

**Petroleum products – Liquefied petroleum gases (LPG) as motor fuel –
Specification**

Foreword

This Philippine National Standard PNS/DOE QS 005-A:2016, specification for Liquefied Petroleum Gas (LPG) as motor fuel was prepared by the Department of Energy through the Technical Committee on Petroleum Products and Additives (DOE/TCPPA) and was approved for adoption as Philippine National Standard by the Bureau of Philippine National Standard.

This standard is a revision of PNS/DOE QS 005:2005 with improvement made in the requirement on the use of odorant for health and safety consideration as well as to update the test methods. This revision is also made to separate the PNS for LPG used as motor fuel from the PNS of other known LPG uses.

This standard cancels and replaces PNS/DOE QS 005:2005.

Further, this is in support of the Philippine Government's effort to promote the utilization of alternative and clean fuel technology and in line with the DOE's policy and program of updating the fuel quality specification of LPG in terms of the current requirements of the industry, its users and manufacturers and also by endeavoring to harmonize international/regional environmental standards for fuel quality.

This standard is subject for review when necessary.

Petroleum products – Liquefied Petroleum Gases (LPG) as motor fuel – Specification

1 Scope

This standard specifies the requirements for liquefied petroleum gas (LPG) used as motor fuel.

2 References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1**Auto-LPG**

a LPG used as motor fuel shall also be referred as Auto-LPG.

3.2**butane**

a gas that is composed of either or both of two isomeric, flammable, gaseous hydrocarbons, C_4H_{10} of the paraffin series: n-butane or isobutene.

3.3**liquefied petroleum gas (LPG)**

a gas liquefied by compression consisting of flammable hydrocarbons predominantly propane and butane or their mixture

3.4**propane**

a gaseous paraffin hydrocarbon C_3H_8 present in natural gas and crude oil

3.5**propane-butane mixture**

a mixture of propane and butane for use where intermediate volatility characteristics are desired

4 Requirements

4.1 Liquefied Petroleum Gas (LPG) used as motor fuel shall conform to the chemical and physical requirements specified in Table 1.

Table 1 – Chemical and physical requirements for LPG as motor fuel

	Propane – Butane (C3-C4 Mixture) Motor Fuel	Test Method
Copper Corrosion 1 h at 37.8°C, max.	No. 1	PNS ASTM D1838
Dienes content (as 1,3 butadiene) mole %, max.	0.5	PNS ISO 7941
Evaporative Residue, mg/kg, max.	100	PNS ISO 13757 or PNS ASTM D 2158
Free Water Content	None	Visual
Hydrogen sulfide	Pass	PNS ISO 8819
Motor Octane No. (MON), min	89.0	PNS ASTM D2598 See below ^a
Sulfur, mass ppm, max. (before stenching)	140	PNS ASTM D2784
Vapor Pressure, at 37.8°C, kPa, max.	1430	PNS ASTM D1267 or PNS ASTM D2163
Volatile Residue, 95% Boiling point at 760 Mm Hg, °C, max. or Butane & heavier, % by vol., max. Pentane & heavier % by vol., max.	2.0	PNS ASTM D1837 PNS ASTM D2163 PNS ASTM D2163
^a The partial MON for each component in the mixture as follows: partial MON = $M \times C$ where: M is the motor octane factor of a specific component as below C is the mole fraction in the mixture.		
^b The finished product shall contain a mercaptan compound that would result to an offensive discernible odor. The amount of odorant to be used is covered by relevant NFPA 58 provisions. Other candidates for odorant shall be subject for review for health and toxicity consideration.		

The partial octane number for all the components is determined and the sum rounded down to the nearest 0.1

Component	MON factor
Propane (+C2)	95.4
Propene	83.9
Butane (+C5)	89.0
2-Methylpropane (isobutane)	97.2
Butenes	75.8

5 Sampling

Sampling of LPG shall be in accordance with PNS ASTM D 1265.

6 Test Methods

LPG shall be tested in accordance with the methods specified in table 1.

References:

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

PNS ASTM D 1267:2012 (ASTM published _____), Standard Test Method for Gage Vapor Pressure of Liquefied Petroleum (LP) Gases (LP-Gas Method)

PNS ASTM D1837:2011 (ASTM published _____), Standard Test Method for Volatility of Liquefied Petroleum (LP) Gases

PNS ASTM D 1838:2014 (ASTM published _____), Standard Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases

PNS ASTM D 2158:2011 (ASTM published _____), Standard Test Method for Residues in Liquefied Petroleum (LP) Gases

PNS ASTM D 2163:2014e1 (ASTM published _____), Standard Test Method for Determination of Hydrocarbons in Liquefied Petroleum (LP) Gases and Propane/Propene Mixtures by Gas Chromatography

PNS ASTM D 2528:2012 (ASTM published _____), Standard Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from Compositional Analysis

PNS ASTM D 2784:2011 (ASTM published _____) Standard Test Method for Sulfur in Liquefied Petroleum Gases (Oxy-Hydrogen Burner or Lamp)

PNS ISO 7941:1988 (ISO published _____), Commercial Propane and Butane - Analysis by Gas Chromatography

PNS ISO 8819:1993 (ISO published _____), Liquefied petroleum gases – Detection of hydrogen sulfide – Lead acetate Method

PNS ISO 13757:1996 (ISO published _____), Liquefied Petroleum Gases – Determination of Oily Residues – High Temperature Method

PNS ASTM D 1265:2011 (ASTM published _____), Standard Practice for Sampling Liquefied Petroleum (LP) Gases, Manual Method

EN 589:2004 - Automotive fuels – LPG – Requirements and test methods

Abbreviations

EN - Euro Norm (Regional Standard of European Countries)

ISO - International Standard Organization

PNS - Philippine National Standard

ASTM - American Society for Testing and Materials

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