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Automotive fuels — Diesel — Requirements and test methods

National foreword

This British Standard is the UK implementation of EN 590:2022. It supersedes BS EN 590:2013+A1:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/2, Liquid Fuels.

This standard is also applicable to diesel fuel used in non-road mobile machinery and stationary internal combustion engines used in agricultural, forestry, domestic and industrial applications.

The UK committee draws users' attention to normative National Annexes NA, NB, NC, and ND, appended at the back of this document, which provide further guidance to assist users in the application of this standard.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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This European Standard was approved by CEN on 6 January 2022.

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European foreword

This document (EN 590:2022) has been prepared by Technical Committee CEN/TC 19 Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 590:2018+A1:2017.

This document has originally been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association [6].

Requirements following amendment 2003/17/EC [2], 2009/30/EC [3], 2011/63/EU [4] and 2014/77/EU [5] to the European Fuels Quality Directive 98/70/EC [1], are taken into account. Dates are included with all normative test method references for properties required by Annex II of the Fuels Quality Directive in order to comply with the requirements of the European Commission; with the accompanying assurance by CEN/TC 19 that any referenced updated versions will always give similar accuracy and the same or better precision (see [4]).

The marking at the pump of this product is in line with the requirements of the Fuels Quality Directive and the Alternative Fuels Infrastructure Directive [7].

Further significant technical changes between this document and the previous edition are:

- Inclusion of the amended EN 14214 FAME specification.
- Update to the normative references towards undated versions where they don't concern requirements originating from European Directives (in line with decisions by CEN/TC 19 in coordination with the European Commission), and updating the effective publication dates where required.
- Introduction of the new section "Terms and Definitions".
- Correct use of the decimal point in limits has been implemented to align with test method reporting requirements (Rancimat by EN 15751) and the European Fuels Directive 98/70/EC [1], including subsequent Amendments [2], [3], [4] and [5] (distillation 95 % (V/V) recovered).
- Deletion of the Fuel Ignition Tester (EN 16144) as an alternative test method for cetane number determination due to its absence of use in the market. Whereas the BASF engine (EN 16906) and the ICN technique (EN 17155) have now been included as alternative methods for cetane number determination.
- Addition of micro-distillation (EN 17306) as an alternative test method to distillation by EN ISO 3405 and EN ISO 3924.
- Addition of automated method (EN ISO 22995) as an alternative test method to cloud point by EN ISO 3015.

- Addition of the Stabinger viscometer (ISO 23581) as an alternative test method to viscosity by EN ISO 3104.
- Addition of oxidation stability by rapid small scale oxidation method (EN 16091) as an alternative test method to oxidation stability by EN 15751 for diesel fuel containing FAME above 2,0 % (m/m).
- Deletion of Annex A and changes to 6.5.1 in relation to test method precision data for diesel fuel containing FAME.
- Update to the 'workmanship clause' in 6.5.3 to address the issue of abrasive wear of fuel injection equipment by hard particles in diesel fuel.
- Introduction of further clarification around the viscosity requirement in Table 1.
- Reduction of the minimum density limit for Grades D, E and F, moving the property from Table 1 to Table 2.
- Clarification of the dispute requirement concerning sulfur content in 6.7.3.
- Deletion of the allowance for cetane alternative methods in 6.7.4.
- Addition of 6.7.10 to address situations in which the test method includes a bias-correction to the dispute method.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies requirements and test methods for marketed and delivered automotive diesel fuel. It is applicable to automotive diesel fuel for use in diesel engine vehicles designed for use on automotive diesel fuel containing up to 7,0 % (V/V) Fatty Acid Methyl Ester (FAME).

NOTE For the purposes of this document, the terms “% (m/m)” and “% (V/V)” are used to represent respectively the mass fraction and the volume fraction.

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.

