

GB 19147-2016

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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 75.160.20

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GB 19147-2016

Replacing GB 19147-2013

Automobile diesel fuels

车用柴油

[Including Amendment 2018XG1]

Issued on: December 23, 2016

Implemented on: December 23, 2015

Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China;

Standardization Administration of the People's Republic of
China.

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Foreword

All technical contents of this Standard are mandatory.

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB 19147-2013 “Automobile diesel fuels (V)”.

Compared with GB 19147-2013, in addition to editorial modifications, main technical changes of this Standard are as follows:

- ADD “automobile diesel fuels cannot be artificially added with methanol” (see 5.1 of this Standard, 5.1 of 2013 edition);
- DELETE technical requirements and test methods for automobile diesel fuels (III) (see Table 1 of 2013 edition); ADD technical requirements and test methods for automobile diesel fuels (V) (see Table 3 of this Standard)
- INCREASE the flash point of No. 5, No. 0 and No. 10 automobile diesel fuels TO not lower than 60 °C (see Table 1 and Table 2 of this Standard, Table 2 and Table 3 of 2013 edition);
- MODIFY the arbitration test method of 10 % carbon residue of distillation residue TO GB/T 17144;
- MODIFY the arbitration test method of polycyclic aromatic hydrocarbons content TO SH/T 0806;
- ADD the determination method, NB/SH/T 0916, of fatty acid methyl ester content, which is regarded as the arbitration test method;
- MODIFY Clause 9, “Implementation of the Standard” (see Clause 9 of this Standard, Clause 9 of 2013 edition).

This Standard is proposed by National Energy Board.

This Standard is under the technical jurisdiction of Subcommittee on Petroleum and Lubricants of National Technical Committee on Petroleum Products and Lubricants of Standardization Administration of China (SAC/TC 280/SC 1).

Drafting organizations of this Standard: China Petroleum & Chemical Corporation Petrochemical Research Institute, China National Petroleum Corporation Refining and Chemical Branch, China National Petroleum Corporation Petrochemical Research Institute, China Petroleum Refining and Chemical Co., Ltd., China Automotive Research Center.

Automobile diesel fuels

WARNING - If the appropriate protective measures are not observed, the products in this Standard may be dangerous in the course of production, transportation, handling, storage and use. This Standard is not intended to advise on all safety issues related to this product. It is the responsibility of the user to adopt appropriate safety and protective measures and to ensure compliance with the conditions set forth in the relevant national regulations.

1 Scope

This Standard specifies terms and definitions, product classification, technical requirements and test methods, sampling, marking, packaging, transportation and storage, safety and implementation of the Standard of automobile diesel fuels.

This Standard applies to automobile diesel fuels made from the petroleum or added with additives that improve the use performance, for compression-ignition engine automobiles. This Standard does not apply to automobile diesel fuels with biodiesel as a blending component.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the dated edition cited applies. For undated references, the latest edition of the referenced document (including all amendments) applies.

GB 190 Packing symbol of dangerous goods

GB/T 258 Standard test method for determination of acidity of light petroleum products

GB/T 260 Determination of water content in petroleum products

GB/T 261 Determination of flash point - Pensky-Martens closed cup method

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

GB/T 268 Petroleum products - Determination of carbon residue - Conradson method

GB/T 386 Standard test method for cetane number of diesel fuel oil

GB/T 508 Petroleum products - Determination of ash

GB/T 510 Petroleum products - Determination of solidification point

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

GB/T 1884 Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method

GB/T 1885 Petroleum measurement tables

GB/T 4756 Method for manual sampling of petroleum liquids

GB/T 5096 Petroleum products - Corrosiveness to copper - Copper strip test

GB/T 6536 Standard test method for distillation of petroleum products at atmospheric pressure

GB/T 11133 Standard test method for determination of water in petroleum products, lubricating oils, and additives - Coulometric Karl Fischer titration method

GB/T 11139 Distillate fuels - Calculation of cetane index

GB/T 11140 Standard test method for sulfur in petroleum products by wavelength dispersive X-ray fluorescence spectrometry

GB/T 17144 Petroleum products - Determination of carbon residue - Micro method

GB/T 20828 Biodiesel blend stock (BD100) for diesel engine fuels

GB/T 23801 Determination of fatty acid methyl esters (FAME) in middle distillates by infrared spectroscopy method

GB 30000.7-2013 Rules for classification and labelling of chemicals - Part 7: Flammable liquids

GB/T 30515 Petroleum products - Transparent and opaque liquid - Determination of kinematic viscosity and calculation of dynamic viscosity

GB/T 33400 Determination of total contamination in middle distillates, diesel fuels and fatty acid methyl esters

