Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments (recast) (Text with EEA relevance)

ANNEX VI

THERMAL ENERGY METERS (MI-004)

The relevant requirements of Annex I, the specific requirements and the conformity assessment procedures listed in this Annex, apply to thermal energy meters defined below, intended for residential, commercial and light industrial use.
DEFINITIONS

A thermal energy meter is an instrument designed to measure the thermal energy which, in a thermal energy exchange circuit, is given up by a liquid called the thermal energy-conveying liquid.

A thermal energy meter is either a complete instrument or a combined instrument consisting of the sub-assemblies, flow sensor, temperature sensor pair, and calculator, as defined in Article 4(2), or a combination thereof

θ	=	the temperature of the thermal energy-conveying liquid;
θ_{in}	=	the value of θ at the inlet of the thermal energy exchange circuit;
θ_{out}	=	the value of θ at the outlet of the thermal energy exchange circuit;
$\Delta\theta$	=	the temperature difference θ_{in} — θo_{ut} with $\Delta_{\theta} \geq 0$;
θ_{max}	=	the upper limit of θ for the thermal energy meter to function correctly within the MPEs;
θ_{min}	=	the lower limit of θ for the thermal energy meter to function correctly within the MPEs;
$\Delta\theta_{max}$	=	the upper limit of $\Delta\theta$ for the thermal energy meter to function correctly within the MPEs;
$\Delta\theta_{min}$	=	the lower limit of $\Delta\theta$ for the thermal energy meter to function correctly within the MPEs;
q	=	the flow rate of the thermal energy conveying liquid;
q_s	=	the highest value of q that is permitted for short periods of

		time for the thermal energy meter to function correctly;
q_p	=	the highest value of q that is permitted permanently for the thermal energy meter to function correctly;
q_i	=	the lowest value of q that is permitted for the thermal energy meter to function correctly;
P	=	the thermal power of the thermal energy exchange;
P_s	=	the upper limit of P that is permitted for the thermal energy meter to function correctly.

SPECIFIC REQUIREMENTS

1. **Rated operating conditions**

The values of the rated operating conditions shall be specified by the manufacturer as follows:

1.1. For the temperature of the liquid: θ_{max}, θ_{min},

— for the temperature differences: $\Delta\theta_{max}$, $\Delta\theta_{min}$,

subject to the following restrictions:

$$\Delta\theta_{max} / \Delta\theta_{min} \geq 10$$

; $\Delta\theta_{min}$ = 3 K or 5 K or 10 K.

1.2. For the pressure of the liquid: The maximum positive internal pressure that the thermal energy meter can withstand permanently at the upper limit of the temperature.

1.3. For the flow rates of the liquid: q_s, q_p, q_i, where the values of q_p and q_i are subject to the following restriction:

$$q_p / q_i \geq 10$$

.

1.4. For the thermal power: P_s.

2. **Accuracy classes**

The following accuracy classes are defined for thermal energy meters: 1, 2, 3.

3. **MPEs applicable to complete thermal energy meters**

The maximum permissible relative errors applicable to a complete thermal energy meter, expressed in percent of the true value for each accuracy class, are:

— For class 1:

$$E = E_f + E_t + E_c$$

, with E_f, E_t, E_c according to points 7.1 to 7.3.

— For class 2:

$$E = E_f + E_t + E_c$$

, with E_f, E_t, E_c according to points 7.1 to 7.3.

— For class 3:

$$E = E_f + E_t + E_c$$

, with E_f, E_t, E_c according to points 7.1 to 7.3.

The complete thermal energy meter shall not exploit the MPEs or systematically favour any party.

4. **Permissible influences of electromagnetic disturbances**

4.1. The instrument shall not be influenced by static magnetic fields and by electromagnetic fields at mains frequency.

4.2. The influence of an electromagnetic disturbance shall be such that the change in the measurement result is not greater than the critical change value as laid down in requirement 4.3 or the indication of the measurement result is such that it cannot be interpreted as a valid result.

4.3. The critical change value for a complete thermal energy meter is equal to the absolute value of the MPE applicable to that thermal energy meter (see point (3).

5. **Durability**

After an appropriate test, taking into account the period of time estimated by the manufacturer, has been performed, the following criteria shall be satisfied:

5.1. Flow sensors: The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed the critical change value.

5.2. Temperature sensors: The variation of the measurement result after the durability test, when compared with the initial measurement result, shall not exceed 0,1 °C.

6. **Inscriptions on a thermal energy meter**

— Accuracy class
— Limits of flow rate
— Limits of temperature
— Limits of temperature difference
— Place of the flow sensor installation: flow or return
— Indication of the direction of flow

7. **Sub-assemblies**

The provisions for sub-assemblies may apply to sub-assemblies manufactured by the same or different manufacturers. Where a thermal energy meter consists of sub-assemblies, the essential requirements for the thermal energy meter apply to the sub-assemblies as relevant. In addition, the following apply:

7.1. The relative MPE of the flow sensor, expressed in %, for accuracy classes:

— Class 1:

$$E_f = (1 + 0{,}01\ q_p / q)$$

, but not more than 5 %,

— Class 2:

$$E_f = (2 + 0{,}02\ q_p / q)$$

, but not more than 5 %,

— Class 3:

$$E_f = (3 + 0{,}05\ q_p / q)$$

, but not more than 5 %,

where the error E_f relates the indicated value to the true value of the relationship between flow sensor output signal and the mass or the volume.

7.2. The relative MPE of the temperature sensor pair, expressed in %:

—

$$E_t = (0{,}5 + 3 \times \Delta\theta_{min} / \Delta\theta)$$

,

where the error E_t relates the indicated value to the true value of the relationship between temperature sensor pair output and temperature difference.

7.3. The relative MPE of the calculator, expressed in %:

—

$$E_c = (0{,}5 + \Delta\theta_{min} / \Delta\theta)$$

,

where the error E_c relates the value of the thermal energy indicated to the true value of the thermal energy.

7.4. The critical change value for a sub-assembly of a thermal energy meter is equal to the respective absolute value of the MPE applicable to the sub-assembly (see points 7.1, 7.2 or 7.3).

7.5. Inscriptions on the sub-assemblies

Flow sensor:	Accuracy class
	Limits of flow rate
	Limits of temperature
	Nominal meter factor (e.g. litres/pulse) or corresponding output signal
	Indication of the direction of flow
Temperature sensor pair:	Type identification (e.g. P_t 100)
	Limits of temperature
	Limits of temperature difference
Calculator:	Type of temperature sensors — Limits of temperature — Limits of temperature difference — Required nominal meter factor (e.g. litres/pulse) or corresponding input signal coming from the flow sensor — Place of the flow sensor installation: flow or return

PUTTING INTO USE

8.

(a) Where a Member State imposes measurement of residential use, it shall allow such measurement to be performed by means of any Class 3 meter.

(b) Where a Member State imposes measurement of commercial and/or light industrial use, it is authorised to require any Class 2 meter.

(c) As regards the requirements under points 1.1 to 1.4, Member States shall ensure that the properties be determined by the utility or the person legally designated for installing the meter, so that the meter is appropriate for the accurate measurement of consumption that is foreseen or foreseeable.

CONFORMITY ASSESSMENT

The conformity assessment procedures referred to in Article 17 that the manufacturer can choose between are:

B + F or B + D or H1.