

## Notification of the Ministry of Commerce

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

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In order to prescribe the type and characteristic of the direct mass flow meter 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 direct mass flow meter, 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.<sup>1</sup>

**Article 2.** In this Notification :

“Liquids” mean the following substances :

- 1) fuel oil,
- 2) lubricating oil,
- 3) liquefied petroleum gas;

“Gas in Vapor State” means the natural gas which is a hydrocarbon mixture primarily consisting of methane, stored in high-pressure storage vessel in the form of compressed vapor to be used as fuel for vehicles, Liquefied Natural Gas (LNG) is not included;

“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;

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<sup>1</sup> Published in the Government Gazette, Volume 136, Special Part 276 d, Page 27, dated 11 November B.E. 2562 (2019).

“Base Conditions” mean the states of the liquids or the gas in a vapor state which are measured, whereby the measured volumes of the liquids or the gas in a vapor state 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 kilopascal;

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

“Mass Measuring System” means the system comprising the direct mass flow meter, 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;

“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;

“Minimum Measured Quantity : MMQ” means the minimum volume which the system of measuring the volume of the liquids or the gas in a vapor state can measure accurately, except for the followings:

(1) as for the system of measuring the volume of the liquids used to discharge the liquids or the system of measuring the volume of the gas in a vapor state used to discharge the gas in a vapor state, the minimum measured quantity is the minimum volume that can be discharged in the system;

(2) as for the system of measuring the volume of the liquids used to store the liquids or the system of measuring the volume of the gas in a vapor state used to store the gas in a vapor state, the minimum measured quantity is the minimum volume that can be stored in the system;

“Flowrate :  $Q$ ” means the volume of the liquids or the gas in a vapor state 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 liquids or of the gas in a vapor state 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 Error” means the value of the maximum difference of the value of the deviation as measured;

“Minimum Specified Quantity Deviation :  $E_{min}$ ” means the maximum permissible error for the measurement of the minimum volume that can be measured by the system.

#### Title 1

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

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**Article 3.** The direct mass flow meter whose system is designed to continuously measure the internal mass flow of pipe system and display the result of mass flow measurement directly, 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 the direct mass flow meter for cryogenic liquid.

## Title 2

Type of Direct Mass Flow Meter  
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**Article 4.** The direct mass flow meter is the meter designed to directly indicate the value of the mass of the liquids or the gas in a vapor state flowing through the meter without depending on any associated devices or data indicating properties of the liquids or the gas in a vapor state at the time of measurement from the source outside the system.

There is one type of the direct mass flow meter, namely Coriolis – Type Mass Flow Meter.

## Title 3

Characteristic, Detail of Materials Used for Manufacture,  
Maximum Permissible Error and Term of Verification  
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## Chapter 1

## General Provisions

**Article 5.** The direct mass flow meter 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 direct mass flow meter shall be produced permanently. In addition, it shall not be simply used as a tool of fraud.

The direct mass flow meter 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 direct mass flow meter 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 direct mass flow meter 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 19.

The maximum permissible errors for the examination of the used meter shall be subject to the stipulation in Article 20.

**Article 9.** The direct mass flow meter shall have the indicating device in a satisfactory manner and in a sufficient number for operation.

**Article 10.** The display of the value of the direct mass flow meter shall have the following characteristics.

(1) 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 is the printing device, the value of printing shall be consistent with the value of displaying.

(2) 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 direct mass flow meter shall be made to be easy to read, clear and indelible.

**Article 12.** The direct mass flow meter 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 direct mass flow meter, 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 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  
Direct Mass Flow Meter

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**Article 14.** The mass measuring system shall have the following characteristics.

(1) It is required to have the ancillary and associated devices whose characteristics are as follows:

(a) in case of the measurement of the liquids, a fume or air eliminator or other automatic system to prevent fume or air from entering into the meter while measuring is compulsory;

(b) valves or other systems preventing the liquids or the gas in a vapor state from flowing back into the meter are compulsory as well.