EN 116, *Diesel and domestic heating fuels - Determination of cold filter plugging point - Stepwise cooling bath method*

EN 12662, *Liquid petroleum products - Determination of total contamination in middle distillates, diesel fuels and fatty acid methyl esters*

EN 12916:2019, *Petroleum products - Determination of aromatic hydrocarbon types in middle distillates - High performance liquid chromatography method with refractive index detection*

EN 14078:2014, *Liquid petroleum products - Determination of fatty acid methyl ester (FAME) content in middle distillates - Infrared spectrometry method*

EN 14214:2012+A2:2019, *Liquid petroleum products - Fatty acid methyl esters (FAME) for use in diesel engines and heating applications - Requirements and test methods*

EN 15195:2014, *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 16091, *Liquid petroleum products - Middle distillates and fatty acid methyl ester (FAME) fuels and blends - Determination of oxidation stability by rapid small scale oxidation method*

EN 16329, *Diesel and domestic heating fuels - Determination of cold filter plugging point - Linear cooling bath method*

EN 16576:2014, *Automotive fuels - Determination of manganese and iron content in diesel - Inductively coupled plasma optical emission spectrometry (ICP OES) method*

EN 16715:2015, *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 16906:2017, *Liquid petroleum products - Determination of the ignition quality of diesel fuels - BASF engine method*

EN 16942, *Fuels - Identification of vehicle compatibility - Graphical expression for consumer information*

EN 17155:2018, *Liquid petroleum products - Determination of indicated cetane number (ICN) of middle distillate fuels - Primary reference fuels calibration method using a constant volume combustion chamber*

EN 17306:2019, *Liquid petroleum products - Determination of distillation characteristics at atmospheric pressure - Micro-distillation*

EN ISO 2160, *Petroleum products - Corrosiveness to copper - Copper strip test (ISO 2160)*

EN ISO 2719, *Determination of flash point - Pensky-Martens closed cup method (ISO 2719)*

EN ISO 3015, *Petroleum and related products from natural or synthetic sources - Determination of cloud point (ISO 3015)*

EN ISO 3104, *Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity (ISO 3104)*

EN ISO 3170, *Petroleum liquids - Manual sampling (ISO 3170)*

EN ISO 3171, *Petroleum liquids - Automatic pipeline sampling (ISO 3171)*

EN ISO 3405:2019, *Petroleum and related products from natural or synthetic sources - Determination of distillation characteristics at atmospheric pressure (ISO 3405:2019)*

EN ISO 3675:1998, *Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method (ISO 3675:1998)*

EN ISO 3924:2019, *Petroleum products - Determination of boiling range distribution - Gas chromatography method (ISO 3924:2019)*

EN 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 4259-2)*

EN ISO 4264, *Petroleum products - Calculation of cetane index of middle-distillate fuels by the four variable equation (ISO 4264)*

EN ISO 5165:2020, *Petroleum products - Determination of the ignition quality of diesel fuels - Cetane engine method (ISO 5165:2020)*

EN ISO 6245, *Petroleum products - Determination of ash (ISO 6245)*

EN ISO 10370, *Petroleum products - Determination of carbon residue - Micro method (ISO 10370)*

EN ISO 12156-1, *Diesel fuel - Assessment of lubricity using the high-frequency reciprocating rig (HFRR) - Part 1: Test method (ISO 12156-1)*

EN ISO 12185:1996, *Crude petroleum and petroleum products - Determination of density - Oscillating U-tube method (ISO 12185:1996)*

EN ISO 12205, *Petroleum products - Determination of the oxidation stability of middle-distillate fuels (ISO 12205)*

EN ISO 12937, *Petroleum products - Determination of water - Coulometric Karl Fischer titration method (ISO 12937)*

EN ISO 13032:2012, *Petroleum products - Determination of low concentration of sulfur in automotive fuels - Energy-dispersive X-ray fluorescence spectrometric method (ISO 13032:2012)*

EN ISO 13759, *Petroleum products - Determination of alkyl nitrate in diesel fuels - Spectrometric method (ISO 13759)*

EN ISO 20846:2019, *Petroleum products - Determination of sulfur content of automotive fuels - Ultraviolet fluorescence method (ISO 20846:2019)*

EN ISO 20884:2019, *Petroleum products - Determination of sulfur content of automotive fuels - Wavelength-dispersive X-ray fluorescence spectrometry (ISO 20884:2019)*

EN ISO 22995, *Petroleum products - Determination of cloud point - Automated step-wise cooling method (ISO 22995)*

ISO 23581, *Petroleum products and related products — Determination of kinematic viscosity — Method by Stabinger type viscometer*

3 Terms and Definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological 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/>

4 Sampling

Samples shall be taken as described in EN ISO 3170 or EN ISO 3171 and/or in accordance with the requirements of national standards or regulations for the sampling of automotive diesel fuel. The national requirements shall be set out in detail or shall be referred to by reference in a National Annex to this document.

