

6 October 1981

## MILITARY SPECIFICATION

## DIOCTYL ADIPATE

This specification is approved for use by the Naval Air 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 establishes the requirements for one type of dioctyl adipate.

## 2. APPLICABLE DOCUMENTS.

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

## STANDARDS

## MILITARY

MIL-STD-129

Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring 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 Air Engineering Center, Engineering Specification and Standards Department (ESSD), Code 93, Lakehurst, NJ 08733, 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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## 3. REQUIREMENTS.

3.1 Product characteristics. The dioctyl adipate covered by this specification shall be a clear liquid.

3.2 Chemical and physical properties. Chemical and physical properties of the dioctyl adipate shall conform to Table I.

3.3 Stability. When stored in the temperature range of 5 to 32 degrees Celsius ( $^{\circ}\text{C}$ ), the dioctyl adipate shall meet the requirements of this specification for 18 months from time of receipt. The shelf life may be extended for 12-month intervals after reacceptance testing for conformance to the moisture requirements of Table I.

3.4 Toxic products and safety. Safety regulations and guidelines applicable to the use of dioctyl adipate should be complied with to preclude personal injury and damage to equipment and facilities.

3.5 Workmanship. Workmanship shall be such that the dioctyl adipate is uniform, of consistent high quality and free from visible contamination.

TABLE I. Chemical and physical properties.

| Property   | Min   | Max   |
|--|-------|-------|
| Moisture, percent                                | ---   | 0.10  |
| Acidity, percent as acetic acid                  | ---   | 0.01  |
| Assay, percent                                   | 99.0  | ---   |
| Specific gravity, 25 $^{\circ}$ /25 $^{\circ}$ C | 0.921 | 0.927 |

## 4. QUALITY ASSURANCE PROVISIONS.

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2.1), the contractor shall be responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the contractor may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling. The lot shall be sampled in accordance with Table II.

TABLE II. Sampling plan.

| Number of containers in lot | Number of containers sampled (primary sample) | Number of composite samples |
|-----------------------------|---|-----------------------------|
| 100 or more                 | 10% (nearest whole number)                    | 5                           |
| 51 - 99                     | 10  | 4                           |
| 11 - 50                     | 10  | 3                           |
| 1 - 10                      | ALL   | 2                           |

4.2.1 Primary samples. Physical properties tests shall be run on each primary sample (see Table II). The material container may be sampled by use of a clean glass tube, rod, or pipet. If the container is small enough to be handled safely, the sample may be obtained by pouring. The smallest sample size possible that is consistent with test requirements shall be taken. The minimum sample size shall be two ounces. Glass containers shall be used for all liquid samples. Each sample shall be labeled with date, lot number, and manufacturer's container identification number. Failure of any primary sample to pass all of the physical-properties tests herein shall result in rejection of the lot represented.

4.2.2 Composite samples. Chemical properties tests shall be run on each composite sample. Divide the primary samples equally into the number of composites shown in Table II. Blend each composite thoroughly by manipulation of the container. Label each composite with Roman numerals, also include date, lot numbers, and manufacturer's container identification numbers. The remainder of the primary samples shall be retained pending acceptance or rejection of the lot. Failure of any composite sample to pass all of the chemical-properties tests herein shall result in rejection of the lot represented.

4.3 Quality conformance inspections and tests. Quality conformance inspections and tests shall consist of the following:

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- a. Tests of Table I properties (see 4.4).
- b. Inspection of filled containers (see 4.5.1).
- c. Visual inspection (see 4.5.2).

4.4 Test methods. Tests shall be performed using apparatus, reagents, and procedures specified herein. The use of alternate apparatus, reagents, or procedures shall require prior written approval of the procuring activity.

4.4.1 Moisture.

4.4.1.1 Apparatus. Beckman "Aquameter", Model KF-4, or equal.

4.4.1.2 Reagents.

- a. Pyridine-methanol solution, 3:1 by volume.
- b. Karl Fisher (KF) reagent, stabilized, water equivalent of 2.0 to 3.0 milligrams/milliliter (mg/ml).

4.4.1.3 Determination of moisture. Neutralize the water in a 100 ml portion of the pyridine-methanol solution. To the reaction vessel add approximately 20.0 to 25.0 grams (gm) of sample weighed by difference to the nearest 0.01 gm and stir. Titrate automatically with KF reagent to the 30 second end point.

Calculation:

$$\text{Percent moisture} = \frac{VE}{10W}$$

Where: V = volume of KF reagent, ml

E = water equivalent of KF reagent, mg/ml

W = weight of sample, g

Report the moisture to the nearest 0.001 percent

4.4.2 Acidity.4.4.2.1 Apparatus.

- a. Magnetic stirrer with Teflon-coated stirring bars.
- b. Micro buret, 10-ml.

#### 4.4.2.2 Reagents.

- a. Benzene-methanol solution, 3:1 by volume
- b. Standard sodium methylate solution, 0.1 Normal (N).
- c. Phenolphthalein solution, 1 percent phenolphthalein in ethanol.

4.4.2.3 Determination. Weigh approximately 100 gm of sample to the nearest 0.01 gm into a 400-ml beaker. After placing a magnetic stirring bar into the beaker and adding 100 ml of the benzene-methanol solution, stir the mixture on the magnetic stirrer until the sample dissolves. Add 4 drops of phenolphthalein indicator solution and titrate with the standard sodium methylate solution to a faint pink color.

Calculation:

$$\text{Percent acidity as acetic acid} = \frac{V \times N \times 6.005}{W}$$

Where: V = volume of standard sodium methylate, ml

N = normality of standard sodium methylate

W = weight of sample, g

Report the acidity to the nearest 0.001 percent.

