

**INCH-POUND**

MIL-DTL-87934B  
9 May 2012  
SUPERSEDING  
MIL-DTL-87934A  
21 February 2001

## DETAIL SPECIFICATION

### DESICCANT, MOLECULAR SIEVE (IMPREGNATED)

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

1. **SCOPE.** This specification covers one type of sodium alumina-silicate molecular sieve desiccant.

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

#### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

#### FEDERAL SPECIFICATIONS

A-A-59282 - Chemicals, Analytical; General Specification for.

Comments, suggestions, or questions on this document should be addressed to DLA Aviation, VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616 or e-mailed to [STDZNMGT@dla.mil](mailto:STDZNMGT@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at <https://assist.daps.dla.mil>.

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### FEDERAL STANDARDS

- FED-STD-595/35109 - Blue, Flat or Lusterless
- FED-STD-595/35177 - Blue, Flat or Lusterless

### DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-D-3464 - Desiccants, Activated, Bagged, Packaging Use and Static Dehumidification.

(Copies of these documents are available at <https://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM E323 - Standard Specification for Perforated-Plated Sieves for Testing Purposes.

(Copies of these documents are available online at <http://www.astm.org/> or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

### AMERICAN SOCIETY FOR QUALITY (ASQ)

- ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of this document are available online at <http://www.asq.org/> or from American Society of Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Material. The desiccant shall be a sodium alumina-silicate molecular sieve type having a free aperture pore size of 3.5 angstroms in diameter and impregnated with an inorganic metal salt moisture indicator (see [3.4](#)).

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3.2 Size and form. The desiccant shall be a spherical 4 x 8 bead form conforming to the sieve analysis in [table I](#) when tested in accordance with [4.3.1](#).

TABLE I. Sieve analysis.

Percent maximum by weight	U.S. Sieve No.
5	Retained on 6.73 mm
10	Through 8
0.2	Through 20

3.3 Crushing strength. The desiccant shall withstand a minimum average pressure of 10 lbs, without crushing, when tested in accordance with [4.3.2](#).

3.4 Moisture indicator. The moisture indicator shall be an inorganic metal salt, which will indicate moisture saturation by changing from a blue to a beige or buff color. The use of organic dyes is prohibited. A minimum of 95 percent of the beads shall be impregnated with the moisture indicator, having a blue color approximately matching number 35177 or 35109 of FED-STD-595. The rest of the beads shall be of a lighter shade of blue. The presence of white or off-white beads, which have not been processed for impregnation, is prohibited.

3.5 Moisture content. The packaged desiccant shall contain a maximum of 5 percent by weight adsorbed water when tested in accordance with [4.3.3](#).

3.6 Water adsorption capacity. The water vapor adsorption capacity of the desiccant shall conform to the minimum weight percents in [table II](#) when tested in accordance with [4.3.4](#).

TABLE II. Water adsorption capacity.

Water vapor % relative humidity	Adsorption capacity % equilibrium adsorption at 25 °C
10	17
20	18
40	19
60	20

3.7 Regeneration. Desorption by three heating cycles in accordance with [4.3.5](#), shall reactivate the desiccant to the as-manufactured adsorption capacity (see [3.6](#)), and blue color (see [3.4](#)).

3.8 Appearance. The packaged desiccant shall be free from foreign material and have a uniform clean appearance.

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3.9 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

#### 4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as a conformance inspection.

#### 4.2 Conformance inspection.

4.2.1 Sampling for inspection and acceptance. Sampling for inspection and acceptance shall be in accordance with ASQ Z1.4, except where otherwise indicated. For purposes of sampling, an inspection lot for acceptance inspection and tests shall consist of all material submitted for inspection and delivery at one time.

4.2.1.1 Examination of desiccant. Representative samples shall be selected from each inspection lot and shall be visually examined for defects in appearance, uniformity and presence of foreign matter. The sample unit shall be one container of desiccant.

4.2.1.2 Testing of desiccant. Samples of the end item from each lot submitted for inspection shall be tested for the applicable characteristics as indicated in [section 3](#). The sample unit shall be one container of desiccant.

4.2.2 Inspection levels and acceptable quality levels. The inspection levels and acceptable quality levels shall be designated in the contract (see [6.2](#)).

