

Notification of the Ministry of Commerce

Regarding Prescription of Type and Characteristic of Meter for Liquids,
Detail of Materials Used for Manufacture, Maximum Permissible Error
and Term of Verification

In order to prescribe the type and characteristic of the meter for the liquids to be clear and standardized, resulting in fairness to all parties pertinent to the purchase – sale, the Weights and Measures Committee had resolution at the meeting No. 1/2562 on Thursday, 25 April B.E. 2562 (2019) to prescribe the type and characteristic of the meter for the liquids, the detail of materials used for manufacture, the maximum permissible error and the term of verification.

By virtue of Section 5, paragraph two of Section 8, Section 16, Section 26 and Section 33 of the Measurement Act, B.E. 2542 (1999), as amended by the Measurement Act (No.3), B.E. 2557 (2014), the Minister of Commerce, upon the recommendation of the Weights and Measures Committee, therefore issues this Notification, as follows.

Article 1. This Notification shall come into force upon the expiration of ninety days from the date of its publication in the Government Gazette.¹

Article 2. In this Notification :

“Liquids” mean the following substances :

- 1) fuel oil,
- 2) lubricating oil,
- 3) liquefied petroleum gas,
- 4) nectar obtained from plants,
- 5) vegetable oil,
- 6) milk;

“Rated Operating Conditions” mean the conditions of the use of the meter which still provide correct results within the maximum permissible errors, e.g. the type of the liquids, the density of the liquids, the viscosity of the liquids, the temperature and the pressure of the liquids, including other stipulations which affect the operation of the meter;

¹ Published in the Government Gazette, Volume 136, Special Part 276 d, Page 9, dated 11 November B.E. 2562 (2019).

“Base Conditions” mean the states of the liquids which are measured, whereby the measured volumes of the liquids are converted according to their conditions, namely their base temperatures and base pressures, by categorizing the base temperatures into 0, 15, 20 or 30 degrees Celsius, and the base pressure is 101.325 kilopascals;

“Metering Conditions” mean the conditions of the liquids which are measured the volume at the time of measurement, namely the temperature and pressure of the liquids during that time;

“Dynamic Measuring Systems for Liquids other than Water” mean the system comprising the meter for the liquids, the ancillary device and the associated device;

“Ancillary Device” means the device which is used to perform a particular function for being directly involved in measurement results, e.g. the zero setting device, the printing device, the price indicating device, the overall result indicating device, the conversion device, or the pre-setting device;

“Associated Device” means the part or the device apart from the ancillary device which is necessary to be used to enhance confidence in measurement results correctly, or is intended to help operate the measurement conveniently, or is the device affecting accuracy in the measurement, e.g., a steam cleaner, a filter, a pump, a valve, or a pipe;

“Conversion Device” means the device which is used to perform a particular function for the following automatic conversions :

(1) converting the value of measured volume at the metering conditions to the value of volume at the base conditions, or

(2) converting the value of measured volume at the metering conditions to the value of mass, or

(3) converting the value of measured mass to the value of volume at the metering conditions, or

(4) converting the value of measured mass to the value of volume at the base conditions;

“Zero Setting Device” means the part which is used to set the meter to display the zero value;

“Indicating Device” means the part of the meter which is used to display the value of material volume as measured;

“Scale Mark” means the scale or other sign on the indicating device which is used to indicate the value of volume as measured;

“Principal Scale Mark” means the value which is displayed as the unit of the volume of difference between the value of two consecutive scales, in case of the display of the value for analog indication, or the difference between two consecutive values as displayed, in case of the display of the value for digital indication;

“Adjustment Device” means the device used to adjust the deviation value of the meter on the shift curve to the point allowed in the range of maximum permissible error, whereby this device can be mechanical or electronic systems;

“Minimum Measured Quantity : MMQ” means the minimum volume which the system of measuring the volume of the liquids can measure accurately, except for the followings:

1) As for the system of measuring the volume of the liquids used to discharge the liquids, the minimum measured quantity is the minimum volume that can be discharged;

2) As for the system of measuring the volume of the liquids used to store the liquids, the minimum measured quantity is the minimum volume that can be stored;

“Flowrate : Q” means the volume of the liquids passing through the meter and the time taken for this volume to pass through the meter;

“Maximum Flowrate : Q_{max} ” means the highest flowrate at which the meter can operate without damaging the meter, and the deviation of the measurement of the volume of the meter not exceeding the maximum permissible errors as specified;

