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MILITARY SPECIFICATION

DEHYDRATOR, DESICCANT, ELECTRIC
(FOR BAGGED DESICCANT)

This specification has been approved by the
Bureau of Aeronautics, Department of the Navy

1. SCOPE

1.1 This specification covers electrically heated and controlled bagged desiccant dehydrators.

2. APPLICABLE DOCUMENTS

2.1 The following specifications, standards, drawings, and publications, of the issue in effect on date of invitation for bids, form a part of this specification.

SPECIFICATIONS

Federal

| | |
|---|---|
| UU-P-271 | Paper, Wrapping, Waterproofed Kraft |
| PPP-B-621 | Boxes, Wood, Nailed and Lock-Corner |

Military

| | |
|---|---|
| MIL-C-104 | Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted |
| MIL-P-116 | Preservation, methods of |
| MIL-C-2212 | Controllers, motor starters, and master switches - alternating current, naval shipboard use |
| MIL-D-3464 | Desiccants Activated (In Bags) for Static Dehumidification and Packaging |
| MIL-D-5028 | Drawings and Data Lists; Preparation of Manufacturers (for Production Aircraft, Guided Missiles, Engines, Accessories, and Other Auxiliary Equipment) |
| MIL-P-6906 | Plates, Information and Identification |
| MIL-A-8625 | Anodic-Coatings, for Aluminum and Aluminum Alloys |
| MIL-L-10547 | Liners, Case, Waterproof |
| MIL-F-16552 | Filters, Air Conditioning, Cleanable, Impingement |
| MIL-M-17059 | Motors, Alternating Current, Fractional HP (Shipboard Use) |
| MIL-M-17060 | Motors, Alternating Current, Integral HP (Shipboard Use) |
| MIL-N-25027 | Nut, Self-Locking, 250°F, 550°F and 800°F |

STANDARDS

| | |
|---|---|
| MIL-STD-129 | Marking for Shipment and Storage |

DRAWINGS

Air Force - Navy Aeronautical Design Standard

| | |
|---|---|
| AN 995 | Wire - Lock |
| AND 10068 | Nuts and Plate Nuts - Self-Locking, Functional Limitations of |
| AND 10398 | Metals - Definition of Dissimilar |

PUBLICATIONS

Air Force - Navy Aeronautical Bulletins

| | |
|---|---|
| No. 143 | Specifications and Standards; Use of |

FSC 4440

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(When requesting specifications, standards, and drawings refer to both title and number. Copies of this specification and applicable specifications, standards, and drawings may be obtained upon application to the Commanding Officer, Naval Aviation Supply Depot, 700 Robbins Avenue, Philadelphia 11, Pa., Attention: Code AD)

3. REQUIREMENTS

3.1 Preproduction tests.- The dehydrator furnished under this specification shall be a product which has been tested and has passed the preproduction tests specified herein.

3.2 Materials.-

3.2.1 Metals.- Metals shall be of the corrosion-resistant type, unless suitably protected to resist corrosion during normal service life.

3.2.1.1 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 Drawing AND10398.

3.2.2 Corrosion protection.- When materials are used in the construction of dehydrators that are subject to corrosion in salt air or other atmospheric conditions likely to occur during service usage, they shall be protected against such corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification.

3.2.3 Selection of materials.- Specifications and standards for all materials, parts, and Government certification and approval of processes and equipment, which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with ANA Bulletin No. 143, except as provided in the following paragraph.

3.2.3.1 Standard parts.- Standard parts (MS, AN, or JAN) shall be used wherever they are suitable for the purpose, and shall be identified on the drawing by their part numbers. Commercial utility parts such as screws, bolts, nuts, cotter pins, etc., may be used, provided they possess suitable properties and are replaceable by the standard parts (MS, AN, or JAN) without alternation, and provided the corresponding standard part numbers are referenced in the parts list and, if practicable, on the contractor's drawings. In the event there is no suitable corresponding standard part in effect on date of invitation for bids, commercial parts may be used provided they conform to all requirements of this specification.

3.2.4 Sealing materials.- The seals of non-welded air passages shall be fabricated from materials suitable for the temperature involved. The use of soft solder and caulking compounds, sealing paste and similar materials is prohibited. All sealing against air leaks shall be accomplished on the inner wall insofar as is practicable to reduce condensation in the insulation shell.

3.3 Design.- The dehydrator shall be designed for manual loading and unloading. The dehydrating cycle shall be automatic after the unit is started.

