

METRIC

MIL-PRF-7254G  
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SUPERSEDING  
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PERFORMANCE SPECIFICATION  
PROPELLANT, NITRIC ACID

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

1. SCOPE

1.1 Scope. This specification covers the requirements for four types of nitric acid propellant.

1.2 Classification. The nitric acid will be of the following types as specified (6.2):

1.2.1 Types. The types of nitric acid are as follows:

- Type IIIA - Nominal 14 percent NO<sub>2</sub> content plus corrosion inhibitor
- Type IIIB - Nominal 14 percent NO<sub>2</sub> content, lower solids content, plus corrosion inhibitor
- Type IIILS - Limited storage propellant with nominal 14 percent NO<sub>2</sub> content, lower solids content, plus corrosion inhibitor, and limited iron content
- Type IV - High density propellant with nominal 44 percent NO<sub>2</sub> content, lower solids content, plus corrosion inhibitor, and limited iron content

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 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

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must meet all specified requirements 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 form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

### SPECIFICATIONS

#### DEPARTMENT OF DEFENSE

MIL-PRF-27401 - Propellant, Pressurizing Agent,  
Nitrogen

(Unless otherwise indicated, copies of the above specifications are available 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 document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

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

ASTM D 1068 - Test Methods for Iron in Water (DoD adopted)  
ASTM E 29 - Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959.)

2.4 Order of precedence. 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 Chemical composition and physical properties. The chemical composition and physical properties of the propellants shall conform to Table I.

3.2 Limiting values. The following applies to all specified limits in this specification: For purposes of determining conformance with these requirements, an observed value or a calculated value shall be rounded off "to the nearest unit" in the last right-hand digit used in expressing the specification limit according to the rounding-off method of ASTM Practice E 29

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for Using Significant Digits in Test Data to Determine Conformance with Specifications.

3.3 Qualitative. The propellant shall be a single phase liquid (6.4) when examined visually by transmitted light, and the IRFNA spectrum resulting from the water analysis (4.4.8 and Figure 2) shall contain the 1440 nm peak which identifies the presence of nitric acid.

TABLE I. Chemical composition and physical properties.

Composition	Type IIIA	Type IIIB	Type IIIS	Type IV	Test Para
HNO <sub>3</sub> , percent by weight	81.6 - 84.9	81.7 - 84.9	83.7 - 86.4	52.7 - 57.4	4.4.9
NO <sub>2</sub> , percent by weight	14 ± 1	14 ± 1	14 ± 1	44 ± 2	4.4.3
HF, percent by weight	0.7 ± 0.1	0.7 ± 0.1	0.7 ± 0.1	0.7 ± 0.1	4.4.4
H <sub>2</sub> O, percent by weight	1.5 - 2.5	1.5 - 2.5	0.5 max	0.5 max	4.4.8
Fe <sub>2</sub> O <sub>3</sub> , percent by weight	not specified	not specified	0.0015 max	0.002 max	4.4.7
Solids, percent by weight, as nitrates	0.10 max	0.04 max	0.04 max	0.04 max	4.4.6
Specific Gravity, 15.6°C/15.6°C	1.564 min 1.575 max	1.564 min 1.575 max	1.572 min 1.582 max	1.642 min 1.652 max	4.4.5

#### 4. VERIFICATION

4.1 Classification of inspections. The inspections shall be classified as quality conformance inspections.

4.2 Quality conformance inspection. The quality conformance inspection shall consist of the following:

- a. Individual tests . . . . . 4.2.1
- b. Sampling tests . . . . . 4.2.2

4.2.1 Individual tests. The propellant shall be subjected to the following test as described under 4.4:

Examination of product . . . . . 4.4.1

4.2.2 Sampling tests. The propellant shall be selected according to 4.2.2.1 and subjected to the following tests as described under 4.3:

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- a. Nitrogen dioxide . . . . . 4.4.3
- b. Hydrogen fluoride. . . . . 4.4.4
- c. Specific gravity . . . . . 4.4.5
- d. Total solids . . . . . 4.4.6
- e. Iron content . . . . . 4.4.7
- f. Water. . . . . 4.4.8