In view of the sensitivity of some of the test methods referred to in this document, particular attention shall be paid to compliance with any guidance on sampling containers which is included in the test method standard.

5 Pump marking

Information to be marked on dispensing pumps and nozzles used for delivering automotive diesel fuel, and the dimensions of the mark shall be in accordance with EN 16942.

Labelling shall be clearly visible, easily legible and displayed at any point where diesel with metallic additives is made available to consumers. The label shall contain: "Contains metallic additives" in the national language(s) and shall be laid down in the National Annex to this document.

6 Requirements and test methods

6.1 Dyes and markers

The use of dyes or markers is allowed.

6.2 Additives

6.2.1 General

In order to improve the performance quality, the use of additives is allowed. Suitable fuel additives without known harmful side-effects are recommended in the appropriate amount, to help to avoid deterioration of driveability and emissions control durability. Other technical means with equivalent effect may also be used.

NOTE Deposit forming tendency test methods suitable for routine control purposes have not yet been identified and developed.

6.2.2 Methylcyclopentadienyl manganese tricarbonyl (MMT)

When methylcyclopentadienyl manganese tricarbonyl (MMT) is used, a specific labelling is required (see also Clause 5). The presence of the MMT is limited via a manganese content limit as in Table 1.

6.3 Fatty acid methyl ester (FAME)

Diesel fuel may contain up to 7,0 % (V/V) of FAME complying with EN 14214:2012+A2:2019, in which case the climate dependent requirements set out in 5.4.2 of EN 14214:2012+A2:2019 do not apply.

NOTE 1 A suitable method for the separation and identification of FAME is given in EN 14331 [8].

Climate dependent requirements for FAME as a blending component for use in diesel fuel according to this document are set out in 5.4.3 of EN 14214:2012+A2:2019. The specific grades shall be specified on a national basis according to local climatic conditions and the FAME volume in the diesel fuel.

The finished blend of diesel fuel shall also comply with the climate dependent requirements set out in 6.6. of this document.

Cold flow additives, when used in FAME, should be specifically matched to the base diesel fuel and FAME quality to ensure correct performance consistent with the requirements set out in this document. The choice could result in incompatibility between the cold flow additives used in the FAME and the diesel fuel. The choice of cold flow additive technology should be a contractual matter between the fuel blender and the FAME supplier taking into account the climatic-dependent requirements of the finished diesel fuel.

NOTE 2 Cold flow requirements for FAME as a blend component in diesel fuel are set out in Tables 3a and 3b and the National Annex of EN 14214:2012+A2:2019, in order to control maximum content of saturated monoglycerides in the final EN 590 blend to ensure trouble-free operation. Work is on-going to identify a suitable performance test to control this aspect of low temperature performance.

In order to improve the oxidation stability of FAME, it is strongly recommended to add oxidation stability enhancing additives to FAME at the production stage and before storage, providing an oxidation stability similar to that obtained with 1 000 mg/kg of 2,6-di-tert-butyl-4-hydroxytoluene (BHT, officially designated by IUPAC as 2,6-bis(1,1-dimethylethyl)-4-methylphenol).

The similar action may be read as providing oxidation stability performance at least equal to that obtained with 1 000 mg/kg of BHT.

CAUTION — There is a potential risk of precipitate formation with oxidation stability enhancing additives at low temperatures in low aromatic arctic fuel. Caution should therefore be taken in the choice of oxidation stability enhancing additives to arctic grade FAME.

6.4 Other (bio-) components

Limits for FAME do not apply to other (non-petroleum derived) hydrocarbons, such as Hydrotreated Vegetable Oil (HVO), Gas To Liquid (GTL) or Biomass To Liquid (BTL) derived hydrocarbons, since these paraffinic diesel components are allowed in any proportions provided that the final blend complies with the requirements of this document. The co-processing of renewable¹ feedstock at refineries is also allowed provided that the final fuel meets the requirements of this document.

6.5 Generally applicable requirements and related test methods

6.5.1 When tested by the methods indicated in Table 1, automotive diesel fuel shall be in accordance with the limits specified in Table 1. The test methods listed in Table 1 have been assessed for application to automotive diesel containing FAME at the maximum level allowed by this document.