(2) The ratio between the maximum flowrate and the minimum flowrate of the mass measuring system are as follows:

(a) in case of the liquefied petroleum gas or the gas in a vapor state, the ratio must be no less than 5 : 1;

(b) in case of other liquids, the ratio must be no less than 10 : 1.

(3) The direct mass flow meter adjustment is required for the adjusting the ratio between the displayed volume and the volume of the liquids or the gas in a vapor state as really measured by the measurement system of the meter. A shortcut piping system is prohibited to be used in adjustment and there shall be a tamper-evident seal to prevent later adjustment.

(4) Indicating Device

(a) The main indicating device shall be provided.

(b) The indicating device shall display the name or symbol of the unit of measurement.

(c) The principal scale mark shall display the value in the form  $1 \times 10^k$ ,  $2 \times 10^k$  or  $5 \times 10^k$ , whereby k is a positive or negative whole number or zero.

(d) The principal scale mark shall not exceed 0.5% of the minimum measured quantity.

(e) As for the digital indicating device, at least 1 digit number shall be displayed farthest to the right with a decimal point (.) or a comma sign (,) placed between integer part and fractional part. In addition, at least 1 digit of the integer shall be displayed before the decimal point and all fractional numbers shall be displayed after the decimal point. Finally, to indicate no quantity, a figure "0" can be displayed at the farthest to the right without any signs.

(f) As for the indicating device, the zero setting shall be done correctly whether by automatic zero setting or not, except for the indicating device of the meter installed in a pipeline transportation system.

(g) The zero setting of the indicating device shall have the following characteristics.

1) 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.

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

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

4) After the completion of zero setting, the indicating device shall accurately display the value of the volume of the liquids or the gas in a vapor state without any deviations, and it shall display the zero value only.

(5) The price calculating device shall correctly display the price per unit corresponding with its product type before every discharge.

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

**Article 15.** The direct mass flow meter 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 of the liquids or the gas in a vapor state 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 volume of the liquids or the gas in a vapor state as discharged 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 volume of the liquids or the gas in a vapor state as discharged shall be in a specified scope.

(2) There shall be the value adjustment device for minimizing the value of deviation.

(a) The adjustment of the ratio between the volume displayed by the meter and the volume of the liquids or the gas in a vapor state as actually measured shall be made not exceeding 0.1%.

(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.

(3) 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 or the gas in a vapor state, 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 or the gas in a vapor state 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 or the gas in a vapor state. Besides, a space for a tamper-evident seal shall be provided to prevent the aforesaid external signal connection.

**Article 16.** The discharge pipe and valve in the mass measuring system shall have the following characteristics.

(1) The liquids or the gas in a vapor state which have already been measured the mass shall not leak out from a measuring 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 or the gas in a vapor state shall flow through the only single discharge channel.

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

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

**Article 17.** In the case where the mass measuring system is equipped with the printing device or a cash register, the printing device or the cash register shall have the following characteristics.

(1) The scale mark shall correspond with the indicating device.

(2) The printing of measurement result shall correspond with the result shown in the indicating device.

(3) The printing of measurement result shall be done after the measuring process is completed.

(4) The printing of measurement result shall include the details as follows:

(a) the total volume of the discharge,

(b) the unit price of the product,

(c) the total purchase price,

(d) the product type indicated by name, symbol, acronym or code,

(e) the date, month and year of sale

**Article 18.** The minimum measured quantity (MMQ) shall be determined by the producer.

**Article 19.** The maximum permissible errors for providing the initial verification and the subsequent verification of the mass measuring system shall be as follows.

(1) If the test volume exceeds twice as much as the minimum measured quantity at the temperature, pressure and flowrate as specified in Article 22, it shall provide both positive and negative sides of the maximum permissible errors of the weight as displayed at the metering conditions or the volume of the liquids or the gas in a vapor state as displayed at the base conditions conforming to the following table.

	Maximum Permissible Errors		
	Liquids Excluding Liquefied Petroleum Gas	Liquefied Petroleum Gas	Gas in Vapor State
Meter Installed in Mass Measuring System (A)	0.5%	1.0%	1.5%
Meter not Installed in Mass Measuring System (B)	0.3%	0.6%	1.0%

(2) If the test volume does not exceed twice as much as the minimum measured quantity at the temperature, pressure and flowrate as specified in Article 22, it shall provide both positive and negative sides of the maximum permissible errors of the weight as displayed at the time of measurement or the volume of the liquids or the gas in a vapor state as displayed at the base conditions as follows.