3.3.1 Preliminary plans.- Prior to manufacture of dehydrators, two sets of drawings and operating instructions shall be submitted to the Bureau of Aeronautics via the cognizant Government inspector for design approval (see 6.3.2).

3.3.2 Corrected plans.- A reproducible drawing of the corrected plans shall be furnished for the files of the Bureau of Aeronautics. The corrected plan shall show the equipment as finally delivered, reflecting all changes.

3.3.3 Trays.- The dehydrator shall contain two tray sections. Either one or both tray sections shall form an independent operable, portable unit. Trays shall be of welded construction consisting of an aluminum frame with suitable side walls and a bottom. Wire mesh or perforated metal shelves may be used. Each tray shall be capable of supporting at least 10 pounds per square foot when suspended from two opposing sides. The dehydrator shall be provided with full-length supports upon which the trays shall normally rest and from which the trays can be either partially or completely withdrawn for loading or unloading. The construction shall be such that air circulating in the dehydrator will come into contact with both the top and the underside of material placed on the trays over the full area of the trays.

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3.3.4 Doors.- Two doors shall be provided, one for access to each tray section.

3.3.4.1 Door seal.- The seal or gasket between the door and the face of the dehydrator shall be of insulating material that is durable under operating conditions.

3.3.4.2 Door latch.- The door latch shall be adequate to effect a satisfactory fit between the door and the oven and to prevent the door from loosening or inadvertent opening.

3.3.5 Filter.- A cleanable type air filter conforming to Specification MIL-F-16552 shall be provided in the reactivator. The installation shall be such that the filter will be readily accessible for servicing and shall completely filter the unheated inlet air.

3.3.6 Rating.- The dehydrator shall operate on a connected load of not more than 22 kilowatts.

3.3.6.1 Power supply.- The dehydrator shall be capable of operating on 220 and 440 volt, a.c., three phase, 60 cycle power. Controls and fan for the dehydrator shall operate on 115 volt, single phase, 60 cycle, a.c. power.

3.3.7 Motors.- Motors shall conform to all applicable requirements of Specification MIL-M-17059 or MIL-M-17060, as applicable, under the following classification requirements:

| | |
|---|---|
| Service | C |
| Ambient temperature | 50°C |
| Insulation | Class A |
| Enclosure | Dripproof |
| Duty | Continuous |
| Voltage | 110 - Single Phase |
| Frequency | 60 CPS |

3.3.8 Controls.- Controllers, motor starters and master switches shall conform to Specification MIL-C-2212.

3.3.9 Air ducts.- Inlet and outlet ports shall be provided with automatic closures so connected that when the fan is operating, the ports will remain open; when the fan shuts off, the ports shall close automatically.

3.3.10 Thermostat.- The temperature of the air entering the tray sections shall be automatically controlled in the range from 230°F to 250°F.

3.3.11 Thermal cut-out.- Thermal cut-outs shall be installed which shall operate to disconnect the heater from the power supply if for any reason the temperature of the air entering the tray sections exceeds 260°F.

3.4 Construction.- The dehydrator shall be so constructed that no parts will work loose or out of alignment in service. They shall be built to withstand the strains, jars, vibrations and other conditions incident to shipping, storage, installation and service. Doors and trays shall neither bind nor shake.

3.5 Interchangeability.- All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of Specification MIL-D-5028.

3.6 Locking of threaded parts.- All internal and external threaded parts shall be positively locked by safety wiring, self-locking nuts, cotter pins, or other approved methods. Safety wire shall have a minimum diameter of 0.032 inch and shall be used in accordance with Drawing AN995. Self-locking nuts shall be of the all-metal type, conforming to Specification MIL-N-25027, and shall be used in accordance with Drawing AND10068. Staking is not permitted.

3.7 Finish.- The finish of the dehydrator and its component parts shall be as specified on the applicable drawings. Protective coatings and finishes which will crack, chip, or scale during normal service life, or under extremes of atmospheric conditions, shall not be used.

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3.7.1 Aluminum alloy parts.- All aluminum alloy parts shall be anodized in accordance with Specification MIL-A-8625 or adequately treated in some other acceptable manner for corrosion prevention.

3.8 Performance.- The dehydrator and component parts shall satisfy the performance requirements specified in Section 4, when subjected to the applicable tests.

3.9 Special tools.- The design shall be such as to accommodate to the greatest possible extent, disassembly, and service maintenance with the use of tools and items of maintenance equipment which are normally available as commercial standards.

