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भारतीय मानक मसौदा

मोटर वाहनों हेतु द्रवित पेट्रोलियम गैस (एल पी जी) — विशिष्टि

(IS 14861 *का पहला पुनरीक्षण*)

Draft Indian Standard

LIQUEFIED PETROLEUM GASES (LPG) FOR AUTOMOTIVE PURPOSES — SPECIFICATION

(*First Revision of* IS 14861)

(ICS No. 43.020;75.160.30)

Petroleum and their Related Products of Synthetic or Biological or Natural Origin Sectional Committee, PCD 03	Last date of comment is 17 November 2025

FOREWORD

(*Formal clauses will be added later*)

This standard was first published in 2000 with the increased stress on reduction of pollution caused by vehicle emissions due to increased population of automobiles, liquefied petroleum gases (LPG) is being used as an alternate fuel abroad. The need is also being felt in India to use LPF as an alternate fuel. The Committee decided to prepare this standard to cover the requirements of LPG exclusively for automobile purpose since the existing standard, namely, IS 4576 'Liquefied petroleum gases — Specification, covers the requirements of commercial propane, commercial butane and a mixture of commercial propane and butane for domestic use.

This standard stipulates the requirements for a mixture of propane (C_3) and butane (C_4) for automotive use. In preparing this standard, the Committee took into consideration, the views of producers and suppliers of liquefied petroleum gases (LPG), fuel technologists and the consumers at large. The Committee also took cognizance of manufacturing practices followed in the country and the need for co-ordination among the standards available on the subject elsewhere.

In the preparation of this standard, considerable assistance was derived from the following standards:

ISO 9162: 2013 Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications
ASTM D1835- 20 Standard Specification for Liquefied Petroleum (LP) Gases
EN 589: 1993 Automotive fuels — LPG — Requirements and methods of test

GPA Standard 2140-2017 Liquefied Petroleum Gas Specifications and Test Methods

In this revision, test methods and odour content have been aligned with IS 4576. Amendment 1 has been incorporated.

The following alternate test methods are also available for the characteristics stated, and in case of dispute, the corresponding part of IS 1448, as given in Table 1, shall be the referee test method.

Characteristic	*Methods of Test*
Vapour Pressure Composition	ASTM D1267/D6897/ISO 4256/ ASTM D2163
Sulphur	ASTM D7994
Hydrogen Sulphide	ASTM D2420/ ISO 8819
Copper Strip Corrosion	ISO 6251

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for liquefied petroleum gases for automotive use.

1.2 This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

3.1 Liquefied Petroleum Gas (LP Gas or LPG)

The term applies to a mixture of certain light hydrocarbons derived from petroleum which are gaseous at normal ambient temperature and atmospheric pressure but may be condensed to the liquid state at normal ambient temperature by the application of moderate pressure.

4 REQUIREMENTS

The material shall comply with the requirements given in Table 1 when tested according to appropriate methods given in col (4) of Table 1.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in suitable cylinders/ containers as agreed between the purchaser and the supplier and subject to the requirements prescribed by statutory authorities. (For cylinders, *see* IS 3196 (Part 1), IS 3196 (Part 2), IS 3196 (Part 3) and IS 3196 (Part 4) and for vessels, *see* IS 2825). Relevant PESO guidelines also need to be followed.

5.2 Marking

As auto LPG is handled in pressure vessels or in cylinders, it is necessary to have the markings as per Rule 16 under SMPV (U) Rules and as per Rule 6 of the *Gas Cylinder Rules*, 1981. Every pressure vessel shall have a metal plate permanently fixed to it showing the following particulars which will be visible from the ground level, namely:

i) Manufacturer's name and identification marks;
ii) The standard or code to which the vessel is constructed;
iii) Official stamp of the Inspector;
iv) Design pressure in kg/cm^2;
v) Date of initial hydrostatic test and the subsequent test;
vi) Hydrostatic test pressure in kg/cm^2;
vii) Water capacity in litres; and
viii) Gas capacity, if filled with liquefiable gas.

