

METRIC

MIL-L-2104E  
AMENDMENT 1  
26 May 1989

MILITARY SPECIFICATION

LUBRICATING OIL, INTERNAL COMBUSTION ENGINE, TACTICAL SERVICE

This amendment forms a part of MIL-L-2104D, dated 1 August 1988, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 3

2.2, under AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM), D 2896, delete the word "Total" from the title and add:

- "D 4624 - Measuring Apparent Viscosity by Capillary Viscometer at High Temperature and High-Shear Rates.
- "D 4741 - Measuring Viscosity at High Temperature and High Shear Rate by Tapered-Plug Viscometer.
- "D 4927 - Elemental Analysis of Lubricant and Additive Components - Barium, Calcium, Phosphorus, Sulfur, and Zinc by Wavelength Spectroscopy."

PAGE 4

2.2, add the following at the end of the section:

DEUTSCHES INSTITUT FUR NORMUNG (DIN)

DIN 51581 - Determination of evaporation loss of lubricating oils.

(Application for copies should be addressed to Deutsches Institut fur Normung e.V., Burggratenstr 4-10, D-1000 Berlin 30, Germany T 26011.)

PAGE 8

Table II, after "High temperature/high shear viscosity" insert an "X" in the columns under 10W, 30 and 40 grades.

Under "Viscosity index, (min)", grade 40, delete the "X" and substitute "80".

PAGE 13

4.5.2, add the following tests:

"Evaporation loss  
High temperature/high shear".

AMSC N/A

FSC 9150

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MIL-L-2104E  
AMENDMENT 1

PAGE 14

Table III, delete in its entirety and substitute the following:

TABLE III. Test methods.

| Test   | Test method        |                                  |      |       |
|--|--------------------|----------------------------------|------|-------|
|  | FED-STD-791        | ASTM                             | SAE  | DIN   |
| Viscosity, kinematic <sup>1/</sup><br>Viscosity, apparent <sup>1/</sup><br>High temperature/high shear |                    | D 445                            | J300 |       |
| Viscosity index  |                    | D 4683, D 4624,<br>D 4741        |      |       |
| Pour point   |                    | D 2270                           |      |       |
| Stable pour point  | 203                | D 97                             |      |       |
| Borderline pumping   |                    | D 4684                           |      |       |
| Flash point  |                    | D 92                             |      |       |
| Evaporative loss <sup>2/</sup>   |                    | D 2887                           |      | 51581 |
| Gravity, API   |                    | D 287                            |      |       |
| Carbon residue   |                    | D 524                            |      |       |
| Color  |                    | D 1500                           |      |       |
| Total acid number  |                    | D 664                            |      |       |
| Base number  |                    | D 2896                           |      |       |
| Phosphorus   |                    | D 1091, D 4047                   |      |       |
| Chlorine <sup>4/</sup>   |                    | D 808, D 1317 <sup>3/</sup>      |      |       |
| Sulfur <sup>4/</sup>   |                    | D 129, D 1552,<br>D 2622, D 4294 |      |       |
| Nitrogen   |                    | D 3228                           |      |       |
| Saponification number  |                    | D 94                             |      |       |
| Sulfated residue   |                    | D 874                            |      |       |
| Boiling range distribution   |                    | D 2887 <sup>5/</sup> , D 4927    |      |       |
| Metallic components  | 5601               | D 4628 <sup>5/</sup> , D 4927    |      |       |
| Foaming  |                    | D 892                            |      |       |
| Stability & compatibility  | 3470 <sup>6/</sup> |                                  |      |       |
| Moisture-corrosion characteristics   |                    | Sequence IID <sup>7/</sup>       |      |       |
| Oxidation & wear characteristics   |                    | Sequence IIIE <sup>7/</sup>      |      |       |
| Low temperature deposits & wear  |                    | Sequence VE <sup>7/</sup>        |      |       |
| Bearing corrosion & shear stability  |                    | Labeco L-38 <sup>8/</sup>        |      |       |
| Ring-sticking, wear, &<br>accumulations of deposits  |                    |                                  |      |       |
| Four-stroke cycle diesel engine <sup>8/</sup>  |                    | Caterpillar 1G2                  |      |       |
| Two-stroke cycle diesel engine   | 355                |                                  |      |       |
| Friction retention characteristics<br>& wear:  |                    |                                  |      |       |
| Slip time & wear   |                    | Allison C-3 <sup>9/</sup>        |      |       |
| Stopping time & wear   |                    | D 4736                           |      |       |
| Seal compatibility   |                    | Allison C-3 <sup>10/</sup>       |      |       |

1/ Obtain the apparent viscosity using the method of test set forth by appendix A of SAE J300.

MIL-L-2104E  
AMENDMENT 1

- 2/ The DIN 51581 is the preferred method.
- 3/ ASTM D 808 is the preferred method.
- 4/ ASTM D 1552 is the preferred method. ASTM D 4294 is only for use with base stock.
- 5/ Other spectrochemical analysis methods as approved by the qualifying activity (see 6.4) may be used as alternates.
- 6/ See 4.6.1 for clarifying instructions.
- 7/ In accordance with ASTM STP 315H.
- 8/ In accordance with STP 509A.
- 9/ Use procedure described in item 9, Allison Transmission Division (ATD) C-3 specification.
- 10/ Use procedure described in item 6, Allison Transmission Division (ATD) C-3 specification.

PAGE 15

Add the following at the top of the page:

"4.5 Shear stability. Determine the shear stability of grade 15W-40 oil by the following method:"

Custodians:

Army - ME  
Navy - SH  
Air Force - 68

Preparing activity:

Army - ME  
Project 9150-1045

Review activities:

Army - AR, SM  
Navy - AS, MC, SA, YD  
Air Force - 11  
DLA - GS

User activities:

Army - AT, MI  
Navy - OS