

MIL-A-82728(OS)
17 AUGUST 1984
SUPERSEDING
WS 12795
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MILITARY SPECIFICATION

ALUMINUM POWDER, ATOMIZED (FOR USE IN EXPLOSIVES)

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers one type of atomized aluminum powder for use in explosives.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

2.1.1 Standards. Unless otherwise specified, the following standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1218	ACS Chemicals

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Ordnance Station, Standardization/Documentation Division (524), Indian Head, MD 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.2.2 Other Government documents, drawings, and publications. The following Government publication forms a part of this specification to the extent specified herein.

CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 100-177 TRANSPORTATION
49 CFR 178-199 TRANSPORTATION

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Officer, Washington, DC 20404. Orders for the above publication should cite "the latest edition and Supplements thereto".)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B214 - 76	Sieve Analysis of Granular Metal Powders
D480 - 70	Sampling and Testing Aluminum Powder and Paste
E34 - 81	Chemical Analysis of Aluminum and Aluminum-Base Alloys
E101 - 67	Spectrochemical Analysis of Aluminum and Aluminum-Base Alloys by the Point-to-Plane Spark Technique

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL MOTOR FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the American Trucking Association, Inc., Traffic Department, 1616 P Street, NW, Washington, DC 20036.)

UNIFORM FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the Uniform Classification Committee, Room 11106, 222 South Riverside Plaza, Chicago, IL 60606.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

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2.3 Order of Precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 4.4).

3.2 Material. The aluminum powder shall be microfine virgin aluminum particles manufactured by an atomizing process. The shape of the particles shall be spheroidal.

3.3 Aluminum Purity. The aluminum purity shall be a minimum of 98.5 percent.

3.4 Impurities. The impurities shall not exceed the maxima specified in Table I.

TABLE I. Impurities

<u>Impurity</u>	<u>Maximum</u>
Silicon	0.3 percent
Iron	0.5 percent
Zinc	0.05 percent
Copper	0.1 percent
Grit	0.05 percent
Oil and grease	0.2 percent
Volatile matter at 105°C	0.1 percent
Alkalinity as magnesium hydroxide	0.07 percent

3.5 Screen Analysis. The material shall conform to the following requirements for the screen analysis:

- a. A minimum of 95.0 percent shall pass through a U.S. Standard 200 sieve.
- b. A minimum of 80.0 percent shall pass through a U.S. Standard 325 sieve.

3.6 Average particle size. The average particle size of the material shall be 11 to 27 micrometers as determined by a Fisher subsieve sizer.

4. QUALITY ASSURANCE PROVISIONS

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4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.4).
- B. Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), inspection conditions shall be as specified in the applicable test method.

4.4 First article inspection. First article inspection shall be performed by the contractor, after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on material which has been produced from raw materials with equipment and procedures normally used in production. When specified in the contract (see 6.2), the contractor shall prepare a report giving the results obtained for all inspections and tests performed. Unless otherwise specified, all chemicals shall be ACS grade in accordance with MIL-STD-1218 and distilled water shall be used. Where applicable, blank determinations shall be run and corrections applied where significant. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts.

4.4.1 Sample size. Sample size shall be as specified in the contract (see 6.2).

4.4.2 Inspection routine. The sample shall be subject to the tests of 4.6 plus any additional tests specified by the procuring activity (see 6.2).

4.4.3 Failure. Failure of the sample to pass any test shall be cause for first article rejection.

4.5 Quality conformance inspection. The material shall be subjected to all the following inspections and tests for acceptance. When specified in the contract (see 6.2), the contractor shall prepare a report giving the results obtained for all inspections and tests performed and a certified statement

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that the lot meets all the requirements of this specification. Unless otherwise specified, all chemicals shall be ACS grade in accordance with MIL-STD-1218 and distilled water shall be used. Where applicable, blank determinations shall be run and corrections applied where significant.

4.5.1 Lot. A lot shall consist of material obtained from a single batch of a batch process or from a single production run of a continuous process and shall be produced using a single set of operations and operating conditions which is offered for acceptance at one time.

4.5.2 Sampling. Ten percent, but in no case more than 10 nor fewer than 3, of the containers shall be randomly selected by the inspector to be representative of the lot. If there are fewer than three containers in the lot, all the containers shall be sampled. The material in each container shall be uniformly mixed throughout and approximately 8 ounces shall be taken from each selected container. Each of these primary samples shall be placed in an airtight container and labeled so that the container from which it was taken can be identified. A composite sample of approximately 8 ounces shall be made from equal portions of the primary samples. The composite sample shall be thoroughly mixed and placed in an airtight container labeled to show the name of the material, manufacturer, plant, contract or purchase order number, and lot size. All acceptance tests shall be performed on the composite sample.

4.6 Test Methods.

4.6.1 Percent aluminum and elemental impurities. Determine percent aluminum by difference and elemental impurities (silicon, iron, zinc, and copper) by chemical analysis in accordance with ASTM E-34 or by spectrochemical analysis in accordance with ASTM E-101.

