

 SURFACE VEHICLE STANDARD	SAE J2359 FEB2013
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	Superseding J2359 NOV1998
Lubricating Oil, Internal Combustion Engine, Military Combat/Tactical Service	

RATIONALE

SAE J2359 was originally issued November 1998 as a means to leverage non-government standard organizations such as SAE to better align military needs with commercial manufacturers and suppliers. Unfortunately, because of the relatively rapid changes in the API heavy-duty diesel engine oil service categories, mainly driven by emission requirements, the commercial and military requirements have become increasingly out of sync. This inconsistency has led to very little interest among industry and support of these documents. Furthermore, because of military uniqueness of the requirements, the administration of these documents is most efficiently handled within the Department of Defense, under current procedures for military performance requirements/specifications.

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1. **Scope**—This SAE Standard covers engine military oils suitable for lubrication of reciprocating internal combustion engines of both spark-ignition and compression-ignition types, and for power transmission fluid applications in combat/tactical service equipment (see 7.1). This document is equivalent to MIL-PRF-2104G when all requirements are met.

- 1.1 **Classification**—The lubricating oils shall be of the following viscosity grades shown in Table 1 (see 7.1):

TABLE 1—VISCOSITY GRADES

SAE Viscosity Grade	Military Symbol	NATO Code
10W	OE/HDO-10	0-237
30	OE/HDO-30	0-238
40	OE/HDO-40	—
15W-40	OE/HDO-15/40	0-1236

2. References

- 2.1 **Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply.

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

- 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J183—Engine Oil Performance and Engine Service Classification (Other than “Energy-Conserving”)
SAE J300—Engine Oil Viscosity Classification

- 2.1.2 ALLISON TRANSMISSION DIVISION (ATD) PUBLICATION—Available from EG&G Stationary Testing, Attn: ATF/ Specialty Lab (C-4), 5904 Bandera Road, San Antonio, TX 78283-1993.

TES-228—C-4 Fluid Specification

2.1.3 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI Z1.4—Sampling Procedures and Tables for Inspections by Attributes

2.1.4 AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC) PUBLICATION—Available from American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.

ASQC Z1.4—Sampling Procedures and Tables for Inspections by Attributes

2.1.5 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 92—Flash and Fire Points by Cleveland Open Cup

ASTM D 94—Saponification Number of Petroleum Products

ASTM D 97—Pour Point of Petroleum Oils

ASTM D 129—Sulfur in Petroleum Products (General Bomb Method)

ASTM D 130—Detection of Copper Corrosion from Petroleum Products, by the Copper Strip Tarnish Test

ASTM D 287—API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

ASTM D 445—Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)

ASTM D 524—Ramsbottom Carbon Residue of Petroleum Products

ASTM D 664—Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration

ASTM D 808—Chlorine in New and Used Petroleum Products (Bomb Method)

ASTM D 874—Sulfated Ash from Lubricating Oils and Additives

ASTM D 892—Foaming Characteristics of Lubricating Oils

ASTM D 1091—Phosphorus in Lubricating Oils and Additives

ASTM D 1317—Chlorine in New and Used Lubricants (Sodium Alcoholate Method)

ASTM D 1500—ASTM Color of Petroleum Products (ASTM Color Scale)

ASTM D 1552—Sulfur in Petroleum Products (High-Temperature Method)

ASTM D 2270—Calculating Viscosity Index from Kinematic Viscosity at 40 and 100 C

ASTM D 2622—Sulfur in Petroleum Products (X-Ray Spectrographic Method)

ASTM D 2887—Boiling Range Distribution of Petroleum Fractions by Gas Chromatography

ASTM D 2896—Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration

ASTM D 3228—Total Nitrogen in Lubricating Oils and Fuel Oils by Modified Kjeldahl Method

ASTM D 3951—Standard Practice for Commercial Packaging

ASTM D 4047—Phosphorus in Lubricating Oils and Additives by Quinoline Phosphomolybdate Method

ASTM D 4057—Manual Sampling of Petroleum and Petroleum Products

ASTM D 4177—Automatic Sampling of Petroleum and Petroleum Products

ASTM D 4294—Sulfur in Petroleum Products by Non-Dispersive X-Ray Fluorescence Spectrometry

ASTM D 4485—Standard Specification for Performance of Engine Oils

ASTM D 4624—Measuring Apparent Viscosity by Capillary Viscometer at High Temperature and High-Shear Rates