“Minimum Flowrate : Q_{min} ” means the lowest flowrate at which the meter can operate, by the deviation of the meter not exceeding the maximum permissible errors as specified;

“Maximum Permissible Error : MPE” means the value of the extreme deviation of the meter as permitted;

“Range of Maximum Permissible Errors” means the difference of the maximum permissible error between the highest value in the positive side and the lowest value in the negative side;

“Range of Error” means the maximum difference of the value of deviation as measured;

“Minimum Specified Quantity Deviation : E_{min} ” means the maximum permissible error for the measurement of the minimum measured quantity;

“Meter for Retail” means the meter used to measure the discharged volume of the liquids usually not exceeding 400 litres per one discharge.

“Meter for Wholesale” means the meter used to measure the discharged volume of the liquids other than the meter for retail.

Title 1

Gauge Being Subject to Measurement Act, B.E. 2542 (1999),
as Amended by Measurement Act (No. 3), B.E. 2557 (2014)

Article 3. The meter for the liquids used to continuously measure the volume of the liquids in a pipe system and to display the measurement result continuously, shall be the gauge being subject to the Measurement Act, B.E. 2542 (1999), as amended by the Measurement Act (No.3), B.E. 2557 (2014), excluding cryogenic liquid, water for consumption, wastewater and hot water.

Title 2

Types of Meter for Liquids

Article 4. The meter for the liquids is the meter designed to measure and to discharge the liquids by volume. It is equipped with the indicating device to display the measurement result.

There are 6 types of the meter for the liquids as follows :

- (1) the meter for fuel oil,
- (2) the meter for liquefied petroleum gas,
- (3) the meter for lubricating oil,
- (4) the meter for nectar obtained from plants,
- (5) the meter for vegetable oil,
- (6) the meter for milk.

Title 3

Characteristic, Detail of Materials Used for Manufacture,
Maximum Permissible Error and Term of Verification

Chapter 1

General Provisions

Article 5. The meter for the liquids which is used in purchasing – selling or exchanging goods with other persons, or providing the service of measurement or using the meter for the benefit of calculating considerations, taxes and fees, shall have the feature as specified in this Notification.

In case of any person who wishes to produce or import the meter, the feature of which differs from that as specified in this Notification, the meter shall be examined by the Central Bureau. If the result of examination appears that the standard feature of the aforesaid meter does not differ that as specified in this Notification and the meter is approved by the Minister of Commerce, a competent official is required to provide verification for the aforesaid meter.

Article 6. The meter for the liquids shall be produced permanently. In addition, it shall not be simply used as a tool of fraud.

The meter for liquids shall be produced from good materials. In addition, it shall be designed and produced in a manner that when it is used as usual, it can always operate accurately. The components of the meter can operate continuously without defect, bend or deformation which affects the accuracy of the meter. In case of adjusting the meter, the adjusted meter is required to maintain the condition of accuracy appropriately.

In case of necessity, the Central Bureau may test the prototype of the meter in accordance with rules, procedures and conditions as stipulated by the Minister, upon the recommendation of the Committee.

Article 7. The meter for the liquids shall display the following details on the instrument. Such details shall be easy to read, clear and indelible.

- (1) a name or a trademark of a producer, an importer or a seller,
- (2) a model which is specified the form of an instrument,
- (3) a series number of an instrument which is specified by a competent official.

The provision under paragraph one shall not be applied to the component which is separated from the meter and necessary to the measurement including not affecting the accuracy of the measurement, or the meter which cannot display the aforesaid details because of the state of the meter or because of the display being possible to damage the meter.

Article 8. The accuracy of the meter for the liquids shall be subject to the maximum permissible errors as specified in this Notification.

The maximum permissible errors for providing the initial verification and the subsequent verification shall be subject to the stipulation in Article 20.

The maximum permissible errors for the examination of the used meter shall be twice as much as the maximum permissible errors for providing the initial verification.

Article 9. The meter for the liquids shall have the indicating device in a satisfactory manner and in a sufficient number for operation.

Article 10. The display of value of the meter for the liquids shall have the following characteristics.

(1) Display of Value in Type of Analog Indication

(a) The scale mark and the indicating device shall be designed appropriately and operate connectively.

(b) The scale mark, numbers, alphabets or other symbols shall be easy to read, clear and indelible.

(c) If there are many places of the indicating device, every place shall display the consistent value.

(d) If there is the printing device, the value of printing shall be consistent with the value of displaying.

