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Thermal energy meters - Part 1: General requirements

Thermische Energiemessgeräte - Teil 1: Allgemeine Anforderungen

Compteurs d'énergie thermique - Partie 1 : Prescriptions générales

Ta slovenski standard je istoveten z: **prEN 1434-1**

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17.200.20	Instrumenti za merjenje temperature	Temperature-measuring instruments

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English Version

Thermal energy meters - Part 1: General requirements

Compteurs d'énergie thermique - Partie 1 : Prescriptions générales

Thermische Energiemessgeräte - Teil 1: Allgemeine Anforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 176.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 1434-1) has been prepared by Technical Committee CEN/TC 176 “Thermal energy meters”, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

This document supersedes EN 1434-1:2015+A1:2018.

EN 1434, *Thermal energy meters* consists of the following parts:

— *Part 1: General requirements*

— *Part 2: Constructional requirements*

— *Part 3: Data exchange and interfaces*[1)]

— *Part 4: Pattern approval tests*

— *Part 5: Initial verification tests*

— *Part 6: Installation, commissioning, operational monitoring and maintenance*

In comparison to EN 1434-1:2015+A1:2018, the following changes have been made:

— the wording “flow straightener” has been changed to “flow conditioner” in the whole document;

— subclause 12.5 “Hints for disposal instructions” was replaced by the enlarged, new subclause 12.5 “Information required when a heat meter is taken out of service for recycling and/or”.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

1) EN 1434-3 is maintained by CEN/TC 294.

1 Scope

This document specifies the general requirements for thermal energy meters. Thermal energy meters are instruments intended for measuring the energy which in a heat-exchange circuit is absorbed (cooling) or given up (heating) by a liquid called the heat-conveying liquid. The thermal energy meter indicates the quantity of thermal energy in legal units.

Electrical safety requirements are not covered by this document.

Pressure safety requirements are not covered by this document.

Surface mounted temperature sensors are not covered by this document.

This document covers meters for closed systems only, where the differential pressure over the thermal load is limited.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 1434-2:2020,[2] *Thermal energy meters — Part 2: Constructional requirements*

prEN 1434-4:2020,[3] *Thermal energy meters — Part 4: Pattern approval test*

EN 60751, *Industrial platinum resistance thermometers and platinum temperature sensors (IEC 60751)*

EN 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements (IEC 61010-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
response time
$\tau_{0,5}$
time interval between the instant when flow or temperature difference is subjected to a specified abrupt change and the instant when the response reaches 50 % of the step value

3.2
fast response meter
meter suitable for heat exchanging circuits with rapid dynamic variations in the exchanged heat

Note 1 to entry: See also Annex C.

[2] Under development
[3] Under development

3.3
rated voltage
U_n
voltage of the external power supply required to operate the thermal energy meter, conventionally the voltage of the AC mains supply

3.4
rated operating conditions
conditions of use, giving the range of values of influence quantities, for which the metrological characteristics of the instrument are within the specified maximum permissible errors

3.5
reference conditions
set of specified values of influence factors, fixed to ensure valid inter-comparison of results of measurements

3.6
influence quantity
quantity, which is not the subject of the measurement, but which influences the value of the measurement and or the indication of the measuring instrument

3.7
influence factors
influence quantity having a value within the rated operating conditions

3.8
disturbance
influence quantity having a value outside the rated operating conditions

3.9
types of errors

3.9.1
error (of indication)
indication of the measuring instrument minus the conventional true value of the measurand

3.9.2
intrinsic error
error of a measuring instrument determined under reference conditions

3.9.3
initial intrinsic error
error of a measuring instrument as determined once prior to performance tests and durability tests

3.9.4
durability error
difference between the intrinsic error after a period of use and the initial intrinsic error

3.9.5
maximum permissible error
MPE
highest values of the error (positive or negative) permitted

3.10
Types of faults

3.10.1
fault
difference between the error of indication and the intrinsic error of the instrument

3.10.2
transitory fault
momentary variations in the indication, which cannot be interpreted, memorized or transmitted as measurements

3.10.3
significant fault
fault greater than the absolute value of the MPE and not being a transitory fault

Note 1 to entry: If the MPE is ± 2 % then the significant fault is a fault larger than ± 2 %.

