# GB

NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 75.100
CCS E 34

# GB 11122-2025

Replacing GB 11122-2006

## Diesel engine oils

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**Issued on: June 30, 2025** **Implemented on: July 01, 2026**

**Issued by: Status Administration for Market Regulation;**
**National Standardization Administration.**

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# Diesel engine oils

**Warning - If appropriate precautions are not followed, the products covered by this document may be hazardous during production, storage, transportation, use. This document does not purport to provide recommendations regarding all safety issues related to this product. Before using this document, users are responsible for establishing appropriate safety and health measures and determining the applicability of relevant regulatory restrictions.**

## 1 Scope

This document specifies the product classification and labeling, technical requirements and test methods, inspection rules, labeling, packaging, storage, transportation, delivery acceptance for diesel engine oils made from base oils with various additives.

This document applies to diesel engine oils used in compression-ignition four-stroke diesel engines.

## 2 Normative references

The contents of the following documents, through normative reference, constitute essential provisions of this document. For dated references, only the version corresponding to that date applies to this document. For undated references, only the latest version (including all amendments) applies to this document. GB/T 260 Determination of Water Content in Petroleum Products - Distillation Method

GB/T 260 Test method for water in petroleum products - Distillation method

GB/T 265 Petroleum products - Determination of kinematic viscosity and calculation of dynamic viscosity

GB/T 387 Dark petroleum products - Determination of sulphur content - Tubular oven method

GB/T 511 Petroleum, petroleum products and additives - Method for determination of mechanical admixtures

GB/T 1995 Petroleum products - Calculation of viscosity index

GB/T 2433 Petroleum products - Lubricating oils and additives - Determination of sulphated ash

GB/T 2541 Petroleum products - Computation table for viscosity indices

GB/T 3535 Petroleum products - Determination of pour point

GB/T 3536 Petroleum products - Determination of flash and fire points - Cleveland open cup method

ASTM D6681 Standard test method for evaluation of engine oils in a high-speed, single-cylinder diesel engine - Caterpillar 1P test procedure

ASTM D6894 Standard test method for evaluation of aeration resistance of engine oils in an indirect-injected turbocharged automotive diesel engine

ASTM D6923 Standard test method for evaluation of aeration resistance of engine oils in a high-speed, single-cylinder diesel engine - Cat-Pillar 1R test sequence

ASTM D6984 Standard test method for evaluation of automotive engine oils in the sequence IIIF, spark-ignition engine

ASTM D6987 Standard test method for evaluation of diesel engine oils in a T-10 exhaust gas recirculation diesel engine

ASTM D7156 Standard test method for evaluation of diesel engine oils in the T-11 exhaust gas recirculation diesel engine

ASTM D7422 Standard test method for evaluation of diesel engine oils in the T-12 exhaust gas recirculation diesel engine

ASTM D8111 Standard test method for evaluation of automotive engine oils in the sequence IIIH, spark-ignition engine

ASTM RR:D-2-1219 Supporting data for ASTM D4485, performance specification for automotive engine oils (Multicylinder engine test sequence for the evaluation of lubricants - Mack T-6)

ASTM RR: D-2-1220 Supporting data for ASTM D4485, performance specification for automotive engine oils (Multicylinder engine test sequence for the evaluation of lubricants - Mack T-7)

# 3 Terms and definitions

This document does not have any terms or definitions to be defined.

# 4 Product classification and labeling

## 4.1 Product classification

**4.1.1** This document covers six diesel engine oil quality grades: CD, CF, CF-4, CH-4, CI-4, D1.

Note: For detailed classification information, see GB/T 28772, ASTM D4485, SAE J183.

**4.1.2** This document does not specify the quality grades of general-purpose internal combustion engine oils. General-purpose internal combustion engine oils may be combined with the diesel engine oil quality grades defined in this document and the gasoline engine oil quality grades defined in GB 11121, as needed. Any general-purpose internal combustion engine oil must meet all the technical requirements of both its gasoline engine oil quality grade and its diesel engine oil quality grade.

**4.1.3** Each quality grade is divided into viscosity grades according to GB/T 14906.

Note: For detailed viscosity classification information, see SAE J300.