SH 0164 Rules for the packaging, storage and delivery of petroleum products

SH/T 0175 Oxidation stability determination method for fractional fuels (acceleration

method)

SH/T 0246 Determination of water content in light petroleum products (electricity method)

SH/T 0248 Determination of cold filter point for diesel fuels and civil heating oil

SH/T 0604 Determination of density of crude oil and petroleum products (U-shaped vibration tube method)

SH/T 0606 Determination method for middle distillate hydrocarbon composition (mass spectrometry)

SH/T 0689 Determination of total sulfur content of light hydrocarbons and engine fuels and other fuels (UV fluorescence)

SH/T 0694 Calculation method for middle distillate fuel cetane index (four variable formula method)

SH/T 0765 Assessment method for diesel fuel lubricity (high frequency reciprocating test method)

SH/T 0806 Determination of aromatics content of middle distillate - Refractive index detector and high performance liquid chromatography

NB/SH/T 0916 Standard test method for determination of biodiesel (fatty acid methyl esters) content in diesel fuel oil using mid infrared spectroscopy

ASTM D7039 Standard Test Method for Sulfurin Gasoline, Diesel Fuel, Jet Fuel, Kerosine, Biodiesel, Biodiesel Blends, and Gasoline-Ethanol Blends by Monochromatic Wave-length Dispersive X-ray Fluorescence Spectrometry

3 Terms and definitions

For the purpose of this document, the following terms and definitions.

3.1

content of polycyclic aromatic hydrocarbons

Total aromatic hydrocarbon content in automobile diesel fuels minus the monocyclic aromatic hydrocarbon content.

4 Product classification

Automobile diesel fuels are divided into six designations according to the solidification

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Corrosiveness to copper (50 °C, 3 h)/grade not more than	1						GB/T 5096
Water content ^c (volume fraction)/% not more than	Trace						GB/T 260
Mechanical admixtures ^d	None						GB/T 511
Lubricity Correction wear mark diameter (60 °C)/μm not more than	460						SH/T 0765
Polycyclic aromatic hydrocarbon content ^e (mass fraction)/% not more than	11						SH/T 0806
Kinematic viscosity ^f (20 °C)/(mm ² /s)	3.0 ~ 8.0		2.5 ~ 8.0		1.8 ~ 7.0		GB/T 265
Solidification point /°C not higher than	5	0	-10	-20	-35	-50	GB/T 510
Cold filter point/°C not higher than	8	4	-5	-14	-29	-44	SH/T 0248
Flash point (closed)/°C not lower than	60			50	45		GB/T 261
Cetane number not less than	51			49	47		GB/T 386
Cetane index ^g not less than	46			46	43		SH/T 0694
Distillation: 50 % recovery temperature/°C not higher than 90 % recovery temperature/°C not higher than 95 % recovery temperature/°C not higher than	300 355 365						GB/T 6536
Density ^h (20 °C)/(kg/m ³)	810 ~ 850			790 ~ 840			GB/T 1884 GB/T 1885
Fatty acid methyl ester content ⁱ (volume fraction)/% not more than	1.0						NB/SH/T 0916

^a It may also use GB/T 11140 and ASTM D7039 for determination; when there is an objection to the results, SH/T 0689 shall prevail.

^b It may also use GB/T 268 for determination, when there is an objection to the results, GB/T 17144 shall prevail. If automobile diesel fuels contain nitrate-type cetane number improvers, the determination of 10 % carbon residue of distillation residue is carried out using base

Annex A

(informative)

The minimum temperature with the risk rate of 10 % of some regions

A.1 The minimum temperature with the risk rate of 10 % of some regions

The minimum temperature with the risk rate of 10 % of some regions (see Table A.1) is extracted from the *Temperature Data for Petroleum Product Standards* prepared by the Central Meteorological Bureau. It is obtained by analyzing the maximum (minimum) temperature record each day from 1961 to 1980 of China's 152 meteorological stations. The minimum temperature with the risk rate of 10 % for a month indicates that the probability that the minimum temperature below the value in this month is 0.1, or the probability that the minimum temperature above the value in this month is 0.9.

A.2 Meaning and use

It is recommended to use the minimum temperature with the risk rate of 10 % to estimate the minimum operating temperature of the region where diesel fuels are used, and to provide reliable temperature data for normal equipment cold protection, fuel system design, diesel fuel production, supply and marketing of diesel fuel engines at low temperatures.