NOTE: The normality must be corrected for any change between the temperature at standardization and the temperature at which the sample was titrated. Changes less than 1°C are insignificant.

#### 4.4.3 Assay.

4.4.3.1 Apparatus. Reflux condenser.

#### 4.4.3.2 Reagents.

- a. Alcoholic potassium hydroxide solution, 0.5 N.
- b. Standard hydrochloric acid solution, 0.5 N.
- c. Phenolphthalein solution, 1 percent phenolphthalein in ethanol.
- d. Isopropanol-water solution, 63 percent isopropanol.

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4.4.3.3 Determination. Weigh approximately 1.5 gm of sample to the nearest 0.0001 gm into a 250-ml Erlenmeyer flask. Pipet 25 ml of alcoholic potassium hydroxide solution and 50 ml of isopropanol-water solution into the sample flask. Prepare a blank. Reflux on a hot plate for 0.5 hour. After cooling, wash the condenser with distilled water, add phenolphthalein indicator solution and titrate with standard 0.5 N hydrochloric acid solution until one drop causes disappearance of the pink color.

Calculation:

$$\text{Percent dioctyl adipate} = \frac{(B - V) \times N \times 18.528}{W}$$

Where: B = volume of standard HCl solution required to titrate blank, ml

V = volume of standard HCl solution required to titrate sample, ml

N = normality of standard HCl solution

W = weight of sample, gm

Report the assay to the nearest 0.01 percent.

#### 4.4.4 Specific gravity.

4.4.4.1 Apparatus. Westphal balance equipped with a plummet with a sealed-in thermometer, or equal.

4.4.4.2 Determination of specific gravity. Suspend the plummet from the arm of the balance and zero the balance in air. Completely immerse the plummet and adjust the temperature of the sample in the measuring cylinder to 23°C. Stir the sample and record the balance reading when the plummet thermometer reaches 25°C. Repeat the procedure using distilled water and determine at 25°C.

Calculation:

$$\text{Specific gravity, } = \frac{\text{Balance reading obtained with sample}}{\text{Balance reading obtained with water}} \quad 25^{\circ}/25^{\circ}\text{C}$$

Report the specific gravity to the nearest 0.001 unit.

#### 4.5 Examinations.

4.5.1 Inspection of filled containers. All filled containers shall be inspected prior to shipment or use for accuracy or markings and for defects in containers and closures. All defective containers and closures shall be repaired or replaced, and contents therein shall be reinspected prior to shipment or use.

4.5.2 Visual inspection. All samples shall be visually inspected to determine conformance to the requirements of 3.5.

4.6 Records. Certification and test data shall be prepared as required by the procuring activity (see 6.2.2).

## 5. PACKAGING.

5.1 Packaging and packing. Unless otherwise specified in the contract or purchase order (see 6.2.1), packaging and packing of the dioctyl adipate shall be in accordance with commercial practice to insure carrier acceptance and shall be of such construction and materials that the contents will be adequately protected against loss or contamination.

5.2 Container marking. Unless otherwise specified in the contract or purchase order (see 6.2.1), each shipping container shall be marked in accordance with the requirements of MIL-STD-129. Container marking shall include the following:

- a. The supplier's lot number.
- b. Procuring activity purchase order number.
- c. Container identification number (applied in numerical sequence as the containers are filled).
- d. Date of manufacture.
- e. Manufacturers' Code Ident.
- f. Net and tare weight of the container.
- g. Material identification.

## 6. NOTES AND CONCLUDING MATERIAL.

6.1 Intended use. The intended use of the material described herein is as an ingredient in solid propellant formulations.

### 6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Responsibility for inspection and inspection facilities if different than 4.1.
- c. Special packaging, packing, or shipping requirements, if applicable (see Section 5).

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6.2.2 Data requirements. When this specification is used in a procurement which incorporates a Contracts Data Requirements List (DD Form 1423) and invokes the provisions of 7-104.9(n) of the Defense Acquisition Regulations (DAR), the data requirements identified below will be developed as specified by an approved Data Item Description (DID) (DD Form 1664) and delivered in accordance with the approved DD Form 1423 incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

| <u>Paragraph</u> | <u>Data Requirement</u>    | <u>Applicable DID</u>     |
|------------------|----------------------------|---------------------------|
| 4.6              | Certification<br>Test Data | UDI-A-23264B<br>DI-T-4024 |

(Copies of DIDs required by the contractor in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

### 6.3 Definitions.

6.3.1 Lot. At place of manufacture, a lot consists of dioctyl adipate from one manufacturer's batch or blend, or if manufactured by a continuous process, any quantity of material made from homogeneous raw materials and during a period of uninterrupted operations. At place of delivery, a lot consists of dioctyl adipate from one manufacturer's lot received in a single shipment. Partial shipments may be considered a single shipment at the option of the procuring activity.

6.4 Suggested source of supply. A product that has met the requirements of this specification in past procurement actions is marketed by Union Camp Corporation, Code Ident Number 33522. This information is for the convenience of the procuring activity and is not to be construed as a waiver of any requirement of this specification nor as any limitation of additional potential sources of supply.

Preparing activity:  
Navy - AS

(Project 6810-NB23)

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MIL-D-85494(AS), DIOCTYL ADIPATE

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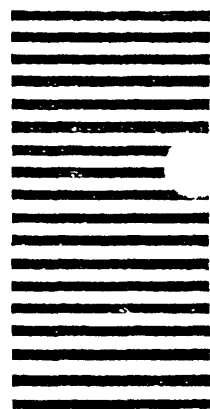
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