ASTM D 4628—Analysis of Barium, Calcium, Magnesium, and Zinc in Unused Lubricating Oils by Atomic Absorption Spectrometry

ASTM D 4629—Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection

ASTM D 4683—Measuring Viscosity at High Temperature and High Shear Rate by Tapered Bearing Simulator

ASTM D 4684—Determination of Yield Stress and Apparent Viscosity of Engine Oils at Low Temperature

ASTM D 4739—Base Number Determination by Potentiometric Titration

ASTM D 4741—Measuring Viscosity at High Temperature and High Shear Rate by Tapered-Plug Viscometer

ASTM D 4927—Elemental Analysis of Lubricants and Additive Components - Barium, Calcium, Phosphorus, Sulfur, and Zinc by Wavelength-Dispersive X-Ray Fluorescence Spectroscopy

ASTM D 4951—Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
ASTM D 4998—Evaluating Wear Characteristics of Tractor Hydraulic Fluids
ASTM D 5119—Evaluation of Automotive Engine Oils in the CRC L-38 Spark-Ignition Engine
ASTM D 5185—Determination of Additive Elements, Wear Metals and Contaminants in Used Lubricating Oils by Inductively-Coupled Plasma Atomic Emission Spectrometry
ASTM D 5480—Motor Oil Volatility by Gas Chromatography
ASTM D 5533—Evaluation of Automotive Engine Oils in the Sequence IIIE, Spark-ignition Engine
ASTM D 5800—Evaporation Loss of Lubricating Oil at the NOACK Method
ASTM D 5862—DDC 6V92TA Test Procedure
ASTM D 5950—Pour Point, Automatic
ASTM D 5966—Roller Follower Wear Test
ASTM D 5967—Evaluation of Diesel Engine Oils in the Mack T-8 Diesel Engine
ASTM D 5968—Corrosion Bench Test
ASTM Special Publication (STP) 315H includes:
Caterpillar 1M-PC Test Procedure—ASTM Research Report D02-1320
Caterpillar 1N Test Procedures—ASTM Research Report D02-1321
HEUI Engine Oil Aeration Test

- 2.1.6 CATERPILLAR INC., ENGINE DIVISION (CAT.) PUBLICATION—Available from Caterpillar, Component Development, Technical Center - C, P.O. Box 1875, Peoria, IL 61656-1875.

Caterpillar TO-4, Fluid Requirements, VC 70.

2.1.7 GOVERNMENT PUBLICATIONS

- 2.1.7.1 *Military and Federal Publications*—Available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-PRF-2104—Lubricating Oil, Internal Combustion Engine, Military Combat/Tactical Service
MIL-L-21260—Lubricating Oil, Internal Combustion Engine, Preservative and Break-In
MIL-L-46167—Lubricating Oil, Internal Combustion Engine, Arctic
FED-STD-313—Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials
Furnished to Government Activities
FED-STD-791—Lubricants, Liquid Fuels and Related Products; Methods of Testing
NATO STANAG 2835
NATO STANAG 2845

- 2.1.7.2 *U.S. Department of Labor (DOL) (OSHA)*—Available from OSHA Publication Office, Room S-4203, 200 Constitution Avenue, NW, Washington, DC 20210.

OSHA 29 CFR 1910.1200—Hazard Communication; Interpretation Regarding Lubricating Oils

- 2.1.7.3 *US Mobility Technology Center*—Available from US Army Tank Automotive and Armament Command, Attn: AMSTRA-TR-0/210, Warren, MI 48397-5000.

Guide for the Qualification of Engine and Gear Lubricants

3. Definitions

- 3.1 Bulk Lot**—An indefinite quantity of a homogeneous mixture of one grade of oil offered for acceptance in a single, isolated container; or manufactured in a single plant run (not exceeding 24 h), through the same processing equipment, with no change in the ingredient materials.
- 3.2 Packaged Lot**—An indefinite number of 208.175 L (55-gal drum) or smaller unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of one grade of oil from a single, isolated container; or filled with a homogeneous mixture of one grade of oil manufactured in a single plant run (not exceeding 24 h), through the same processing equipment, with no change in the ingredient materials.