4.2.2.1 Sampling plan.4.2.2.1.1 Lot. A lot shall consist of one of the following:

a. The propellant produced in not more than 24 consecutive hours from a continuous process which is used to fill shipping containers directly from the process output. A continuous process shall be the production of product by continuous input of raw materials and output of finished product by one manufacturer in one plant with no change in manufacturing conditions or materials.

b. The propellant from individual runs of a batch process which is used to fill shipping containers directly from the process output. A batch process shall be the production of product by runs from single additions of raw materials which are reacted and purified forming the product.

c. The propellant from either or both the continuous and batch processes which is held in a single storage tank and subsequently withdrawn to fill shipping containers. The product shall be homogeneous at the time of withdrawal and shall not be added to while being withdrawn. After each addition to the storage tank, the contents shall constitute a separate lot.

4.2.2.1.2 Sample. A sample consists of not less than 150 milliliters (mL) of propellant. Unless otherwise specified, quality conformance tests shall be made on the sample of propellant taken directly from the shipping containers. When required, the sample shall be forwarded to a laboratory designated by the procuring activity for subjection to the quality conformance specified herein.

TABLE II. Sampling for test

Number of containers in lot	Number of containers to be sampled
2 - 25	2
26 - 150	3
151 - 1200	5

4.2.2.1.3 Containers of 400 liters or less water capacity. The number of containers selected for sampling from each lot shall be in accordance with Table II. The first and last containers to be filled within a given lot shall be sampled. Other containers may be selected at random. If more than one lot is represented in the shipment, then each lot represented shall be treated as a separate shipment for sampling purposes. The contents of each selected container shall be thoroughly mixed by rolling and inverting immediately prior

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to sampling. The samples may be obtained in any convenient manner. Each sample shall be subjected to all the tests of this specification.

4.2.2.1.4 Containers greater than 400 liters water capacity. Each container shall constitute a lot. Unless otherwise specified, the sample shall be from a point 6 to 12 inches from the bottom of the shipping container and shall be tested to determine compliance with this specification.

4.3 Rejection. When any sample tested in accordance with 4.4 fails to conform to the requirements specified herein, the entire lot represented by the sample shall be rejected. Unless otherwise specified, disposition of rejected product shall be specified by the procuring activity (6.2).

4.4 Test methods.

4.4.1 Examination of product. The propellant shall be visually examined to determine compliance with the requirement specified herein. Examination to ensure that the propellant conforms to paragraph 3.3 shall be conducted after 25 mL of sample has been transferred to a 100-mL polychlorotrifluoroethylene vessel or equal.

4.4.2 Neutralization. The acid sample shall be neutralized by the following procedure.

4.4.2.1 Sample preparations. Transfer 1 mL of acid into a tared 2-mL polyethylene or polypropylene weighing vial and close the top. Weigh the vial with the sample and determine the sample weight. Sample sizes should average about 1.3 g when using 0.5N alkali.

4.4.2.2 Procedure. The weighed ampoule shall be placed into a heavy-walled, glass stoppered 500-mL iodine flask, containing a measured amount of 0.5N sodium hydroxide which is in excess of that required for neutralization. The amount of alkali needed shall be calculated after the sample weight is known. Cool the contents of the iodine flask in a salt-water-ice bath for five minutes. Displace the air in the flask with gaseous nitrogen conforming to MIL-PRF-27401. Immerse the plastic vial in a bath of powdered carbon dioxide or liquid nitrogen and freeze the liquid sample. Open the top of the vial, drop it into the flask after the air above the solution has been displaced, and quickly insert the glass stopper. The stopper shall be held in place with the thumb, and the flask shaken vigorously. The flask shall be allowed to stand for 15 minutes at room temperature with occasional shaking during this time. A small quantity of distilled water shall be poured into the lip of the flask, the stopper loosened to allow the water to run into the flask and the stopper shall be rinsed with a stream of distilled water, also into the flask. Add 3 to 5 drops of phenolphthalein indicator to ensure that the contents of the flask are slightly alkaline with respect to phenolphthalein.

4.4.2.3 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.2.