### 4.2 Product labeling

**4.2.1** Diesel engine oil products are labeled as follows:

| Quality grade | Viscosity grade | Diesel engine oil |
|---|---|---|

Examples: CI-41 0W-40 diesel engine oil, CD 40 diesel engine oil.

**4.2.2** General-purpose internal combustion engine oil products are labeled as follows:

| Gasoline engine oil quality grade/Diesel engine oil quality grade | Viscosity grade | General-purpose internal combustion engine oil |
|---|---|---|

or

| Diesel engine oil quality grade/Gasoline engine oil quality grade | Viscosity grade | General-purpose internal combustion engine oil |
|---|---|---|

Examples: SJ/CF-4 5W-30 general-purpose internal combustion engine oil or CF-4/SJ 5W-30 general-purpose internal combustion engine oil. The former indicates that its formulation primarily meets the technical requirements of SJ gasoline engine oil, while the latter indicates that its formulation primarily meets the technical requirements of CF-4 diesel engine oil. Both products meet all the technical requirements of both SJ gasoline engine oil and CF-4 diesel engine oil.

Note: The order of quality grades for gasoline or diesel engine oils is determined by the manufacturer based on the product formulation characteristics.

## 5 Technical requirements and test methods

**5.1** The technical requirements and test methods for viscosity-temperature performance of CD quality grade diesel engine oil shall comply with Table 1 or Table A.1 in Appendix A. The technical requirements and test methods for viscosity-temperature performance of other quality grades of diesel engine oil shall comply with Table 1. Multigrade oils shall meet the technical requirements of both the W-containing viscosity grade and the high-temperature viscosity grade in the series.

**5.2** The technical requirements and test methods for physical and chemical properties and simulated performance of diesel engine oil shall comply with Table 2.

**5.3** The technical requirements and test methods for the performance of diesel engine oil shall comply with Table 3.

## 6 Inspection rules

### 6.1 Inspection categories and items

#### 6.1.1 Exit-factory inspection

Exit-factory batch inspection items include: low-temperature starting viscosity, kinematic viscosity, viscosity index, pour point, water content, foam characteristics,

mechanical impurities, flash point, base number, sulfur content, phosphorus content, nitrogen content.

Assuming there are no changes in raw materials or production processes that could affect product quality, exit-factory periodic inspection items include: low-temperature pumping viscosity of diesel engine oils meeting the viscosity-temperature performance requirements of Table 1 shall be tested semi-annually; boundary pumping temperature of CD diesel engine oils meeting the viscosity-temperature performance requirements of Table A.1 shall be tested semi-annually; high-temperature high-shear viscosity, evaporation loss, sulfated ash shall be tested semi-annually; corrosion test, high-temperature corrosion test, diesel nozzle shear test, L-38 engine test, or Sequence VIII engine test shall be tested every two years.

### 6.1.2 Type Inspection

Type inspection items include all inspection items specified in the technical requirements of Chapter 5.

Type inspection shall be conducted and the test results retained for reference in the following circumstances:

a) When a new product is put into production or undergoes product type-finalization;

b) When there are significant changes in raw materials, processes, etc. that may affect product quality;

c) When the exit-factory inspection results differ significantly from the previous type inspection results.

When base oils are changed, relevant tests shall be conducted in accordance with the "API Base Oil Interchangeability Guidelines for Passenger Car and Diesel Engine Oils" in API 1509; the test results shall be retained for reference. When extending viscosity grades, relevant tests shall be conducted in accordance with the "API Guidelines for Engine Testing of SAE Viscosity Grades" in API 1509; the test results shall be retained for reference.

The CA6DM3, DCI11, WP13, 2.0CTI methods for evaluating the comprehensive properties of D1 quality grade diesel engine oils do not support base oil interchangeability or viscosity extension. Therefore, the formulation shall be fine-tuned according to Appendix B, relevant testing shall be conducted, the test results retained for future reference.

## 6.2 Group-batching

Under the same raw materials and process, each can or kettle produced is considered a batch.

## 6.3 Sampling

Sampling shall be conducted in accordance with GB/T 4756. The sampling volume shall meet the requirements for exit-factory inspection, type inspection, retained samples.

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