



Designation: **D1835—18 D1835 – 18a**

## Standard Specification for Liquefied Petroleum (LP) Gases<sup>1</sup>

This standard is issued under the fixed designation D1835; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope\*

1.1 This specification covers those products commonly referred to as liquefied petroleum gases, consisting of propane, propene (propylene), butane, and mixtures of these materials. Four basic types of liquefied petroleum gases are provided to cover the common use applications.

1.2 This specification is applicable to products intended for use as domestic, commercial and industrial heating, and engine fuels.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3.1 The non-SI unit ‘psig’ is the standard unit for footnote B of **Table 1** because that unit of measurement is widely used in North American industry.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

**D1265 Practice for Sampling Liquefied Petroleum (LP) Gases, Manual Method**

**D1267 Test Method for Gauge Vapor Pressure of Liquefied Petroleum (LP) Gases (LP-Gas Method)**

**D1657 Test Method for Density or Relative Density of Light Hydrocarbons by Pressure Hydrometer**

**D1837 Test Method for Volatility of Liquefied Petroleum (LP) Gases (Withdrawn 2017)<sup>3</sup>**

**D1838 Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases**

**D2158 Test Method for Residues in Liquefied Petroleum (LP) Gases**

**D2163 Test Method for Determination of Hydrocarbons in Liquefied Petroleum (LP) Gases and Propane/Propene Mixtures by Gas Chromatography**

**D2420 Test Method for Hydrogen Sulfide in Liquefied Petroleum (LP) Gases (Lead Acetate Method)**

**D2598 Practice for Calculation of Certain Physical Properties of Liquefied Petroleum (LP) Gases from Compositional Analysis**

**D2713 Test Method for Dryness of Propane (Valve Freeze Method)**

**D3700 Practice for Obtaining LPG Samples Using a Floating Piston Cylinder**

**D5504 Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence**

**D5623 Test Method for Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection**

**D6667 Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence**

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **D02** on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee **D02.H0** on Liquefied Petroleum Gas.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

\*A Summary of Changes section appears at the end of this standard

[D6897 Test Method for Vapor Pressure of Liquefied Petroleum Gases \(LPG\) \(Expansion Method\)](#)

[D7756 Test Method for Residues in Liquefied Petroleum \(LP\) Gases by Gas Chromatography with Liquid, On-Column Injection](#)

[D7828 Test Method for Determination of Residue Composition in Liquefied Petroleum Gas \(LPG\) Using Automated Thermal Desorption/Gas Chromatography \(ATD/GC\)](#)

[D7994 Test Method for Total Fluorine, Chlorine, and Sulfur in Liquid Petroleum Gas \(LPG\) by Oxidative Pyrohydrolytic Combustion Followed by Ion Chromatography Detection \(Combustion Ion Chromatography-CIC\)](#)

2.2 *GPA Midstream Association Standard*.<sup>4</sup>

[GPA Standard 2140 Liquefied Petroleum Gas Specifications and Test Methods](#)

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *commercial butane, n*—a hydrocarbon product for use where low volatility is required.

3.1.2 *commercial PB mixtures, n*—mixtures of propane and butane for use where intermediate volatility is required.

3.1.3 *commercial propane, n*—a hydrocarbon product for use where high volatility is required. Commercial propane is suitable for certain low severity internal combustion engine applications.

3.1.4 *liquefied petroleum gas (LP Gas, LPG), n*—a narrow boiling range mixture of hydrocarbons consisting of propane, propylene, butanes and butylenes, individually or in specified combinations, with limited amounts of other hydrocarbons (such as ethane) and naturally occurring, petroleum-derived, non-hydrocarbons.

#### 3.1.4.1 Discussion—

LPG is typically maintained in a liquid state by containing it within a closed container or storage tank that can withstand the vapor pressure of the LPG at ambient temperature, or at a low temperature in refrigerated storage.

#### 3.1.4.2 Discussion—

In many jurisdictions, LPG for fuel purposes is required to be odorized with a stenching agent such as ethyl mercaptan.

3.1.5 *special-duty propane, n*—a product composed chiefly of propane which exhibits superior antiknock characteristics and was specifically developed for use as fuel in spark-ignition internal combustion engines.

### 4. Sampling

4.1 Proper sampling of liquefied gases is extremely important if the test results are to be significant. Obtain representative samples in accordance with Practice [D1265](#) or Practice [D3700](#). In the event of a dispute involving sample integrity when sampling for testing against D1835 requirements, Practice [D3700](#) shall be used as the referee sampling procedure.

### 5. Detailed Requirements

5.1 The four types of liquefied petroleum gases shall conform to the requirements prescribed in [Table 1](#).

### 6. Keywords

6.1 butane; HD-5 propane; liquefied petroleum (LP) gases specifications; LPG; propane; special duty propane

<sup>4</sup> Available from GPA Midstream Association, 6060 American Plaza, Suite 700, Tulsa, OK 74135, <http://www.gpaglobal.org>.

