



SLOVENSKI STANDARD
SIST EN 589:2000
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Automotive fuels - LPG - Requirements and test methods

Kraftstoffe für Kraftfahrzeuge - Flüssiggas - Mindestanforderungen und Prüfverfahren

Carburants pour automobiles - GPL - Exigences et méthodes d'essai

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 589

May 2000

ICS 75.160.30

Supersedes EN 589:1998

English version

Automotive fuels - LPG - Requirements and test methods

Carburant pour automobiles - GPL - Exigences et
méthodes d'essai

Kraftstoffe für Kraftfahrzeuge - Flüssiggas - Anforderungen
und Prüfverfahren

This European Standard was approved by CEN on 17 April 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 19 "Petroleum products, lubricants and related products", the secretariat of which is held by NNI.

This European Standard replaces EN 589:1998.

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of an identical text or by endorsement, at the latest by November 2000, and conflicting national standards shall be withdrawn at the latest by November 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

In this third edition of EN 589 all relevant characteristics, requirements and test methods are specified. Significant technical changes between this European Standard and the previous edition are on:

- determination of water
- requirement of sulfur content
- test method for sulfur
- test method for vapour pressure, including Annex C
- requirement for methanol
- requirement for vapour pressure

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In this standard annex A, B and C are normative, annex D is informative.

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1 Scope

This European Standard specifies requirements and test methods for marketed and delivered automotive LPG (Liquefied Petroleum Gas). It is applicable to automotive LPG for use in LPG engine vehicles designed to run on automotive LPG.

NOTE For the purposes of this European Standard, the term “% (V/V)” is used to represent the volume fraction.

WARNING Attention is drawn to the risk of fire and explosion when handling LPG and to the hazard to health which arises through inhalation of excessive amounts of LPG.

LPG is a highly volatile hydrocarbon liquid which is normally stored under pressure. If the pressure is released large volumes of gas will be produced which form flammable mixtures with air over the range of approximately 2 % (V/V) to 10 % (V/V). This European Standard involves the sampling, handling and testing of LPG. All procedures should be conducted away from sources of ignition such as naked flames, unprotected electrical equipment and electrostatic hazards. Testing should be performed as far as practicable under an electrically-safe ventilation hood.

LPG in the liquid form can cause cold burns to the skin. Protective clothing such as gloves and goggles should be worn if contact with the skin is likely to occur.

Unnecessary inhalation of LPG vapour should be avoided. The operator should not be exposed to atmospheres containing more than 1 800 mg/m³ over an 8 h time-weighted average (TWA) reference period, or more than 2 250 mg/m³ over a short term, 10 min reference period. One of the tests described in this European Standard involves the operator inhaling a mixture of air and LPG vapour. Particular attention is drawn to the cautionary statement provided in annex A.1, where this method is referred to.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 3993 *Liquefied petroleum gas and light hydrocarbons - Determination of density or relative density - Pressure hydrometer method* (ISO 3993:1984)

EN ISO 4256 *Liquefied petroleum gases - Determination of gauge vapour pressure - LPG method* (ISO 4256:1996)

EN ISO 4257 *Liquefied petroleum gases - Method of sampling* (ISO 4257:1988)

EN ISO 4259 *Petroleum products - Determination and application of precision data in relation to methods of test* (ISO 4259:1992/Cor 1:1993)

EN ISO 6251 *Liquefied petroleum gases - Corrosiveness to copper - Copper strip test* (ISO 6251:1996)

EN ISO 8819 *Liquefied petroleum gases - Detection of hydrogen sulfide - Lead acetate method* (ISO 8819:1993)

EN ISO 8973 *Liquefied petroleum gases - Calculation method for density and vapour pressure*

(ISO 8973:1997)

EN ISO 13757 *Liquefied petroleum gases - Determination of oily residues - High-temperature method* (ISO 13757:1996)

EN 24260 *Petroleum products and hydrocarbons - Determination of sulfur content - Wickbold combustion method* (ISO 4260:1987)

EN 27941 *Commercial propane and butane - Analysis by gas chromatography* (ISO 7941:1988)

ISO 8174 *Ethylene and propylene for industrial use - Determination of acetone, acetonitrile, propan-2-ol and methanol - Gas chromatographic method*

ASTM D 3246-96 *Standard Test Method for Sulfur in Petroleum Gas by Oxidative Microcoulometry*

3 Definition

For the purposes of this European Standard, the following definition applies.

3.1

liquefied petroleum gases

petroleum gases which can be stored and/or handled in the liquid phase under moderate conditions of pressure and at ambient temperature. These consist predominantly of propane, butanes, with small proportions of propene, butenes and pentanes/pentenenes.

4 Sampling

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Samples shall be taken as described in EN ISO 4257 and/or in accordance with the requirements of national standards or regulations for the sampling of automotive LPG. The national requirements shall be set out in detail or shall be referred to by reference in a national annex to this European Standard.

NOTE 1 It is important that the sampling procedure is followed in detail in order to avoid evaporation losses.