3.11
reference values of the measurand
RVM
specified value of the flow rate, the outlet temperature and the temperature difference, fixed to ensure valid intercomparison of the results of measurements

3.12
conventional true value
quantity value attributed by agreement to a quantity for a given purpose

Note 1 to entry: A conventional true value is, in general, regarded as sufficiently close to the true value for the difference to be insignificant for the given purpose.

EXAMPLE A true value is the heat coefficient according to Annex A.

3.13
meter model
different sizes of thermal energy meters or sub-assemblies having a family similarity in the principles of operation, construction and materials

3.14
electronic device
device employing electronic elements and performing a specific function

3.15
electronic element
smallest physical entity in an electronic device which uses electron hole conduction in semi-conductors, or electron conduction in gases or in a vacuum

3.16
qualifying immersion depth of a temperature sensor
immersion depth over which the sensor measures with an accurate temperature value

Note 1 to entry: The conditions to define the qualified immersion depth are written in prEN 1434-4:2020, 7.4.4.1.

3.17
self-heating effect
increase in temperature signal that is obtained by subjecting each temperature sensor of a pair to a continuous power dissipation of 5 mW when immersed to the qualifying immersion depth in a water bath, having a mean water velocity of 0,1 m/s

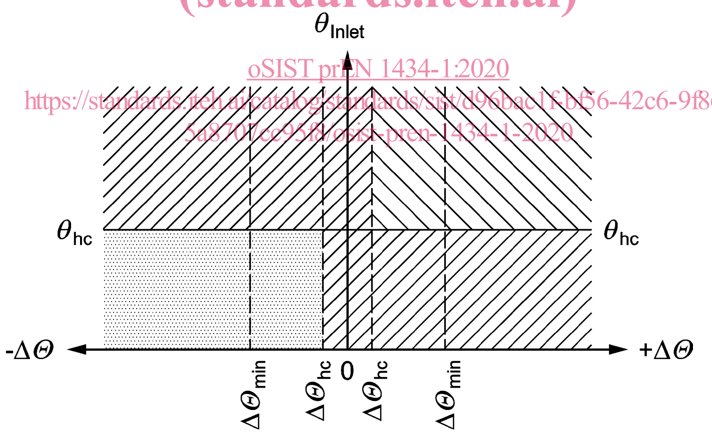
3.18
thermal energy meter
instrument intended for measuring the energy which in a heat-exchange circuit is absorbed (cooling) or given up (heating) by a liquid called the heat-conveying liquid

3.19
meters other than for heating

3.19.1
cooling meter
thermal energy meter designed for cooling applications at low temperatures, normally covering the temperature range 2 °C to 30 °C and $\Delta\Theta$ up to 20 K

3.19.2
bifunctional meters for change-over systems between heating and cooling
instrument measuring heating and cooling energy in two separate registers

Note 1 to entry: In other directives and requirements, bifunctional meters are called combined meters.



Key

No energy recording

Heating

Cooling

θ_{Inlet} temperature of the inlet respectively outlet

θ_{hc} switching temperature for heating/cooling (e.g. 25 °C)

$\Delta\Theta_{\text{hc}}$ starting temperature difference of energy accumulation (e.g. 0,1 K)

$\Delta\Theta_{\text{min}}$ minimum approved temperature difference (e.g. 3 K)

Figure 1 — Example for function of heating and cooling register

3.20
flow direction
direction of the liquid going through the system from inlet to outlet

Note 1 to entry: The inlet is for the heating case the hot side and for the cooling case the cold side.

Note 2 to entry: In the literature the word “flow” is also being used for “inlet”, and the word “return” is also being used for “outlet”.

Note 3 to entry: Different temperature values for θ_{hc} for heating and cooling applications may also occur.

3.21
electrical pulse
electrical signal (voltage, current or change in resistance), that departs from an initial level for a limited duration of time and ultimately returns to the original level

3.22
pulse output and input devices

3.22.1
pulse output device
functional part of flow sensor, calculator or auxiliary devices

EXAMPLE Remote displays or input devices of control systems.

3.22.2
pulse input device
functional part of flow sensor, calculator or auxiliary devices

EXAMPLE Pulse input for external water meter.