3.10 Marking.-

3.10.1 Nameplate.- The dehydrator shall have the following information marked on a suitable nameplate securely attached in a convenient location accessible for inspection from the front of the dehydrator:

Dehydrator, Desiccant, Electric (For bagged desiccant)
Rating (KW, Phase Frequency, Voltage)
Specification MIL-D-21576 (Aer)
Manufacturer's Part No. (or identification)
Manufacturer's Serial No.
Contract No.
Manufacturer's Name or Trademark
U. S. Property

3.10.2 Information and identification plates.- The following plates conforming to Specification MIL-P-6906, except that plastic material shall not be used, shall be provided as required.

Operating instructions
Danger warning plates including a warning plate to prohibit the reactivation of bagged desiccants cleaned in trichloroethylene or petroleum distillates
Lubrication plates
Direction of rotation arrows
Maintenance instructions
Component nameplates such as instruments and controls

3.11 Workmanship.- Workmanship shall be of the highest quality and in accordance with the best practice for this type of equipment.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests.- The inspecting and testing of dehydrators shall be classified as follows:

4.1.1 Preproduction tests.- Preproduction tests are those tests accomplished on the first dehydrator unit manufactured under each contract. The testing shall be conducted at the contractor's plant. The tests shall consist of all the tests described under "Test Methods".

4.1.2 Acceptance tests.- Acceptance tests are those tests accomplished on all remaining dehydrators under contract after preproduction tests have been approved. The testing shall be conducted at the contractor's plant. The tests shall consist of the following tests, which are described under "Test Methods":

(a) Inspection
(b) Dielectric strength
(c) Safety devices

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4.2 Correction of defects.- Any defects discovered during the preproduction tests shall be corrected by the contractor. Such corrective measures as may be found necessary shall likewise be incorporated in all subsequent dehydrators offered for acceptance under contract. Any defects discovered during the acceptance tests shall be corrected by the contractor. Before resubmitting, full particulars concerning rejections and the action taken to correct the defects found shall be furnished to the Government inspector.

4.3 Test conditions.- Unless otherwise specified, a room temperature of between 70°F to 90°F shall be maintained for test purposes. Temperature shall be measured by a thermometer placed from 5 to 10 feet from the nearest surface of the dehydrator. Air circulation in the test room shall be such as to obtain reasonably uniform temperature distribution, but shall cause no direct draft on the item being tested.

4.4 Test methods.-

4.4.1 Inspection.- Each complete dehydrator and its components shall be carefully examined to determine conformance with the requirements of this specification not covered by tests.

4.4.2 Dielectric strength.-

4.4.2.1 Each dehydrator shall be subjected to and shall withstand for a period of one minute, a dielectric test voltage of twice the rated voltage plus 1,000 volts. Dielectric tests shall be made upon the completely assembled equipment. There shall be no evidence of insulation breakdown as a result of this test.

4.4.2.2 Each piece of equipment shall be operated at rated voltage and high heat for one hour, after which each circuit, including thermostats, switches, heating units and wiring, shall be subjected to the required dielectric test between each phase and ground. During the test all other circuits and metal parts shall be effectively grounded and all relays or contactors shall be closed. During this test, the dehydrator shall be at operating temperature (230°F to 250°F).

4.4.2.3 The frequency of the test voltage may be of any convenient value. The voltmeter method shall be used to measure the test voltage.

4.4.3 Safety devices.- Tests shall be performed to determine that all safety devices will function satisfactorily.

4.4.4 Operation.-

4.4.4.1 Desiccant conditioning.- The dehydrator shall be charged with 500 - 16 unit bags of desiccant conforming to Specification MIL-D-3464. The bags shall be uniformly arranged in single layers on the trays with a minimum overlapping. The charge shall be reactivated for not less than 24 hours at a controlled air temperature of 230°F to 250°F measured at the tray inlet. The rate of airflow measured at the air inlet to the dehydrator shall be not more than 400 cfm. Upon completion of the above reactivation five (5) bags located in each of the four corners and in the center of each alternate tray shall be suitably identified and weighed, while hot, to nearest gram.

4.4.4.2 Humidification.- After weighing allow the charge to cool and come to equilibrium with ambient air having a relative humidity of over 90 percent. This may be accomplished without removing the charge from the dehydrator by allowing the unit to cool completely and then recirculating unheated air through the charge humidified by means of a controlled steam jet. Humidification shall be controlled so that liquid water is not permitted to condense on the bags or trays. Humidification shall continue until each sample bag has absorbed at least 120 grams of moisture at which time record the weight in grams of each sample bag and the resulting gain over the weight recorded in 4.4.4.1.

