# SLOVENSKI STANDARD
# SIST EN 1434-6:2016+A1:2019

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**Merilniki toplote - 6. del: Vgradnja, zagon, nadzor in vzdrževanje (vključno z dopolnilom A1)**

Thermal energy meters - Part 6: Installation, commissioning, operational monitoring and maintenance

Thermische Energiemessgeräte - Teil 6: Einbau, Inbetriebnahme, Überwachung und Wartung



Compteurs d'énergie thermique - Partie 6 : Installation, mise en service, surveillance et maintenance



**Ta slovenski standard je istoveten z:** **EN 1434-6:2015+A1:2019**

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**SIST EN 1434-6:2016+A1:2019** **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

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# EN 1434-6:2015+A1

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ICS 17.200.10

Supersedes EN 1434-6:2015

English Version

# Thermal energy meters - Part 6: Installation, commissioning, operational monitoring and maintenance

Compteurs d'énergie thermique - Partie 6 : Installation, mise en service, surveillance et maintenance

Thermische Energiemessgeräte - Teil 6: Einbau, Inbetriebnahme, Überwachung und Wartung

This European Standard was approved by CEN on 5 September 2015 and includes Amendment 1 approved by CEN on 5 February 2018.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.



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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 (EN 1434-6:2015+A1:2019) has been prepared by Technical Committee CEN/TC 176 "Thermal energy meters", the secretariat of which is held by SIS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2019, and conflicting national standards shall be withdrawn at the latest by August 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 5 February 2018.

This document supersedes A1 EN 1434-6:2015 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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.

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



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 1434-6:2007, the following changes have been made:

— special cases for combined A1 thermal energy meters A1 are added;

— additional functionalities for smart metering applications are added;

— installation requirements added for A1 thermal energy meters A1 which are located next to cables like data communication cables and mains supply cables;

— installation requirement changed for 4-wire connections;

— cooling meters are added.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

# 1 Scope

This European Standard specifies commissioning, operational monitoring and maintenance and applies to [A1] thermal energy meters [A1]. [A1] Thermal energy meters [A1] 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 [A1] thermal energy meter [A1] indicates the quantity of heat in legal units.

Electrical safety requirements are not covered by this European Standard.

Pressure safety requirements are not covered by this European Standard.

Surface mounted temperature sensors are not covered by this European Standard.

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

# 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[A1] EN 1434-1:2015+A1:2018, *Thermal energy meters — Part 1: General requirements* [A1]

# 3 Terms and definitions



For the purposes of this document, the terms and definitions given in [A1] EN 1434-1:2015+A1:2018 [A1] and the following apply.



**[A1] 3.1**
**thermal energy system**
heating or cooling installations of the dwelling or premises, including the exchange circuit, the thermal energy meter, the associated fittings and the electrical equipment

Note 1 to entry: The heating or cooling systems typically commences and finishes at the two connections to the heat or cooling mains.

**3.2**
**thermal energy mains**
heat or cooling suppliers distribution pipes to which the consumer's installation is connected

**3.3**
**inlet and outlet limbs**
pipes connecting the heating or cooling system to the thermal energy mains

**3.4**
**primary circuit**
circuit hydraulically connected to the thermal energy mains [A1]

**3.5**
**secondary circuit**
circuit hydraulically separated from the primary circuit

**3.6**
**competent authority**
persons or organizations charged with the responsibility for the [A1] thermal energy meter [A1] and/or its installation

# 4 Requirements

## 4.1 Design requirements

**4.1.1** When designing the [A1] heating and cooling system [A1], the [A1] thermal energy meter [A1] manufacturer meter specification and installation instructions shall be followed.

For DN 40 and smaller, it is possible to use short direct sensors. To achieve good temperature sensitivity, direct sensors should be installed without temperature pockets. Temperature pockets should only be used when required for safety reasons.

**4.1.2** To avoid unnecessary systematic error the temperature sensors shall be placed directly before and after the thermal load. If the differential pressure between the sensors is too high this systematic error might be too large.

For typical systematic negative error as a function of differential pressure and temperature difference, see Table 1.

**Table 1 — Typical systematic negative error as a function of differential pressure and temperature difference**



| Diff in bar | Temperature difference in K | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 5 | 10 | 20 | 30 | 40 | 50 | 60 |
| 0,5 | 0,2 | 0,2 | 0,1 | 0,1 | 0,1 | 0 | 0 | 0 |
| 1 | *0,5* | *0,4* | 0,3 | 0,2 | 0,1 | 0,1 | 0,1 | 0,1 |
| 2 | *0,9* | *0,7* | *0,5* | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 |
| 3 | *1,4* | *1,1* | *0,8* | *0,5* | 0,3 | 0,2 | 0,2 | 0,2 |
| 4 | *1,8* | *1,5* | *1,0* | *0,6* | *0,4* | 0,3 | 0,3 | 0,2 |
| 5 | *2,3* | *1,9* | *1,3* | *0,8* | *0,5* | *0,4* | 0,3 | 0,3 |
| 6 | *2,7* | *2,2* | *1,5* | *0,9* | *0,6* | *0,5* | *0,4* | 0,3 |
| 7 | *3,2* | *2,6* | *1,9* | *1,1* | *0,7* | *0,6* | *0,5* | *0,4* |
| 8 | *3,6* | *3,0* | *2,0* | *1,2* | *0,9* | *0,7* | *0,5* | *0,4* |
| 9 | *4,1* | *3,3* | *2,3* | *1,4* | *1,0* | *0,7* | *0,6* | *0,5* |
| 10 | *4,5* | *4,0* | *2,5* | *1,5* | *1,1* | *0,8* | *0,7* | *0,5* |



