	Technical Specification for Verification and Inspection of Liquefied Petroleum Gas Flow Meters	S/N	CNMV 201
		Rev	1

1. This Technical Specification is developed pursuant to Paragraph 2, Articles 14 and 16 of the Weights and Measures Act.

2. The date of promulgation, document number, date of enforcement and content of the amendment are listed as follows:

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1. Scope: this specification applies to liquefied petroleum gas flow meters subject to verification and inspection.

2. Construction

2.1 The measuring unit of liquefied petroleum gas flow meter is liter, symbol L.

2.2 A liquefied petroleum gas meter shall be marked with the following items clearly:

(1) Model and instrument number.

(2) Caliber of measuring chamber outlet.

(3) Maximum pressure.

(4) Maximum flow rate.

(5) Range of compensation temperature, if provided with a temperature conversion device.

(6) Manufacturer's name or trademark.

2.3 The display (indicator) of a liquefied petroleum gas meter shall be marked with the measuring unit or the symbol of the unit.

2.4 The graduation lines, numbers and other markings of a liquefied petroleum gas flow meter shall be correct, obvious and hard to be erased.

2.5 For a liquefied petroleum gas flow meter with a pricing device, it shall be marked with unit, unit price and total price clearly.

2.6 For a liquefied petroleum gas meter with a zeroing device, the flow display (indicator) shall be set to zero prior to each operation; if the meter is also provided with a pricing device, the total price display (indictor) shall be set to zero too.

2.7 The display (excluding zeroing device) of a liquefied petroleum gas flow meter shall not be provided with a structure for changing the indication externally.

2.8 The pointer tip of the display (indicator) of a liquefied petroleum gas flow meter must overlap with the graduation line or reach the graduation line.

2.9 The count of the display (indicator) of a liquefied petroleum gas flow meter shall progress in a normal sequence on a decimal system basis, without intermittence or repetition.

2.10 The count and the indicated value of a cycle on the display (indicator) of a liquefied petroleum gas flow meter shall be a positive or negative power of 1 or 10.

2.11 On the display (indicator) of a liquefied petroleum gas flow meter, the minimum scale intervals shall not be more than 0.1 L (or 0.5 L if the maximum flow rate is more than 80 L/min).

2.12 A liquefied petroleum gas flow meter with a volume presetting device shall be marked with operation instructions of the device clearly.

2.13 For a liquefied petroleum gas flow meter with a volume presetting device, the indication errors of the displayed (indicated) volume shall be less than the maximum permissible errors of verification or inspection after the presetting operation is finished.

2.14 A liquefied petroleum gas flow meter with coin insertion or prepaid credit card reading device shall be able to display (indicate) the money inserted and the corresponding volume of liquefied petroleum gas automatically.

2.15 A liquefied petroleum gas flow meter with a real time transfer or credit card reading device shall be able to correctly display the gas volume filled and the corresponding amount upon termination of liquefied petroleum gas filling.

2.16 For a liquefied petroleum gas flow meter with two or more gas filling pipes, the pipes shall be operated independently without affecting each other.

2.17 The materials of the flow measuring device of a liquefied petroleum gas meter shall be resistant to abrasion, corrosion, dissolution and deformation.

2.18 The temperature conversion device of a liquefied petroleum gas flow meter shall be based at 15 ℃.

2.19 The measuring device of a liquefied petroleum gas flow meter shall be connected firmly to avoid leakage.

2.20 A liquefied petroleum gas flow meter shall be equipped with the following auxiliary devices:

(1) Filter.

(2) Gas separator.

(3) Gasification prevention device. (The liquefied petroleum gas shall be kept in a liquid state in the measuring chamber during the process of measurement).

(4) Pressure gauge for measuring the pressure of gas and liquid.

(5) (Liquefied) gas filling hose and (liquefied) gas nuzzle.

(6) A liquefied petroleum gas meter without temperature conversion device shall be equipped with a detector for measuring the temperature of liquefied petroleum gas. (Estimating temperature detectors for liquefied petroleum gas flow meters shall be installed on the outlet side of the measuring chamber, at a distance of not less than 5 times the nominal caliber without temperature changes).

2.21 During the measurement of liquefied petroleum gas and operation of a liquefied petroleum gas meter, there shall be no instruments that could be hazardous.