(2) Display of Value in Type of Digital Indication

(a) The display of value, whether using numbers, alphabets or other symbols unitedly or not, shall not cause confusion in reading the value.

(b) If there are many places of the indicating device, every place shall display the same value.

(c) If there are the indicating devices in both digital and analog types, the display of value in the digital type shall be consistent with the display of value in the analog type.

(d) If there is the printing device, the value of printing shall be consistent with the value of displaying.

(3) In case of displaying the value of the meter which can calculate the price, the sum of money shall be consistent with the volume of the measurement as displayed.

Article 11. The inscriptions of all of the controllers for operation, the indicating device and other equipment, including the switch of the meter for the liquids shall be made to be easy to read, clear and indelible.

Article 12. The meter for the liquids shall provide a space for a tamper-evident seal so as to prevent unauthorized alterations after the examination and verification. The meter shall be modified or repaired after the seal is destroyed.

Article 13. In the case where there is a software program to be used with the meter for the liquids, and the aforesaid program results in the accuracy of the meter,

(1) the program shall neither cause the accuracy of the meter to deviate exceeding the maximum permissible errors, nor express, print, calculate or record the value of the measurement result to deviate exceeding the maximum permissible errors after the examination and verification, and there shall be protection methods to prevent the modification or the adjustment of the program by means of a mechanical seal or an electronic seal, e.g. an audit trail, or both methods together,

(2) the business operator of the meter or the possessor is required to display a name, a model and a software identification relating to the program on the indicating device and/or the value recording device every time of closing or opening the meter, or such data can be seen when an user or a relevant person requires,

(3) the business operator of the meter or the possessor is required to produce a complete guidebook to use the program in accordance with the use of the meter, and the guidebook shall always be presented to a competent official or the Weights and Measures Inspector.

In case of a software program to be used with the device which is extended further away from the meter, the business operator of the meter or the possessor shall take the following actions :

(1) to inform to a name, a model and a software identification relating to the program together with a product owner including other details to a competent official at the Central Bureau or the Branch Bureau within 15 days as from the date of the completion of installation,

(2) to display a name, a model and a software identification relating to the program and necessary information on the extended device clearly and indelibly.

Chapter 2

Meter for Liquids

Article 14. The indicating and printing devices of the meter for the liquids shall have the following characteristics.

(1) The main indicating device shall be provided.

(2) The indicating device shall display the name or symbol of the unit of measurement. The principal scale mark shall display the value in the form 1×10^k , 2×10^k or 5×10^k , whereby k is a positive or negative whole number or zero.

(3) Display of Value in Type of Analog Indication

(a) Scale Mark

1) The main and subsidiary scale marks shall be in different lengths, i.e. the main scale mark is longer than the subsidiary one; therefore, the measuring result will be clear to read.

2) The scale marks which are consistent shall have an equal width in a straight line, and the width shall neither be less than 0.2 millimetres nor exceed the width of the interval between two lowest adjacent scale marks.

3) The width of the main scale mark shall not exceed 1.5 times wider than that of subsidiary scale mark.

4) The scale interval shall display the value of the volume of the scale interval which has the width of 2 millimetres, or display the value of the volume at the width of one fifth of the scale interval, by preferring the greater value, whereby the value of volume shall not exceed the minimum specified quantity deviation (E_{\min}).

(b) Indicator

1) The indicator and the scale mark shall be in parallel.

2) In the case where the indicator and the scale mark are not parallel, the tip of the indicator shall reach to the displayed scale mark.

3) In the case where the indicator and the scale mark are parallel, the tip of the indicator shall not exceed 1 millimetre away from the scale mark.

4) Width

a) The width of the indicator tip shall not exceed the width of the widest scale mark.

b) In case of the indicating needle, its tip shall have a constant width that can completely cover the scale mark.

5) In the case where the indicator and the scale mark are not parallel, the distance between the indicator and the parallel of the scale mark shall not exceed 1.5 millimetres.

(4) The digital indicating device shall display the measurement result continuously while measuring the volume of the liquids for the purchase – sale purpose. And the display of the value of volume which is twice as much as the most diminutive principal scale mark shall not exceed the minimum specified quantity deviation (E_{\min}).

(5) Zero Setting Device for Volume Indicating Device

(a) The volume indicating device may provide the zero setting device which can be adjusted by hand or by an automatic system.

(b) At the beginning of setting zero, the indicating device to display the value of volume shall not display the result to be different from the previous measurement result, and shall display the zero value upon the completion of setting zero.

