.3.3.3 Method C. The component or assembly shall be purged with dry nitrogen. Preservatives shall not be applied to the component or assembly. Components or assemblies having sharp edges or projections shall have these areas wrapped with cushioning as specified herein to protect the bag or barrier from damage. The component or assembly shall be heat-sealed in a bag fabricated from barrier material conforming to MIL-B-22191, Type II, which shall then be preserved in accordance with MIL-P-116, Method II, submethod as applicable. The desiccant shall be placed outside the initially sealed bag. When Submethod IIA is utilized, the initial barrier bag shall be constructed as specified in MIL-P-116 for the floating bag.

3.3.4 Intermediate packing. Small components or assemblies final unit-packed in bags shall be intermediate packed in close-fitting boxes conforming to PPP-B-636, Type CF, Class Weather Resistant, style optional. Intermediate packs shall contain uniform quantities. Closure of the boxes shall be in accordance with the appendix to the box specification, Method V. Strapping of boxes shall not be required.

3.4 Exterior packing. Exterior packing shall be Level A - maximum military protection, Level B - minimum military protection or commercial as specified (see 6.2).

3.4.1 Level A - maximum military protection. Unit-packed and intermediate packed components or assemblies shall be exterior packed in close-fitting boxes conforming to PPP-B-621, Class 2, style optional, PPP-B-601, Overseas Type, style optional, Grade B, or crates conforming to MIL-C-104, Type I, Class 1 or 2, Style a. Strapping for boxes shall conform to QQ-S-781, Class 1, Type I or IV size as applicable and unless otherwise specified, shall be Finish B (see 6.2). When specified, Finish A strapping shall be used.

3.4.2 Level B - minimum military protection. Unit-packed and intermediate components or assemblies shall be exterior packed in close-fitting boxes conforming to PPP-B-636, Type CF, Class Weather Resistant, style optional, PPP-B-640, Class 2, style optional, PPP-B-621, Class 1, style optional,

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PPP-B-601, Domestic Type, style optional or crates conforming to PPP-C-650, Type V, Style A, Class 1 or MIL-C-3774, Type I, Style A. Box strapping shall be as specified for Level A, Finish A.

3.4.3 Commercial. Unit-packed and intermediate packed components or assemblies shall be exterior packed in accordance with FED. STD. No. 356.

### 3.5 Marking.

3.5.1 Military. Each unit-pack, intermediate pack and exterior pack shall be marked in accordance with MIL-STD-129 and as outlined in special marking (see 3.5.1.1).

3.5.1.1 Special marking. Each unit-pack shall be marked with a warning label that states the applicable cleanliness classification (Class A, B, C, D or E) of the component or assembly. Green paper labels shall be used and shall match FED. STD. No. 595, Color No. 14187. Lettering shall be black and shall read as follows:

"WARNING - THIS PART HAS BEEN CLEANED TO CLASS \_\_\_\_\_ CLEANLINESS  
REQUIREMENTS OF MIL-C-52211 FOR OXYGEN EQUIPMENT APPLICATION.  
DO NOT OPEN UNTIL READY FOR USE."

3.5.2 Commercial. Each exterior pack shall be marked in accordance with FED. STD. No. 356.

3.6 Workmanship. Workmanship shall be of a quality compatible with procedures specified to assure components or assemblies being packaged will be adequately protected from contamination, corrosion and deterioration during shipment and prolonged periods of storage.

## 4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Material inspection. The supplier is responsible for insuring that all materials used are manufactured, examined, and tested in accordance with referenced specifications and standards.



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4.1.2 Alternate test procedure approval. In instances wherein a test may necessitate an impossible or impractical manipulation of a mounted preserved item or where the overall size or weight of the item or test equipment availability obviates compliance with a specific test requirement of this specification, the supplier may, through the cognizant Government representative, submit a request, accompanied by detailed justification, for approval of an alternate test procedure.

4.2 Classification of inspections. Inspections shall be classified as follows:

- (a) Preproduction pack inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

#### 4.3 Preproduction pack inspection.

4.3.1 Examination. The preproduction pack shall be examined for the defects listed in 4.4.1.1. Presence of one or more defects shall be cause for rejection of the preproduction pack.

