SLOVENSKI STANDARD
SIST EN 1434-5:2016+A1:2019

01-april-2019

Nadomešča:
SIST EN 1434-5:2016

Merilniki toplote - 5. del: Preskusi prve overitve (vključno z dopolnilom A1)

Thermal energy meters - Part 5: Initial verification tests

Thermische Energiemessgeräte - Teil 5: Tests für Konformitätsuntersuchungen und Eichungen

Compteurs d'énergie thermique - Partie 5: Essais de vérification initiaux

Ta slovenski standard je istoveten z: EN 1434-5:2015+A1:2019

ICS:

17.200.10	Toplota. Kalorimetrija	Heat. Calorimetry

SIST EN 1434-5:2016+A1:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1434-5:2015+A1

February 2019

ICS 17.200.10

Supersedes EN 1434-5:2015

English Version

Thermal energy meters - Part 5: Initial verification tests

Compteurs d'énergie thermique - Partie 5 : Essais de vérification initiaux

Thermische Energiemessgeräte - Teil 5: Tests für Konformitätsuntersuchungen und Eichungen

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

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.

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

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

Contents

Page

European foreword

This document (EN 1434-5:2015+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 1434-5:2015 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 1434-5:2007, the following changes have been made:

— metrological requirements for smart metering applications are added;

— additional functionalities for smart metering applications are added;

— bath constructions are added;

— tests for cooling applications are added;

— single temperature sensor for smart metering are added;

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

— test for bi-functional meters for change-over between heating and cooling 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 Scope

This European Standard specifies initial verification tests for 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

A1⟩ EN 1434-4:2015+A1:2018, *Thermal Energy meters —Part 4: Pattern approval tests* ⟨A1

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

3 Terms and definitions

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

4 General

Initial verification of a measuring instrument is a series of tests and visual examinations carried out to determine whether an instrument manufactured to replicate a given pattern conforms to that pattern and to regulations, and that its metrological characteristics lie within the limits of the maximum permissible errors. If the instrument passes all tests and examinations, it is given legal character by its acceptance as evidenced by stamping and/or issuance of a certificate of verification.

The provisions of this standard also apply to the re-verification of A1⟩ thermal energy meters ⟨A1.

The instrument shall be tested under rated operating conditions at the extremes and midpoints of its ranges.

Initial verification is divided into metrological, technical and administrative phases.

In tests of a A1⟩ thermal energy meter ⟨A1 as a combined instrument, the flow sensor, the temperature sensors and the calculator shall each be tested separately.

Unless otherwise stated in the certificate of pattern approval, the verification shall be carried out in accordance with this standard.

NOTE Modern A1⟩ thermal energy meters ⟨A1 are mainly equipped with CMOS microprocessors with a very low power consumption, allowing battery operation. Testing and adjusting of this type of meter needs a completely different approach. Until now, almost every meter type needed its own test equipment to handle the manufacturer's specific requirements. This is a very complicated and expensive way for users of several types of meters and for initial verification institutes. The more different types of A1⟩ thermal energy meters ⟨A1 a user has

installed, the more testing equipment he may need. An economical testing of several meters should be possible and an easy adaptation to the existing test bench is of great interest.

Since this problem came up, experts have been researching an acceptable solution to it. Details of one example of an acceptable solution are given in “Normierter Wärmezähler Adapter” (Standardised heat meter adapter) Version 1.5 of September 2000, AGFW Merkblatt 6, Band 2, Frankfurt, Germany.

5 Uncertainty of test equipment

Standards, instruments and methods used in verification shall suit the purpose, be traceable to more precise standards and be part of a reliable calibration programme.

The uncertainties associated with these standards, methods and measuring instruments shall always be known. They shall either:

a) not exceed 1/5 of the MPE (maximum permissible error) of the EUT (equipment under test),

or, if exceeding 1/5 of the MPE,

b) if the uncertainty is higher than 1/5 of MPE, the value of the difference between uncertainty and 1/5 MPE shall be subtracted from MPE, to calculate a new reduced MPE.

It is recommended that option a) is used.

6 Tests to be carried out

6.1 General

If the error determined lies outside the MPE, the test shall be repeated twice. The test is then declared satisfactory if both

— the arithmetic mean of the result of the three tests,

and

— at least two of the test results are within or at the MPE.

The meters shall not exploit the MPE or systematically favour any party. Each individual meter with electronic abilities for adjustments of their error curves, where the errors are aligned into the same sign (±) in the complete measuring range, shall only pass the verification assessment if any of the errors does not exceed half of the MPE. Mechanical meters (e.g. Woltman Turbine Meters) with no abilities by electronic adjustments shall be produced as close as possible to zero error.

For information regarding bath constructions, see 〚A1〛 EN 1434-4:2015+A1:2018 〚A1〛, Annex A. For initial verification tests for temperature sensors the recommended ambient temperature is (23 ± 2) °C.

6.2 Flow sensors

The verification of the flow sensor shall be carried out within each of the following flow rate ranges at a liquid temperature of (50 ± 5) °C for heating applications and (15 ± 5) °C for cooling applications.

a) $q_i \leq q \leq 1{,}2\ q_i$;

b) $0{,}1\ q_p \leq q \leq 0{,}11\ q_p$;

c) $0{,}9\ q_p \leq q \leq 1{,}1\ q_p$.

If the pattern approval certificate so provides, the verification may be carried out with cold water in accordance with the procedures laid down in the certificate.

When testing the flow sensors, the guidelines in the pattern approval certificate shall be followed (e.g. requirements for water conductivity, water temperature, straight inlet/outlet tubes).

To enable rapid testing of the flow sensor, it is customary to bypass the output signal used by the calculator. However, for at least one test, this signal shall be included.

Test of flow sensors shall be done above minimum operation pressure specified by the manufacturer with examination of absence of cavitation.

6.3 Temperature sensor pair

6.3.1 Error in temperature difference

The individual temperature sensors of the temperature sensor pair shall be tested, without their pockets, in the same temperature bath at temperatures within each of the three temperature ranges in Table 1.

Table 1 — Test temperature ranges

Test points	Test temperature range	
θ_1	θ_{min} to $(\theta_{min} + 10K)$	
θ_2	$\frac{\theta_1 + \theta_3}{2} \pm 5K$	
θ_3	$\theta_{max} \leq 150\,°C$	$(\theta_{max} - 10K)$ to θ_{max}
	$\theta_{max} > 150\,°C$	$(\theta_{max} - 20K)$ to θ_{max} but in any case more than 140 °C
NOTE If specified in the pattern approval certificate, variations in the temperature ranges and the number of temperatures are permissible.		

The immersion depth of the sensor under test shall be at least 90 % of the total length.

The determined resistance values shall be used in a system of three equations to calculate the three constants of the temperature/resistance equation of EN 60751 and a curve shall be drawn through the three test points. Thereby the characteristic curve for the temperature sensor is known.

The “ideal” curve using the standard constants of EN 60751 shall be generated. To give the error at any temperature, the “ideal” curve shall be subtracted from the characteristic curve for each temperature sensor.

As a further step, the worst case error of the temperature sensor pair shall be determined over the temperature range and over the temperature difference range specified for the sensors.

For outlet temperatures above 80 °C, only temperature differences over 10 K shall be taken into account.

The error determined as described above shall be within the limits stated in [A1⟩ EN 1434-1:2015+A1:2018 ⟨A1], 9.2.2.2.

When measuring resistance, the current shall be such, that the power dissipation does not exceed 0,2 mW RMS.