4. Requirements

4.1 Qualification

- 4.1.1 **QUALIFICATION—GENERAL**—Engine lubricating oils furnished under this specification shall be products that are qualified by the qualifying activity (see 7.4) for listing on the applicable qualified products list at the time of contract award (see 5.1.1 and 7.4). Qualification will be granted by the qualifying activity (see 7.4) to any manufacturer (original or reblander) of lubricating oils provided a "Manufacturing Facility Survey" (MFS) has been accepted as described in the "Guide for Qualification of Engine and Gear Lubricants." Each manufacturing facility intended for the manufacture of products under this specification shall have a MFS. This is a one time requirement provided there is no change in facilities, blending method or equipment. Companies requesting rebrand approvals do not need an MFS to be qualified. The qualifying activity (see 7.4) may waive complete qualification testing or may require only partial qualification testing of SAE 40 grade oil if the contractor states in a written affidavit that the product has been formulated with base stocks, refining treatment, and additives the same as those used in the formulation of SAE 30 grade oil qualified under this specification.
- 4.1.2 **QUALIFICATION PERIOD**—Each viscosity grade of oil which satisfies all the requirements of this specification shall be qualified for a period not exceeding four years from the date of its original qualification. The qualification period for each SAE 40 grade oil qualified in accordance with 4.1 shall not exceed that of the SAE 30 grade used in the qualification procedure. When the qualification period has expired, or whenever there is a change in the base stock, in the refining treatment or in the additives used in the formulation, each product must be retested if the contractor wishes to maintain the formulation as a qualified product and be eligible to bid on government solicitations for this material.
- 4.1.3 **TOLERANCES**—The engine lubricating oil supplied under contract shall have the same base stocks and additives components, at the appropriate concentrations, as when qualified. The finished oil properties shall fall within permissible tolerances assigned by the qualifying activity to the properties listed in 4.5, of the product receiving qualification. The values resulting after the application of tolerances shall not exceed the maximum nor fall below the minimum limits specified herein (see Table 2 and 4.4.1 through 4.4.11).
- 4.1.4 **POUR-POINT DEPRESSANT**—No changes shall be made in either the type or concentration of the pour-point depressant after qualification testing and approval unless:
- The oil is retested for conformity to the pour-point, stable pour point, borderline pumping temperature and all viscosities (see Table 2).
 - The qualifying activity (see 7.4) is informed of the proposed change(s) and of the retesting.
 - The qualifying activity approves the proposed change(s) in writing.

TABLE 2—FINISHED OIL REQUIREMENTS

Property	SAE Grade 10W	SAE Grade 30	SAE Grade 40	SAE Grade 15W-40
Kinematic viscosity, cSt, @ 100 °C min. max.	5.6 <7.4	9.3 <12.5	12.5 <16.3	12.5 <16.3
@ 40 °C ⁽¹⁾	X	X	X	X
Viscosity apparent, cP @ °C ⁽²⁾ min. max.	3500@-25 3500@-20	— —	— —	3500@-20 3500@-15
High-temperature/high-shear viscosity, min.	X	2.9	3.7	3.7
Pumpability, 60 000 cP, max. @ temperature, °C	-30	—	—	-25
Viscosity index, min.	X	80	80	X
Pour point, °C, max.	-30	-18	-15	-25
Stable pour point, °C, max. ⁽³⁾	-30	—	—	-25
Flash point, °C, min.	205	220	225	215
Evaporative loss, %	18	—	—	15
Other properties ⁽¹⁾				
Gravity	X	X	X	X
Carbon residue	X	X	X	X
Sulfur	X	X	X	X
Sulfated ash	X	X	X	X
Total acid number	X	X	X	X
Base number	X	X	X	X
Phosphorus	X	X	X	X
Nitrogen	X	X	X	X
Metallic components	X	X	X	X

1. Value shall be reported ('X' indicated report).

2. Report the measured apparent viscosity for grades 10W and 18W-40 oils at the minimum and maximum temperatures.

3. After being cooled down to its pour point, the oil shall regain its homogeneity on standing at a temperature not more than 6 °C above the pour point. However, it should not exceed the indicated limits.

- 4.1.5 MATERIAL SAFETY DATA SHEETS—When applying for qualification, the manufacturer shall submit to the qualifying activity (see 7.4) a sample of the product tested (see 4.4.2.1) and include Material Safety Data Sheets prepared in accordance with FED-STD-313. When FED-STD-313 is at variance with the OSHA 29 CFR 1910.1200, the CFR shall take precedence, modify, and supplement FED-STD-313.