4.3.2 Tests. The preproduction pack shall be subjected to the tests specified in 4.4.1.2, and, in addition, boxed components or assemblies shall be subjected to the rough handling test as specified in MIL-P-116 and crated components or assemblies shall be subjected to the railroad car guided impact test as specified in Appendix A to MIL-STD-1186. The railcar shall strike a string of five empty cars with draft gear extended and the brake set. The speed of the car at impact shall be approximately 10 miles per hour. Shifting of contents, loosening or breaking of anchoring, blocking or bracing within the crate shall be cause for rejection of the crated pack.

#### 4.4 Quality conformance inspection.

##### 4.4.1 Preservation and unit-packing.

4.4.1.1 Examination. Each component or assembly preserved and unit-packed as specified herein shall be examined for the following defects. Presence of one or more defects shall be cause for rejection.

##### Major

- 101. Materials not as specified.
- 102. Preservation and unit-packing processing not performed in a clean work area or a controlled-atmosphere room.
- 103. Components or assemblies do not meet or exceed the cleanliness requirements of the specified cleanliness classification.

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- 104. Method of preservation and unit-packing not as specified.
- 105. Small components or assemblies final unit-packed in bags not intermediate packed as specified.
- 106. Marking illegible, incorrect, incomplete, or missing.

4.4.1.2 Tests. Each component or assembly preserved and unit-packed as specified herein shall be subjected to the applicable tests required to verify conformance to the specified cleanliness classification and unit packing. The tests for determining cleanliness Classes A, B, D, and E shall be as specified in 4.4.1.2.1 through 4.4.1.2.6. The test for determining cleanliness Class C shall be as specified in 4.4.1.2.7. Results of these tests shall be determined using the criteria as specified in 4.4.1.2.8. Tests for the unit-packing shall be as specified in 4.4.1.2.9.

4.4.1.2.1 Incandescent light inspection. Using a high-intensity light source (minimum 200 watt rating) shining at an oblique angle, carefully examine all surfaces, depressions, inside corners, and crevices of the component or assembly.

4.4.1.2.2 Ultraviolet light inspection. Using an ultraviolet light source with a wavelength of 360 to 370 nanometers, at a distance that will provide maximum light intensity, carefully examine all surfaces, depressions, inside corners, and crevices of the component or assembly.

4.4.1.2.3 Wipe test. Using a white, lint-free cloth and a dark, lint-free cloth, wipe portions of the surfaces of the component or assembly with the white cloth and the remaining portions of the surfaces of the component or assembly with the dark cloth. Examine each cloth.

4.4.1.2.4 Alkalies and acids. Using methyl red pH indicating paper to test for the lower pH limit and red litmus pH indicating paper to test for the upper pH limit or universal pH indicating paper, conforming to O-P-94, to test for both lower and upper pH limits, wet the cleaned and dried surfaces of the component or assembly with a few drops of distilled water and then wet the pH indicating paper with the distilled water from these surfaces. Examine the pH indicating papers.

4.4.1.2.5 Water break. Dip the component or assembly in distilled water, or, for large components or assemblies, pour the distilled water onto surfaces using a chemist's flexible wash bottle. Allow the water to drain while observing the flow pattern of the draining water.

4.4.1.2.6 Solvent rinse. Flush the surface or surfaces of the component or assembly with clean solvent and collect the effluent in a clean graduated

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container. Subject the effluent to an ultraviolet light source as specified in 4.4.1.2.2 and examine the effluent. Filter the effluent through an RA millipore filter and examine the filter and residue. (Note: A 100 mil (approximately 3.5 oz) sample of flush solvent shall be considered as representing the effluent of 1 square foot of enclosed surface.)

4.4.1.2.7 Bourdon tube type gages. Use any method which will insure complete tube fill, total solvent removal, and which will allow analysis of effluent. A suggested procedure to accomplish the test is as follows: Place the gage so that the pressure inlet is facing up; using a hypodermic needle with graduated syringe, completely fill the gage tube with clean solvent (Note: Gently tapping the gage while filling will assist in accomplishing a complete fill); collect the effluent in a clean graduated container; compare the amount of effluent with the quantity used in the fill; subject the effluent to an ultraviolet light source as specified in 4.4.1.2.2 and examine the effluent; filter the effluent through a Whatman No. 44 or equal filter paper and examine the filter surface for particulate quantity and size. Following completion of the test, purge the Bourdon tube with dry nitrogen. Sniff the inlet after purge to determine complete solvent removal.