(c) The zero setting device shall not cause any change to the measurement result, except for a change to the display of the zero value.

(d) At the time of measuring, there shall be no means to be capable of adjusting the volume indicating device to display the zero value.

(e) In case of the analog indicating device, the display of the value of volume after the completeness of setting zero shall deviate not greater than half of the minimum specified quantity deviation (E_{min}).

(f) In case of the digital indicating device, the display of the value of volume after the completeness of setting zero shall not deviate, and shall display the zero value only.

(6) If the system of measuring the volume of the liquids is equipped with the conversion device, the system shall display the value of the volume at the base conditions and the metering conditions. In this regard, a sign or a symbol shall be clearly shown the value of the volume at which condition.

(7) Meter for Retail

(a) As for the display of discharged volume, prior to discharging, the indicating device to display the value of volume shall display the zero value. And when the discharge starts, the indicating device to display the value of volume shall display the volume of the discharge at that time on the indicating device.

(b) The meter which can calculate the price shall correctly display the price per unit corresponding with its product type before every discharge.

(c) Price Calculating Device

1) The price calculating device shall compute the total price according to the price per unit of the purchase – sale in each time while measuring.

2) In displaying the total purchase price according to any volume as discharged, the price calculating device shall display the value accurately by providing the deviation of positive or negative side not exceeding than a multiple of 0.01 litre with the price per unit.

(d) In displaying the price per unit, in the case where each meter is used to measure the volume of the discharge of different products but the same indicating device is shared, before the measurement of the volume of the discharge of any product in each time, the indicating device shall display the price per unit of such a product. And while measuring, there shall be no means to be capable of adjusting the display of the price per unit.

(e) As for the display of the total volume and the total purchase price in each purchase – sale, after the completeness of the measurement of the discharge volume, the indicating device shall display the total discharge volume and the total purchase price at least 5 minutes or until the next purchase – sale.

(f) In the case where the oil discharging equipment is equipped with the printing device, the data printing of the discharge of the product shall have the details as follows:

- 1) the total volume of the discharge,
- 2) the price per unit,
- 3) the total purchase price,
- 4) the type of product, i.e. name, symbol, acronym or code.

(g) If the system of measuring the volume of the liquids is equipped with the conversion device, the system shall display the value of the volume at the base conditions by the operation of the conversion device, and display the value of the volume at the metering conditions. In this regard, a sign or a symbol shall be clearly shown the value of the volume in relevant condition. During the time of purchase – sale, however, it is required to display the value of volume, particularly for the volume which is used in retail only.

(8) As for the meter for wholesale, if the price can be calculated, the total purchase price shall be printed and it shall correspond to the result of mathematical calculation.

Article 15. The meter for the liquids shall have the ancillary device and the associated device with the following characteristics.

(1) A fume or air eliminator or other automatic system to prevent fume or air from entering into the meter while measuring is compulsory, except for the liquids with dynamic viscosity exceeding 20 mPa.s at 20 degrees Celsius.

(a) The effect from fume or air shall not exceed

1) 1% of the measured volume for the system of the meter for the liquids with dynamic viscosity exceeding 1 mPa.s at 20 degrees Celsius and milk,

2) 0.5% of the measured volume for the system of the meter for the liquids other than the one specified under 1).

(b) It shall be designed to be corresponding to the metering conditions, the maximum flowrate and the minimum flowrate of the system of measuring the volume of the liquids.

(2) There shall be valves or other systems preventing the liquids from flowing back into the meter.

(3) As for the meter for lubricating oil, when the level of lubricant discharging source recedes to the point that affects the accuracy of measurement, there shall be the equipment that automatically shuts down the operation of the meter or a clear warning sign.

(4) As for the direct mass flow meter, if it is required to display the value of volume, there shall be an automatic technique to be capable of measuring and adjusting the product's density while measuring when the changing density can affect the accuracy of measurement.

Article 16. The meter for the liquids might be equipped with the ancillary device and the associated device with the following characteristics.

(1) Quantity Pre-setting Device and Price Pre-setting Device

(a) The principal scale mark and the measurement unit of the mechanism device for stopping the discharge shall be the same as the indicating device.

(b) It can stop the discharge accurately. And in the case where the meter has the pre-setting device, the volume or the amount of money which are preset shall be displayed prior to the measurement. Upon stopping the discharge, the indicating device shall display the discharged volume or the total purchase price to be the same as the value as preset.

(c) The stop setting device shall make the stopping mechanism to be capable of adjusting the distance of stop so that the discharged volume shall be in a specified scope.

