



**International  
Standard**

**ISO 8217**

**Products from petroleum, synthetic  
and renewable sources — Fuels  
(class F) — Specifications of  
marine fuels**

*Produits d'origine pétrolière, synthétique ou renouvelable —  
Combustibles (classe F) — Spécifications des combustibles pour  
la marine*

**Seventh edition  
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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, Subcommittee SC 4, *Classifications and specifications*.

This seventh edition cancels and replaces the sixth edition (ISO 8217:2017), which has been technically revised.

The main changes are as follows:

- terms and definitions ([Clause 3](#)) have been updated;
- the Scope and the general requirements in [Clause 5](#) have been amended;
- [Tables 2](#) and [3](#) have been added;
- former [Table 2](#) has been modified and has become [Table 4](#);
- changes to the distillate fuels, including the following:
  - the requirement to report the fatty acid methyl ester(s) content (FAME) of DF grades has been changed, allowing up to 100 %;
  - the distinction between winter and summer quality for cloud point and cold filter plugging point has been removed;
  - the requirement to report the net heat of combustion for DF grades has been added;
  - a minimum cetane number requirement for DF grades has been added;
  - the requirement for oxidation stability for DF grades has been added;
- [Clauses 9](#) and [10](#) have been added;
- new [Annexes F, H](#) and [K](#) have been added (the former [Annex F](#) has become [Annex G](#), the former [Annex G](#) has become [Annex I](#), and the former [Annex H](#) has become [Annex J](#));

— existing annexes have been reviewed and updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

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## Introduction

This document was prepared in cooperation with ship owners, ship operators, shipping associations, national standards bodies, classification societies, fuel testing services, engine designers, fuel treatment equipment manufacturers, marine fuel suppliers, fuel additive suppliers and the petroleum industry to meet the requirements for marine fuels supplied on a world-wide basis for consumption on board ships.

The increased focus on environmental concerns and legislation to address them is leading to a transition in the nature of marine fuels. There is a shift away from marine fuels supplied from traditional oil products derived from the processing of petroleum crude, and a shift towards oil products derived from synthetic and renewable, recycled or alternative sources. This document takes into consideration the diverse nature of these fuels and incorporates a number of categories of distillate and residual fuels, even though it is possible that not all categories are available in every supply location. This document facilitates the transition, however sustainability aspects and accounting are not within the scope.

The categories of fuel in this document have been classified according to ISO 8216-1 and include the distillate fuel categories DMX, DMA, DMB, DMZ, DFA, DFB, DFZ and the residual fuel categories RMA, RME, RMG, RMK and RF.

In the instances where a fuel, which does not conform exactly to any of these distillate or residual fuel categories, is offered to a purchaser, the fuel characteristics or limits can be agreed between the buyer and the seller, and defined by both a category of fuel given by this document, together with any different or additional fuel characteristics or limits, as necessary to adequately define that fuel.

This document specifies the permitted minimum flash point limits following the provisions given in the SOLAS Convention.<sup>[3]</sup>

MARPOL Annex VI,<sup>[4]</sup> which controls air pollution from ships, includes a requirement that either the fuel does not exceed a specified maximum sulfur content, or an approved equivalent alternative means is used. During the lifetime of this document, regional and/or national authorities can introduce their own local emission requirements, which can impact the allowable sulfur content. It is the buyer's and the user's responsibility to establish which statutory requirements are necessary to meet and specify on that basis the corresponding maximum fuel sulfur content to the seller.



# Products from petroleum, synthetic and renewable sources — Fuels (class F) — Specifications of marine fuels

**WARNING** — The handling and use of products specified in this document can be hazardous if precautions as mentioned in the Safety Data Sheet (SDS) are not taken into consideration when product is handled. This document does not purport to address all the safety and health considerations that can be associated with its use. It is the responsibility of the users of this document to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

## 1 Scope

This document in its entirety defines the general requirements and specifications for fuels used in marine diesel engines and boilers, prior to onboard fuel handling (storage, settling, centrifuging, filtration, heating) before use.

For the purposes of this document, the term “fuels” comprises of the following:

- hydrocarbons from petroleum crude oil, oil sands and shale oil;
- synthetic hydrocarbons, renewable hydrocarbons or hydrocarbons from recycled sources, with molecular structures that are indistinguishable from petroleum hydrocarbons;
- fatty acid methyl ester (FAME), where permitted as specified in this document;
- blends of any of the above, where permitted as specified in this document.

The general requirements and specifications for fuels in this document can also be applied to fuels used in stationary diesel engines of the same or similar type as those used for marine purposes.