4.4.1.2.8 Acceptance criteria. Results of tests specified in 4.4.1.2.1 through 4.4.1.2.7 shall be determined by the applicable cleanliness classification criteria as follows: Nonconformance to the specified criteria shall constitute failure of the test and shall be cause for rejection of the cleaned component or assembly.

#### 4.4.1.2.8.1 Class A.

4.4.1.2.8.1.1 Incandescent light inspection. Examination shall show no visible evidence of moisture, rust, corrosion, scale, slag, weld spatter, organic materials (oil, grease, crayon, paint, etc.) or any other foreign matter.

4.4.1.2.8.1.2 Ultraviolet light inspection. Examination shall show no fluorescence on the component or assembly.

4.4.1.2.8.1.3 Wipe test. Examination shall show no visible deposits on either cloth.

4.4.1.2.8.1.4 Alkalies and acids test. Examination shall show no red tint on the methyl red paper or blue tint on the red litmus paper. Colors shall show a pH reading within the range of 6.5 to 8.5 using the universal indicating paper.

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4.4.1.2.8.1.5 Water break test. The flow pattern of draining water shall be an even flow, without film breaking or formation of small droplets.

4.4.1.2.8.1.6 Solvent rinse test. Examination shall show no fluorescence from the effluent or discoloration of the filter. Residue shall contain no particle larger than 500 microns, no more than 25 particles between 175 and 500 microns, no fiber in excess of 2000 microns in length and no accumulation of fibers per square foot of surface tested.

4.4.1.2.8.2 Class B.

4.4.1.2.8.2.1 Incandescent light inspection. Examination shall show no visible evidence of moisture, rust, corrosion, scale, slag, weld spatter, organic materials (oil, grease, crayon, paint, etc.) or any other foreign matter.

4.4.1.2.8.2.2 Ultraviolet light inspection. Examination shall show no fluorescence on the component or assembly.

4.4.1.2.8.2.3 Wipe test. Examination shall show no visible deposits on either cloth.

4.4.1.2.8.2.4 Alkalies and acids test. Examination shall show no red tint on the methyl red paper or blue tint on the red litmus paper. Colors shall show a pH reading within the range of 6.5 to 8.5 using the universal indicating paper.

4.4.1.2.8.2.5 Water break test. The flow pattern of draining water shall be an even flow, without film breaking or formation of small droplets.

4.4.1.2.8.2.6 Solvent rinse test. Examination shall show no fluorescence from the effluent or discoloration of the filter. Residue shall contain no particle larger than 750 microns, no more than 10 particles between 500 and 750 microns, no fiber in excess of 2000 microns in length, and no accumulation of fibers per square foot of surface tested.

4.4.1.2.8.3 Class C.

4.4.1.2.8.3.1 Test for Bourdon tube type gages. Examination shall show no fluorescence from the effluent or discoloration of the filter. Residue shall contain no particle larger than 750 microns, no more than five particles between 500 and 750 microns, no fiber in excess of 2000 microns in length and no accumulation of fibers.

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4.4.1.2.8.4 Class D.

4.4.1.2.8.4.1 Incandescent light inspection. Examination shall show no visible evidence of moisture, rust, corrosion, scale, slag, weld spatter, organic materials (oil, grease, crayon, paint, etc.) or any other foreign matter.

4.4.1.2.8.4.2 Ultraviolet light inspection. Examination shall show no fluorescence on the component or assembly.

4.4.1.2.8.4.3 Wipe test. Examination shall show no visible deposits on either cloth.

4.4.1.2.8.4.4 Solvent rinse test. Examination shall show no fluorescence from the effluent or discoloration of the filter. Residue shall contain no particle larger than 1000 microns, no more than 10 particles between 750 and 1000 microns, no fiber in excess of 6000 microns in length and no accumulation of fibers per square foot of surface tested.

4.4.1.2.8.5 Class E.

4.4.1.2.8.5.1 Incandescent light inspection. Examination shall show no visible evidence of moisture, rust, corrosion, scale, slag, weld spatter, organic materials (oil, grease, crayon, paint, etc.) or any other foreign matter.

4.4.1.2.9 Unit-packing tests.

4.4.1.2.9.1 Leakage test, heat-sealed seam test, and cyclic exposure test. The leakage test, heat-sealed seam test, and, when specified (see 6.2), the cyclic exposure test shall be performed in accordance with requirements specified in MIL-P-116.