4.2.3 Certification. The contractor shall furnish a certificate that the desiccant is a sodium alumina-silicate molecular sieve type having a free aperture pore size of 3.5 angstroms in diameter (see [3.1](#)), and that the beads are impregnated with a moisture indicator which will change from a blue to a beige color when adsorption capacity is exhausted (see [3.4](#)).

#### 4.3 Tests.

4.3.1 Sieve analysis. Nest together, with the coarsest on top, a 6.73 mm, No. 8 and No. 20 U.S. Standard Sieve conforming to square-hole perforated-plate sieves of ASTM E 323. Transfer 100 grams (g) of sample desiccant into the top sieve and sift the desiccant down through all three sieves by shaking and tapping the sieve frame as necessary. After the retained amount of desiccant on all sieves is not significantly reduced by further sifting, remove and weigh the desiccant retained on each sieve. Failure of the retained percentage of total weight to conform to [3.2](#) at the levels specified in the contract (see [6.2](#)) shall be cause for rejection.

4.3.2 Crushing strength. Ten beads from each sample shall be tested. Place a single bead between a pair of anvils on a compression tester equipped with a load indicator graduated in 1/4 lb increments. Apply an increasing load at a steady rate of approximately 60 lb/minute until the bead crushes and record the load in pounds to the nearest 1/4 lb. Failure of the calculated

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average load to conform to [3.3](#) at the levels specified in the contract (see [6.2](#)) shall be cause for rejection.

4.3.3 Moisture content. Exercise care to minimize adsorption of moisture after the package is opened, avoiding exposure to humid air before conducting this weight test. Weigh out at room temperature,  $100 \pm 0.001$  g of the sample desiccant and spread in a Pyrex glass dish to a maximum depth of two beads. Place the dish and contents in an oven and heat for 2 hours at  $575 \pm 5$  °C. Cool at room temperature in a closed desiccator and reweigh the sample. Failure of the weight loss of the specimens to conform to section [3.5](#) at the level specified in the contract (see [6.2](#)) shall be cause for rejection.

4.3.4 Water adsorption capacity. Testing shall be in accordance with the unit adsorption capacity testing of MIL-D-3464, except the relative humidity solutions shall be prepared from glycerol conforming to A-A-59282 and distilled or deionized water as specified in [table III](#). Testing shall be conducted at  $25 \pm 2$  °C. The desiccant sample shall be 20 to 30 g. The adsorption capacity of the desiccant in equilibrium with air at a specified relative humidity shall be calculated as specified below:

$$\% \text{ Adsorption capacity} = \frac{\text{Increase in weight} \times 100}{\text{Initial weight of sample}}$$

Failure of water adsorption capacity of the samples to conform to section [3.6](#) at the levels specified in the contract (see [6.2](#)) with relative humidity solutions prepared as below shall be cause for rejection.

TABLE III. Preparation of relative humidity solutions.

% relative humidity at 25 °C	% by weight glycerol distilled water
10	99
20	96
40	86
60	74

4.3.5 Regeneration. Spread approximately 50 g of moisture saturated desiccant in a Pyrex dish to a depth of approximately 13 mm. Place the dish and contents in a convection oven for two hours at  $315 \pm 5$  °C, and then cool to  $20 \pm 5$  °C in a closed desiccator. Failure of sample regeneration to conform to [3.7](#) at the levels specified in the contract (see [6.2](#)) shall be cause for rejection.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see [6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the

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inventory control point's packaging activities within the military service or defense agency, or within the military service's system command. Packaging data retrieval is available from the managing military department's or defense agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The molecular sieve desiccant covered by this specification is intended for use in a dehydrator (Westinghouse Electric Corporation drawing 500R840) for critical equipment such as a radar system. The color change of the moisture indicator in the molecular sieve desiccant will be visible to the operator to signal approaching moisture saturation. Desiccant is designed to be reactivated by heating.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. The specific issue of individual documents referenced (see [2.2](#) and [2.3](#)).
- c. Packaging requirements (see [5](#)).
- d. Inspection levels and acceptable quality levels (see [4.2.2](#), [4.3.1](#), [4.3.2](#), [4.3.3](#), [4.3.4](#), and [4.3.5](#)).

6.3 Subject term (key word) listing.

Adsorption capacity  
Crushing strength  
Glycerol  
Inorganic metal salt  
Moisture indicator  
Sodium alumina-silicate

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information using the ASSIST database at <https://assist.daps.dla.mil>.