The values are shown as fraction of the maximum permissible error for the calculator. The values below the marked line are higher than 1/3rd of the maximum permissible error for the heat calculator. If the resulting error is higher than 1/3rd of the maximum permissible error, it is recommended to change the installation to have smaller differential pressure.

NOTE In cases where flows from two different loads with different temperatures (e.g. for space heating and domestic warm water) are merged together just before the temperature sensor, the optimum position for the sensor is after the flow sensor.

**4.1.3** For bifunctional meters for change-over systems between heating and cooling additional requirements are necessary to ensure the correct switching over function between the heating and cooling register. These requirements are:

— the lowest operating temperature in the inlet pipe at heating conditions shall be at least 3 °C higher than any specified optional switching over temperature $\theta_{hc}$,

— the highest operating temperature in the inlet pipe at cooling conditions shall be at least 3 °C lower than any specified optional switching over temperature $\theta_{hc}$,

— the minimum temperature difference in heating and cooling application shall be more than 3 K.

NOTE The above mentioned temperature range of at least 3 °C covers the maximum accepted uncertainty in absolute temperature and the cable resistance.

A temperature sensor with smaller tolerances than 2 °C for measuring absolute temperature is recommended.

## 4.2 Installation requirements

The [A1] thermal energy meter [A1] shall be installed in accordance with the manufacturer's instructions.

Before installation, the circuit into which the flow sensor is to be installed shall be thoroughly flushed to remove debris. The strainer, where fitted, shall be cleaned.

The [A1] thermal energy meter [A1] shall be protected from the risk of damage by shock and vibration induced by the surroundings at the place of installation.



The [A1] thermal energy meter [A1] shall not be subjected to undue stresses caused by pipes and fittings.



The pipe lines of the heating system up and downstream of the [A1] thermal energy meter [A1] shall be adequately anchored.

[A1] Thermal energy meters [A1] designed to operate from an AC mains supply shall be wired in accordance with wiring regulations applicable.

The AC mains power supply shall be secured against accidental interruption. However, circuit protection shall be incorporated according to the state of the art, to safely disconnect the device when electrical problems occur.

Measurement signal leads shall not be laid directly alongside other leads such as mains supply cables, low voltage supply cables and data communication cables and shall be independently supported. The separation between those groups shall not be less than 50 mm. Unless the calculator under installation was type tested according to the latest version of EN 1434-4, it is recommended to install cables and calculators with a distance of at least 60 cm to strong electromagnetic fields, e.g. frequency controlled pumps and similar high energy mains cables.

Mains and external signal cables longer than 10 m shall in areas where lightning is frequent be protected with an external lightning surge protection at the cable entrance to the building.

Each signal lead between temperature sensors and calculator shall be one continuous length without joints except 4-wire connection solutions which are approved.

Signal circuits between parts of a [A1] thermal energy meter [A1] shall be so installed as to deter unauthorized interference and disconnection.

Precautions shall be taken to prevent damage to the [A1] thermal energy meter [A1] by unfavourable hydraulic conditions (cavitation, surging, water hammer).

When the installation of the heat and cooling meters is complete, it shall be inspected and approved by representatives of the competent authority in accordance with established procedures and the inspection shall be documented.

Installation shall be done according to national legislation on legal metrology.

## 4.3 [A1] Thermal energy meter [A1] commissioning

### 4.3.1 General

The responsibility for the carrying out of each of the inspection phases is not necessarily restricted to one person or one authority depending on the national legislation on legal metrology, but however arranged, the following points shall be addressed and responsibilities defined.

### 4.3.2 Certification check

Before commissioning commences it shall be ascertained firstly, that the correct [A1] thermal energy meter [A1] has been installed by comparing the [A1] thermal energy meter [A1] manufacturer's type and size designation against the system specification. Secondly, it shall be checked that the [A1] thermal energy meter [A1], if a complete instrument, bears the correct pattern approval mark and, if a combined instrument, that each of the meters sub-assemblies bear the pattern approval marks stipulated in the pattern approval document for the [A1] thermal energy meter [A1] installed.

### 4.3.3 Installation check

At least the following points shall be checked:



— Is the flow sensor mounted in the correct position and with the correct flow direction?

— Does the temperature sensor fit correctly into the pocket (pockets shorter than 140 mm shall be marked "EN 1434" or dimensions checked)?



— Are the temperature sensors correctly installed?

— Is the [A1] thermal energy meter [A1] installed at a safe distance from sources of electromagnetic interference (switchgear, electric motors, fluorescent lights)?