5. PREPARATION FOR DELIVERY  
(Not applicable.)

6. NOTES

6.1 Intended use. The packaging requirements specified herein are intended to insure adequate preparation for safe delivery and storage of components and assemblies for industrial gas production, storage and transport equipment.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) When a preproduction pack is not required (see 3.1).

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- (c) Time frame required for submission of the preproduction pack (see 3.1).
- (d) Cleaning process required (see 3.3.2.1).
- (e) When interior of component or assembly is to be pressurized (see 3.3.3.1).
- (f) Exterior packing required (see 3.4).
- (g) When cyclic exposure tests are required (see 4.4.1.2.9.1).
- (h) When other than Finish B strapping is required (see 3.4.1).

6.3 Preproduction pack. Any changes or deviations of production packs from the approved preproduction pack will be subject to approval of the contracting officer. Approval of the preproduction pack will not relieve the supplier of his obligation to package the components or assemblies in accordance with this specification.

#### 6.4 Definitions.

6.4.1 Particle. A particle is defined as any solid matter other than a fiber, the size being determined by its maximum linear dimension or diameter.

6.4.2 Fiber. A fiber is defined as a nonmetallic, flexible, threadlike structure with a length equivalent to at least 10 times its diameter.

6.4.3 Micron. A unit of measurement equal to one-millionth of a meter.

6.4.4 Meter. A unit of measurement equal to 39.37 inches.

6.4.5 Cleanliness classification. A designation assigned to a component or assembly to specify the cleanliness requirements for that component or assembly based on its most critical application.

6.5 Environmental pollution preventive measures are contained in the material specifications indicated herein. Refer to the material specifications (or preparing activity) for recommended disposability methods.

#### Custodian:

Army - ME

#### Review activity:

Army - SM

#### Preparing activity:

Army - ME

Project No. 3655-A076

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## APPENDIX

10. SCOPE. This appendix specifies the criteria for determining the cleanliness classification required for components and assemblies to be packaged in accordance with this specification.

## 20. REQUIREMENTS

20.1 Determining cleanliness classification. The cleanliness classification for components and assemblies to be packaged in accordance with this specification shall be determined by the specific application of the component or assembly. Components or assemblies of critically cleaned systems which will have their condition degraded during installation (welding, soldering, brazing, etc.) shall be initially classified for Class E cleanliness and shall be reclassified as applicable and cleaned with the complete system or subsystem after the installation has been completed.

20.1.1 Class A cleanliness. Class A cleanliness is the class of cleanliness applied to components or assemblies that employ moving parts that will in use contact liquid or gaseous oxygen. Examples are: Compressors, pumps, valves, flow meters, rotometers, etc.

20.1.2 Class B cleanliness. Class B cleanliness is the class of cleanliness applied to components or assemblies that employ fixed surfaces that will in use contact liquid or gaseous oxygen. Examples are: Fixed plumbing fixtures, such as tubing, connectors, fittings, filters, rupture assemblies, dewars, etc.

20.1.3 Class C cleanliness. Class C cleanliness is the class of cleanliness applied to pressure-measuring devices using a Bourdon tube or bellows-type movement. Examples are: Pressure-monitoring devices and flow or liquid level differential pressure instruments.

20.1.4 Class D cleanliness. Class D cleanliness is the class of cleanliness applied to components or assemblies that will in use contact an oxygen-rich atmosphere or a pure product fluid. Examples are: Plumbing fixtures, such as tubing, connectors, fittings, filters, etc., of pure product circuits, controls, tanks, etc.

20.1.5 Class E cleanliness. Class E cleanliness is the class of cleanliness applied to components or assemblies that will in use not contact liquid or gaseous oxygen, an oxygen-enriched atmosphere or pure product fluids. An example is the plumbing fixtures of the process air circuit of a gas generating plant. This classification shall also be applied to components or assemblies that are to be cleaned prior to installation in a system and then cleaned with the complete system or subsystem (see 20.1).



**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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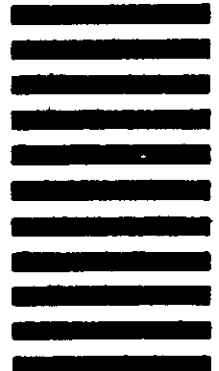
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