

VV-D-1078B
9 December 1983
 SUPERSEDING
 VV-D-1078A
 July 14, 1970

FEDERAL SPECIFICATION

DAMPING FLUID, SILICONE BASE (DIMETHYL POLYSILOXANE)

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal agencies.

1 SCOPE AND CLASSIFICATION

1.1 Scope This specification covers the requirements of dimethyl polysiloxane silicone base damping fluids having viscosities of 0.65 through 2,500,000 centistokes. Damping fluids identified by NATO code numbers are listed in 6.3.

2 APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on date of invitation for bids or solicitation for offers, form a part of this specification to the extent specified herein.

Federal Specifications

TT-N-97 - Naphtha, Aromatic

Federal Standards

FED-STD-123 - Marking for Domestic Shipment (Civil Agencies)
 FED-STD-313 - Material Safety Data Sheets Preparation and Submission of
 FED-STD-791 - Lubricants, Liquid Fuels and Related Products, Methods of Testing

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

VV-D-1078B

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies)

Military Standards

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-290 - Packaging of Petroleum and Related Products

(Copies of military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer)

Laws and Regulations

CODE OF FEDERAL REGULATIONS

- 16 CFR - The Federal Hazardous Substances Act
- 49 CFR - Transportation - Hazardous Materials.

(The Code of Federal Regulations (CFR) are for sale on a subscription basis by the Superintendent of Documents, U S. Government Printing Office, Washington, DC 20402. When indicated reprints of certain regulations may be obtained from the Federal Agency responsible for issuance thereof

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards

- D70 - Specific Gravity of Semi-Solid Bituminous Materials
- D92 - Flash and Fire Points by Cleveland Open Cup
- D97 - Pour Point of Petroleum Oils
- D150 - A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
- D4057 - Manual of Sampling Petroleum and Petroleum Products
- D4177 - Automatic Sampling of Petroleum and Petroleum Products
- D445 - Kinetic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
- D924 - Power Factor and Dielectric Constant of Electrical Insulating Liquids
- D1084 - Viscosity of Adhesives
- D1298 - Density, Specific Gravity, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
- D1310 - Liquids by Tag Open Cup Apparatus, Flash Point of
- D1747 - Refractive Index of Viscous Materials

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI Z129.1 - American National Standard for the Precautionary Labeling of Hazardous Industrial Chemicals

VV-D-1078B

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

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 Materials. The materials used in the manufacture of damping fluids shall be such as to produce finished products which meet the requirements of this specification

3.2 Physical properties. The physical properties of the damping fluids shall conform to table I, when tested as specified in 4.5.2 through 4.5.6

3.3 Material safety data sheets Material safety data sheets shall be prepared and submitted in accordance with FED-STD-313. Material safety data sheets shall also be forwarded as specified in 4.3.1. The damping fluid shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting agency to the appropriate departmental medical service who will act as an advisor to the contracting agency (see 4.3.1 and 6.2h).

3.4 Workmanship The damping fluid ingredients shall be processed in a manner that will produce high quality material free from visible suspended matter, water or sediment

3.5 Additional Unit Pack Markings In addition to those markings required in section 5, unit pack markings shall contain use, mixing, handling and precautionary markings as well as noting any protective clothing and equipment required

4 QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 examinations and tests. The examination and tests of the damping fluids shall be classified as quality conformance inspection.

4.3 Quality conformance inspection. The quality conformance inspection of the damping fluid shall consist of tests of samples from 4.3.3.2 in accordance with table II and an examination of samples from 4.3.3.1 for conformance with 4.5.1. Samples shall be labeled completely with the information identifying the purpose of the sample, name of product, specification number, lot and batch number, date of sampling and contract number.

