

MIL-G-21352(WOrd)  
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~~SECRET~~  
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## MILITARY SPECIFICATION

### GUANIDINE NITRATE

#### 1. SCOPE

1.1 Scope. This specification covers guanidine nitrate for use in military pyrotechnics.

1.2 Classification. This specification covers one grade of guanidine nitrate.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids form a part of this specification:

#### SPECIFICATIONS

##### Federal

RR-S-366

Sieves, Standard for Testing  
Purposes

#### STANDARDS

##### Military

MIL-STD-129

Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific

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procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply:

#### CODE OF FEDERAL REGULATIONS

49 CFR 71-78

Transportation, Interstate Commerce  
Commission, Explosive and Other  
Dangerous Articles

(The Interstate Commerce Commission Regulations are now a part of the Code of Federal Regulations available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Orders for the above publication should cite '49 CFR 71-78' latest edition and supplements thereto.)

### 3. REQUIREMENTS

3.1 Material. Guanidine nitrate furnished under this specification shall be a material which has been tested and has passed the tests specified in section 4.

3.2 Chemical requirements. Guanidine nitrate shall conform to the chemical requirements specified in Table I.

TABLE I

#### CHEMICAL REQUIREMENTS

PROPERTY	PERCENT MINIMUM	PERCENT MAXIMUM
Moisture	----	0.8
Guanidine Nitrate	97.0	---
Ammonium Nitrate	----	1.0
Melamine	----	1.0
Ash	----	0.5

3.3 Granulation. Guanidine nitrate shall conform to the requirements specified in Table II. All percentages shall be by weight using sieves conforming to the requirements of specification RR-S-366.

TABLE II  
GRANULATION REQUIREMENTS

U.S. STANDARD SIEVE NUMBER	AMOUNT PASSED THROUGH SIEVE
16	100 percent minimum
20	90 percent minimum
100	45 percent minimum
230	15 percent minimum

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified herein the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.2 Sampling. A representative two ounce sample shall be removed from each of five representative containers taken from the lot by the Government inspector. If there are fewer than five containers in the lot, a specimen shall be removed from each container. The specimens drawn above shall be combined into a composite sample and placed in a clean, dry container, sealed and labeled to identify the composite sample with the lot and material represented. The composite sample shall be tested as specified in 4.4, 4.5 and 4.6.

4.3 Lot. A lot shall consist of not less than 100 pounds nor more than 1,000 pounds produced by one manufacturer under essentially the same manufacturing conditions with no change in material.

#### 4.4 Chemical tests

4.4.1 Determination of moisture. Transfer to a tared glass-stoppered weighing bottle, a weighed portion of approximately 2 grams (gm) of the sample. Heat in an oven at 100° to 105° Centigrade (C) for 3 hours, cool in a dessiccator, and weigh. Calculate the loss in weight to percent moisture.

4.4.2 Determination of guanidine nitrate.

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4.4.2.1 Preparation of precipitation and washing solution. Add 7.5 gm of reagent grade picric acid, 0.075 gm of reagent grade guanidine nitrate, and 8 milliliters (ml) of concentrated ammonium hydroxide to a 1000 ml volumetric flask. Add 500 ml of distilled water to the flask and mix thoroughly. Fill the flask with distilled water to the calibration mark and allow to stand approximately 10 days before use.

4.4.2.2 Standardization. Weigh 0.2 gm of reagent grade guanidine nitrate into a 250 ml erlenmeyer flask. Add 15 ml distilled water and 5-10 drops concentrated ammonium hydroxide. Heat the flask and contents until the guanidine nitrate is dissolved. Remove the flask from the heat and allow it to cool to room temperature. Slowly add 100 ml of the precipitation solution prepared in 4.4.2.1 to the guanidine nitrate solution while continually rotating the flask. Allow the solution to stand 8-12 hours at room temperature, then filter through a Sela porcelain filtering crucible, of fine porosity, attached to a vacuum system by means of a crucible holder and filtering flask. Rinse the erlenmeyer flask with portions of the precipitating and washing solution. Wash the precipitate with these portions and evacuate the crucible to dryness. Dry the filtering crucible and contents to a constant weight in a drying oven at 105°C. Cool the filtering crucible and contents in a desiccator and weigh. Calculate the value of the guanidine nitrate to guanidine picrate factor (A) as follows:

$$A = \frac{C}{B} \times \frac{D}{100}$$

Where:

- A - guanidine nitrate to guanidine picrate factor.
- B - weight of precipitate in crucible (gm).
- C - weight of sample used (gm).
- D - purity of guanidine nitrate reagent in percent.

4.4.2.3 Guanidine nitrate determination. Repeat the procedure described in 4.4.2.2 using the guanidine nitrate sample instead of the reagent grade guanidine nitrate. Calculate the percent guanidine nitrate as follows:

$$\text{Percent guanidine nitrate} = \frac{E}{F} \times A \times 100$$

Where:

- E - weight of precipitate in crucible (gm).
- F - weight of sample used (gm).
- A - guanidine nitrate to guanidine picrate factor determined in 4.4.2.2.

## 4.4.3 Determination of ammonium nitrate.

4.4.3.1 Preparation of a standardized formaldehyde solution. To 25 ml of formaldehyde, add a few drops of phenolphthalein. Slowly titrate the solution with 0.5N sodium hydroxide to a faint pink color.

