INTERNATIONAL STANDARD

ISO 9162

Second edition
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Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications

Produits pétroliers — Combustibles (classe F) — Gaz de pétrole liquéfiés — Spécifications

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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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents.

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

The committee responsible for this document is ISO/TC 28, *Petroleum products and lubricants,* Subcommittee SC 4, *Classifications and specifications,* WG 5, *Gas turbine fuels.*

This second edition cancels and replaces the first edition (ISO 9162:1989), of which it constitutes a minor revision with the following changes:

— ISO 4260 (Wickbold sulphur determination method) has been replaced by ASTM D6667 (method for determination of total volatile sulphur);

— new methods for evaporation residue in liquefied petroleum gas (LPG) have been added: EN 15470, EN 15471, and EN 16423.

Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications

HEALTH AND SAFETY — WARNING — The use of this International Standard involves potentially hazardous materials, operations, and equipment. This International Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to consult the relevant safety and health regulations, determine the applicability of regulatory limitations, and establish appropriate safety and health practices prior to use.

1 Scope

This International Standard specifies required characteristics and additional information to be supplied to the purchaser by the vendor of those products commonly referred to as liquefied petroleum gases (see ISO 8216-3) and is intended to apply to international transfers of commercial propane and commercial butane. This International Standard is neither intended nor expected to replace or encroach upon national standards of any country, since each country is subject to different regulations, codes, industry practices and market utilization.

NOTE National standards and safety codes might be applicable when formulating any characteristics required for specific uses.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3993, *Liquefied petroleum gas and light hydrocarbons — Determination of density or relative density — Pressure hydrometer method*

ISO 4256, *Liquefied petroleum gases — Determination of gauge vapour pressure — LPG method*

ISO 4257, *Liquefied petroleum gases — Method of sampling*

ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test*

ISO 6251, *Liquefied petroleum gases — Corrosiveness to copper — Copper strip test*

ISO 7941, *Commercial propane and butane — Analysis by gas chromatography*

ISO 8216-3, *Petroleum products — Fuels (class F) — Classification — Part 3: Family L (Liquefied petroleum gases)*

ISO 8819, *Liquefied petroleum gases — Detection of hydrogen sulfide — Lead acetate method*

ISO 8973, *Liquefied petroleum gases — Calculation method for density and vapour pressure*

EN 15470, *Liquefied petroleum gases — Determination of dissolved residues — High temperature gas chromatographic method*

EN 15471, *Liquefied petroleum gases — Determination of dissolved residues — High temperature gravimetric method*

EN 16423, *Liquefied petroleum gases — Determination of dissolved residue — Gas chromatographic method using liquid, on-column injection*

ASTM D6667-04, *Standard test method for determination of total volatile sulphur in gaseous hydrocarbons and liquefied petroleum gases by ultraviolet fluorescence*

3 Requirements

3.1 General

When determined in accordance with the methods given in Table 1, the properties of commercial butane and commercial propane shall be in accordance with the limiting requirements given in that table.

NOTE Individual contractual agreements, national standards, national safety codes, and/or requirements of distribution systems may prescribe other limits.

Table 1 — Specifications for liquefied petroleum gases

Character	Unit	Limit	Commercial propane ISO-F-LP	Commercial butane ISO-F-LB	Test method reference
Density at 15 °C	kg/m^3		Report	Report	ISO 3993 or ISO 8973
Gauge vapour pressure at 40 °C	kPa	max	1550[a]	520[a]	ISO 4256[b] or ISO 8973
Volatility					ISO 7941
C_2 hydrocarbons	% (molar)		Report[c]	-	
C_4 hydrocarbons	% (molar)	max	7,5[a]	-	
C_5 hydrocarbons	% (molar)	max	0,2[e]	2,5[e]	
Unsaturated hydrocarbons	% (molar)		Report[d]	Report[d]	ISO 7941
Dienes	% (molar)	max	0,5[e]	0,5[e]	ISO 7941
Evaporation residue	mg/kg	max	60	60	EN 15470[g] or EN 15471[g] or EN 16423
Corrosiveness to copper		max	1	1	ISO 6251
Sulphur	mg/kg	max	50[e]	50[e]	ASTM D6667
Hydrogen sulphide			Pass	Pass	ISO 8819
Free water content			None[f]	None[f]	

[a] Certain national standards and/or regulations may describe other limits.

[b] In case of dispute about the vapour pressure, ISO 4256 shall prevail.

[c] Physical limitations of transport and storage facilities shall be considered for refrigerated transport; a common limit is 2 % (molar) maximum.

[d] Certain national standards may prescribe a limitation on saturated hydrocarbons.

[e] Certain national standards may prescribe other limits.

[f] The presence of water shall be determined by visual inspection. For shipments of refrigerated liquefied petroleum gases at their atmospheric boiling point, it is essential that the water content is below the saturation level at this temperature as determined by a method agreed between the buyer and the seller.

[g] In case of dispute about the evaporation residue, EN 15470 and EN 15471 shall prevail.

3.2 Water content

Commercial butane and commercial propane shall not contain free or suspended water detectable by visual inspection.

4 Precision and interpretation of test results

Most of the methods of test given in Table 1 contain a statement of the precision, i.e. the repeatability and reproducibility, to be expected from them but, in cases of dispute, the procedure described in ISO 4259, which uses precision data in the interpretation of test results, shall be used.

5 Documentation

The documentation supplied to the purchaser by the vendor shall include at least the following:

a) a reference to this International Standard;

b) the type of liquefied petroleum gas supplied, i.e. commercial propane or commercial butane;

c) the brand name of the product;

d) the ISO designation code, i.e. ISO-F-LP or ISO-F-LB (see ISO 8216-3);

e) the supplier's production code and the date of production;

f) precautionary and safety advice.

If a transportable container is supplied with the liquefied petroleum gas, it shall also be clearly marked with this information.

6 Sampling

A representative sample of non-refrigerated commercial butane or commercial propane shall be taken in accordance with the procedure given in ISO 4257.

For refrigerated liquefied petroleum gases, a sampling procedure shall be agreed between the parties concerned.

NOTE Proper sampling of the liquefied petroleum gases is extremely important if the test results are to be significant.

Annex A
(informative)

Evaporation residue of liquefied petroleum gases

Liquefied petroleum gases may contain trace amounts of non-volatile residues. These contaminants can include a variety of hydrocarbons derived from the distillation process, compressor lubricating oils, valve greases, and rubber and elastomer extenders from hoses.

In the majority of applications, the liquid is evaporated and the fuel is fed to the appliance in the gaseous phase.

In those cases where the natural evaporation capacity of the storage tank is not sufficient to provide the required quantity of gas, vaporizers are widely used. In this case, excessive non-volatile residues can be very detrimental.

A distinction can be made between industrial and automotive vaporizers and a variety of energy sources may be applied.

Automotive vaporizers use, in the majority of installations, the engine coolant as a heat source. With the engine fully warmed up, the coolant will have a temperature of about 80 °C to 100 °C. Taking this temperature into account as well as the more complicated construction of the automotive vaporizer/pressure regulator relative to the industrial installation, it can be concluded that the automotive equipment is the most sensitive with respect to the content of residual matter.