3.23
maximum admissible temperature
maximum temperature of the heat conveying liquid the meter can withstand in combination with the maximum admissible working pressure and the permanent flow rate for short periods of time (< 1 h/day; < 200 h/year) without a significant fault after the exposure to this maximum admissible temperature

3.24
durability
characteristic of a measuring instrument to keep the metrological characteristics over time (e.g. to fulfil the double of MPE), provided that it is properly installed, maintained and used within the permissible environmental conditions

3.25
long life flow sensor
flow sensor designed to have a longer lifetime than a normal flow sensor, which typically has a durability of 5 years under the specified operating conditions

3.26
user interface
interface forming part of the instrument that enables information to be passed between a human user and the measuring instrument or its components (e.g. display)

3.27
communication interface
electronic, optical, radio or other technical interface that enables information via correct transceiving of at least thermal energy to be passed between measuring instruments, sub-assemblies or external devices

3.28
meter for smart metering
thermal energy meter with the capability of data communication and support of smart metering functionalities

Note 1 to entry: Data could be transmitted via user interface and/ or communication interface in fixed time intervals and/or on request.

Note 2 to entry: For more information on smart meters, see standard series EN 13757 and CEN/CLC/ETSI/TR 50572.

3.29
registration device
optional additional device fitted to the meter as an integral part or separate device, in order to register the amount of thermal energy accumulated in additional registers during periods, depending on conditions, e. g. flow rate, inlet or outlet temperatures, temperature differences or time points

3.30
register
component of a registration device which contains accumulated or actual values e. g. thermal energy, volume, maximum flow rate, power or temperature

3.31
interval register
register which contains frequently accumulated or copied values used for registration of billing purposes and/ or for controlling processes

Note 1 to entry: During consecutive time intervals values could be achieved by copying from an accumulating main register which contains actual values of e.g. thermal energy or volume.

Note 2 to entry: During consecutive time intervals the measured process values of flow rate and/or temperature could be additionally stored.

3.32
maximum flow
highest rate of flow which is expected at operating conditions

Note 1 to entry: For the limits of flow rates, see 5.3.

3.33
heat-conveying liquids other than water (mixed fluids, e.g. water glycol mixtures)
mixture of water with a defined proportion of another fluid e.g. mono-ethylene or propylene glycol

Note 1 to entry: Typical heat conveying liquids on the market consist of a base liquid (e.g. water with propylene glycol) and additives to prevent corrosion or counteract chemical reactions like acid formation. The liquids often differ in their constitution regarding their additives

Note 2 to entry: For many topics within this document the liquids can be classified in liquid categories according to their base liquid (e.g. mono ethylene-based products, propylene glycol-based products, ethanol-based products)

4 Types of instruments

4.1 General

For the purposes of this European Standard, thermal energy meters are defined either as complete instruments or as combined instruments.

4.2 Complete instrument

A thermal energy meter, which does not have separable sub-assemblies as defined in 4.5.

4.3 Combined instrument

A thermal energy meter, which has separable sub-assemblies as defined in 4.5.

4.4 Hybrid instrument

A thermal energy meter, which for the purpose of pattern approval and verification can be treated as a combined instrument as defined in 4.3 or combinations between sub-assemblies. However, after verification, its sub-assemblies shall be treated as inseparable.

NOTE Hybrid instruments are often called “compact instruments”.

4.5 Sub-assemblies of a thermal energy meter, which is a combined instrument

4.5.1 General

The flow sensor, the temperature sensor pair and the calculator or a combination of these.

4.5.2 Flow sensor

A sub-assembly through which the heat-conveying liquid flows, at either the inlet or outlet of a heat-exchange circuit, and which emits a signal, which is a function of the volume or the mass or the volumetric or mass flow rate.

4.5.3 Temperature sensor pair

A sub-assembly (for mounting with or without pockets), which senses the temperatures of the heat-conveying liquid at the inlet and outlet of a heat-exchange circuit.

4.5.4 Calculator

A sub-assembly, which receives signals from the flow sensor, and the temperature sensors and calculates and indicates the quantity of thermal energy exchanged.

4.6 Equipment under test (EUT)

A sub-assembly, a combined sub-assembly or a complete meter subject to a test.

5 Rated operating conditions

5.1 Limits of temperature range

5.1.1 The upper limit of the temperature range, θ_{max}, is the highest temperature of the heat conveying liquid, at which the thermal energy meter shall function without the maximum permissible errors being exceeded.