4.4.2.3.1 Reagents.

a. Sodium hydroxide solution, 0.5N: Dissolve 20 g of ACS reagent grade, low carbonate, NaOH in distilled water in a 1000-mL volumetric flask. Allow to cool and dilute to the mark with distilled water. Store in polyethylene and ensure the exclusion of atmospheric carbon dioxide.

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- b. Distilled water.
- c. Phenolphthalein indicator.
- d. Gaseous nitrogen conforming to MIL-PRF-27401.

4.4.2.3.2 Equipment.

- a. Flask, iodine, heavy walled glass stoppered, 500 mL capacity.
- b. Ampoules, polyethylene or polypropylene, as required.
- c. Flasks, volumetric, 1000 mL capacity.
- d. Ice bath, salt-water.
- e. Bath of powdered carbon dioxide or liquid nitrogen.

4.4.3 Nitrogen dioxide. The nitrogen dioxide content of all types of propellant shall be determined by the following procedure:

4.4.3.1 Procedure. The slightly alkaline sample of 4.4.2 shall be transferred quantitatively to a 250-mL volumetric flask and diluted to volume with distilled water. A 50-mL aliquot of this solution shall be withdrawn and transferred to a 250-mL flask and placed in the salt-water ice bath. The remaining solution shall be transferred to a plastic screw-cap container and reserved for tests in 4.4.4. One mL of 1N H<sub>2</sub>SO<sub>4</sub> shall be added with stirring. Add without stirring an exact volume of 0.1N ceric solution sufficient to react the nitrite ion, amount can be calculated from the aliquot weight of the sample, plus 5 mL in excess. The beaker shall be placed on the stirring platform and the electrode assembly immersed, and a blanket of gaseous nitrogen conforming to MIL-PRF-27401, Type I, shall cover the contents. Start the stirring motor and titrate the excess ceric solution with standardized 0.05N ferrous ammonium sulfate potentiometrically using the millivolt scale of a pH meter or a recorder. A plot of volume (mL) versus millivolts (mv) shall be drawn from which the end point can be determined.

4.4.3.2 Calculation. The NO<sub>2</sub> content shall be calculated by the following formula:

$$NO_2, \text{ percent by weight} = \frac{[(mL Ce^{4+} \times N) - (mL Fe^{2+} \times N_1)] \times 4.601}{0.2W}$$

where:

N = normality of the ceric solution

N<sub>1</sub> = normality of the ferrous ammonium sulfate

W = original weight in grams (4.4.2.1)

4.4.3.3 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.3.

4.4.3.3.1 Reagents.

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a. Standard ceric solution 0.1N: Dissolve exactly 54.878 g of dry primary standard grade ceric ammonium hexanitrate  $[(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6]$  in 2N  $\text{H}_2\text{SO}_4$  and make up to the mark in a 1000-mL volumetric flask with 2N  $\text{H}_2\text{SO}_4$ . The ceric nitrate is dried for two hours at 60°C (140°F) in a vacuum oven. Store the solution in a polyethylene bottle with a gaseous nitrogen atmosphere. Solution which has been prepared in excess of seven days shall be standardized weekly before use with NIST primary standard grade arsenic trioxide using ferroin as the indicator.

b. Standard ferrous solution, 0.05N: Dissolve 19.608 g of ferrous ammonium sulfate hexahydrate,  $[\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}]$ , with 0.5N sulfuric acid in a 1000-mL volumetric flask, and dilute to the mark with the same sulfuric acid solution. Standardize the ferrous sulfate reagent against 25 mL of the 0.1N ceric solution in triplicate, using the potentiometric procedure of 4.4.3.1.

c. Sulfuric acid solution, 0.5N, 1N, and 2N: Dilute 14 mL, 28 mL, and 56 mL respectively of concentrated ACS reagent-grade  $\text{H}_2\text{SO}_4$  to 1000 mL with distilled water.

d. Nitrogen, gaseous, conforming to MIL-PRF-27401, Type I.

#### 4.4.3.3.2 Equipment.

- a. Volumetric flasks, 250-, 1000-, and 2000-mL.
- b. Volumetric pipets, 50- and 25-mL.
- c. Buret, 50-mL, 0.1-mL graduations, 2 each.
- d. Ice bath, salt water.
- e. Flasks, 250- to 400-mL.
- f. Stirring motor and magnetic polytetrafluoroethylene covered stirring bar.
- g. Plastic bottle, 1 pt, polyethylene, or equivalent.
- h. Electrode assembly, platinum and saturated calomel.
- i. pH meter, equipped with a millivolt scale.
- j. Recorder, optional, Varian G-11, or equivalent.