Each cylinder/container shall also be marked with the caution label 'FLAMMABLE' together with the corresponding symbol for labelling dangerous goods [*see* Fig. 18 of IS 1260 (Part 1)] as per applicable guidelines of PESO.

5.2.1 *BIS Certification Marking*

The cylinder/container may also be marked with the standard mark, provided the content/ container to the relevant Indian Standard.

5.2.1.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

6 SAMPLING

6.1 Proper sampling of liquefied petroleum gases (LPG) is extremely important if tests are to be significant. Samples of LPG are examined by various test methods to determine physical and chemical characteristics. The test results are often used for custody transfer. It is therefore, essential that the samples be representative of the product to be tested. The representative samples of liquefied petroleum gas shall be drawn as prescribed in IS 1447 (Part 2).

6.2 Tests on vapour pressure shall be conducted on individual samples.

Table 1 Requirements for Liquefied Petroleum Gases for Automotive Purposes
(*Clause* 4)

Sl. No.	Characteristic	Requirement	Method of Test
(1)	(2)	(3)	(4)
i)	Vapour pressure[1)] at 40 °C, kPa, gauge,		IS 1448 (Part 71)
	Min	520[2)]	
	Max	1050	
ii)	C_5 Hydrocarbons and heavier, volume percent, *Max*	2.0	IS 1448 (Part 151)
iii)	Dienes (as 1:3 Butadiene), mole percent. *Max*	0.5	ISO 7941

iv)	Total volatile Sulphur, mg/kg (ppm) (After stanching) , *Max*	50	ASTM D6667
v)	Copper strip corrosion at 40 °C for 1 hour, *Max*	Not worse than No 1	IS 1448 (Part 152)
vi)	Hydrogen sulphide[6)]	Pass the test	IS 1448 (Part 73)
vii)	Evaporation residue, mg/kg, *Max*	100	IS 1448 (Part 150)/ ISO 13757
viii)	Free water content[7)]	Nil	Visual[3)]
ix)	Motor octane number (MON), *Min*	88	ISO 7941 plus Annex B
x)	Odour	Adequate	(*see* Notes 4 and Note 5)

NOTES

1) Vapour pressure may be determined at any other temperature and converted to 40 °C by means of suitable vapour pressure temperature graph. The same can also be determined by analysing the gas by means of a gas chromatograph and then using the composition and vapour pressure data. The vapour pressure can be calculated at 40 °C from the standard values of vapour pressures at various temperatures. Method can be used as ISO 8973/IP 432

2) In winter, the gauge vapour pressure requirement shall be minimum 700 kPa at 40 °C. Winter period shall be from 1st November to 15th February.

3) The water content shall be determined at the Refinery/first dispatching location.

4) Product shall contain adequate mercaptan at the first dispatching location to ensure the detection of leakage, by odour.

5) To detect the odour the following procedures shall be adopted:
5 ml Doctor Solution + 8 ml Iso-Octane + Pinch of Flower Sulphur in 25 ml stoppered cylinder. Shake and add 2 ml LPG (Aq). Shake slowly by releasing pressure. Odour is adequate if sulphur turns yellowish-brown.

6) Pass the test indicates hydrogen sulphide not more than 5 ppm. Hydrogen sulphide can also be determined with the following procedure: Take 5 ml of lead acetate solution (prepared in IPA) + 25 ml LPG (liquid) in measuring cylinder and shake well. If black precipitation is not seen, then H_2S test passes. GC SCD/GC PFPD/GC FPD techniques also used for H_2S determination and limit is 5.0 mg/kg max.

7) Free water content can also be determined with the following procedure: Take 100 ml of liquid in dry graduated tube and allow to vaporize the LPG. When about 2 ml to 3 ml residue is left, shake and pour the residue on wattman filter paper. Allow the residue on filter paper to evaporate; if wet spot not seen, free water is absent.