VV-D-1078B

TABLE I Physical properties of dimethyl polysiloxane silicone base damping fluids

Characteristics	Viscosity grades, in centistokes													
	0.65 1/	1.0 1/	1.5 1/	2.0 1/	5.0 1/	10.0 1/	20.0 1/	50.0 1/	100 2/	200 2/	350 2/	500 2/	1,000 2/	5,000 2/
Viscosity in centistokes at 25°C (77°F)	--	0.41	0.46	0.48	0.55	0.57	0.58	0.59	0.60	0.60	0.60	0.60	0.60	0.61
Viscosity - temperature coefficient ± 0.02														
Specific gravity ± 0.004 at 25°C/25°C (77°F/77°F)	0.761	0.818	0.851	0.872	0.915	0.935	0.950	0.960	0.966	0.968	0.969	0.971	0.971	0.971
Refractive index ± 0.002 at 25°C (77°F)	1.375	1.382	1.387	1.390	1.397	1.399	1.400	1.402	1.4025	1.4033	1.4033	1.4033	1.4033	1.4035
Pour point, °C (°F), maximum	-68 (-90.4)	-68 (-90.4)	-100 (-148)	-54.4 (-66)	-53.9 (-65)	-53.9 (-65)	-53.9 (-65)	-53.9 (-65)	-47.2 (-53)	-47.2 (-53)	-47.2 (-53)	-47.2 (-53)	-47.2 (-53)	-44.4 (-48)
Dielectric constant ± 0.03 at 100 cycles and 23°C (73.4°F)	2.18	2.32	-	2.44	2.59	2.65	2.68	2.72	2.73	2.75	2.75	2.75	2.75	2.76
Flash point, °C (°F), minimum	-4 (25)	38 (100)	55 (130)	79 (175)	121 (250)	163 (325)	204 (400)	302 (535)	302 (575)	302 (575)	316 (600)	302 (575)	302 (575)	316 (600)
Volatility, percent, maximum	--	--	--	--	--	--	--	--	2.0	2.0	2.0	2.0	2.0	2.0
Acid number, maximum	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

1/ Tolerance of ± 10 percent2/ Tolerance of ± 5 percent3/ Tolerance of ± 0.04

VV-D-1078B

TABLE I Physical properties of dimethyl polysiloxane silicone base damping fluids - continued

Characteristics	Viscosity grades, in centistokes									
	7,500 1/	12,500 2/	20,000 2/	30,000 2/	40,000 2/	60,000 2/	100,000 1/	200,00 1/	1,000,000 1/	2,500,000 1/
Viscosity in centistokes at 25°C (77°F)	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.57 3/	0.57 3/
Viscosity - temperature coefficient ± 0.02	0.971	0.971	0.972	0.973	0.973	0.973	0.973	0.973	0.974	0.974
Specific gravity ± 0.004 at 25°C/25°C (77°F/77°F)	1.4035	1.4035	1.4035	1.4035	1.4035	1.4035	1.4035	1.4036	--	--
Refractive index ± 0.002 at 25°C (77°F)	-44.4 (-48)	-44.4 (-48)	--	--	--	--	--	--	--	--
Pour point, °C (°F), maximum	2.76	2.76	2.77	2.77	2.77	2.77	2.77	2.78	--	--
Dielectric constant ± 0.03 at 100 cycles and 23°C (73.4°F)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)	316 (600)
Flash point, °C (°F), minimum	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Volatility, percent, maximum	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Acid number, maximum										

1/ Tolerance of ± 10 percent2/ Tolerance of ± 5 percent3/ Tolerance of ± 0.04

VV-D-1078B

TABLE II. Quality conformance tests

Inspection	Paragraph	
	Requirement	Test method
Viscosity in centistokes	3.2	4 5 2
Viscosity - temperature coefficient	3 2	4.5 3
Specific gravity	3 2	4 5 2
Refractive index	3 2	4 5 2
Pour point	3 2	4 5 2
Dielectric constant	3.2	4 5 4
Flash point	3 2	4 5 2
Volatility	3.2	4 5 5
Acid number	3.2	4 5.6
Examination of filled container	5.1 and 5 2	4.5 1

4 3.1 Test reports Two copies of the manufacturer's test report, containing complete test data showing that the material conforms to the requirements of this specification, shall be submitted with the quality conformance samples. Location and identity of the plant which produced the samples tested shall also be supplied. Material safety data sheets on toxicity prepared as specified in 3.3 shall also be submitted to the contracting activity.

4 3.2 Lot formation For the purpose of sampling and inspection, a lot shall not exceed 2,000 gallons and shall consist of all the damping fluid produced by one manufacturer, at one plant, from the same materials and under essentially the same conditions, provided the operation is continuous and does not exceed a 24 hour period. In the event the process is a batch operation, each batch shall constitute a lot (see 6.6).

