

INCH-POUND

MIL-DTL-46014A  
 28 January 2010  
 SUPERSEDING  
 MIL-L-46014  
 16 February 1968

## DETAIL SPECIFICATION

## LUBRICATING OIL, SPINDLE

Reactivated after 28 January 2010 and may be used for new and existing designs and acquisitions.

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

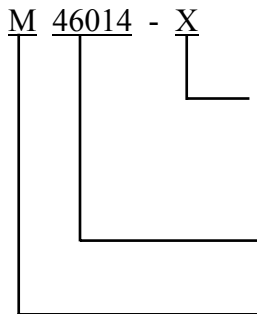
## 1. SCOPE

1.1 Scope. This specification covers spindle oil for machine tool operation.

1.2 Classification. The spindle oils are of the following types, as specified (see 6.2).

Type I - Extra low viscosity  
 Type II - Low viscosity  
 Type III - Medium viscosity

1.3 Part or identifying number (PIN). The PIN to be used for spindle oils acquired to this specification is created as follows:



Type: 1 - Type I - Extra low viscosity  
 2 - Type II - Low viscosity  
 3 - Type III - Medium viscosity

Specification number

Denotes military specification

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616, or e-mailed to [STDZNMGT@dla.mil](mailto:STDZNMGT@dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at <https://assist.daps.dla.mil/>.

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## 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 cited 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 must meet all specified requirements of the documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Standards. The following standard forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of this document is that cited in the solicitation or contract.

## FEDERAL STANDARD

FED-STD-791	- Testing Method of Lubricants, Liquid Fuels, and Related Products
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(Copies of this document are available online at <https://assist.daps.dla.mil/> or 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 these documents are those cited in the solicitation or contract.

## ASTM INTERNATIONAL

ASTM D91	- Standard Test Method for Precipitation Number of Lubricating Oils
ASTM D92	- Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D130	- Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
ASTM D445	- Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D974	- Standard Test Method for Acid and Base Number by Color-Indicator Titration
ASTM D4057	- Standard Practice for Manual Sampling of Petroleum and Petroleum Products

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## ASTM INTERNATIONAL - Continued

ASTM D4177

- Standard Practice for Automatic Sampling of  
Petroleum and Petroleum Products

(Copies of these documents are available online at <http://www.astm.org/> or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Materials. The spindle oils shall consist of refined petroleum hydrocarbons, with or without additives.

3.2 Physical and chemical requirements. The spindle oils shall conform to the requirements for the respective types as specified in table I and in 3.3, 3.3.1, 3.3.2, 3.3.3, and 3.4.

TABLE I. Viscosity and flash point requirements.

Properties	Values		
	Type I	Type II	Type III
Viscosity at 100 °F (40 °C) Kinematic, mm <sup>2</sup> /s	2.7 max	9.0 - 12.0	20.0 - 23.0
Viscosity at 210 °F (100 °C) Kinematic, mm <sup>2</sup> /s	-	2.0 - 3.0	3.0 - 5.0
Flash point (°F)	175 min	280 min	300 min

3.3 Oxidation stability. After being subjected to the oxidation stability test specified in 4.6, oils shall meet the requirements of 3.3.1, 3.3.2, and 3.3.3.

3.3.1 Acid number. The acid number of the spindle oil after the oxidation stability test shall not have increased by more than 0.10 milligrams of potassium hydroxide per gram of sample (see 4.6).

3.3.2 Precipitation number. The precipitation number of the spindle oil after the oxidation stability test shall be not greater than 0.05 milliliters (see 4.6).

3.3.3 Corrosion. After the oxidation stability test, there shall be no visual evidence of etching or pitting on the metal squares. The degree of staining on the copper square shall not be

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more than that shown for classification 1b of ASTM D130. On the steel square, a dark brown, grey, or black stain shall be cause for rejection.

3.4 Contamination. The spindle oil shall contain not more than 1.0 mg of solid material per liter of oil (see 4.6).

3.5 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

#### 4. VERIFICATION

4.1 Classification of inspections. The inspection requirement specified herein is classified as conformance inspection (see 4.2).

4.2 Conformance inspection. Conformance inspection shall include the lotting of 4.3 and sampling of 4.4.

##### 4.3 Lot.

4.3.1 Bulk lot. An indefinite quantity of a homogeneous mixture of material offered for acceptance in a single isolated container; or manufactured in a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material.

4.3.2 Packaged lot. An indefinite number of drums or other unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of material from one isolated container; or filled with a homogeneous mixture of material manufactured in a single plant run (not to exceed 24 hours) through the same processing equipment with no change in ingredient material.

##### 4.4 Sampling.

4.4.1 Sampling for tests. Sampling of a lot for test purposes shall be done in accordance with ASTM D4057 or ASTM D4177, as applicable.

##### 4.5 Classification of tests. All tests are classified as conformance tests.

4.6 Test methods. Tests shall be performed in accordance with the applicable methods listed in table II.

4.6.1 Contamination testing. Contamination testing shall be performed using local methods adhering to government-approved industry best practices.

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TABLE II. Test methods.

Test	FED-STD-791	ASTM International
Viscosity (kinematic)	-	ASTM D445 <sup>1</sup>
Flash point (open cup)	-	ASTM D92
Oxidation stability	5308	-
Acid number	-	ASTM D974
Precipitation number	-	ASTM D91
Corrosion	-	ASTM D130
Contamination (see 4.6.1)	-	-

<sup>1</sup> If Saybolt viscosity values are desired, see 6.4.

## 5. PACKAGING

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

## 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 spindle oils covered by this specification are intended for the use as lubricants for high-speed spindles on machine tools. The type of oil selected should be based on the recommendation of the manufacturer of the machine tool. These oils may be used satisfactorily in other applications requiring extra low, low, or medium viscosity, oxidation-resistant oils.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type of spindle oil required (see 1.2).
- c. Packaging requirements (see 5.1).

6.3 Storage conditions. The spindle oils may be stored at temperatures ranging from -70 °F to +120 °F (-57 °C to +49 °C).

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6.4 Saybolt viscosity values. Kinematic viscosity values shall be determined by ASTM D445 and may be converted to Saybolt Universal Seconds using procedure described in ASTM D2161, "Standard Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity".

6.5 Subject term (key word) listing.

Petroleum  
Hydrocarbon  
Viscosity  
Oxidation-resistant

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:  
Air Force - 68  
DLA - GS

Preparing Activity:  
DLA - GS3

(Project 9150-2010-001)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST database at <https://assist.daps.dla.mil/>.