2.22 The volume adjusting device, indication error adjusting device and temperature conversion device of a liquefied petroleum gas meter shall be prohibited from readjustment after being verified and lead sealed.

3. Verification, inspection and maximum permissible errors

3.1 Verification and inspection equipment: certificates of traceability and uncertainty shall be provided.

(1) Standard volume tube measuring system (used in comparison method).

(2) Standard weighing instrument (used in weighing method).

(3) Standard suspension densimeter (embedded with thermometer) (used in weighing method): density rangeis from 0.500 to 0.650 g/cm^3, the minimum scale intervals shall not be more than 0.002 g/cm^3; temperature measuring range of the thermometer shall be from 0 ℃ to more than 40 ℃, minimum scale intervals shall not be more than 1 ℃.

(4) Standard pressure gauge (used in weighing method).

(5) Thermometer: 0 ℃ to more than 50 ℃, minimum scale intervals shall not be more than 1 ℃.

3.2 Verification or inspection of errors of a liquefied petroleum gas flow meter: circulate the liquefied petroleum gas through the meter at least one time, test it with a flow rate of not less than 1/5 of the maximum flow rate (if less than 20 L/min, use a flow rate of 20 L/min), and then perform the verification or inspection with 2 random flow rates by using the comparison or weighing method.

3.3 Using the weighing method to verify errors of a liquefied petroleum gas flow meter: fill a pressure container with the steam of liquefied petroleum gas, and inject not less than 10L of liquefied petroleum gas filling not more than 70% of the volume of the container. Calculate the mass of gas by a standard weighing method, measure the density with a standard suspension density for liquefied petroleum gas, and then work out the indication error with the following formula:

$$E = I - \frac{W}{d_e} + I \times \beta(P_1 - P_e)$$

E: Errors of the liquefied petroleum gas meter tested (L).

I: Volume indicated on the liquefied petroleum gas flow meter tested (L).

W: Mass of the liquefied petroleum gas tested, measured by standard weighing instruments (kg).

d_e: Density of liquefied petroleum gas in a balanced state, at a consistent temperature when passing through the liquefied petroleum gas flow meter (g/cm^3).

P_1: Pressure of liquefied petroleum gas passing through the liquefied petroleum gas flow meter (kg/cm^2).

P_e: Pressure of liquefied petroleum gas in a balanced state, at a consistent temperature when passing through the liquefied petroleum gas flow meter (kg/cm^2).

β : Compression coefficient of liquefied petroleum gas, $0.00035/kg/cm^2$.

3.4 Using the comparison method to verify or inspect errors of a liquefied petroleum gas flow meter: compare the measured volume of the liquefied petroleum gas passing through the liquefied petroleum gas flow meter tested, as indicated on the standard volume tube (for a liquefied petroleum gas flow meter with a temperature conversion device, using the converted volume under standard temperature), with the indicated value on the liquefied petroleum gas meter tested. The volume of liquefied petroleum gas passing shall be not less than 10 L.

3.5 Using the comparison method to determine errors of a liquefied petroleum gas flow meter: subtract the actual volume passing through the standard volume tube from the indicated value on the liquefied petroleum gas flow meter tested. Using the weighing method to determine errors: subtract the quotient by dividing the indicated mass on the standard weighing instrument by the density (for a petroleum liquefied gas flow meter a with

temperature conversion device, the density under the standard temperature) from the indicated volume.

3.6 Where the verified volume of a liquefied petroleum gas flow meter is not more than 20 L, the maximum permissible errors of verification are ±0.2 L; if more than 20 L, the maximum permissible errors of verification are ±1 % of the verified volume.

3.7 The maximum permissible errors of inspection of a liquefied petroleum gas flow meter are 1.5 times the maximum permissible errors of verification.

3.8 The period of validity of verification is 1 year, commencing from the day of a verification compliance mark affixed to the liquefied petroleum gas flow meter and expiring on the first day of the next month of next year.

4. Verification Compliance Marks

4.1 The verification compliance mark of a liquefied petroleum gas meter shall be located at the flow adjusting device (including volume adjusting device, indication error adjusting device and temperature conversion device), and attached to the meter with metal wire and lead sealed. A verification compliance tag shall be clearly affixed to the front of the liquefied petroleum gas flow meter.