NOTE The following methods were found to have precision data for diesel fuel containing up to 5 % (V/V) FAME, similar to the published values:

- Ash content, EN ISO 6245;
- Oxidation stability, EN ISO 12205.

Precision for these test methods has not yet been assessed at 7 % (V/V) of FAME content.

6.5.2 The limiting value for the carbon residue given in Table 1 is based on product prior to addition of ignition improver, if used. If a value exceeding the limit is obtained on finished fuel in the market, EN ISO 13759 shall be used as an indicator of the presence of a nitrate-containing compound. If an ignition improver is thus proved present, the limit value for the carbon residue of the product under test cannot be applied. The use of additives does not exempt the manufacturer from meeting the requirement of maximum 0,30 % (m/m) of carbon residue prior to addition of additives.

6.5.3 Diesel fuel shall be free from any adulterant or contaminant that may render the fuel unacceptable for use in diesel engine vehicles. Attention is drawn to Annex B of CEN/TR 15367-1 [9] in relation to the issue of abrasive wear of fuel injection equipment by hard particles in diesel fuel. It includes information relating to acceptable (precautionary) particle count levels and laboratory test methods.

NOTE 1 For further information on preventing contamination by water or sediment that may occur in the supply chain, or for cross-contamination, it is advisable to check CEN/TR 15367-1 [9] or CEN/TR 15367-3 [10] respectively.

NOTE 2 CEN/TC 19 is developing a test method to quantify fine, abrasive particles in diesel.

¹ For clarification of the term “renewable” see Directive (EU) 2018/2001 [15].

Table 1 — Generally applicable requirements and test methods for automotive diesel fuel

Property	Unit	Limits		Test method ^a (See Clause 2)
		minimum	maximum	
Cetane number		51,0	-	EN ISO 5165:2020 EN 1525:2014 EN 16715:2015 EN 16906:2017 ^c EN 17155:2018
Cetane index		46,0	-	EN ISO 4264
Polycyclic aromatic hydrocarbons ^d	% (m/m)	-	8,0	EN 12916:2019
Sulfur content	mg/kg	-	10,0	EN ISO 20846:2019 ^e EN ISO 20884:2019 EN ISO 13032:2012
Manganese content ^f	mg/l	-	2,0	EN 16576:2014
Flash point	°C	Above 55,0	-	EN ISO 2719
Carbon residue ^g (on 10 % distillation residue)	% (m/m)	-	0,30	EN ISO 10370
Ash content	% (m/m)	-	0,010	EN ISO 6245
Water content	% (m/m)	-	0,020	EN ISO 12937
Total contamination	mg/kg	-	24	EN 12662
Copper strip corrosion (3 h at 50 °C)	rating	class 1		EN ISO 2160
Fatty acid methyl ester (FAME) content ^h	% (V/V)	-	7,0	EN 14078:2014
Oxidation stability ⁱ	g/m ³	-	25	EN ISO 12205
Oxidation stability for diesel fuel containing FAME above 2,0 % (V/V) ⁱ	h or min	20,0 or 60,00	- -	EN 15751 or EN 16091
Lubricity, wear scar diameter (WSD) at 60°C	µm	-	460	EN ISO 12156-1 ^j
Viscosity at 40 °C	mm ² /s	2,000	4,500	EN ISO 3104 ^k ISO 23581
Distillation ^{l, m, n} % (V/V) recovered at 250 °C % (V/V) recovered at 350 °C 95 % (V/V) recovered at	% (V/V) % (V/V) °C	85	< 65 360,0	EN ISO 3405:2019 ⁿ EN ISO 3924:2019 EN 17306:2019 ^c
NOTE Requirements in bold refer to the European Fuels Directive 98/70/EC [1], including subsequent Amendments [2], [3], [4] and [5].				
^a See also 6.7.1.				
^b See also 6.7.4.				
^c See also 6.7.10.				
^d For the purposes of this document, polycyclic aromatic hydrocarbons are defined as the total aromatic hydrocarbon content less the mono-aromatic hydrocarbon content, both as determined by EN 12916:2019.				
^e See also 6.7.3.				
^f See also 6.2.2.				
^g See also 6.5.2.				