ANNEX A
(*Clause* 2)
LIST OF REFERED STANDARDS

IS No./ Others Standards	*Title*
IS 1260 (Part 1): 1973	Pictorial marking for handling and labelling of goods: Part 1 Dangerous goods (*first revision*)
IS 1447 (Part 2): 2013/ ISO 4257 : 2001	Methods of sampling of petroleum and its products: Part 2 Liquefied petroleum gases — Method of sampling (*second revision*)
IS 1448	Methods of test for petroleum and its products
(Part 71): 2004/ ISO 4256:1996	Liquefied petroleum gases — Determination of gauge vapour pressure — LPG method (*second revision*)
(Part 73): 2004/ ISO 8819:1993	Liquefied petroleum gases — Detection of hydrogen sulphide — Lead acetate method (*first revision*)

(Part 151): 2004/ ISO 7941:1988	Commercial propane and butane — Analysis by gas chromatography
(Part 152): 2004/ ISO 6251:1996	Liquefied petroleum gases — Corrosiveness to copper — Copper strip test
IS 2825: 1969	Code for unfired pressure vessels
IS 3196 (Part 1): 2013	Welded low carbon steel cylinders exceeding 5 litres water capacity for low-pressure liquefiable gases Part 1 Cylinders for liquefied petroleum gases (LPG) — Specification (sixth revision)
IS 3196 (Part 2): 2006	Welded low carbon steel cylinders exceeding 5 litres water capacity for low-pressure liquefiable gases Part 2 Cylinders for liquefiable non-toxic gases other than LPG - Specification (*first revision*)
IS 3196 (Part 3)	Welded low carbon steel cylinders exceeding 5 litres water capacity for low pressure liquefiable gases Part 3 Methods of test (*fifth revision*)
IS 3196 (Part 4)	Welded Low Carbon Steel Cylinders Exceeding 5 Litres Water Capacity for Low Pressure Liquefiable Gases Part 4 **C**ylinders for toxic and corrosive gases
ISO 8973: 1997	Liquefied petroleum gases — Calculation method for density and vapour pressure
ASTM D6667-21	Standard Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence
IP 432: 2000	Liquefied petroleum gases- calculation method for density and vapour pressure

ANNEX B

[*Table* 1, *Sl. No.* (ix)]

METHOD OF CALCULATION OF THE MOTOR OCTANE NUMBER FROM COMPOSITIONAL ANALYSIS OF LPG

B-1 INTRODUCTION

This Annex describes a method for the calculation of the motor octane number from a compositional analysis of LPG.

B-2 PRINCIPLE

The composition of a sample of LPG is obtained using gas chromatography. The motor octane number of the sample is calculated from the partial motor octane factors of the constituents and their concentrations determined from the analysis.

B-3 DETERMINATION

Determine the concentration of each constituent present at a concentration in excess of 0.1 percent mole in the gas sample, using the method described in ISO 7941.

B-4 CALCULATION AND EXPRESSION OF RESULTS

B-4.1 Calculate the partial motor octane number for each component in the mixture as follows:

$$\text{Partial octane number} = M \times C$$

where

M = motor octane factor of specific component (*see* Table 2); and
C = mole fraction of component in the mixture.

B-4.2 Add the partial motor octane numbers for all of the components determined and round the sum down to the nearest 0.1.

B-5 TEST REPORT

Report the total **(B-4.2)** as the LPG motor octane number of the sample.

Table 2 Factors for Determining the Motor Octane Number of LPG
(*Clause* B-4.1)

Sl. No.	Component	Motor Octane Number Factor, *M*
(1)	**(2)**	**(3)**
i)	Propane (+C_2)	95.4
ii)	Propene	83.9
iii)	Butane (+C_3)	89.0
iv)	2-Methylpropane (Isobutane)	97.2
v)	Butenes	75.8

NOTE — The above factors for motor octane number are empirical values to be used only in the calculation procedures described in this method.