SLOVENSKI STANDARD
SIST EN 835:2002

01-marec-2002

Delilniki stroġkov porabe toplote ogreval ï Naprave brez elektriļ nega napajanja na osnovi izhlapevanja

Heat cost allocators for the determination of the consumption of room heating radiators - Appliances without an electrical energy supply, based on the evaporation principle

Heizkostenverteiler für die Verbrauchswerterfassung von Raumheizflächen - Geräte ohne elektrische Energieversorgung nach dem Verdunstungsprinzip

Répartiteurs de frais de chauffage pour enregistrer les valeurs de consommation de surfaces de corps de chauffe - Appareils sans alimentation en énergie électrique en vertu du principe d'évaporation

Ta slovenski standard je istoveten z: **EN 835:1994**

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems

SIST EN 835:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 835

October 1994

ICS 91.140.10

Descriptors: Metrology, buildings, heating, energy consumption, measuring instruments, temperature measuring instruments, recording apparatus, definitions, equipment specifications, performance evaluation, installation, inspection

English version

Heat cost allocators for the determination of the consumption of room heating radiators - Appliances without an electrical energy supply, based on the evaporation principle

Répartiteurs de frais de chauffage pour enregistrer les valeurs de consommation de surfaces de corps de chauffe - Appareils sans alimentation en énergie électrique en vertu du principe d'évaporation

Heizkostenverteiler für die Verbrauchswerterfassung von Raumheizflächen - Geräte ohne elektrische Energieversorgung nach dem Verdunstungsprinzip

This European Standard was approved by CEN on 1994-10-14. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 171 "Heat cost allocation", the secretariat of which is held by DIN.

This standard includes 2 informative annexes A and B. These parts of the standard are not binding.

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 April 1995, and conflicting national standards shall be withdrawn at the latest by April 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 Introduction

This standard defines heat cost allocators without electrical power supply, based on the evaporation principle which serve to establish the consumption value of a room radiator. It also specifies the minimum requirements for construction, materials, production, installation, function and evaluation of the displayed readings established by these measuring devices.

This standard specifies test procedures to establish the compliance with the stated requirements and gives instruction for the manner and the extent of their realization.

2 Scope and general terms

Heat cost allocators in accordance with this standard are instruments for the registration of the heat output of radiators in consumer units.

Consumer units are dwellings, office buildings, business premises or industrial plants in which the heat is supplied by a common central heating system or by a common district heating connection.

A complete grouping of consumer units is called an account unit.

It could be necessary to divide an account unit into user groups, if an account unit comprises consumer units with typical differences (e.g. technically different types of heating systems or different by way of consumption e.g. industrial plants as opposed to private apartments).

Heat cost allocators only allow the determination of the heat consumption of each radiator in a consumer unit as a share of the total heat consumption of the account unit or user group (see clause 3). It is therefore necessary to determine this total heat consumption either by measuring the consumed fuel quantity or the amount of heat delivered (the latter e.g. by a heat meter).

The condition for correct use of heat cost allocators in accordance with this standard is that they are used in a heating system which

- at the time of installation of the heat cost allocators, corresponds to the state of the art and
- is operated in accordance with the state of the art (see annex A, A.1).

Heat cost allocators in accordance with this standard shall not be used for heating systems where the temperature limits are exceeded, where the rating factor for the thermal power, K_Q, is not clearly specified or where the heating surface is inaccessible. This applies e. g. to following heating systems:

underfloor heating

radiant ceiling heating

flap-controlled radiators

radiators with ventilators

fan-assisted air heaters

bath-tub convectors

heating systems where the radiators attached thereto are operated by steam and

horizontal single pipe heating systems exceeding more than one consumer unit

3 Functional principle

Heat cost allocators in accordance with this standard are measuring devices for the registration of the temperature integral with respect to time. The temperature is the basis for the determination of the thermal output of the radiators on which the heat cost allocators are installed. Heat cost allocators in accordance with this standard, without electrical power supply based on the evaporation principle, use of the characterisic temperatures determining the thermal output only the temperature of the radiator surface (or the temperature of the heat medium). The non-rated displayed reading is the approximate value of the time integral of the measured characteristic temperature of the radiator. This type of construction utilizes the so-called single--sensor method.

The rated displayed reading is obtained from the non-rated displayed reading by multiplication by rating factors, particularly with those for the nominal thermal power of the radiator and those for the thermal contact between the surface and the heat cost allocators (see 4.15). The rated displayed reading is obtained either by reading the heat cost allocators equipped with a product scale directly (see 4.11) or by later conversion of the non-rated displayed reading (see 4.12). The rated displayed reading is an approximation of the heat emitted from the heating surface over the measuring period and consumed by the user.

