SAE Aerospace
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# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3420F

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Superseding AMS 3420E

## Dehydrating Agent
## Silica Gel

1. SCOPE:

1.1 Form:

This specification covers silica gel dehydrating agent in the form of a granular powder in either plain or indicator grades.

1.2 Application:

This product has been used typically for corrosion prevention of metals during storage in closed spaces, but usage is not limited to such applications.

1.3 Classification:

Covered by this specification are classified as follows:

Grade D - Large particle size with indicator
Grade E - Medium particle size without indicator
Grade F - Medium particle size with indicator type

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AS167 Chart, Humidity Indicator, Color Comparison





**TO PLACE A DOCUMENT ORDER:** Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
**SAE WEB ADDRESS:** http://www.sae.org

**SAE values your input. To provide feedback on this Technical Report, please visit**
**http://www.sae.org/technical/standards/AMS3420F**

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 214 Sieve Analysis of Granular Metal Powder

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Material shall be non-deliquescent and shall absorb water by physical means and not by chemical combination except for the cobalt chloride in indicator grades.

3.2 Properties:

The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified test methods:

3.2.1 Composition:

3.2.1.1 Grades D and F shall be silica gel containing not less than 99.6% $Si0_2$ impregnated with not more than 1.5 pounds (0.68 kg) of anhydrous cobalt chloride ($CoC1_2$) per 100 pounds (45 kg) of finished material on a dry weight basis determined by test method acceptable to purchaser.

3.2.1.2 Grade E shall be silica gel containing not less than 99.4% $Si0_2$ on a dry weight basis.

3.2.2 Color: Indicating grades shall have characteristic colors when in equilibrium with the atmosphere and shall closely match the colors shown on AS167 for relative humidities of 0, 20, 40 and 60% at 25 °C ± 2 (77 °F ± 4).

3.2.3 Water Content: Shall not exceed 5.75% by weight for Grades D and F, determined in accordance with 4.4.1; no limit is established for Grade E.

3.2.4 Water Vapor Adsorption Capacity: Shall be not lower than shown in Table 1 when in equilibrium with the relative humidities given, determined as in 4.4.2.

TABLE 1 - Water Vapor Adsorption Capacity

| Relative Humidity % | Water Vapor Adsorption % by Weight Grades D and F | Water Vapor Adsorption % by Weight Grade E |
|---|---|---|
| 10 | 4.3 | 5.7 |
| 20 | 8.6 | 10.5 |
| 40 | 18.2 | 21.5 |
| 60 | 27.7 | 28.0 |
| 80 | 32.9 | 31.2 |

3.2.5 Particle Size: Shall be as shown in Table 2 for the respective grades, determined in accordance with 4.4.3.

TABLE 2 - Particle Size Distribution

| Screen | Size Distribution Percent Grade D | Size Distribution Percent Grades E and F |
|---|---|---|
| Retained on No. 6 (3.35 mm), maximum | 2.0 | |
| Through No. 6 (3.35 mm), Retained on No. 12 (1.70 mm), minimum | 55.0 | |
| Through No. 12 (1.70 mm), Retained on No. 18 (1.00 mm), minimum | 19.0 | |
| Through No. 18 (1.00 mm), maximum | 3.5 | |
| Through No. 20 (850 µm), maximum | 0.5 | |
| Retained on 0.530 inch (13.5 mm) opening | | 0.0 |
| Through 0.530 inch (13.5 mm) opening, retained on No. 80 (180 µm), minimum | | 96.0 |
| Through No. 80 (180 µm), maximum | | 4.0 |

3.2.6 Particle Strength: Shall be as shown in Table 3 for the respective grades, determined in accordance with 4.4.4.

TABLE 3 - Particle Strength

| Screen | Powdering Grade D Percent | Powdering Grades E & F Percent |
|---|---|---|
| Through No. 30 (600 µm), maximum | 1.5 | - |
| Through No. 200 (75 µm), maximum | - | 0.8 |

3.2.7 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure acceptable to purchaser. Discoloration of metal shall not be considered objectionable.

3.3 Quality:

The drying agent, as received by purchaser, shall be a uniform in quality and condition and free from foreign materials and from imperfections detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.2.1), color (3.2.2), water content (3.2.3) and quality (3.3) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all product from the same batch of compound processed in one continuous run and presented for vendor's inspection at one time. A lot shall not exceed 500 pounds (227 kg).

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1.

4.3.2 For Preproduction Tests: Sample quantity shall be at the discretion of the vendor unless otherwise specified by purchaser.

4.4 Test Methods:

Shall be as follows:

4.4.1 Water Content: Weigh accurately 2 to 4 grams of the product into a silica crucible, cover, and immediately place in a cool electric furnace. Bring the temperature to 960 °C ± 30 (1760 °F ± 54) within one hour. Remove the cover from crucible and continue to heat crucible for 30 to 45 minutes. Remove crucible from furnace and cool to room temperature in desiccator, reweigh, and calculate water content from loss in weight.

