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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3420D

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Superseding AMS 3420C

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. Indicator grades shall be impregnated with cobalt chloride.

1.2 Application: Primarily for corrosion prevention of metals during storage in closed spaces.

1.3 Classification: Dehydrating agents are classified in types, indicating or plain, and grades according to particle size as follows:

Grade D - Large particle size, Indicator Type
Grade E - Medium particle size, Plain Type
Grade F - Medium particle size, Indicator Type

1.3.1 When so ordered, the above grades shall be blended in proportions specified by purchaser but no blend shall contain less than 25% of indicating types.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Standards shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.1.2 Aerospace Standards:

AS 167 - Chart, Humidity Indicator, Color Comparison

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E11 - Wire-Cloth Sieves for Testing Purposes

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Form Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

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% SiO_2 impregnated with not more than 1.5 lb (0.65 kg) of anhydrous cobalt chloride ($CoCl_2$) per 100 lb (45 kg) of finished material on a dry basis.

3.2.1.2 Grade E shall be silica gel containing not less than 99.4% SiO_2 on a dry basis.

3.2.2 Color: Indicating types shall have characteristic colors when in equilibrium with the atmosphere and shall closely match the colors shown on AS 167 for relative humidities of 0, 20, 40 and 60% at 25°C ± 2 (77°F ± 5).

3.2.3 Water Content: Shall not exceed 5.75% by weight for Grades D and F, determined in accordance with 4.5.1; no limit is established for Grade E.

3.2.4 Water Vapor Adsorption Capacity: Shall be not lower than the following when in equilibrium with the relative humidities given, determined as in 4.5.2:

Relative Humidity %	Water Vapor Adsorption, % by Weight	
	Grades D and F	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 follows for the respective grades, determined in accordance with 4.5.3:

Screen	Distribution	
	Grade D	Grades E & F
Retained on No. 6 (3.35 mm), max	2.0%	
Through No. 6 (3.35 mm), Retained on No. 12 (1.70 mm), min	55.0%	
Through No. 12 (1.70 mm), Retained on No. 18 (1.00 mm), min	19.0%	
Through No. 18 (1.00 mm), max	3.5%	
Through No. 20 (850 µm), max	0.5%	
Retained on 0.530 in. (13.2 mm) opening		0.0
Through 0.530 in. (13.2 mm) opening, retained on No. 80 (180 µm), min		96.0%
Through No. 80 (180 µm), max		4.0%

3.2.6 Particle Strength: Shall be as follows for the respective grades, determined in accordance with 4.5.4:

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

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

3.3 Ø Quality: The product, as received by purchaser, shall be 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 performing all Ø required tests. Results of such tests shall be reported to the purchaser as required by 4.6. 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: Tests to determine conformance to the following requirements are classified as acceptance tests and shall be performed on each lot:

	Requirement	Paragraph Reference
	Composition	3.2.1
Ø	Color	3.2.2
	Water Content	3.2.3

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests Ø and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when Ø requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from Ø 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 Ø one continuous run and presented for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg).

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have Ø been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6.1 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.
Ø

4.4 Approval:

4.4.1 Sample product shall be approved by purchaser before product for production use is supplied, unless such approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample product. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material, processing, or both and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be as follows:

4.5.1 Water Content: Weigh accurately 2 - 4 g of material into a silica crucible, cover, and immediately place in a cool electric furnace. Bring the temperature to 960°C ± 30 (1760°F ± 50) within one hour. Remove the cover from crucible and continue to heat crucible for 30 - 45 minutes. Remove crucible from furnace and cool to room temperature in desiccator, reweigh, and calculate water content from loss in weight.

4.5.2 Water Vapor Absorption Capacity:

4.5.2.1 Arrange 6 glass saturator bottles as in Fig. 1; each bottle shall have not less than 500 mL capacity and be equipped with a petticoat bubbler. Pass air from a flowmeter through the saturator bottles at a rate of 14 cu ft (0.4 m^3) per min.; each bottle shall be filled to 1/3 - 1/2 its volume with sulfuric acid of the proper concentration to give the desired relative humidity, in accordance with the table below. Pass the air from the saturator bottles through a mist trap, which can be an ordinary drying tube or cylinder approximately 1.5 in. (40 mm) in diameter and 8 - 9 in. (200 - 225 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 and a top with a ground glass joint and a tubular opening for the air to pass (See Fig. 2). Duplicate sets of apparatus shall be provided to make simultaneous determinations for

4.5.2.1 (Continued):

relative humidities of 10, 20, 40, 60 and 80% at temperature of 25° - 30°C, (77° - 86°F). Temperature change during a test shall be not greater than ±1°C (±2°F).

Relative Humidity % at 25° - 30°C (77° - 86°F)	Sulfuric Acid Solution % by weight
10	64.7
20	58.2
40	47.8
60	38.4
80	26.4

4.5.2.2 Place 5 - 10 g of product, weighed to the nearest milligram, in a tared adsorption bulb. Do not expose the material to air any more than necessary. Make a tight rubber connection to the outlet of the mist trap and adjust air flow to 240 cu in. ± 30 (4.0 L ± 0.5) per minute. After 3 hr, weigh the adsorption bulb quickly; repeat the weighings until 2 successive weighings approximately 1 hr apart show a variation not greater than 10 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 material 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 material has attained equilibrium.

4.5.3 Particle Size: Bring a sample of material to approximate equilibrium with the atmosphere. Place a 5 oz (150 g) sample of material on the coarsest screen in a nest of the applicable sizes and shake for 3 min. on a screen shaker equivalent to the W.S. Tyler Ro-Tap machine.

4.5.4 Particle Strength: Repeat the particle size test of 4.5.3. Mix the portions of the Grade D sample retained on the No. 18 and coarser screens and the portion of Grade E or F retained on the No. 80 and coarser screens, bring to approximate equilibrium with the atmosphere, weigh out a 1.5 oz ± 0.2 (50 g ± 5) sample to an accuracy of ±0.01 oz (±0.2 g) and place on the No. 18 or No. 80 screen, as applicable, together with 5 copper disks the size and weight of a U.S. penny. 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 min. in the apparatus specified in 4.5.3. Weigh the powder collected in the retaining pan and report as a percentage of the original sample weight.

4.6 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 of this specification. This report shall include the purchase order number, AMS 3420D, formula number, lot number, and quantity.

4.7 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 Ø nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Packaging shall be accomplished in such a manner as will ensure that the Ø product, during shipment and storage, will be protected against damage from exposure to weather or any other normal hazard.

5.1.2 Each package shall be permanently and legibly marked with not less than Ø the following information:

DEHYDRATING AGENT
AMS 3420D
GRADE _____
SIZE OR PART NUMBER _____
LOT NUMBER _____
PURCHASE ORDER NUMBER _____
QUANTITY _____
MANUFACTURER'S IDENTIFICATION _____

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

5.1.4 For direct U.S. Military procurement, packaging shall be in accordance Ø with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1 and 5.1.3 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase order.

7. REJECTIONS: Material not conforming to this specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

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 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Grade and type of product desired
Quantity of product desired
Applicable level of packaging (See 5.1.4)

8.4 Similar Specification: MIL-D-3716 is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.

8.5 Product meeting the requirements of this specification has been classified under Federal Supply Classification (FSC) 6850.