4.4.4 Hydrogen fluoride. The hydrogen fluoride content of all types of propellant shall be determined by the following procedure.

4.4.4.1 Procedure. A 100-mL aliquot of the slightly alkaline solution of 4.4.3.1 shall be transferred to a 500-mL volumetric flask, diluted to the mark with distilled water, and mixed. A specific selected volume from 25 mL to 50 mL is transferred immediately to a plastic 100- to 200-mL beaker. The pH is adjusted to 5.5 by addition of an equal volume of citrate buffer. Check the calibration curve of the specific ion meter using the 2 ppm and 4 ppm fluoride standard solution. As soon as stable and repetitive readings are obtained, the meter system is ready for measuring the sample. Immerse the fluoride specific ion and the silver/silver chloride reference electrodes in

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the sample solution. Turn on the stirring motor and allow at least 15 seconds before taking a reading. Repeat the calibration check procedure using the 2 ppm and 4 ppm fluoride standard solutions. Obtain the ppm F<sup>-</sup> (µg F<sup>-</sup>/mL) from the calibration curve.

4.4.4.2 Calculation. The hydrogen fluoride content shall be calculated by the following formula:

$$HF, \text{ percent by weight} = \frac{0.264a}{W}$$

where:

a = µg F<sup>-</sup>/mL from calibration curve

W = original weight in grams (4.4.2.1)

4.4.4.3 Calibration curve. A calibration curve shall be prepared as follows. Place a 100-mL calibration line on four clean 4 oz plastic screw-cap bottles, using 100 mL of distilled water. Discard over half of the water and pipet or measure from a microburet 1.0, 2.0, 4.0, and 8.0 mL of the working NaF standard, (100 µg F<sup>-</sup>/mL), into the four marked bottles. Dilute to the mark with citrate buffer and mix. Using the same electrode and meter specified in 4.4.4.1, obtain a stable reading from each bottle and plot meter reading versus micrograms of fluoride per milliliter (µg F<sup>-</sup>/mL) using distilled water as zero concentration.

4.4.4.4 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.4.

4.4.4.4.1 Reagents.

a. Citrate buffer: Combine in a beaker 57 mL glacial acetic acid, 58 g NaCl, and 0.3 g sodium citrate with 500 mL of distilled water. Adjust the pH to between 5.0 and 5.5 with NaOH (pellets). Transfer the mixture to a 1000-mL volumetric flask and dilute to the mark with distilled water.

b. Stock standard F<sup>-</sup> solution: Dry several grams of ACS reagent grade sodium fluoride overnight in a vacuum oven at 100°C (212°F). Weigh out exactly 2.2105 g of dried NaF and dissolve it in distilled water contained in a 1000-mL volumetric flask and dilute to the mark. Transfer the solution to a plastic screw-cap bottle. This solution contains 1000 ppm F<sup>-</sup> (1.0 mg F<sup>-</sup>/mL).

c. Working standard F<sup>-</sup> solution: Pipet 10.0 mL of solution b into a 100-mL volumetric flask and dilute to the mark with distilled water. Transfer to a plastic screw-cap bottle for storage. This solution contains 100 ppm F<sup>-</sup> (100 µg F<sup>-</sup>/mL).

4.4.4.4.2 Equipment.

a. Pipets, 1-, 2-, 4-, 8-, 10-, 25-, 50-, and 100-mL.

b. Microburet, 10-mL, 0.01-mL graduations.

c. Plastic bottles, 4 oz and 1 qt.

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- d. Plastic beakers, 100- and 200-mL.
- e. Electrodes, silver/silver chloride and F<sup>-</sup> specific ion.
- f. pH meter with glass and SCE electrodes.
- g. Specific ion meter, Orion Model 401 or 404, or equivalent.
- h. Volumetric flasks, 100-, 500-, and 1000-mL.