— Where called for, has the [A1] thermal energy meter [A1] been correctly earthed?

— The specified protection class (IP) has to be ensured: Is every cable diameter within the minimum and maximum diameter as specified by the manufacturer?

— Are the gaskets dedicated to the application (e.g. temperature range, pressure, durability, medium)?

— Are the accessories correctly installed according to the installation instructions of the manufacturer and operator?

— Is the [A1] thermal energy meter [A1] seen to be functioning when the heating system starts operating?

### 4.3.4 [A1] Thermal energy meter [A1] security

At the completion of commissioning, the [A1] thermal energy meter's [A1] protective devices shall be sealed by representatives of the competent authority. For any further adjustment of the meter or for replacement of sub-assemblies, batteries, etc., it will thus be necessary to break one or more seals.

If a seal has to be broken then the renewal shall be conducted in conformity with the national legislation of legal metrology.

# Annex A
(informative)

# [A1] Thermal energy meter [A1] installation

## A.1 General

This annex gives recommendations for the installation of [A1] thermal energy meters [A1] into the heating system of which they form a component.

It includes reference to the quality of the heat conveying liquid and contains recommendations of direct concern to the distributor of heat, the building owner and the final consumer.

## A.2 Criteria for the selection of a [A1] thermal energy meter [A1]

The type, size, accuracy and environmental class of a [A1] thermal energy meter [A1] is determined according to the operating and environmental conditions of the installation, taking into account in particular the following:

a) pressure of the heat conveying liquid;

b) physical and chemical characteristics of the heat conveying liquid;

c) acceptable pressure loss across the [A1] thermal energy meter [A1];

d) accuracy requirements;

e) temperature ranges in inlet and outlet limbs to the heating system and the system temperature difference;

f) expected maximum and minimum flow rate of the heat conveying liquid;

g) required thermal power of the heating system;

h) nature of the flow rate through the [A1] thermal energy meter [A1], whether constant, variable or intermittent;

i) requirements concerning the electrical supply to the [A1] thermal energy meter [A1];

j) special requirements of the space around the [A1] thermal energy meter [A1] for ease of reading, security installation and servicing of the meter;

k) requirements for connections, i.e. flanges, fittings and meter dimensions.



## A.3 Quality of the heat conveying liquid

### A.3.1 General

[A1] Thermal energy meters [A1] in general are constructed to withstand variations in the chemical constituents and the acidity or alkalinity of the heat conveying liquid. However, the presence of solids in suspension and their deposition onto the surfaces of the passages of the [A1] thermal energy meter [A1] or their effect on the moving parts of a mechanical flow sensor causes degradation of the performance with time.

Solids may be present as products of corrosion from the materials of which the heating system and the supply mains are constructed. They may also be created, in the case of hot water systems, within the circuit by the action of heat on the chemicals contained in the water.

### A.3.2 Primary water quality

The quality of the water in primary circuits is in general high and closely controlled because of its boiler origin. Hence [A1] thermal energy meters [A1] in primary circuits tend to function in a satisfactory environment. Water quality should be according to CEN/TR 16911.

### A.3.3 Secondary water quality

[A1] Thermal energy meters [A1] functioning in secondary circuits, experience shows, are more prone to problems arising from the water quality. Water quality should be according to CEN/TR 16911.

When purchasing or specifying [A1] thermal energy meters [A1] the owner of the meter should consult with the meter manufacturer to determine any particular water requirements.

## A.4 [A1] Thermal energy meter [A1] flow circuit design

Circuit design should be arranged/modified to ensure efficiency of meter operation and should take account of individual installation requirements.

Typical circuit design layouts are indicated in Figures A.1 to A.7.

To avoid deterioration of the metrological performance of the [A1] thermal energy meter [A1], any pressure controlling device should not be placed between the temperature sensors.



It is also recommended that arrangements are made to permit in-situ checking of [A1] thermal energy meters [A1], for example, a double set of temperature measuring points.



Thermal comfort in smaller dwellings will normally require the use of automatic control devices if optimum energy performance of the installation is to be obtained.

The inlet and outlet temperature sensors and the flow sensors are installed in the same circuit. Where possible, the pipes should have identical dimensions and similar velocity profiles. The two temperature sensors should be mounted in an identical manner.

For temperature measurement, long probes and/or direct sensors are given preference.

Evaluating small circuits therefore could involve consideration of the following aspects:

— heat consumption above the upper limit of flow rate $q_s$;

— heat consumption below the lower limit of flow rate $q_i$;

— dynamic stability considerations.

As a general rule [A1] thermal energy meters [A1] are specified and tested under steady state conditions within the maximum and minimum limits specified by the manufacturer.

When setting up requirements for small circuits the foregoing effects should be considered from a technical and economic viewpoint according to the prescriptions of the manufacturer and of the type examination certificate.

To minimize problems arising from these phenomena the following actions can be taken:

— installation of flow and temperature limiters when $q_s$ may be exceeded;

— employment of [A1] thermal energy meters [A1] with a large measuring range (1:100) when very low flow rates are expected;