(2) Conversion Device

(a) The computation of the value conversion of any volume shall conform to the rules, methods and conditions as laid down by the Central Bureau.

(b) A thermometer, a manometer and a density gauge which cooperate with the conversion device in the system of measuring the volume of the liquids shall be installed not exceeding 1 meter away from the meter. The difference between the value of the measurement result after converting the value by the conversion device and the result of computation under (a) shall not exceed the difference of the maximum permissible errors for the meter installed in the system of measuring the volume of the liquids and the maximum permissible errors for the meter not installed in the system of measuring the volume of the liquids according to the table as shown in Article 20 (1) or half of the minimum specified quantity deviation, and the greater value will be preferred.

(c) If sensors in the thermometer, the manometer and the density gauge which cooperate with the conversion device are installed exceeding 1 meter away from the meter, each of the gauges shall be inspected by the government agencies or organizations approved by the Central Bureau in accordance with the rules and conditions as laid down by the Central Bureau. The maximum permissible errors shall not exceed the ranges specified in the following table.

Gauges	Maximum Permissible Errors		
	Accuracy Classes of System of Measuring Volume of Liquids		
	Class 0.3	Class 0.5	Class 1.0
Thermometer	$\pm 0.3^{\circ}\text{C}$	$\pm 0.5^{\circ}\text{C}$	
Manometer	Measured Value less than 1 MPa : $\pm 50\text{ kPa}$ Measured Value from 1 Mpa to 4 Mpa : $\pm 5\%$ Measured Value greater than 4 Mpa : $\pm 200\text{ kPa}$		
Density Gauge (for converting the measured mass value to the value of the volume of the liquids)	$\pm 1.0\text{ kg/m}^3$	$\pm 2.0\text{ kg/m}^3$	
Density Gauge (for converting the value of temperature or the value of pressure)	$\pm 5.0\text{ kg/m}^3$		

(d) There shall be a method to be capable of halting the operation of the conversion device in order that the meter can display the value and print the value of the volume as measured at the metering conditions.

(e) The thermometer, the manometer, the density gauge and the viscosity gauge and/or any kinds of gauges for measuring any properties of the measured liquids which cooperate with the conversion device, including the mechanical conversion device which cannot display the value or print the pre-set factors used for calculation, shall provide a space for a tamper-evident seal so as to prevent unauthorized alterations.

(3) The adjustment device shall be used for minimizing the value of the deviation.

(a) The adjustment of the ratio between the volume as displayed by the meter and the volume of the liquids as actually measured shall be made not exceeding 0.05% for the system of measuring the volume of the liquids at accuracy Class 0.3 and not exceeding 0.1% for the system of measuring the volume of the liquids at accuracy Class 0.5 and Class 1.0.

(b) The adjustment of the aforesaid ratio made by a short-cut piping system is prohibited.

(c) A space for a tamper-evident seal shall be provided to prevent unauthorized alterations.

(4) In case of the ancillary device and the associated device which connect a signal through the external signal connection equipment of the meter for the liquids, the ancillary device and the associated device shall not cause the errors of measurement result and data. In addition, such devices shall not be able to transmit an order or data to the meter for the liquids to cause the meter to display, to print, to calculate or to record the value of the measurement result of volume to be different from a situation where there is no such equipment connected to the meter for the liquids. Besides, a space for tamper-evident seal shall be provided to prevent the aforesaid external signal connection.

Article 17. The discharge pipe and valve shall have the following characteristics.

(1) The liquids which have already been measured the volume shall not leak out from a measurement unit or the discharge pipe.

(2) In case of more than two way pipes being installed, there shall be an automatic system for the following purposes.

(a) While discharging, the liquids shall flow through the only single discharge channel.

(b) The discharge controlling device shall clearly display the flowing direction.

(3) The shortcut or bypass gas pipe, carrying the liquids without flowing through the meter for the liquids, is prohibited.

Article 18. The accuracy of the system of measuring the volume of the liquids is categorized into 3 different classes as follows:

(1) Class 0.3,

(2) Class 0.5,

(3) Class 1.0.

Article 19. Rules governing the categorization of the accuracy class of the system of measuring the volume of the liquids shall be in accordance with particulars in the table as shown below.