(a) As for the meter installed into the mass measuring system, the maximum permissible error shall be equal to

$$(2 \times \text{MMQ}) \times (A/100)$$

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

(b) As for the meter not installed into the mass measuring system, the maximum permissible error shall be equal to

$$(2 \times \text{MMQ}) \times (B/100)$$

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

(3) As for the errors in replication of the test volume in the mass flow measurement of the liquids or the gas in a vapor state, if the test volume is no less than 5 times as much as the minimum measured quantity at the temperature, pressure and flowrate as specified in Article 22, the difference between the highest and lowest values of the test volumes which are the same and consistent as displayed at the metering conditions or the volume of the liquids or the gas in a vapor state as displayed at the base conditions shall have the values of weight conforming to the following table.

	Errors in Replication		
	Liquids Excluding Liquefied Petroleum Gas	Liquefied Petroleum Gas	Gas in Vapor State
A	0.3%	0.6%	1.0%
B	0.2%	0.4%	0.6%

(4) As for the ranges of error of the test volume in the mass flow measurement, if the test volume is no less than 5 times as much as the minimum measured quantity at the temperature, pressure and flowrate as specified in Article 22, its weight shall not exceed the ranges specified in the following table.

	Ranges of Error in Mass Flow Measurement Result		
	Liquids Excluding Liquefied Petroleum Gas	Liquefied Petroleum Gas	Gas in Vapor State
A	0.5%	0.5%	1.0%

The gas in a vapor state to be used in the meter test shall be the gas in a vapor state in the same kind as the gas to be actually measured, or the gas whose physical properties are close or equal to the gas to be actually measured, or the gas in a vapor state or the liquid as designated by the Central Bureau.

**Article 20.** The maximum permissible errors for the inspection of the meter which is installed in the mass measuring system when in service shall correspond to the designated ranges in the following table.

	Maximum Permissible Errors for Inspection		
	Liquids Excluding Liquefied Petroleum Gas	Liquefied Petroleum Gas	Gas in Vapor State
A	1.0%	2.0%	2.0%

**Article 21.** The mass measuring system in petrol stations providing the liquefied petroleum gas and the gas in a vapor state shall have the following additional characteristics.

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

(2) If there is the mechanism for stopping the discharge,

(a) the mechanism shall stop the discharge accurately, and in the case where the meter has the pre-setting device, upon stopping the discharge, the indicating device shall display the volume of the discharge and the purchase price to be the same as the value as preset;

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

(3) There shall be the zero setting device for the indicating device to display the value of volume as discharged and for the price indicating device.

(4) Prior to discharging the liquefied petroleum gas or the gas in a vapor state, the indicating device to display the value of volume as discharged and the total purchase price indicating device shall display the zero value.

(5) In case of the failure of the electricity source for the operation of the electronic mass measuring system, the direct mass flow meter shall further display the discharge volume and the total purchase price uninterruptedly for at least 5 more minutes. And the meter will not be able to operate the discharge unless it is reset to zero.

(6) For multi-mass measuring systems sharing the same indicating device, such indicating device shall display the discharge volume via the only one single system.

**Article 22.** The mass measuring system shall clearly and indelibly display the following details.

(1) a year of production,

(2) the minimum flowrate and the maximum flowrate,

(3) the maximum pressure at which the meter can operate,

(4) the range of temperature at which the meter can operate,

(5) the range of viscosity or the type of product as used,

(6) the minimum measured quantity,

(7) the rated operating conditions,

(8) In the case where there are other limitations, the display of such limitations shall be made.

**Article 23.** The direct mass measuring system shall have the term of verification for two years as from the date of providing the verification.

The direct measuring system 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 2<sup>nd</sup> Day of October B.E. 2562 (2019)

Julin Laksanawisit

Minister of Commerce