Property	Unit	Limits		Test method ^a (See Clause 2)
		minimum	maximum	
^h FAME shall meet the requirements of EN 14214:2014+A2:2019, see [3].				
ⁱ The oxidation stability requirement using EN ISO 12205 applies to all diesel fuels regardless of FAME content. For diesel fuel containing FAME above 2,0 % (V/V), there is an additional requirement to test oxidation stability using either EN 15751 or EN 16091. See also 6.7.9.				
^j The lubricity of a diesel fuel, regardless of its FAME content, shall meet the HFRR limit of 460 µm maximum. Diesel fuel with a FAME content exceeding 4,0 % (V/V) generally has good lubricity with HFRR below 460 µm and does not necessarily require a HFRR test as long as no adverse experience is known.				
^k See also 6.7.8.				
^l For the calculation of the cetane index the 10 %, 50 % and 90 % (V/V) recovery points are also needed.				
^m The limits for distillation at 250 °C and 350 °C are included for diesel fuel in line with EU Common Customs tariff.				
ⁿ EN ISO 3924:2019 gives instructions to convert to ISO 3405-equivalent data. See also 6.7.5.				

6.6 Climate dependent requirements and related test methods

6.6.1 For climate-dependent requirements, options are given to allow for seasonal grades to be set nationally. The options are for temperate climates six grades and for arctic or severe winter climates five different classes. Climate-dependent requirements are given in Table 2 (temperate climates) and Table 3 (arctic or severe winter climates). When tested by the methods given in Table 2 and Table 3, automotive diesel fuel shall be in accordance with the limits specified in these tables.

NOTE Attention is drawn to CEN/TR 16884 [11] on cold operability testing and fuel performance correlation. In addition, CEN has developed another technical report on cold filterability issues [12] that have been reported in some geographical areas at low temperatures above the cloud point of the fuel. Work to improve understanding of these issues and develop technical solutions is on-going within CEN and some national standardization bodies.

6.6.2 In a National Annex to this document, each country shall detail requirements for a summer and a winter grade and may include (an) intermediate and/or regional grade(s) which shall be justified by national meteorological data.

Table 2 — Climate-related requirements and test methods — Temperate climates

Property	Unit	Limits						Test method ^a (See Clause 2)
		Grade A	Grade B	Grade C	Grade D	Grade E	Grade F	
CFPP	°C, max.	+5	0	-5	-10	-15	-20	EN 116 ^b EN 16329 ^c
Density at 15 °C	kg/m ³ , min	820,0	820,0	820,0	815,0	815,0	815,0	EN ISO 3675:1998 EN ISO 12185:1996 ^d
	kg/m ³ , max	845,0	845,0	845,0	845,0	845,0	845,0	EN ISO 3675:1998 EN ISO 12185:1996 ^d
^a See also 6.7.1.								
^b See also 6.7.6.								
^c See also 6.7.10.								
^d See also 6.7.2.								

Table 3 — Climate-related requirements and test methods — Arctic or severe winter climates

Property	Units	Limits					Test method ^a (See Clause 2)
		class 0	class 1	class 2	class 3	class 4	
CFPP	°C, max.	-20	-26	-32	-38	-44	EN ISO 3015 EN 16329 ^c
Cloud point	°C, max.	-10	-16	-22	-28	-34	EN ISO 3015 ^d EN ISO 22995
Density at 15 °C	kg/m ³ , min. kg/m ³ , max.	800,0 845,0	800,0 845,0	800,0 840,0	800,0 840,0	800,0 840,0	EN ISO 3675:1998 EN ISO 12185:1996 ^e
Viscosity at 40 °C	mm ² /s, min. mm ² /s, max.	1,500 4,000	1,500 4,000	1,500 4,000	1,400 4,000	1,200 4,000	EN ISO 3104 ^f ISO 23581
Cetane number EU ^g	minimum	51,0	51,0	51,0	51,0	51,0	EN ISO 5165:2020 ^h EN 15195:2014 EN 16715:2015 EN 16906:2017 ^c EN 17155:2018
Cetane number ⁱ	minimum	49,0	49,0	48,0	47,0	47,0	EN ISO 5165:2020 ^h EN 15195:2014 EN 16715:2015 EN 16906:2017 ^c EN 17155:2018
Cetane index	minimum	46,0	46,0	46,0	43,0	43,0	EN ISO 4264
Distillation ^{j, k}							EN ISO 3405:2019 ^l
recovered at 180 °C	% (V/V), max.	10,0	10,0	10,0	10,0	10,0	EN ISO 3924:2019
recovered at 340 °C	% (V/V), min.	95,0	95,0	95,0	95,0	95,0	EN 17306:2019 ^c
^a See also 6.7.1. ^b See also 6.7.6. ^c See also 6.7.10. ^d See also 6.7.7. ^e See also 6.7.2. ^f See also 6.7.8. ^g In countries where the European Fuels Directive 98/70 EC [1] including amendments 2003/17/EC [2], 2009/30/EC [3], 2011/63/EU [4] and 2014/77/EU [5] applies. ^h See also 6.7.4. ⁱ In countries where the European Fuels Directive 98/70 EC [1] including amendments 2003/17/EC [2], 2009/30/EC [3], 2011/63/EU [4] and 2014/77/EU [5] does not apply. ^j EU Common Customs Tariff definition of gas oil may not apply to the grades defined for use in arctic or severe winter climates. ^k For the calculation of the cetane index the 10 % (V/V), 50 % (V/V) and 90 % (V/V) recovery points are also needed. ^l See also 6.7.5.							