Types of System of Measuring Volume of Liquids	Accuracy Classes
- System of Meter for Pipeline Transportation	Class 0.3

Types of System of Measuring Volume of Liquids	Accuracy Classes
<ul style="list-style-type: none"> - System of Measuring Volume of Fuel Oil in Petrol Stations - System of Measurement Permanently Installed in Tanker or System of Measurement Permanently Installed in Mobile Tank for Liquids with Dynamic Viscosity not Exceeding 20 mPa.s at Atmospheric Pressure - System of Measuring Volume of Cargo Ship, Railway and Truck Transportations - System of Measuring Volume of Aviation Fuel - System of Measuring Volume of Milk - System of Measuring Volume of Vegetable Oil - System of Measuring Volume of Nectar Obtained from Plants - System of Measurement of Fuel Oil Liquid 	Class 0.5
<ul style="list-style-type: none"> - System of Measuring Volume of Liquefied Petroleum Gas in Petrol Stations - System of Measuring Volume of Liquefied Petroleum Gas - System of Measurement of Liquids with Dynamic Viscosity Exceeding 1000 mPa.s - System of Measuring Volume of Lubricating Oil - System of Measurement of Maximum Flowrate not Exceeding 20 Litres per Hour or not Exceeding 20 Kilograms per Hour 	Class 1.0

Article 20. The maximum permissible errors for providing the initial verification and the subsequent verification of the meter for the liquids under the system of measuring the volume of the liquids shall be in accordance with the following stipulations.

(1) When the test volume weighs 2 liters, 2 kilograms or more, it shall provide both positive and negative sides of the maximum permissible errors of the volume as displayed at the metering conditions or the volume as displayed at the base conditions conforming to the following table.

	Maximum Permissible Errors		
	Accuracy Class 0.3	Accuracy Class 0.5	Accuracy Class 1.0
Meter Installed in System of Measuring Volume of Liquids (A)	0.3%	0.5%	1.0%
Meter not Installed in System of Measuring Volume of Liquids (B)	0.2%	0.3%	0.6%

(2) When the test volume is less than 2 litres or 2 kilograms, it shall provide both positive and negative sides of the maximum permissible errors of the volume as displayed at the metering conditions or the volume as displayed at the base conditions conforming to the following table.

Test Volume (litre or kilogram)		Maximum Permissible Errors of System of Measuring Volume of Liquids					
		Class 0.3		Class 0.5		Class 1.0	
0.02 to 0.1	A	1.2	ml	2	ml	4	ml
			g				g
	B	0.8	ml	1.2	ml	2.4	ml
			g				g
0.1 to 0.2	A	0.012 x MMQ	l	0.02 x MMQ	l	0.04 x MMQ	l
			kg				kg
	B	0.008 x MMQ	l	0.012 x MMQ	l	0.024 x MMQ	l
			kg				kg
0.2 to 0.4	A	2.4	ml	4	ml	8	ml
			g				g
	B	1.6	ml	2.4	ml	4.8	ml
			g				g
0.4 to 1.0	A	0.006 x MMQ	l	0.01 x MMQ	l	0.02 x MMQ	l
			kg				kg
	B	0.004 x MMQ	l	0.006 x MMQ	l	0.012 x MMQ	l
1.0 to 2.0	A	6	ml	10	ml	20	ml
			g				g
	B	4	ml	6	ml	12	ml
			g				g

(3) As for the meter installed in the system of measuring the volume of the liquids, the minimum specified quantity deviation (E_{min}) shall be as follows:

(a) When the minimum measured quantity (MMQ) is 2 litres, 2 kilograms or more

$$E_{min} = (2 \times MMQ) \times (A/100)$$

When A is the maximum permissible error in the table under (1) corresponding to line A.

(b) When the minimum measured quantity (MMQ) is less than 2 litres or 2 kilograms, the minimum specified quantity deviation (E_{min}) shall be twice as much as the value in the table under (2) corresponding to line A.

(4) As for the meter not installed in the system of measuring the volume of the liquids, the minimum specified quantity deviation (E_{min}) shall be as follows:

(a) When the minimum measured quantity (MMQ) is 2 litres, 2 kilograms or more

$$E_{min} = (2 \times MMQ) \times (B/100)$$

When B is the maximum permissible error in the table under (1) corresponding to line B.

(b) When the minimum measured quantity (MMQ) is less than 2 litres or 2 kilograms, the minimum specified quantity deviation (E_{min}) shall be twice as much as the value in the table under (2) corresponding to line B.

(5) The maximum permissible errors of the test volume in any cases shall be less than one of the followings whose value is higher.