NOTE 2 Before sampling for the determination of the evaporation residue, 20 l of product should be pumped in order to obtain a representative sample.

5 Pump marking

Information to be marked on dispensing pumps used for delivering automotive LPG, and the dimensions of the mark shall be in accordance with the requirements of national standards or regulations for the marking of pumps for automotive LPG. Such requirements shall be set out in detail or shall be referred to by reference in a national annex to this European Standard.

6 Requirements and test methods

6.1 General

When tested by the methods of test given in table 1, automotive LPG fuel shall comply with the limiting requirements specified in that table.

For the minimum vapour pressure, four grades, A, B, C and D are given to allow for seasonal limits to be set nationally for the winter period. In a national annex to this European Standard each country shall indicate which (winter) grade(s) it adopts and shall detail the date range applicable to each grade. For the summer period no minimum vapour pressure limit is specified.

6.2 Water content

Liquefied petroleum gases for automotive purposes shall not contain free water at 0 °C and at the saturated vapour pressure on visual inspection.

NOTE 1 For propane rich mixtures with a minimum of 60 % propane, compliance with EN ISO 13758¹ equally satisfies this requirement.

NOTE 2 For this purpose the equipment as described in EN ISO 3993 may be used.

6.3 Odour

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When tested in accordance with the procedure described in annex A, the odour of the gas shall be characteristic (i.e. distinctive and unpleasant), detectable at a concentration in air of 20 % of the lower flammability limit.

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6.4 Density

If density is required, EN ISO 3993 or EN ISO 8973 are recommended.

¹ EN ISO 13758:1996, *Liquefied petroleum gases - Assessment of the dryness of propane - Valve freeze method* (ISO 13758:1996)

Table 1 - Requirements and test methods

Property	Unit	Limits		Test method ¹
		Minimum	Maximum	
Motor octane number, MON		89,0		Annex B
Total dienes content ³	mole %		0,5	EN 27941
Hydrogen sulfide		negative		EN ISO 8819
Total sulfur content ² (after stenching)	mg/kg		100	EN 24260 ASTM D 3246-96
Copper strip corrosion (1 h at 40 °C)	rating	class 1		EN ISO 6251
Evaporation residue	mg/kg		100	EN ISO 13757
Vapour pressure, gauge, at 40 °C ²	kPa		1550	EN ISO 4256 EN ISO 8973 and Annex C
Vapour pressure, gauge, min. 150 kPa at a temperature of ^{4,5} - for grade A - for grade B - for grade C - for grade D	°C		-10 -5 0 +10	EN ISO 8973 and Annex C
Water content		No free water at 0 °C		See 6.2
Methanol content ^{6,7}	mg/kg		2000	ISO 8174
Odour		Unpleasant and distinctive at 20 % LEL		See 6.3 and Annex A

¹ See also 6.5.1.
² See also 6.5.2.
³ If more than 0,1 % (*m/m*) 1,3 butadiene is present, the package shall be labelled according to the EC Labeling Directive.
⁴ For the purpose of this standard EN ISO 8973 together with Annex C shall be applied at the indicated temperatures. For internal routine quality control purposes the values as given in the informative Annex D may also be used.
⁵ See also 6.1.
⁶ For the purpose of this standard ISO 8174 shall be applied.
⁷ Other antifreeze agents shall not be added.

6.5 Precision and dispute

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

6.5.2 In cases of dispute concerning the total sulfur content, EN 24260 shall be used. In cases of dispute concerning the vapour pressure, EN ISO 4256 shall be used.

Annex A (Normative)

Test method for odour of LPG

A.1 Introduction

This annex describes a method for assessing the odour of commercial LPG which has either an odour due to the presence of unsaturated hydrocarbons or an odour imparted by the addition of odorants.

WARNING In order to minimize the exposure of personnel conducting the odour test, it is strongly recommended that the test should only be performed when it has been ascertained that LPG already meets the other specification limits detailed in table 1 of this European Standard. The test involves the operator inhaling a mixture of LPG vapour and air. There is a risk that the short-term and/or long-term (8 h TWA reference period) occupational exposure limits for substances contained in the LPG may be exceeded. The operator should consult relevant safety and health regulations and ensure that exposure during the sampling, handling and testing of LPG does not exceed the prescribed limits.

As a guide, and provided the LPG being tested complies with the quality requirements listed in table 1 of this European Standard, an operator will normally remain within recommended occupational exposure limits provided inhalation of the LPG/air mixture does not exceed three 10 s periods during each test and not more than two tests per hour are performed in the course of an 8 hour working day. This guidance only takes account of the operator's exposure whilst conducting odour tests. Other potential exposures should be assessed in order to estimate total exposure.

A.2 Principle

The gas is vaporized and diluted with purified air so that the mixture contains the gas at a concentration of 20 % of the lower limit of its flammability² in air. The odour of the gaseous mixture is assessed by at least three observers.

A.3 Material

Activated charcoal, particle size 1,18 mm to 1,70 mm, for purifying the air stream.

² The lower limits of flammability in air may be taken as:

- butane 1,9 % (V/V)
- propane 2,4 % (V/V)