4.4.2 Water Vapor Absorption Capacity:

4.4.2.1 Arrange six glass saturator bottles as in Figure 1; each bottle shall have not less than 500 mL capacity and shall be equipped with a petticoat bubbler. Pass air from a flowmeter through the saturator bottles at a rate of 14 cubic feet (0.4 $m^3$) per minute; each bottle shall be filled to 1/3 to 1/2 its volume with sulfuric acid of the proper concentration to give the desired relative humidity in accordance with Table 4. Pass the air from the saturator bottles through a mist trap, which can be an ordinary drying tube or cylinder approximately 1.5 inches (38 mm) in diameter and 8 to 9 inches (203 to 229 mm) high packed with glass wool, and then through the adsorption bulb, which can be a cylindrical bulb with a flat bottom, a short tubular arm, a top with a ground glass joint, and a tubular opening for the air to pass (See Figure 2). Duplicate sets of apparatus shall be provided to make simultaneous determinations for relative humidities of 10, 20, 40, 60 and 80% at temperature of 25 to 30 °C, (77 to 86 °F). Temperature change during a test shall be not greater than ±1 C (±2 F) degrees.



TABLE 4 - Water Vapor Absorption

| Relative Humidity Percent at 25 to 30 °C | Relative Humidity Percent at 77 to 86 °F | Sulfuric Acid Solution Percent by Weight |
|---|---|---|
| 10 | 10 | 64.7 |
| 20 | 20 | 58.2 |
| 40 | 40 | 47.8 |
| 60 | 60 | 38.4 |
| 80 | 80 | 26.4 |

4.4.2.2 Place 5 to 10 grams of product, weighed to the nearest milligram, in a tared adsorption bulb. Do not expose the product to air any more than necessary. Make a tight rubber connection to the outlet of the mist trap and adjust air flow to 240 cubic inches ± 30 (4.0 L ± 0.5) per minute. After three hours, weigh the adsorption bulb quickly; repeat the weighings until two successive weighings approximately one hour apart show a variation not greater than ten milligrams. Generally, the weight increase will rise to a maximum and then decrease slightly before reaching constant weight. The gain in weight, expressed as a percentage of the original weight, is the percentage of water vapor the product will hold in equilibrium with air of the relative humidity attained in the saturators. The attained relative humidity in the saturators shall be determined on the exit end solution in each chain after the product has attained equilibrium.

4.4.3 Particle Size: Bring a sample of the product to approximate equilibrium with the atmosphere. Place a five ounce (142 gram) sample of the product on the coarsest screen in a nest of the applicable sizes and shake for three minutes on a screen shaker. Equipment shall be in accordance with ASTM B 214.

4.4.4 Particle Strength: Repeat the particle size test of 4.4.3. Mix separately, the portions of the Grade D sample retained on the No. 18 or coarser screens and the portion of Grade E or F retained on the No. 80 or coarser screens, bring to approximate equilibrium with the atmosphere, weigh out a 1.5-ounce ± 0.2 (43-gram ± 5) sample to an accuracy of ±0.01 ounce (±0.2 gram) and place on the No. 18 or No. 80 screen, as applicable, together with five copper disks approximately 0.50 inch thick and 0.750 inch in diameter (1.3 x 19 mm). Fit the screen with a tight cover and nest with a finer screen and a retaining pan; the finer screen shall be No. 30 for Grade D and No. 200 for Grades E and F. Shake the sample for 15 minutes in the apparatus specified in 4.4.3. Weigh the powder collected in the retaining pan and report as a percentage of the original sample weight.

4.5 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3420F, formula number, and quantity.

4.6 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Identification:

Dehydrating agent shall be assigned a unique name or other alphanumeric code identification traceable to a specific set of ingredients and raw materials, manufacturing processes and sequences, controls and inspection processes. In the event of any change in ingredients, raw materials, manufacturing processes, inspection procedures, that name or other coded identification shall also be changed.

5.1.1 Each package of product shall be permanently and legibly marked with not less than the following information:

DEHYDRATING AGENT, SILICA GEL
AMS 3420F
GRADE _____
SIZE OR PART NUMBER _____
LOT NUMBER _____
PURCHASE ORDER NUMBER _____
QUANTITY _____
MANUFACTURER'S IDENTIFICATION (See 5.1.1) _____

5.2 Packaging:

5.2.1 Packaging shall be accomplished to ensure that the product, during shipment and storage, will be protected against damage from exposure to weather or any other normal hazard.

5.2.2 A lot of dehydrating agent may be packaged in small quantities and delivered under the same basic lot designation provided lot identification is maintained.

5.2.3 Packages of product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT:

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 A change bar ( **l** ) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. An (R) symbol to the left of the document title indicates a complete revision of the specification, including technical revisions. Change bars and (R) are not used in original publications, nor in specifications that contain editorial changes only.

8.2 Dimensions and properties in inch/pound units and the Celsius temperatures are primary; dimensions and properties in SI units and the Fahrenheit temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 Purchase documents should specify not less than the following:

AMS 3420F
Grade desired
Quantity of product desired.

8.4 Key Words:

Corrosion prevention, storage