4.4.4.3 Reactivation.- Reactive the charge in accordance with the manufacturer's approved operating instructions. After reactivation, reweigh each sample bag and record the weight loss of this weight from the weight after humidification. Calculate the percent reactivation of each sample by the following formula:

$$\text{percent reactivation} = \frac{\text{Weight loss in (4.4.4.3)}}{\text{Weight gain in (4.4.4.2)}} \times 100$$

The percent reactivation of each sample shall be not less than 95 percent.

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4.4.4.4 Final inspection.- Upon completion of the above test, the dehydrator shall be examined for loose electrical connections, corrosion due to heat or moisture, burnt parts, or any other damage which might subsequently affect the performance of the unit.

5. PREPARATION FOR DELIVERY

5.1 Application.- The requirements of Section 5 apply only to direct purchases by or direct shipments to the Government.

5.2 Packaging.- The level of packaging shall be Level A, unless otherwise specified by the procuring activity.

5.2.1 Level A.- Surfaces of components subject to corrosion shall be thoroughly cleaned, preserved and wrapped in accordance with the applicable method of Specification MIL-P-116.

5.2.2 Level C.- When level C is specified by the procuring activity, packaging shall conform to good commercial practice.

5.3 Packing (See 6.3).- The level of packing shall be as specified by the procuring activity. Each shipping container shall contain the components for one complete dehydrator.

5.3.1 Level A.- Dehydrators preserved and packaged as specified in paragraph 5.2.1, shall be packed in fully sheathed nailed wood crates together with components and disassembled parts which shall be packed in nailed wood boxes, as follows:

5.3.1.1 Fully sheathed nailed wood crates shall conform to Specification MIL-C-104. Dehydrators shall be securely bolted, blocked or braced to the base of the crate. Not less than 2 inches clearance shall be allowed at the top, ends and sides of the assembly. The top and sides of each crate shall be lined between the sheathing and the frame members with waterproof material conforming to the requirements of Type C-2, Specification UU-P-271. To prevent moisture condensation, ventilating holes shall be drilled in the side panels of the crate immediately below the upper frame members and shall extend through the waterproof material comprising the water shed. The holes shall not be more than 1/2 inch in diameter, bored upward at an angle of 45 degrees and arranged in clusters of approximately 9 holes, one cluster to each framing panel. A baffle of plywood or sheet metal shall be secured to the inside face of the framing members and shall extend at least 6 inches on either side of and below the ventilating holes. A sufficient number of holes not over 1/2 inch in diameter shall be drilled in the base to provide proper drainage.

5.3.1.2 Nailed wood boxes shall conform to the requirements of Specification PPP-B-621, class 2. Boxes shall be lined with case liners conforming to Specification MIL-L-10547. Boxes shall be securely bolted or strapped to the base of and within the crate carrying the main assembly. Suitable interior packing, blocking or bracing shall be used in each box to prevent contents from shifting or damage from shock.

5.3.2 Level B.- Level B packing shall be as described above for Level A packing except that nailed wood boxes shall conform to PPP-B-621, class 1, and need not be lined with case liners.

5.3.3 Level C.- Packages shall be packed in exterior shipping containers in a manner that will insure safe transportation at the lowest rate to the point of delivery. Containers shall meet Consolidated Freight Classification rules or regulations of the common carrier, as applicable to the mode of transportation.

5.4 Marking of shipment.- Packages and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 Intended use.- Dehydrators covered by this specification are intended for use on shipboard and shore installations to reactivate bagged dessicant.

6.2 Drawing requirements.- The attention of contractors is invited to the fact that Government contracts for equipment, whether procured directly by the Government or through another contractor, require that all drawings submitted, shall be in accordance with the requirements of Specification MIL-D-5028.

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6.3 Ordering data.- Procurement documents should include the following:

Title, Number and Date of this Specification
Quantity
Voltage required (see paragraph 3.3.6.1)
Reproducible finished plans, if required. (see paragraph 3.3.2)
Applicable levels of packaging and packing protection required (see Section 5)

6.3.1 Provisions for acceptance testing.- Normally, unless otherwise indicated by the bureau or technical activity concerned, contracts should state that acceptance testing to determine conformance with the specification requirements will be the responsibility of the Contractor.

6.3.2 Attention is invited to tha fact that design approval is required (see paragraph 3.3.1) after award of contract but prior to manufacture. Inasmuch as units will be procured for shipboard use, consideration will be given to envelope dimensions.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use or sell any patented inventions that may in any way be related thereto.

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the pole on tree trunk