4.4.5 Specific gravity. The specific gravity shall be determined at 15.6°C/15.6°C (60°F/60°F) by any convenient standard method, such as a hydrometer and the specific gravity shall conform to the limits in Table I. Because of HF attack, periodic calibration will be required.

4.4.5.1 Equipment. The following equipment shall apply as a test condition of 4.4.5.

- a. Cylinder, graduated, 100-mL.
- b. Hydrometer, NIST calibrated to include the specific gravity for the applicable grade.
- c. Thermometer, °F or °C, 0.2°F or 0.1°C increments, NIST calibrated.

4.4.6 Total solids. The total solids of all types of propellant shall be determined by the following procedure.

4.4.6.1 Procedure. The sample shall be thoroughly shaken. Transfer exactly 60.0 mL or two 30.0 mL portions of propellant to a clean platinum crucible accurately tared to the nearest 0.1 mg. Add 1 mL of concentrated sulfuric acid and slowly evaporate the acid on a hot plate in a fume hood until dense fumes of sulfur trioxide evolve. Transfer the crucible from the hot plate to a triangle over a Meeker burner to continue the decomposition of the sulfates. Ignition may be carried out at 900°C (1652°F) for 30 minutes to constant weight in a muffle furnace or over a Meeker burner.

4.4.6.2 Calculation. The residue shall be calculated by the following formula:

$$\text{Solids, percent by weight} = \frac{g \times 100 \times a}{60 \times SpG}$$

where:

- a = 4.18 for aluminum containers or
- = 3.03 for steel containers

4.4.6.3 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.6.

4.4.6.3.1 Reagents.

- a. Sulfuric acid: ACS reagent grade, 98% H<sub>2</sub>SO<sub>4</sub>.

4.4.6.3.2 Equipment.

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- a. Platinum crucible, 50- to 100-mL.
- b. Hot plate, electrical
- c. Triangle, silica.
- d. Tripod.
- e. Meeker burner, or equivalent.
- f. Analytical balance, 0.1 mg sensitivity, 200 g capacity

4.4.7 Iron content. The iron content of the propellant shall be determined by the following method or ASTM D-1068, Method A, paragraph 12. In case of dispute the following method shall be used.

4.4.7.1 Procedure. Add 5.0 mL of the propellant to a 25 mL volumetric flask containing approximately 15 mL of distilled water. Mix the contents and dilute to the mark with distilled water and mix again. Determine the percent absorption of the sample using a suitable atomic absorption spectrophotometer which has been set at an Fe wavelength near 2480Å. The spectrophotometer shall be set at 0 percent absorption using 5N HNO<sub>3</sub>.

4.4.7.2 Calculation. The iron oxide (Fe<sub>2</sub>O<sub>3</sub>) content of the sample shall be calculated as follows:

$$Fe_2O_3, \text{ percent by weight} = \frac{\text{ppm Fe (from calibration curve)} \times 1.43 \times 25}{SpG \times 10^4 \times 5}$$

4.4.7.3 Calibration. A calibration curve shall be constructed by the following procedure. Prepare 5 ppm Fe, 10 ppm Fe, and 20 ppm Fe standards by taking 0.5 mL, 1.0 mL, and 2.0 mL of the 1000 ppm Fe stock standard solution, respectively, placing the aliquots into each of three 100-mL volumetric flasks and diluting to the mark with the 5N HNO<sub>3</sub> solution. Transfer the dilute standards to plastic screw-cap bottles. Determine the percent absorption of the three Fe standards at 2480Å, which is the same Fe line as for the sample, using the 5N HNO<sub>3</sub> solution to set the instrument at 0 percent absorption. Convert the percent absorption to absorbance (A) and plot A versus ppm Fe on linear graph paper. Draw a smooth curve through the origin. Replace the dilute standards whenever they deviate from the points on the freshly prepared calibration curve.

4.4.7.4 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.7.

4.4.7.4.1 Reagents.

a. Hydrochloric acid, 6N: Add 50 mL ACS reagent grade 37% (average) concentrated HCl to 50 mL distilled/deionized water. Store in a plastic bottle.

b. Nitric acid, 5N: Dilute 320 mL of concentrated (70%) ACS reagent grade nitric acid to 1000 mL by adding acid to 500 mL of distilled water contained in a 1000 mL volumetric flask. Mix the contents of the flask, dilute to the mark with distilled water, and mix again. Store in a plastic bottle.