This document specifies seven categories of distillate fuels, one of which is for diesel engines used for emergency purposes. It also specifies four categories of residual fuels for sulfur content at or below 0,50 % by mass, five categories of residual fuels containing FAME and five categories of residual fuels for sulfur content exceeding 0,50 % by mass.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2719, *Determination of flash point — Pensky-Martens closed cup method*

ISO 3015, *Petroleum and related products from natural or synthetic sources — Determination of cloud point*

ISO 3016, *Petroleum and related products from natural or synthetic sources — Determination of pour point*

ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

ISO 3733, *Petroleum products and bituminous materials — Determination of water — Distillation method*

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- ISO 4259-2, *Petroleum and related products — Precision of measurement methods and results — Part 2: Interpretation and application of precision data in relation to methods of test*
- ISO 4264, *Petroleum products — Calculation of cetane index of middle-distillate fuels by the four variable equation*
- ISO 5165, *Petroleum products — Determination of the ignition quality of diesel fuels — Cetane engine method*
- ISO 6245, *Petroleum products — Determination of ash*
- ISO 8754, *Petroleum products — Determination of sulfur content — Energy-dispersive X-ray fluorescence spectrometry*
- ISO 10307-1, *Petroleum products — Total sediment in residual fuel oils — Part 1: Determination by hot filtration*
- ISO 10307-2, *Petroleum products — Total sediment in residual fuel oils — Part 2: Determination using standard procedures for ageing*
- ISO 10370, *Petroleum products — Determination of carbon residue — Micro method*
- ISO 10478, *Petroleum products — Determination of aluminium and silicon in fuel oils — Inductively coupled plasma emission and atomic absorption spectroscopy methods*
- ISO 12156-1, *Diesel fuel — Assessment of lubricity using the high-frequency reciprocating rig (HFRR) — Part 1: Test method*
- ISO 12185, *Crude petroleum, petroleum products and related products — Determination of density — Laboratory density meter with an oscillating U-tube sensor*
- ISO 12205, *Petroleum products — Determination of the oxidation stability of middle-distillate fuels*
- ISO 12937, *Petroleum products — Determination of water — Coulometric Karl Fischer titration method*
- ISO 14596, *Petroleum products — Determination of sulfur content — Wavelength-dispersive X-ray fluorescence spectrometry*
- ISO 14597, *Petroleum products — Determination of vanadium and nickel content — Wavelength-dispersive X-ray fluorescence spectrometry*
- EN 116, *Diesel and domestic heating fuels — Determination of cold filter plugging point — Stepwise cooling bath method*
- EN 14077, *Petroleum products — Determination of organic halogen content — Oxidative microcoulometric method*
- EN 14078, *Liquid petroleum products — Determination of fatty methyl ester (FAME) content in middle distillates - Infrared spectrometry method*
- EN 14214, *Liquid petroleum products — Fatty acid methyl esters (FAME) for use in diesel engines and heating applications — Requirements and test methods*
- EN 15195, *Liquid petroleum products — Determination of ignition delay and derived cetane number (DCN) of middle distillate fuels by combustion in a constant volume chamber*
- EN 15751, *Automotive fuels — Fatty acid methyl ester (FAME) fuel and blends with diesel fuel — Determination of oxidation stability by accelerated oxidation method*
- EN 15940, *Automotive fuels — Paraffinic diesel fuel from synthesis or hydrotreatment — Requirements and test methods*
- EN 16329, *Diesel and domestic heating fuels — Determination of cold filter plugging point — Linear cooling bath method*

EN 16715, *Liquid petroleum products — Determination of ignition delay and derived cetane number (DCN) of middle distillate fuels — Ignition delay and combustion delay determination using a constant volume combustion chamber with direct fuel injection*

EN 17155, *Liquid petroleum products — Determination of indicated cetane number (ICN) of middle distillate fuels — Primary reference fuels calibration method using a constant volume combustion chamber*

ASTM D240, *Standard Test Method for Heat of combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter*

ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

ASTM D2622, *Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry*

ASTM D4294, *Standard Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry*

ASTM D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*

ASTM D6890, *Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber*

ASTM D7371, *Standard Test Method for Determination of Biodiesel (Fatty Acid Methyl Esters) Content in Diesel Fuel Oil Using Mid Infrared Spectroscopy (FTIR-ATR-PLS Method)*

ASTM D7668, *Standard Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils— Ignition Delay and Combustion Delay Using a Constant Volume Combustion Chamber Method*

ASTM D7963, *Standard Test Method for Determination of Contamination Level of Fatty Acid Methyl Esters in Middle Distillate and Residual Fuels Using Flow Analysis by Fourier-Transform Infrared Spectroscopy-Rapid Screening Method*

ASTM D8183, *Standard Test Method for Determination of Indicated Cetane Number (ICN) of Diesel Fuel Oils using a Constant Volume Combustion Chamber—Reference Fuels Calibration Method*

IP 470, *Determination of aluminium, silicon, vanadium, nickel, iron, calcium, zinc and sodium in residual fuel oil by ashing, fusion and atomic absorption spectrometry*

IP 500, *Determination of the phosphorus content of residual fuels by ultra-violet spectrometry*

IP 501, *Determination of aluminium, silicon, vanadium, nickel, iron, sodium, calcium, zinc and phosphorus in residual fuel oil by ashing, fusion and inductively coupled plasma emission spectrometry*

IP 570, *Determination of hydrogen sulfide in fuel oils — Rapid liquid phase extraction method*

IP 631, *Determination of the contamination level of fatty acid methyl esters in middle distillate and residual fuels using Flow Analysis by Fourier Transform Infrared Spectroscopy — Rapid Screening Method*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **ultra low sulfur fuel oil**

##### **ULSFO**

marine fuel with a maximum sulfur content of 0,10 % by mass