Thus the rated displayed reading is a measuring result influenced by characteristics of the heat cost allocators, of the radiator, of additional conditions and by factors of uncertainty of the rating factors and the installation. Consequently the measuring deviations (measuring errors) of the recorded heat consumption are not only dependent on the heat cost allocator alone. Thus, heat cost allocators cannot be calibrated in the same way as heat meters.

Because of the described characteristics the measuring result is not related to physical energy units. The rated displayed reading is non-dimensional. It is only a value relative to the sum of the rated displayed readings of the account unit or of the user group. A relative value of a measured rated displayed reading which has been defined in that way has to be understood as a part of the total heat, consumed by the account unit or of the user group. At the end of the measuring period, this value is established separately for every radiator. From the sum of all the rated displayed readings for the radiators of a consumer unit, the above relative value will determine the part of the heat consumption of the respective consumer unit related to the total consumption of the account unit or the user group.

Heat cost allocators consist of at least a casing, an ampoule with the measuring liquid, a reading scale, the installations and the seal. The seal serves to protect against unauthorized manipulation. Each heat cost allocator is a functional unit. Its individual parts are manufactured in compliance with certain tolerances. Thus each part of a particular kind of heat cost allocator (type, make) functions in the same way when used in the same way.

The measuring liquid in the open and transparent ampoule evaporates as a function of the temperature and the duration of the influence of that temperature. After each measuring period (normally 12 months) the old ampoule will be exchanged against a full new one.

4 Definitions

For the purpose of this standard, the following definitions apply:

4.1 Reference condition

For the purpose of determining the rating factors and the c-value, a reference condition must be defined. The reference condition can be freely selected within certain limits.

The reference condition of a radiator is as follows:

- upper flow inlet
- mean heating medium temperature: t_m = 50 °C to 65 °C
- Reference air temperature t_L = (20 ± 2) °C. It shall be measured 0,75 m above the floor and at a distance of 1,5 m from the heating surface in a test chamber with a stable climate.
- Heating medium flow (water flow through the radiator) at t_V / t_R / t_L = 90 °C / 70 °C / 20 °C

where:

t_V is the flow temperature

t_R is the return temperature

4.2 Reference temperature of the measuring liquid

The reference temperature of the measuring liquid is used for the determination of the rating factor K_C (see 4.16.2). The reference temperature is to be determined in the reference condition.

4.3 Design flow and return temperatures - mean design heating medium temperature - design temperature of the measuring liquid

The design flow and return temperatures are the temperatures of the heating medium of the radiators required to reach the design indoor temperature in the heated rooms under steady state conditions at a heat load corresponding to a geographically determined design reference outside temperature. The mean value of the design flow temperature $t_{V,A}$ and the design return temperature $t_{R,A}$ is the mean design heating medium temperature $t_{m,A}$. This temperature is to be determined from the logarithmic mean value of the excess temperatures relating to the reference air temperature of 20 °C. The temperature of the measuring liquid under these conditions is the design temperature of the measuring liquid $t_{FI,A}$.

4.4 Displayed reading

The displayed reading is the reduction of the liquid level in scale graduations, measured from zero on the scale. The displayed reading may be unrated or it can directly represent the rated displayed reading (see 4.5). Interpolation is permissible.

4.5 Rated displayed reading

The rated displayed reading is the displayed reading rated with the rating factors in accordance with 4.16.

4.6 Nominal evaporation

The nominal evaporation is the displayed reading (see 4.4 and 4.5) after 210 days at a measuring liquid temperature of 50 °C.

4.7 Evaporation rate

The evaporation rate v is the rate of the change of the liquid level. It is a function of the temperature and the liquid level. It is given in millimetres per time unit.

4.8 Counting rate

The counting rate R is the rate of the change of the count of display which is expressed in scale graduations per time unit. A non-linear graduation corresponding to the requirements of this standard serves to make the counting rate independent of the liquid level.

4.9 Meter characteristic

The meter characteristic is the relation between the counting rate and the temperature of the measuring liquid.

4. 10 Counting ratio

The counting ratio R_{50} / R_{20} is the quotient of the counting rate at 50 °C and at 20 °C.

4.11 Consumption scale

When the consumption scale is used, each radiator is assigned a scale which takes rating factors into account (see 4.16) causing the displayed reading to represent directly the rated displayed reading.

4.12 Unit scale

If an identical scale is used for the heat cost allocators on all radiators, it shall be referred to as the "unit scale".