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c. Iron standard solution, 1000 ppm: Weigh 1.000 g Fe wire or shot accurately. Transfer to a 1000-mL volumetric flask and add 17 mL 6N HCl solution. Heat on a hot plate until the Fe is dissolved. Dilute to the mark with 5N HNO<sub>3</sub>.

d. Distilled/deionized water.

#### 4.4.7.4.2 Equipment.

a. Volumetric flasks, 25-, 100-, and 1000-mL, as required.

b. Hot plate, controllable heat settings.

c. Atomic absorption spectrophotometer, Perkin Elmer Model 290 or 303, or equivalent, with an Fe hollow cathode lamp.

d. Plastic bottles, screw-cap, 4 oz, as required.

4.4.8 Water. The water content shall be determined by the following procedure.

4.4.8.1 Procedure. Obtain the absorption spectrum of the sample between 1500 and 1350 nm versus CH<sub>2</sub>Cl<sub>2</sub>, both contained in 5-mm cells constructed in accordance with Figure 1. Determine the absorbance ( $\Delta A$ ) of the water peak in accordance with the technique illustrated by Figure 2. The water content is determined from the calibration curve prepared in accordance with 4.4.8.3 and the following calculation.

4.4.8.2 Calculation. Calculate the weight percent water in the sample as follows:

$$H_2O, \text{ percent by weight} = \frac{D}{d} \times 100$$

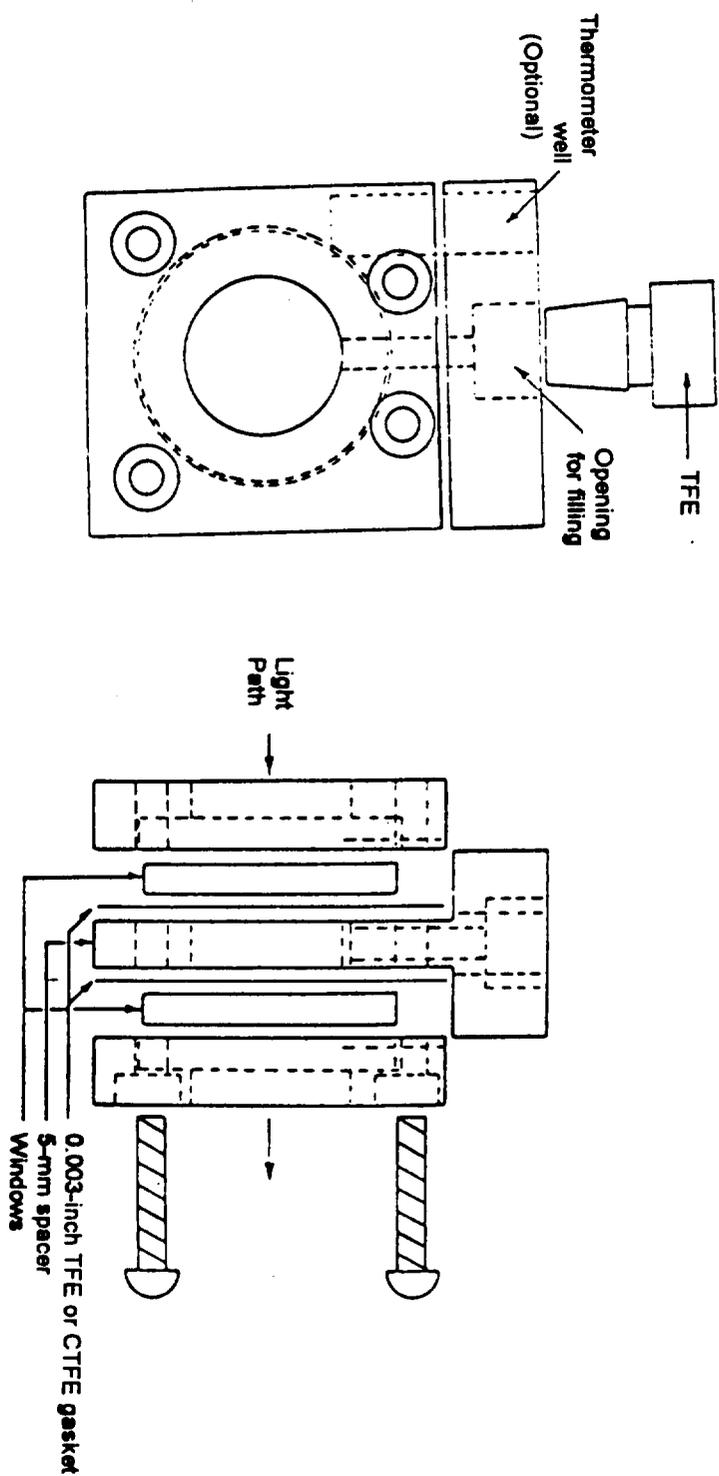
where:

D = g H<sub>2</sub>O/mL CH<sub>3</sub>CN from calibration curve

d = specific gravity of sample (4.4.5)

4.4.8.3 Calibration. Calibrate the spectrophotometer using the same cells used for the sample analysis. Prepare a series of water standards containing 0.00, 0.01, 0.02, 0.03, 0.04, 0.06 g H<sub>2</sub>O/mL of acetonitrile (CH<sub>3</sub>CN) solution and a series of reference beam compensating solutions substituting dichloromethane (CH<sub>2</sub>Cl<sub>2</sub>) for the water. Prepare the standards in accordance with Table III. Determine the absorbance of each H<sub>2</sub>O/CH<sub>3</sub>CN solution versus the matching CH<sub>2</sub>Cl<sub>2</sub>/CH<sub>3</sub>CN solution between 1500 nm and 1350 nm in the 5-mm cells. Plot a curve through the points showing the absorbance ( $\Delta A$ ) versus g H<sub>2</sub>O/mL CH<sub>3</sub>CN.

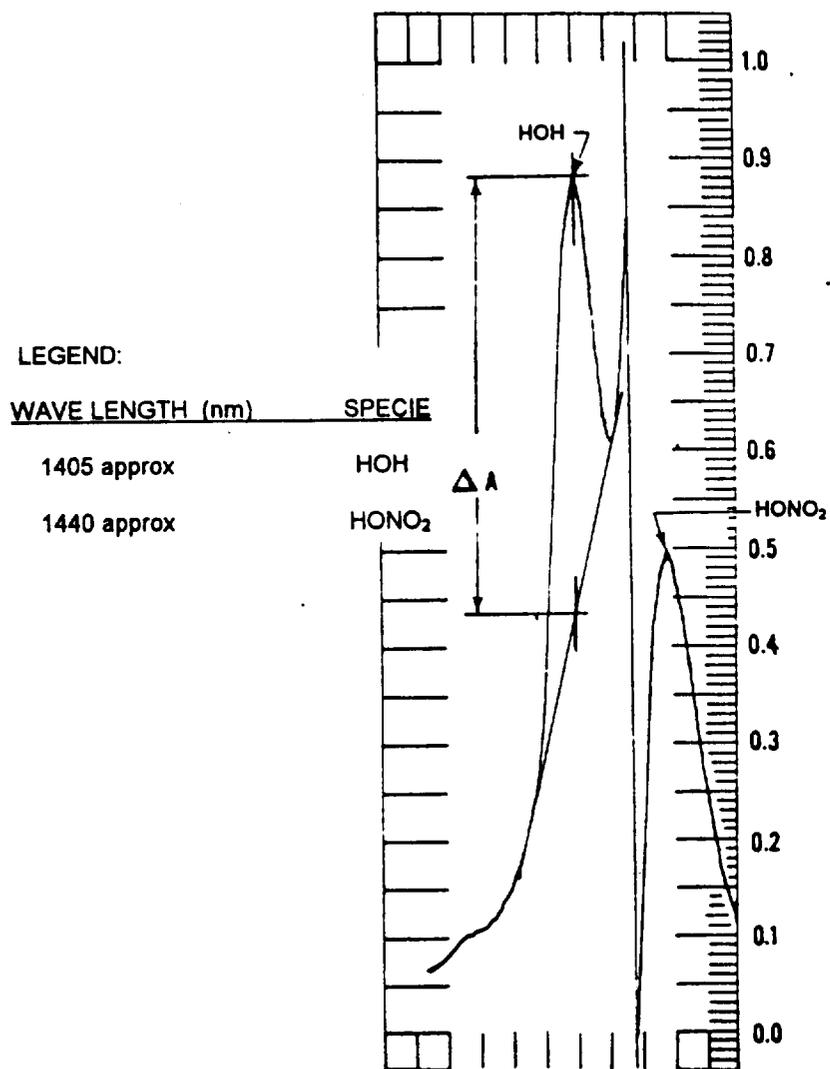
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SCALE = APPROX 1.5x

