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Toplotni števci - 1. del: Splošne zahteve

Heat meters - Part 1: General requirements

Wärmezähler - Teil 1: Allgemeine Anforderungen

Compteurs d'énergie thermique - Partie 1: Prescriptions générales

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Heat meters - Part 1: General requirements

Compteurs d'énergie thermique - Partie 1: Prescriptions générales

Wärmezähler - Teil 1: Allgemeine Anforderungen

This European Standard was approved by CEN on 7 January 2007.

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Foreword

This document (EN 1434-1:2007) has been prepared by Technical Committee CEN/TC 176 “Heat meters”, the secretariat of which is held by DS.

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of an identical text or by endorsement, at the latest by August 2007, and conflicting national standards shall be withdrawn at the latest by August 2007.

This document supersedes EN 1434-1:1997.

The other parts are:

Part 2 - Constructional requirements

Part 3 - Data exchange and interfaces

Part 4 - Pattern approval tests

Part 5 - Initial verification tests

Part 6 - Installation, commissioning, operational monitoring and maintenance

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

1 Scope

This European Standard specifies the general requirements and applies to heat meters, that is to instruments intended for measuring the heat which, in a heat-exchange circuit, is absorbed (cooling) or given up (heating) by a liquid called the heat-conveying liquid. The heat meter 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.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 60751, *Industrial platinum resistance thermometer sensors (IEC 60751:1983 + A1:1986)*

EN 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements (IEC 61010-1:2001)*

3 Types of instrument

3.1 General

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

3.2 Complete instrument

A heat meter, which does not have separable sub-assemblies as defined in 3.5.

3.3 Combined instrument

A heat meter, which has separable sub-assemblies as defined in 3.5.

3.4 Hybrid instrument (often called a "compact" instrument)

A heat meter, which for the purpose of pattern approval and verification can be treated as a combined instrument as defined in 3.3. However, after verification, its sub-assemblies shall be treated as inseparable.

3.5 Sub-assemblies of a heat meter, which is a combined instrument

3.5.1 General

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

3.5.2 Flow sensor

A sub-assembly through which the heat-conveying liquid flows, at either the flow or return 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.

3.5.3 Temperature sensor pair

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

3.5.4 Calculator

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

3.6 Equipment under test (EUT)

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

4 Terms, definitions and symbols

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

4.1
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

4.2
fast response meter
meter suitable for heat exchanging circuits with rapid dynamic variations in the exchanged heat

4.3
rated voltage U_n
voltage of the external power supply required to operate the heat meter, conventionally the voltage of the AC mains supply

4.4
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

4.5
reference conditions
set of specified values of influence factors, fixed to ensure valid inter-comparison of results of measurements

4.6
influence quantity
quantity, which is not the subject of the measurement, but which influences the value of the measurand or the indication of the measuring instrument

4.7
influence factors
influence quantity having a value within the rated operating conditions

4.8
disturbance
influence quantity having a value outside the rated operating conditions

4.9
types of error

4.9.1
error (of indication)
indication of the measuring instrument minus the conventional true value of the measurand

4.9.2
intrinsic error
error of a measuring instrument determined under reference conditions

4.9.3
initial intrinsic error
error of a measuring instrument as determined once prior to performance tests and durability tests

4.9.4
durability error
difference between the intrinsic error after a period of use and the initial intrinsic error

4.9.5
maximum permissible error; MPE
extreme values of the error (positive or negative) permitted

4.10
types of fault

4.10.1
fault
difference between the error of indication and the intrinsic error of the instrument

4.10.2
transitory fault
momentary variations in the indication, which cannot be interpreted, memorized or transmitted as measurements

4.10.3
significant fault
fault greater than the absolute value of the MPE and not being a transitory fault

NOTE If the MPE is ± 2 % then the significant fault is a fault larger than 2 %.

4.11
reference values of the measurand; RVM
specified value of the flow-rate, the return temperature and the temperature difference, fixed to ensure valid intercomparison of the results of measurements

4.12
conventional true value
value of a quantity, which for the purpose of this European Standard is considered as the true value

NOTE 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.

4.13
meter model
different sizes of heat meters or sub-assemblies having a family similarity in the principles of operation, construction and materials

4.14
electronic device
device employing electronic elements and performing a specific function

4.15
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

4.16
qualifying immersion depth of a temperature sensor
immersion depth over which the sensor is considered stable enough for the purpose of this European Standard

4.17
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

4.18
meters other than for heating

4.18.1
cooling meter
heat 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

4.18.1
meters for heating and cooling
instrument measuring heating and cooling energy in two separate registers

4.19
flow direction
is described by the terms flow and return. Flow meaning the forward direction to the system and return meaning output from the system. (Flow/return means high/low temperature for a heat meter but low/high temperature for a cooling meter)

4.20
electrical pulse
electrical signal (voltage, current or resistance), that departs from an initial level for a limited duration of time and ultimately returns to the original level

4.21
pulse output and input device
two types of pulse devices are defined and specified:

a) the pulse output device;

b) the pulse input device.

Both devices are functional parts of flow sensor, calculator or auxiliary devices such as remote displays or input devices of control systems

4.22
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 (< 200 h in the total life time of the unit) without a significant fault after the exposure to this maximum admissible temperature

4.23
Long life flow sensor
flow sensor designed to have a longer lifetime that a normal flow sensor, which typically lasts for 5 years

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 heat meter shall function without the maximum permissible errors being exceeded.

5.1.2 The lower limit of the temperature range, Θ_{min}, is the lowest temperature of the heat-conveying liquid, at which the heat meter shall function without the maximum permissible errors being exceeded.

5.2 Limits of temperature differences

5.2.1 The temperature difference, $\Delta\Theta$, is the absolute value of the difference between the temperatures of the heat-conveying liquid at the flow and return of the heat-exchange circuit.

5.2.2 The upper limit of the temperature difference, $\Delta\Theta_{max}$, is the highest temperature difference, at which the heat meter shall function within the upper limit of thermal power, without the maximum permissible errors being exceeded.

5.2.3 The lower limit of the temperature difference, $\Delta\Theta_{min}$, is the lowest temperature difference, above which the heat meter shall function, without the maximum permissible errors being exceeded.

5.3 Limits of flow-rate

5.3.1 The upper limit of the flow-rate, q_s, is the highest flow-rate, at which the heat meter shall function for short periods (< 1h / day; < 200 h / year), without the maximum permissible errors being exceeded.

5.3.2 The permanent flow-rate, q_p, is the highest flow-rate, at which the heat meter shall function continuously without the maximum permissible errors being exceeded.

5.3.3 The lower limit of the flow-rate, q_i, is the lowest flow-rate, above which the heat meter shall function without the maximum permissible errors being exceeded.

5.4 Limit of thermal power

The upper limit of the thermal power is the highest power at which the heat meter shall function without the maximum permissible errors being exceeded.

5.5 Maximum admissible working pressure; PS

The maximum positive internal pressure that the heat meter can withstand permanently at the upper limit of the temperature range, expressed in bar.