4.4.3.2 Add 10 gm of the guanidine nitrate sample to 200 ml water in a beaker. Stir the contents of the beaker over a moderate flame until all the guanidine nitrate has dissolved, add 5 ml of standardized formaldehyde solution (see 4.4.3.1) to the beaker, add a few drops of phenolphthalein and titrate with 0.5N sodium hydroxide to a faint pink color. Calculate the percent of ammonium nitrate as follows:

$$\text{Percent ammonium nitrate} = \frac{G}{1000} \times H \times J \times \frac{100}{K}$$

Where:

- G - ml of sodium hydroxide used in titration.
- H - normality (N) of sodium hydroxide.
- J - molecular weight of ammonium nitrate.
- K - weight of guanidine nitrate sample (gm).

4.4.4 Determination of melamine. Dissolve a weighed 10 gm guanidine nitrate sample in 200 ml hot distilled water. Cool and transfer quantitatively into a 250 ml volumetric flask. Fill to the mark with distilled water and agitate. Draw out 50 ml of the solution by means of pipette and run a potentiometric determination with 1N sulfuric acid. The potential shift is at pH approximately 3.5 (190-200 millivolts, calomelantimony electrode). Calculate the percentage of melamine in the solution as follows:

$$\text{Percent melamine} = \frac{L}{1000} \times M \times N \times \frac{100}{P}$$

Where:

- L - ml of sulfuric acid used in potentiometric determination.
- M - normality (N) of the sulfuric acid.
- N - molecular weight of melamine (126).
- P - weight in grams of guanidine nitrate introduced in the potentiometric determination. This value may be calculated as follows:

$$P = \frac{\left( \begin{array}{l} \text{grams guanidine} \\ \text{(nitrate dissolved)} \end{array} \right) \left( \begin{array}{l} \text{volume of solution} \\ \text{(used in analysis)} \end{array} \right)}{\left( \begin{array}{l} \text{capacity of volumetric} \\ \text{flask in ml} \end{array} \right)}$$

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P = 2.0 when sample size, flask size, and solution volume drawn with pipette are exactly as detailed in the procedure.

4.4.5 Determination of ash. Weigh 5 gm of the guanidine nitrate sample into a porcelain crucible previously heated to a constant weight. Carefully and slowly heat the crucible and contents until the sample decomposes. Continue heating the crucible and contents in an electric furnace at 900°C until a constant weight is obtained. Calculate the percentage of ash using the following formula:

$$\text{Percent ash} = \frac{R}{S} \times 100$$

Where:

R - gain in weight of the crucible (gm).

S - weight of guanidine nitrate sample (gm).

4.5 Determination of granulation. Nest the specific sieves (see Table II) complying with specification RR-S-366, on a bottom pan. Place a 100 gm. weighed sample of guanidine nitrate on the upper sieve, cover and shake for 10 minutes by hand, or for 5 minutes by means of a mechanical shaker geared to produce 300  $\pm$  15 gyrations and 150  $\pm$  10 taps of the striker per minute. Weigh the amounts retained by the sieves and calculate to percentages as required.

#### 4.6 Acceptance criteria

4.6.1 A lot shall be accepted for the chemical requirements of paragraph 3.2, provided that the composite sample meets those requirements. A lot shall be rejected if the sample fails to meet those chemical requirements.

4.6.2 Granulation requirements. A lot shall be accepted for the granulation requirements of paragraph 3.3, provided that the composite sample meets those requirements. A lot shall be rejected if the sample fails to meet those granulation requirements.

4.7 Resubmission and retest. The contractor shall have the option of having a partial or complete analysis made on a sample taken from each lot, at no expense to the Government. If the contractor elects to resubmit a rejected lot, the contractor shall remove the defective portions of the lot and present it as a resubmitted lot. On a resubmitted lot, samples shall be taken as specified in 4.2. The resubmitted lot shall be accepted provided the composite sample passes all the tests required by this

specification. If the composite sample fails to comply with the requirements of this specification, the lot shall be rejected and may not be offered for resubmission again.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Not applicable

### 5.2 Packing

5.2.1 Level A. Unless otherwise specified, guanidine nitrate shall be packed in plywood drums conforming to Code of Federal Regulations, '49 CFR 71-78' Specification 22A.

5.2.2 Level B. Not applicable

5.2.3 Level C. Packaging of guanidine nitrate shall be in accordance with the manufacturer's commercial practice when adequate to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Containers shall comply with Code of Federal Regulations '49 CFR 71-78'.

### 5.3 Marking

5.3.1 Special markings. The shipping containers shall be marked in accordance with the Code of Federal Regulations '49 CFR 71-78'.

5.3.2 Normal markings. In addition to the markings required by contract or order, unit packages, intermediate packages (when used), and shipping containers shall be marked in accordance with the requirements of MJL-STD-129.

## 6. NOTES

6.1 Intended use. The guanidine nitrate covered by this specification is intended for use in the manufacturing of pyrotechnics.

6.2 Ordering data. Procurement documents shall specify the following:

- (a) Title, symbol and date of this specification
- (b) Selection of applicable levels of preservation and packaging and packing
  - (1) Unless otherwise specified Level A preservation and packaging shall be required.



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6.2.1 Criteria for use of proper level of preservation, packaging and packing shall be as follows:

For Level A. This level shall be used for those items which are to be shipped to indeterminate destinations or stored under indeterminate conditions for redistribution anywhere.

For Level C. This level shall be used only when it is definitely known that the packaged item is to be shipped to domestic installations for immediate use at the first receiving activity.

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 U. S. 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 invention that may in any way be related thereto.





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