6.7 Precision and dispute

6.7.1 All test methods referred to in this document include a precision statement. In cases of dispute, the procedures for resolving the dispute and interpretation of the results based on test method precision, described in EN ISO 4259-2, shall be used.

6.7.2 In cases of dispute concerning density, EN ISO 12185 shall be used.

6.7.3 In cases of dispute concerning sulfur content, either EN ISO 20846 or EN ISO 20884 shall be used. All parties shall agree to use the same test method when settling the dispute.

NOTE For further reading see ASTM D6617 [13] and ISO 4259-5 [14].

6.7.4 In cases of dispute concerning cetane number, EN ISO 5165:2015 shall be used.

6.7.5 In cases of dispute concerning distillation, EN ISO 3405:2019 shall be used.

6.7.6 In cases of dispute concerning CFPP, EN 116 shall be used.

6.7.7 In cases of dispute concerning cloud point, EN ISO 3015 shall be used.

6.7.8 In cases of dispute concerning viscosity, EN ISO 3104 shall be used.

6.7.9 In cases of dispute concerning oxidation stability for fuels containing FAME above 2,0 % (V/V), EN 15751 shall be used.

6.7.10 In cases where the test method includes a bias-correction to the dispute method, the bias-corrected result shall be used to determine compliance to the limit.

Bibliography

- [1] Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC
- [2] Directive 2003/17/EC of the European Parliament and of the Council of 3 March 2003 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC
- [3] Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC
- [4] Directive 2011/63/EU of 1 June 2011 amending, for the purpose of its adaptation to technical progress, Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels
- [5] Commission Directive 2014/77/EU of 10 June 2014 amending Annexes I and II of Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels
- [6] Mandate M/394 - *Mandate to CEN on the revision of EN 590 to increase the concentration of FAME and FAEE to 10% v/v*, 13 November 2006
- [7] Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure
- [8] EN 14331, *Liquid petroleum products - Separation and characterisation of fatty acid methyl esters (FAME) from middle distillates - Liquid chromatography (LC)/gas chromatography (GC) method*
- [9] CEN/TR 15367-1, *Petroleum products - Guidelines for good housekeeping - Part 1: Automotive diesel fuels*
- [10] CEN/TR 15367-3, *Petroleum products - Guide for good housekeeping - Part 3: Prevention of cross contamination*
- [11] CEN/TR 16884, *Automotive fuels - Diesel fuel - Cold operability testing and fuel performance correlation*
- [12] CEN/TR 16982, *Diesel blends and fuels - Cold filterability issues*
- [13] ASTM D6617, *Standard Practice for Laboratory Bias Detection Using Single Test Result from Standard Material*
- [14] EN ISO 4259-5², *Petroleum and related products - Precision of measurement methods and results - Part 5: Relative bias assessment between different methods that claim to measure the same property of a material (ISO 4259-5)*
- [15] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources

² Under preparation. Stage at the time of publication: prEN ISO 4259-5.

National Annex NA (normative)

Sampling requirements

NA.1 Introduction

This National Annex gives the sampling requirements to comply with Clause 3 of this standard.