FIGURE 1. Stainless Steel Absorption Cell with Sapphire Windows

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FIGURE 2. A Typical IRFNA Spectrum versus CH<sub>2</sub>Cl<sub>2</sub>

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TABLE III. Standards

g H <sub>2</sub> O/mL CH <sub>3</sub> CN solution	g H <sub>2</sub> O or mL CH <sub>2</sub> Cl <sub>2</sub>	mL CH <sub>3</sub> CN solution
0.00	0.00	50.0
0.01	0.50	49.5
0.02	1.00	49.0
0.03	1.50	48.5
0.04	2.00	48.0
0.06	3.00	47.0

4.4.8.4 Reagents and equipment. The following reagents and equipment shall apply as test conditions of 4.4.8.

4.4.8.4.1 Reagents.

- a. Water, distilled.
- b. Acetonitrile, ACS reagent grade.
- c. Dichloromethane, ACS reagent grade.

4.4.8.4.2 Equipment.

- a. Spectrophotometer, double beam, recording, range from 2500 nm to 350 nm or better.
- b. Cell, absorption, 2 each (Figure 1).
- c. Syringe, polytetrafluoroethylene, 2.5 mL.
- d. Flask, 50 mL, volumetric.
- e. Balance, 500 g capacity, 0.01 g sensitivity.

4.4.9 Final calculations. The final calculations shall be performed by the following procedure.

4.4.9.1 Procedure.

$$\text{HNO}_3, \text{ percent by weight} = 100 - (\%HF + \%residue + \%NO_2 + \%H_2O)$$

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department'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.

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## 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 propellants covered by this specification are intended for use as oxidizers in rocket engines. Type IIIIS is intended for special purposes and will not be used for applications where storage life is a criterion because of its tendency to change composition.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Type required (1.2).
- c. Issue of DoDISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (2.2).
- d. Method of shipment, type and capacity of containers.
- e. When other limits or tests are required (3.1).
- f. When disposition of rejected product is to be made by other than the procuring activity (4.3).
- g. When other analytical procedures are to be used (4.4).

6.3 Part or identifying number (PIN). The PINs to be used for nitric acid acquired to this specification are created as follows:

M	7254	- X	Example of PIN: M7254-3B
			Type (see 1.2.1). Use 3B for Type IIIB; 4 for Type IV.
			Specification number.
			Prefix for military specification.

6.4 Definitions.

- a. IRFNA. Inhibited, red-fuming nitric acid.
- b. Single phase liquid. A single phase liquid is devoid of any visible foreign liquid but may contain solid material as permitted within this specification.

6.5 Subject term (key word listing).

Hydrofluoric acid  
IRFNA  
Missile propellant  
Nitric acid  
Nitrogen dioxide

MIL-PRF-7254G

Oxidizer  
Rocket engines

6.6 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.

Custodians  
Army - MI  
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Civil Agency Interest  
NASA

(Project 9135-0148)

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

### INSTRUCTIONS

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<b>I RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-PRF-7254G	2. DOCUMENT DATE (YYMMDD) 97/12/15
3. DOCUMENT TITLE Propellant, Nitric Acid		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)</i>		
5. REASON FOR RECOMMENDATION		
<b>6. SUBMITTER</b>		
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c. ADDRESS <i>(include Zip Code)</i>	d. TELEPHONE <i>(Include Area Code)</i>	e. DATE SUBMITTED <i>(YYMMDD)</i>
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