4.6.2 Grit. Weigh, to the nearest 0.01 gram (g), 5.0 to 5.1 g of specimen into a 400-milliliter (ml) beaker. Cover with approximately 10 ml of water. Cautiously and slowly, add 60 ml of concentrated hydrochloric acid. Cover with a ribbed watch glass, heat to effect solution of specimen, cool and transfer sufficient specimen solution to a tared 50-ml centrifuge tube to balance a second centrifuge tube containing approximately 45-ml of water. Centrifuge the two centrifuge tubes, in balanced position, at 600 to 700 relative centrifugal force (r_{fc}, see 6.3) for 15 minutes. Allow the centrifuge to stop without braking and decant the liquid layer from the centrifuge tube containing the specimen solution. Add the rest of the specimen solution to the centrifuge tube. Rinse the beaker with water and add the rinsing to the specimen centrifuge tube. Add a sufficient quantity of rinsing water to the specimen tube to balance it with the centrifuge tube containing water. Centrifuge, stop, and decant as above. Add sufficient water to balance the centrifuge tube, shake to mix, and centrifuge as above. Decant the liquid layer and dry the tared centrifuge tube to a constant weight in a drying oven at $105^{\circ} \pm 2^{\circ}\text{C}$. Cool in a desiccator and weigh to the nearest 0.1 milligram. Calculate percent grit as follows:

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$$\text{Percent grit} = \frac{100(A - B)}{W}$$

Where:

A = weight of centrifuge tube and dried contents in grams

B = tare weight of centrifuge tube in grams

W = weight of specimen in grams

4.6.3 Easily extracted fatty and oily matter. Determine the percent of easily extracted fatty and oily matter in accordance with the procedure for aluminum of ASTM D480.

4.6.4 Volatile Matter at 105°C. Determine the percent of volatile matter in accordance with the procedure for aluminum paste of ASTM D480, except that a 10g specimen shall be used.

$$\text{Volatile matter at 105°C(percent)} = \frac{\text{Loss Weight}}{\text{Weight of Sample}} \times 100$$

4.6.5 Alkalinity. Weigh to the nearest milligram approximately 2 g of specimen and transfer to a stoppered erlenmeyer flask. Add 200 ml of cold water. Stopper and shake the flask every 2 minutes; after 15 minutes, filter through a dry, neutral filter paper. Titrate 100 ml of filtrate with 0.05N sulfuric or hydrochloric acid using 5 drops of bromothymol blue as indicator. Run a blank determination. Calculate alkalinity as percent magnesium hydroxide as follows:

$$\text{Percent alkalinity} = \frac{5.833N(A - B)}{W}$$

Where:

A = Milliliters of acid required for specimen titer

B = Milliliters of acid required for blank titer

N = Normality of acid

W = Weight of specimen in grams

4.6.6 Particle size distribution. Determine the particle size distribution of aluminum powder in accordance with ASTM E-214 using ASTM Sieves and 50-g specimens. A weighed portion of approximately 50 g of the sample shall be placed on the top sieve of the nest of sieves assembled as follows: top to bottom: 100, 200, 230, 325, and bottom pan.

4.6.7 Average particle size. The average particle size shall be determined by a Fisher subsieve sizer according to the manufacturer's instructions.

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5. PACKAGING

5.1 Packaging. Packaging shall conform to the manufacturers best commercial practice.

5.2 Packing. Packing shall be commerical. Atomized aluminum powder, is exempted from 49 CFR 173 and shall be shipped in unlined, full, open-headed drums protected against corrosion. Containers shall contain a maximum of 700 pounds. Each drum shall be provided with a tubular rubber cover gasket, firmly cemented in place. When the jackscrew is tightened, the rim shall be tapped with a mallett to ensure complete and proper sealing of the gasket. Container and method of shipment shall comply with the Uniform Freight Classification and National Motor Freight Classification or other carrier regulations applicable to the mode of transporation.

5.3 Marking. Marking to ensure safe handling shall conform to 49 CFR 171-177, and in addition shipments shall be marked in accordance with MIL-STD-129. Unless otherwise specified, marking shall include, but not be limited to the following:

- a. Title, number, and date of this specification
- b. Manufacturer's name
- c. Lot number
- d. Quantity in container

6. NOTES

6.1 Intended use. The material is intended for use in explosives.

6.2 Ordering data. Acquisition of documents should specify the following:

6.2.1 Acquisition requirements.

- a. Title, number, and date of this specification
- b. Quantity desired
- c. Inspection conditions, if other than specified (see 4.3)
- d. First article instructions regarding arrangements for examinations, (test and approval (see 4.4))
- e. First article sample size, if required (see 4.4.1)
- f. Additional first article tests, if any (see 4.4.2)
- g. Request for tests results, certificate, if required; (see 4.4, 4.5 and 6.2.2)
- h. Lot size (see 4.5.1)

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6.2.2 Contract Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of 27.410-6 of the DoD FAR Supplement are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs:

<u>Paragraph</u>	<u>Data Requirement</u>	<u>Applicable DID</u>
4.4	Test report	DI-T-2072
4.5	Certification data/report	UDI-A-23264

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DOD 5000.19L, Vol. II. AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 Relative centrifugal force(rcf). Relative centrifugal force is defined as follows:

$$rcf = A \frac{B^2}{265}$$

Where:

A = diameter of swing in inches measured between tips of opposite tubes when in rotating position

B = speed of centrifuge in revolutions per minute

Preparing activity:
Navy - OS

(Project 6810-NB41)

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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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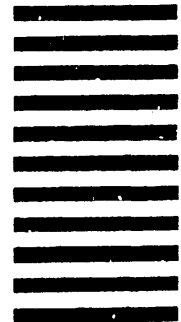
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