(a) the maximum permissible errors as specified in (1) and (2) and

(b) the minimum specified quantity deviation (E_{min})

(6) As for the system of measuring the volume of the liquids at accuracy Class 0.3 or Class 0.5, when the measured liquid temperature is lower than -10 degrees Celsius or higher than 50 degrees Celsius, the maximum permissible errors at accuracy Class 1.0 shall be applied.

(7) As for any errors of the meter with every flowrate in the same side, there shall be at least one value not exceeding half of the maximum permissible errors.

(8) The range of error for the system of measuring the volume of the liquids shall not exceed half of the range of maximum permissible errors.

(9) The maximum permissible errors might be set higher or lower than those as stipulated above if the accuracy of the meter is tested by using different kinds of liquids other than the liquids which are designated to be measured by this meter in accordance with stipulations as made by the Minister.

(10) As for the measurement result of the volume of the liquids having the volume of not less than 5 times as much as the minimum measured quantity of the system of measuring the volume of the liquids, the meter shall provide the difference of the value of the measured volume of the consecutive measurement of equal volume by which the highest value minus the lowest one and the result shall not exceed two fifth of the maximum permissible errors under (1) which corresponds to line A.

Article 21. The system of the meter for the fuel oil in petrol stations shall have the following additional characteristics.

(1) It shall be designed in the way that the ratio of the maximum flowrate and the minimum flowrate is no less than 10:1. In addition, after installation and being in service, such ratio shall not lower than 5:10.

(2) Prior to discharging the fuel oil, the indicating device to display the value of volume and the total purchase price indicating device shall display the zero value.

(3) When the electricity source for the operation of the electronic system of measuring the volume of the liquids fails, the meter for the fuel oil shall further display the value of the measurement result of the volume and the total purchase price uninterruptedly for at least 5 minutes. In this regard, the meter shall not be able to run the operation of discharge.

(4) As for the multi-systems of measuring the volume of the liquids which share the same indicating device, such multi-systems shall not be able to work at the same time.

(5) In case of the system of measuring the volume of the liquids with the maximum flowrate not exceeding 3.6 cubic meters per hour, the minimum flowrate as measured in the system shall not exceed 5 litres.

(6) The meter for the fuel oil in petrol stations with the ancillary and associated devices, i.e. a vending machine by putting coins, inserting a banknote or a credit card, shall have the following additional characteristics.

(a) The vending machine by putting coins, inserting a banknote or a credit card shall be equipped with the pre-setting mechanism for stopping the discharge of the fuel oil which is installed at the meter.

(b) The vending machine by putting coins, inserting a banknote or a credit card shall be equipped with the indicating device to display all the money which the machine receives when there is the discharge of the oil in each time, such a device is installed on the body of the machine in an area which can be easy to read and clear to see.

Article 22. The system of the meter for the liquefied petroleum gas shall have the following additional characteristics.

(1) The meter for retail shall be designed in the way that the ratio of the maximum flowrate and the minimum flowrate is no less than 5:1. In addition, after installation and being in service, such ratio shall not lower than 2.5:1.

(2) The system shall be equipped with the unit maintaining a state of liquid in order to maintain a state of the liquefied petroleum gas throughout the measuring period. And if the unit can be adjusted, there shall be a tamper-evident seal to prevent unauthorized alterations after adjustment.

(3) If the system of measuring the volume of the liquids is equipped with an automatic temperature compensation device, it shall have the following functions.

(a) The display and printing of the value of the volume measurement at any temperatures shall be made the value of the volume at the base conditions. The indicating device or the printing device shall clearly display the value of volume, and it shall be obvious that the discharged volume is turned into the value of the volume at the base conditions.

(b) There shall be a technique that can shut down the operation of the automatic temperature compensation device, so that the meter can display and print the value of the measured volume at the metering conditions.

(c) The automatic temperature compensation device shall measure the temperature of the liquid inside the unit of measuring the liquid, in the position of an entrance pipe or an exit pipe adjacent to the meter.

(d) The automatic temperature compensation device shall provide a space for a tamper-evident seal to prevent its removal from the system of measuring the volume of the liquids as well as the prevention of any modifications.

(e) The thermometer which cooperates with the automatic temperature compensation device shall provide the most diminutive measurement for at least 0.5 degrees Celsius.

(f) There shall be a space for putting the thermometer adjacent to the entrance or exit position of the meter.

(4) As for the system of the meter for liquefied petroleum gas in petrol stations, the designated base temperature is 15 degrees Celsius.