Table A.1 -- The minimum temperature with the risk rate of 10 % of some regions

Region	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Hebei Province	-14	-13	-5	1	8	14	19	17	9	1	-6	-12
Shanxi Province	-17	-16	-8	-1	5	11	15	13	6	-2	-9	-16
Inner Mongolia Autonomous Region	-43	-42	-35	-21	-7	-1	4	1	-8	-19	-32	-41
Heilongjiang Province	-44	-42	-35	-20	-6	1	7	4	-6	-20	-35	-43
Jilin Province	-29	-27	-17	-6	1	8	14	12	2	-6	-17	-26
Liaoning Province	-23	-21	-12	-1	6	12	18	15	6	-2	-12	-20
Shandong Province	-12	-12	-5	2	8	14	19	18	11	4	-4	-10
Jiangsu Province	-10	-9	-3	3	11	15	20	20	12	5	-2	-8
Anhui Province	-7	-7	-1	5	12	18	20	20	14	7	0	-6
Zhejiang Province	-4	-3	1	6	13	17	22	21	15	8	2	-3
Jiangxi Province	-2	-2	3	9	15	20	23	23	18	12	4	0
Fujian Province	-4	-2	3	8	14	18	21	20	15	8	1	-3
Taiwan Province ^a	3	0	2	8	10	16	19	19	13	10	1	2

°C

Annex B

(normative)

Test for nitrate-type cetane number modifiers in automobile diesel fuels

B.1 Scope

B.1.1 This method is applicable to the determination of nitrate-type cetane improvers used in automobile diesel fuels. This method can be used as a qualitative screening method for the determination of carbon residue.

B.1.2 This method involves certain hazardous substances, operations and equipment, and is not intended to advise on all safety concerns involved. Therefore, appropriate safety and protective measures shall be established prior to the use of this method and the applicability of the relevant regulatory limits shall be established.

B.2 Summary of the method

The diesel fuel sample is saponified in the potassium hydroxide-n-butanol mixture, filtered with glass fiber filter, and the material remaining on the filter paper is dried and treated with diphenylamine reagents. Diphenylamine is oxidized by nitrates to dark blue quinone compounds. The resulting blue or blue-black spots show that there are nitrate-type cetane number improvers. It can be determined that there are no nitrate-type cetane number improvers if no color change.

B.3 Instruments or equipment

B.3.1 Reaction bottle: wild-mouth bottle with a capacity of 30 mL and a nut cap having tin or plastic lining inside.

B.3.2 Glass fiber filter paper: diameter of 37 mm.

B.3.3 Pipette: capacity of 10 mL, with a suction ball.

B.3.4 Cylinders: 10 mL and 25 mL.

B.3.5 Suction flask: suitable for connection with 60 mL glass sintered filter.

B.3.6 Glass sintered filter: capacity of 60 mL.

B.3.7 Oven: suitable for drying glass fiber filter paper at 110 °C.

B.4 Reagents

B.4.1 Potassium hydroxide, analytically pure.

B.4.2 N-butanol, analytically pure.

B.4.3 Sulfuric acid, analytically pure.

B.4.4 Diphenylamine solution (1 g/100 mL solution).

Preparation: dissolve 0.250 g of diphenylamine (analytically pure) in 25 mL of sulfuric acid.

B.4.5 Toluene, analytically pure.

WARNING - Toluene is toxic combustible, it shall avoid inhalation of its vapor and avoid contact with the skin.

B.5 Test procedure

B.5.1 MIX 6.5 g of potassium hydroxide and 100 mL of n-butanol; HEAT to dissolve potassium hydroxide; after the solution is cooled, use glass fiber filter paper to filter the mixture, that is saponified mixture.

B.5.2 PIPETTE 10 mL of the sample into the reaction flask with a pipette, add 5 mL of toluene, and add 10 mL of saponified mixture.

WARNING - Do not use suction pipettes because of the presence of toxic substances in the test.

B.5.3 COVER the reaction bottle firmly with a nut cap, mix the contents and place it in a 110 °C oven for 4 h.

B.5.4 REMOVE the reaction flask from the oven and cool it to 25 °C ± 3 °C.

B.5.5 FILTER the contents of the reaction flask in a glass sintered filter equipped with glass fiber filter paper.

B.5.6 WASH the reaction flask with 2.5 mL of toluene and transfer it to a glass sintered filter for filtration.

B.5.7 Carefully remove the glass fiber filter and place it in a 110 °C oven to dry for 15 min.

B.5.8 REMOVE the glass fiber filter and cool it to 25 °C ± 3 °C.

B.5.9 ADD 3 drops of diphenylamine solution TO the center of the filter paper, and observe whether there is blue or blue-black.

B.6 Report

If blue appears, it shall report that there are nitrate-type cetane number improvers. The

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