**TABLE 1 Detailed Requirements for Liquefied Petroleum Gases**

	Product Type				ASTM Test Methods (see Section 2)
	Commercial Propane	Commercial Butane	Commercial PB Mixtures	Special-Duty Propane <sup>A</sup>	
Vapor pressure at 37.8 °C (100 °F), kPa (psig) max	1435 (208)	483 (70)	<sup>B</sup>	1435 (208)	D1267 <sup>C</sup> or D2598 or D6897
Heavier hydrocarbon contaminants: <sup>D</sup>					
Butane and heavier, <sup>E</sup> % by volume, max	2.5	...	...	2.5	D2163
Pentane and heavier, <sup>F</sup> % by volume, max	...	2.0	2.0	...	D2163
Propylene content, % by volume, max	...	...	...	5.0	D2163
Residual matter: <sup>G,H</sup>					
One of the following requirements shall be met:					
(7) Residue on evaporation of 100 mL, mL, max, and	0.05	0.05	0.05	0.05	D2158 <sup>J</sup>
(1) Residue on evaporation of 100 mL, mL, max, and	0.05	0.05	0.05	0.05	D2158 <sup>J</sup>
Oil stain observation	pass <sup>H</sup>	pass <sup>H</sup>	pass <sup>H</sup>	pass <sup>H</sup>	D2158 <sup>J</sup>
Oil stain observation	pass <sup>I</sup>	pass <sup>I</sup>	pass <sup>I</sup>	pass <sup>I</sup>	D2158 <sup>J</sup>
or					
(2) Residue by gas chromatography, mg/kg, max	350	350	350	350	D7756
Density at 15 °C or relative density at 15.6/15.6 °C (60/60 °F)	<sup>J</sup>	<sup>J</sup>	<sup>J</sup>	...	D1657 or D2598
Density at 15 °C or relative density at 15.6 °C/15.6 °C (60 °F/60 °F)	<sup>K</sup>	<sup>K</sup>	<sup>K</sup>	...	D1657 or D2598
Corrosion, copper, strip	No. 1	No. 1	No. 1	No. 1	D1838 <sup>K</sup>
Corrosion, copper, strip	No. 1	No. 1	No. 1	No. 1	D1838 <sup>L</sup>
Sulfur, mg/kg (ppm by mass), max	185 <sup>L</sup>	140 <sup>L</sup>	140 <sup>L</sup>	123 <sup>L</sup>	D6667
Sulfur, mg/kg (ppm by mass), max	185 <sup>M</sup>	140 <sup>M</sup>	140 <sup>M</sup>	123 <sup>M</sup>	D6667
Hydrogen sulfide	pass	pass	pass	pass	D2420
Moisture content	pass	...	...	pass	D2713
Free water content	...	none <sup>M</sup>	none <sup>M</sup>	...	...
Free water content	...	none <sup>N</sup>	none <sup>N</sup>	...	...

<sup>A</sup> Equivalent to Propane HD-5 of GPA Standard 2140.

<sup>B</sup> The permissible vapor pressures of products classified as PB mixtures shall not exceed 208 psig (1435 kPa) and additionally shall not exceed the pressure calculated in psig from the following relationship between the observed vapor pressure at 100 °F (37.8 °C) and the observed relative density at either 60 °F or 15.6 °C:

Vapor pressure, psig, max

$$= 1167 - 1880 (\text{relative density at } 60 \text{ °F}/60 \text{ °F}) \quad (1)$$

$$= 1167 - 1880 (\text{relative density at } 15.6 \text{ °C}/15.6 \text{ °C}) \quad (2)$$

A specific mixture shall be designated by the vapor pressure at 100 °F in pounds per square inch gauge. To comply with the designation, the vapor pressure of the mixture shall be within +0 psi to -10 psi of the vapor pressure specified.

<sup>C</sup> In case of dispute about the vapor pressure of a product, the value actually determined by Test Method D1267 shall prevail over the value calculated by Practice D2598 or measured by Test Method D6897.

<sup>D</sup> See X1.2.2.3.

<sup>E</sup> "Butane and heavier" includes all hydrocarbons (including olefins) with 4 or more carbon atoms.

<sup>F</sup> "Pentane and heavier" includes all hydrocarbons (including olefins) with 5 or more carbon atoms.

<sup>G</sup> See X1.2.4 for information about residues in LPG and for information about gas chromatographic tests for residues in LPG.

<sup>H</sup> See X1.2.9 for information about determining halide contaminants in LPG.

<sup>I</sup> An acceptable product shall not yield a persistent oil ring when 0.3 mL of solvent residue mixture is added to a filter paper, in 0.1 mL increments and examined in daylight after 2 min as described in Test Method D2158.

<sup>J</sup> In case of dispute, Test Method D2158 shall be the referee test method.

<sup>K</sup> Although not a specific requirement, the density or relative density can be needed for other purposes and should be reported. Additionally, the relative density of PB mixture is needed to establish the permissible maximum vapor pressure (see Footnote B).

<sup>L</sup> This method may not accurately determine the presence of reactive materials (for example, H<sub>2</sub>S, S<sup>o</sup>) in liquefied petroleum gas if the product contains corrosion inhibitors or other chemicals which diminish the reaction with the copper strip.

<sup>M</sup> The total sulfur limits in these specifications do include sulfur compounds used for stenching purposes.

<sup>N</sup> The presence or absence of water may be determined by visual inspection of the samples on which the density or relative density is determined.