NA.2 Normative references

The following referenced documents are indispensable for the application of this National Annex. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN ISO 3170, *Petroleum liquids — Manual sampling* (dual numbered as BS 2000-475).

BS EN ISO 3171, *Petroleum liquids — Automatic pipeline sampling* (dual numbered as BS 2000-476).

BS EN 14275, *Automotive fuels — Assessment of petrol and diesel fuel quality — Sampling from retail site pumps and commercial site fuel dispensers* (dual numbered as BS 2000-509).

NA.3 Sampling

NA.3.1 Sampling from storage tanks

All sampling from storage tanks shall be carried out in accordance with the relevant procedures given in BS EN ISO 3170/BS 2000-475.

NA.3.2 Sampling from pipelines

All sampling from pipelines shall be carried out in accordance with the relevant procedures given in either BS EN ISO 3170/BS 2000-47 or BS EN ISO 3171/BS 2000-476.

NA.3.3 Sampling from retail site pumps and commercial site fuel dispensers

All sampling from retail site pumps and commercial site fuel dispensers shall be carried out in accordance with the relevant procedures given in BS EN 14275/BS 2000-509.

NA.3.4 Labelling and transport

Full and legible information relating to the source of the sample shall be attached to the can in such a manner that it shall not easily become detached subsequently.

NOTE 1 If required, the sample may be sealed and labelled to maintain its legal integrity.

NOTE 2 Attention is drawn to:

- the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) as amended, particularly with regard to the provisions for “Limited Quantities”;
- the Carriage of Dangerous Goods (Classification, Packaging and Use of Transportable Pressure Receptacles) Regulations, 2004 (as amended);
- the Carriage of Dangerous Goods by Road Regulations 1996 (as amended), with reference to the labelling and transport of samples.

National Annex NB
(normative)

Pump marking requirements

To conform with the requirements of clause 4 and 5.2.2, dispensing pumps and nozzles shall be labelled in accordance with BS EN 16942.

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National Annex NC (normative)

Climate-dependent requirements

NC.1 Introduction

This National Annex gives the climate-dependent requirements to comply with Clause 5.6 of this standard.

NC.2 Requirements

For the purposes of this British Standard, the following grades shall apply:

	Summer	Winter
For delivery from refineries and imports into the United Kingdom	16 March to 15 October inclusive CFPP Grade C	16 October to 15 March inclusive CFPP Grade E Maximum Cloud Point -5°C (EN 23015)
For delivery from terminals (including refinery-based terminals)	16 March to 31 October inclusive CFPP Grade C	01 November to 15 March inclusive CFPP Grade E Maximum Cloud Point -5°C (EN 23015)
For sales from the retail pump	16 March to 15 November inclusive CFPP Grade C	16 November to 15 March inclusive CFPP Grade E Maximum Cloud Point -5°C (EN 23015)

NOTE 1 The date for the change from summer grade to winter grade will be reviewed in the light of experience.

NOTE 2 At the seasonal change-over points, product should not be deemed to be out of compliance with BS EN 590:2022, providing it:

- i) complies with the previous season's quality, and
- ii) is stored in a filling station tank to which fewer than three deliveries have been made since four weeks prior to the relevant sales date in BS EN 590:2022.

NOTE 3 A 'refinery-based terminal' is a facility located within a refinery boundary which is used to load fuel onto road tanker vehicles for delivery to retail service stations and other end-consumers.

NC.3 Filter Blocking Tendency (FBT, CFBT & SMG)

For the purposes of this British Standard, the following requirements will apply:

Property	Unit	Limits		Test Method
		Minimum	Maximum	
Ambient Filter Blocking Tendency (see Note 2)	a	-	2.52	IP 387, Procedure B
Cold Filter Blocking Tendency (see Note 3)	a			Report IP 618, conducted at -1°C (see Note 3)
Saturated Monoglyceride - winter grade (see Notes 5, 6 & 7)	mg/l		40	BS EN 14214:2012+A2:2019 Annex C (see Notes 5 and 6)
Saturated Monoglyceride - summer grade (see Notes 5, 6 & 7)	mg/l		90	BS EN 14214:2012+A2:2019 Annex C (see Notes 5 and 6)

a The filter blocking tendency value is a dimensionless number.