(5) The provisions under Article 21 (2), (3), (4) and (5) shall be applied to the system of the meter for liquefied petroleum gas in petrol stations, *mutatis mutandis*.

Article 23. The system of the meter for the milk shall have the following additional characteristics.

(1) There shall be a fume or air eliminator or other automatic system to prevent fume or air from entering into the meter while measuring.

(2) A storing unit shall be set with a static reference liquid level for the measurement in each time. The aforesaid reference liquid level can be located either in the fume or air eliminator or in a separately particular tank. The liquid level shall not vary exceeding twice as much as the minimum specified quantity deviation (E_{\min}) throughout a period of the measurement of volume.

(3) The reference liquid level either in the fume or air eliminator or in the separately particular tank shall be able to be inspected by a level peephole or a liquid level sensor.

(4) If the system of the meter for the milk requires a certain amount of liquid to set the system in order to have the full liquid in the measurement system, the aforesaid amount of liquid shall be displayed in a datasheet.

(5) There shall be an automatic system keeping the pressure condition at the exit channel of the meter which is higher than an outside atmospheric pressure.

(6) The printing device (if any) for retail or minor purchase shall be equipped with the system preventing consecutive purchase – sale. And the next purchase – sale can be made after the printing device is reset to zero.

Article 24. The system of the meter permanently installed in a tanker or the system of the meter permanently installed in a mobile tank for the liquids with dynamic viscosity not exceeding 20 mPa.s at atmospheric pressure shall have the following additional characteristics.

(1) The tank may be divided into either separate sections or not.

(2) If the tank is divided into separate sections,

(a) in each section of the tank, separate valves for opening and closing are required for each section,

(b) a piping system in each section of the tank shall not be interconnected with one another.

(3) An anti-swirl device shall be installed in the tank.

(4) The indicating device shall be equipped with the zero setting device according to Article 14 (5).

(5) The printing device (if any) shall print the value after the completion of discharge, and shall be able to print again for the new value after being reset to zero for the next discharge.

Article 25. The meter for the liquids shall display the following details.

(1) The system of measuring the volume of the liquids shall clearly and indelibly display the following details.

- (a) a year of production,
- (b) the minimum measured quantity,
- (c) the minimum flowrate and the maximum flowrate,
- (d) the minimum and maximum pressures of the liquids,
- (e) the temperature range of the measured liquids,
- (f) the range of viscosity or the type of product as used,
- (g) the accuracy class of the system of measuring the volume of the liquids.

(2) After being installed and ready for service, the meter for retail with the maximum flowrate being equal to 100 litres per minute upward shall clearly display the minimum flowrate and the maximum flowrate on the meter. The minimum flowrate shall not exceed 20% of the maximum flowrate.

(3) If several meters operate by sharing the same components, it is required to display the specification of each component in the system, and the specifications may be jointly displayed in the same datasheet.

Article 26. The term of verification of the system of the meter for the liquids shall be in accordance with particulars in the table as shown below.

Meters for Liquids	Term of Verification (from the date of providing the verification)
- System of Meter for Pipeline Transportation	2 Years
- System of Measuring Volume of Fuel Oil - System of Measuring Volume of Fuel Oil in Petrol Stations or for Wholesale - System of Measuring Volume of Aviation Fuel Oil - System of Measurement Permanently Installed in Tanker or System of Measurement Permanently Installed in Mobile Tank for the Liquids with Dynamic Viscosity not Exceeding 20 mPa.s at Atmospheric Pressure	2 Years

Meters for Liquids	Term of Verification (from the date of providing the verification)
<ul style="list-style-type: none"> - System of Measuring Volume of Milk - System of Measuring Volume of Vegetable Oil - System of Measuring Volume of Nectar Obtained from Plants 	
<ul style="list-style-type: none"> - System of Meter for Liquefied Petroleum Gas - System of Measuring Volume of Liquefied Petroleum Gas in Petrol Stations or for Wholesale - System of Measurement of Liquids with Dynamic Viscosity Exceeding 1000 mPa.s - System of Measurement of Lubricating Oil Liquid - System of Measurement of Maximum Flowrate not Exceeding 20 Litres per Hour or not Exceeding 20 Kilograms per Hour 	2 Years

The system of the meter for the liquids under paragraph one which is certified by a repairer shall have the term of verification for sixty days as from the date of providing the verification.

This shall be enforced henceforth.

Given on the 2nd Day of October B.E. 2562 (2019)

Jurin Laksanawisit

Minister of Commerce