Identical displayed readings are obtained from different radiators when the measuring liquid is exposed to the same temperature for the same period of time.

The rating of the displayed readings is carried out by calculation using the rating factors (see 4.16) to obtain rated displayed readings.

4.13 Idle evaporation

Idle evaporation is the evaporation of the measuring liquid at room temperature, without heat output from the radiator.

4.14 Measuring period

The measuring period is the time interval between insertion of the ampoule and the reading with subsequent exchange of the ampoule.

4.15 c-value

The c-value expresses the degree of thermal coupling between the measuring liquid temperature and the temperature of the heating medium. It is defined as a temperature difference ratio according to following equation:

$$c = \frac{t_m - t_{Fl}}{t_m - t_L} \quad \text{or} \quad c = 1 - \frac{\Delta t_{Fl}}{\Delta t} \qquad (1)$$

where:

t_m is the mean heating medium temperature
t_{Fl} is the temperature of the measuring liquid
t_L is the reference air temperature
$\Delta t_{Fl} = t_{Fl} - t_L$ is the excess temperature of the measuring liquid
$\Delta t = t_m - t_L$ is the excess temperature of the heating medium

4.16 Rating factors

The following rating factors convert the displayed readings of the individual heat cost allocators into rated displayed readings in a form suitable for the calculation of the consumption costs.

4.16.1 Rating factor K_Q for the thermal output of the radiator

The rating factor K_Q is the (non-dimensional) numerical value of the nominal thermal output of the radiator which is given in Watt.

The nominal thermal output is the thermal output of a radiator at flow temperature, return temperature and air temperature of 90 °C, 70 °C and 20 °C in a test chamber with a stable temperature. The air temperature has to be measured 0,75 m above the floor at a distance of 1,5 m from the heating surface. If the nominal thermal output of the radiator was established under other temperature conditions, it shall be converted into the above mentioned conditions[1]).

4.16.2 Rating factor K_C for the heat transfer to the measuring liquid

The rating factor K_C takes into account that the heat transfer between the heating medium and the measuring liquid varies according to the different types of radiator surfaces[1]).

K_C is the quotient of the counting rate at the reference temperature of the measuring liquid and at the temperature of the measuring liquid at the radiator operated at the reference condition:

$$K_C = \frac{R_{Reference}}{R_{Rating}} \qquad (2)$$

[1]) If a special type of radiator connection is used which deviates from the reference conditions described in 4.1 or if the casings are connected to the radiator in such a way that they cannot be changed by the user, the rating factors K_Q and K_C shall be determined under these conditions.

4.16.3 Rating factor K_T for rooms with low design indoor temperatures which deviate from the basic reference air temperature

The rating factor K_T takes account of the change of the thermal output and the change in the measuring liquid temperature when the design indoor temperature is less than the reference air temperature at the reference condition.

4.16.4 Resulting rating factor K

The resulting rating factor K is the product of the individual rating factors:

$$K = K_Q \times K_C \times K_T \qquad (3)$$

4.17 Manufacturer

A manufacturer according to this standard is the person or company responsible for the supply and installation of the heat cost allocator.

5 Requirements for the heat cost allocators

5.1 Casing

The mechanical strength and thermal durability of the casing shall be sufficient to prevent any deformations during installation and operation which may impair the intended function.

Heat transport from the heat-conductive section of the casing to the measuring liquid shall be uniform over the full range of the device.

The casing shall not reduce the evaporation rate by more than 15 %.

The ampoule and the scale shall be positioned in the casing in such a way that the deviation between the zero mark on the scale and the set point for the measuring liquid zero level in the ampoule is not more than ± 0,75 mm.

The ampoule shall be enclosed by the casing in such a way that there is no possibility of influence of heat conduction from the outside.

5.2 Ampoule

The materials of the ampoule shall be resistant to the measuring liquid, and shall be sufficiently transparent to allow the liquid level to be read against the scale. When operating, the ampoule shall be open to allow evaporation of the liquid.

The liquid volume, including the over-fill for idle evaporation (see 4.13 and 5.4), shall not exceed 5 cm^3.

The ampoule shall be designed in such a way that the evaporation rate at the level of the zero mark on the scale is no more than four times the evaporation rate at the highest value of the scale.

The ampoules shall be manufactured with tolerances such that the standard deviation of the displayed reading is no more than 2 %.

5.3 Measuring liquid

When filling the ampoule with measuring liquid, deviations of ± 0.5 mm are permitted, based on a liquid temperature of 20 °C.