4 3.3 Sampling

4 3.3.1 For examination of filled containers. A random sample of filled containers, fully prepared for delivery, shall be selected from each lot of damping fluid in accordance with MIL-STD-105, inspection level I with an acceptable level (AQL) of 2.5 percent defective.

4 3.3.2 For tests A composite sample of damping fluid, consisting of two 1-litre containers, shall be taken from each lot in accordance with ASTM D4057 or ASTM D4177. The lot shall be unacceptable if either sample fails to comply with any of the tests specified in 4.5.2 through 4.5.6.

4 4 Inspection conditions.

4 4.1 Test conditions. Unless otherwise specified, inspection shall be in accordance with the provision of MIL-STD-105, the requirements of method 9601 of FED-STD-791 and 4.5. Physical and chemical values specified in table I apply to

VV-D-1078B

the average of the determinations made on the samples for those values which fall within any stated repeatability or reproducibility limits of the applicable test method.

4.5 Methods of examinations and tests

4.5.1 Examinations Each of the filled containers, selected in accordance with 4.3.3.1, shall be examined to determine that packaging, packing and marking comply with the requirements of 5.1, 5.2 and 5.2.1 of this specification. Defects shall be scored in accordance with the list below. The sample unit for this examination shall be one shipping container fully prepared for delivery except that it shall not be palletized and need not be sealed. Shipping containers fully prepared for delivery that have not be palletized shall be examined for defects of closure. The lot size shall be the number of shipping containers in the end item inspection lot. Each sample shall also be weighed to determine the amount of contents. If the number of defective containers exceeds the acceptance number of the sampling plan specified in 4.3.3.1, the lot shall be rejected.

<u>Examine</u>	<u>Defect</u>
Packaging	Container not as specified, closures not accomplished by specified or required methods or material. Leakage or seepage of contents. Non-conforming component, component missing, damaged or otherwise defective. Bulged or distorted container.
Markings	Data, including directions for use, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.5.2 Tests. Tests shall be performed in accordance with table III and 4.5.3 through 4.5.6.

TABLE III. Inspection methods

Tests	ASTM method
Viscosity in centistokes (cs):	
For grades 0.65 through 100,000 cs	D445
For grades 200,000 through 2,500,000 cs	D1084
Specific gravity:	
For grades 0.65 through 1,000 cs	D1298
For grades 5,000 through 2,500,000 cs	D70
Refractive index	D1747
Pour point	D97
Flash point	D92 <u>1/</u>

1/ 0.65 and 1.0 cs fluids should use ASTM D1310

VV-D-1078B

4.5.3 Viscosity-temperature coefficient (VTC) The viscosity-temperature coefficient of the fluid shall be determined as follows:

$$VTC = 1 - \frac{v_1}{v_2}$$

Where

v_1 = viscosity at 99°C

v_2 = viscosity at 38°C

4.5.4 Dielectric constant The dielectric constant of the fluids shall be determined by testing in accordance with ASTM D150 using a measuring cell conforming to the appendix to ASTM D924. The sample for test shall be of sufficient volume to allow for prerinsing of the measuring cell if desired. Calculation for the dielectric constant is as follows

$$\text{Dielectric constant} = \frac{C_p}{C_v}$$

Where

C_p = parallel capacitance of test sample

C_v = capacitance of air as dielectric

4.5.5 Volatility. Weigh 2000 mg + 200 mg of the damping fluid samples in clean tared 50 ml pyrex beakers. The accuracy of all the weights shall be ± 1.0 mg. Heat the weighed samples in a circulating air oven at $150^\circ \pm 5^\circ\text{C}$ for 24 hours. Remove, cool in a dessicator, reweigh and calculate loss as follows

$$\text{Percent volatility} = \frac{W_1 - W_2}{W_1 - T}$$

Where

W_1 = initial gross weight

W_2 = gross weight after heating

T = tare of beaker

Run samples in triplicate and report individual results and average

VV-D-1078B

4 5 6 Acid number The acid number shall be determined on a sample of approximately 500 mg of damping fluid, weighed to the nearest 100 mg. Weigh the sample into a stoppered flask, add 25 ml of naphtha solvent conforming to TT-N-97 and shake until solution is complete. With damping fluids having a viscosity greater than 1,000 centistokes, 50 ml of naphtha solvent may be advantageously used. Add 25 ml of neutralized alcohol and titrate with 0.01N potassium hydroxide solution with vigorous shaking until the pink color of the alcohol-water layer has been restored.