NOTE 1 All limits in NC.3 will be reviewed annually by PTI/2 or once sufficient technical evidence is available from CEN and/or from work carried out in PTI Task forces, whichever is sooner.

NOTE 2 The Ambient Filter Blocking Tendency requirement (IP 387) will apply during the Winter Period (as per BS EN 590 Annex NC Climate Dependant "Sales from the retail pump" requirements).

NOTE 3 The Cold Filter Blocking Tendency requirement (IP 618) will apply during the Winter Period (as per BS EN 590 Annex NC Climate Dependant "Sales from the retail pump" requirements).

NOTE 4 Samples which are not subject to specific pre-treatment and which can have cooled to 5°C or lower during sampling or transport should be warmed to 40°C to 45°C for 1 hour to delete the thermal history. The sample should be allowed to cool naturally to between 20°C and 25°C and maintained at that temperature prior to testing.

NOTE 5 The Saturated Monoglyceride content in FAME (B100) is estimated from the cloud point (CP) of FAME and the monoglyceride content of FAME as described in Annex C of BS EN 14214:2012+A2:2019 (the 'Calculated' method).

The Saturated Monoglyceride (SMG) content in the final diesel fuel blend is calculated as Note 5.

NOTE 6 The Saturated Monoglyceride (SMG) content in the final diesel fuel blend is calculated from the volume of FAME (B100) blended into the final diesel product, with the FAME (B100) SMG content calculated as described in Annex C of BS EN 14214:2012+A2:2019 (the 'Calculated' method).

Example:

FAME saturated monoglyceride content, SMG = 649 mg/kg

FAME measured density = 880 kg/m³

FAME SMG content = (649 x 880)/1000 = 571 mg/l

A diesel blend which contains 7 % volume FAME in the final fuel would result in a SMG content SMG = (571 x 7)/100 = 40 mg/l.

NOTE 7 The Saturated Monoglyceride requirements for blends of BS EN 590 during the Winter Period (as per BS EN 590 Annex NC Climate Dependant "Sales from the retail pump" requirements) will apply between 16 November and 15 March (inclusive).

NOTE 8 Attention is drawn to clauses 1 and 3 of this standard, which also apply to this national annex regarding its application and sampling.

National Annex ND (normative)

Abrasive particles

ND.1 Introduction

Investigation by the Abrasive Particles Task Force convened by CEN/TC 19/WG 24 has revealed internal damage to fuel injector moving parts. The damage is believed to be correlated with hard particles in diesel fuel causing erosion/abrasion of moving components. Soft particles, such as those typically found in FAME, do not appear to cause erosive/abrasive wear.

The total contamination test BS EN 12662 in BS EN 590, *Automotive fuels — Diesel — Requirements and test methods*, does not appear to provide protection against this particle erosion/abrasion issue.

Because of the time required to develop a method that is fit for purpose (ongoing work by CEN) and the need for swift action in the UK, National Annex ND has been added to this British Standard.

ND.2 Requirements

For the purposes of this British Standard, the following requirements will apply:

Property	Unit	Limits		Test Method
		Minimum	Maximum	
Particle Size $\geq 4 \mu\text{m(c)}$	Counts /ml		10,000	IP 630 Procedure A or B (See Note 2)

This limit applies at the point of BS EN 590 certification of the fuel.

NOTE 1 All limits in ND.2 will be reviewed annually by PTI/2 or once sufficient technical evidence is available from CEN and/or from work carried out in PTI Task forces, whichever is sooner.

NOTE 2 The maximum allowable particle content of 10,000 counts/ml was defined using ASTM D7619-17. IP 630 specifies particle counting be performed according to ASTM D7619-17, IP 577 or IP 565, which are technically equivalent. Each method may be used and the test portion prepared by either procedure A or procedure B (but not procedure C) of IP 630 to demonstrate compliance with this requirement. Procedure B of IP 630 uses a co-solvent to eliminate non-damaging soft particles that could be present in diesel fuel, such as from FAME blending. IP 630 requires that the test portion preparation procedure used (A or B) is reported with the test result.

NOTE 3 Attention is drawn to PD CEN/TR 15367-1:2020 regarding appropriate housekeeping measures to minimize abrasive particle contamination.

NOTE 4 Attention is drawn to clauses 1 and 3 of this standard, which also apply to this national annex regarding its application and sampling.

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