To obtain a blank, determine the volume of 0.01N potassium hydroxide solution required to neutralize 25 ml of naphtha solvent by adding 25 ml of neutralized alcohol and titrating as above. Correct for this blank.

Calculate the acid number as mg of KOH per g of sample. Neutralized alcohol shall be obtained by preparing a one to one mixture of 95 percent ethyl alcohol and water, containing 100 mg of phenolphthalein per liter, and neutralizing to a faint pink color by the addition of dilute potassium hydroxide solution.

5 PREPARATION FOR DELIVERY

5 1 Packaging and packing The damping fluid shall be packaged and packed in accordance with MIL-STD-290. The type and size of the containers and the level of packaging and packing shall be as specified by the procuring activity (see 6.2).

5 2 Marking. All unit, intermediate and shipping containers shall be marked in accordance with MIL-STD-290 and Title 49 of the Code of Federal Regulations and any other additional special markings specified by the acquiring activity (see 5.1 2 and 6 2 1h). All unit and intermediate packs of toxic and hazardous chemicals and materials shall also be labeled in accordance with the applicable laws, statutes, regulations or ordinances, including Federal, State, and Municipal requirements. In addition unit and intermediate containers, including unit containers that serve as shipping containers, such as pails and drums, shall be marked with the applicable precautionary information detailed in ANSI Z129.1.

5 2.1 Additional marking. In addition to any special marking required in the contract or order (see 6 2), the following note shall appear on each container:

DO NOT MIX THIS FLUID WITH ANY OTHER LUBRICATING
OIL OR HYDRAULIC FLUID. WHEN REPLACING ANOTHER
FLUID WITH THIS FLUID, DISASSEMBLE ALL PARTS AND
CLEAN THOROUGHLY WITH FRESH SOLVENT.

6 NOTES

6 1 Intended use The materials covered by this specification are intended for use as damping fluids, transducer fluids, lubricants, heat transfer fluids, dielectric fluids, mold release agents, water repellents, hydraulic fluids and protective dressings and impregnants. Dimethyl polysiloxanes are not effective lubricants (steel against steel) at high loads. These fluids, particularly in the lower viscosities, tend to cause certain elastomers to shrink and harden. Consideration should be given to the type elastomer used when in contact with these fluids.

VV-D-1078B

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number and date of this specification
- (b) Size and type of container desired (see 5.1)
- (c) Specify viscosity grade of damping fluid desired (see table I)
- (d) Quantity desired (see 5.1)
- (e) Selection of applicable levels of packaging and packing (see 5.1)
- (f) Marking required (see 5.2)
- (g) Where toxicity information should be forwarded (see 4.3.1)
- (h) Specify DAR clauses 7-104.98 and 1-323.2

6.3 Nato code numbers. The following damping fluids are identified by corresponding NATO code numbers

<u>Grade in centistokes</u>	<u>NATO code number</u>
10	S-1714
50	S-1718
100	S-1720
7,500	S-1724
20,000	S-1726
100,000	S-1728
200,000	S-1732

6.4 International standardization agreements. Certain provisions of this specification (see 1.1 and 6.3) are the subject of international standardization agreement, ASCC Air Standard 15/1, NATO STANAG NAT-STD-1135. When amendment, revision, or cancellation of this specification is proposed, which affects or violates the international agreement concerned, the preparing activity will inform GSA so that appropriate reconciliation action may be taken through international standardization channels.

6.5 Supersession data. The 1,000,000 and 2,500,000 cs grades in this specification supersede Missile Interim Specification MIS13948.

6.6 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process and subjected to some physical mixing operation intended to make the final product substantially uniform.

VV-D-1078B

MILITARY INTERESTS:

CIVIL AGENCY COORDINATING ACTIVITY

Custodians

GSA - OPP

Army - ME
Air Force - 20
Navy - AS

PREPARING ACTIVITY

Navy - AS

Review Activities

DOD Project 9150-0661

Army - AR, EA, MI
Navy - MC
Air Force - 68
DNA - DS

User Activities

Navy - OS, SH

Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein.

INSTRUCTIONS. In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE NAVY



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 12503 WASHINGTON D C

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE NAVY

Commander
Naval Sea System Command (SEA 3112)
Department of the Navy
Washington, DC 20362



